APPENDIX 14b

Galilee Coal Project
EIS Extracts

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1.1 OVERVIEW

The Galilee Coal Project (Northern Export Facility) (also known as the China First Project), (hereafter referred to as the project) comprises a new coal mine located in the Galilee Basin, Queensland, approximately 30 km to the north of Alpha; a new rail line connecting the mine to coal terminal facilities; and use of coal terminal facilities in the Abbot Point State Development Area (APSDA) and port loading facilities at the Port of Abbot Point.

Figure 1 shows the overall project concept.

Waratah Coal proposes to mine 1.4 billion tonnes of raw coal from its existing tenements, Exploration Permit for Coal (EPC) 1040 and EPC 1079. The mine development involves the construction of four nine Million Tonnes Per Annum (Mtpa) underground long-wall coal mines, two 10 Mtpa open cut pits, two coal preparation plants with raw washing capacity of 28 Mtpa (see Figure 2) .

The annual Run-of-Mine (ROM) coal production will be 56 Mtpa to produce 40 Mtpa of saleable export highly volatile, low sulphur, steaming coal to international markets. At this scale of operation, the capital expense of constructing the required rail and port infrastructure is economically viable over the life of the project.

For the Environmental Impact Statement (EIS), the mine development is defined as the underground and open cut mines, Mine Industrial Area (MIA) and two coal handling and preparation plants (CHPP) and the supporting coal-handling infrastructure through to the train loading facility. The rail component commences at the balloon loop at the mine and ends at the balloon loop adjoining the T4 – T7 coal handling facility at the Abbot Point State Development Area, and includes the 447 km single gauge rail line. Marshalling and maintenance facilities for the rail and rolling stock are included as part of the rail component. The T4 – T7 coal terminal and coal handling facilities are located adjacent to the train unloading facility and includes infrastructure to convey the coal through to the ship loaders. Each of the three components includes numerous auxiliary and administrative infrastructure and these are included in the discussion for each component.

The assessment of the mining construction and operation is detailed throughout Volume 2 of this EIS. This chapter provides a description of the key components comprising the mine development and discusses the construction, operational and decommissioning phases associated with the mine.

1.1.1 LOCATION

The mine development is located approximately 30 km to the northwest of the township of Alpha in central Queensland, and falls within the Barcaldine Regional Shire Council administrative area. Figure 1 shows the location of the mine in the regional context and Figure 2 shows the mine infrastructure arrangement.

1.1.2 TENURE DESCRIPTION

The tenures incorporated into the project are Exploration Permit-Coal (EPC) 1040 and EPC 1079 both which are held by Waratah Coal. Waratah Coal has held a 100% interest in these tenements since 22 June 2006 and 2 November 2007 respectively. These tenures been granted for a five-year conditional term.

EPC 1040 covers 241 sub-blocks (which equates to approximately 725 km^2) adjoining the southern boundary of Mineral Development License (MDL) 285 (held by Hancock Prospecting P/L). EPC 1079 adjoins the western boundary of EPC 1040 as well as MDL 285 and MDL 333 (both held by Hancock Prospecting P/L). Additionally, Waratah Coal has been granted permits EPC 1039 and EPC 1053, which adjoin the northern boundary of MDL 333. The southeastern corner of EPC 1040 is located approximately 7 km to the west of the township of Alpha in central Queensland.

EPC 1079 covers 223 sub-blocks (which equates to approximately 704 km^2) and adjoins the boundaries of other Waratah EPC’s 1039, 1040, 1080, 1105, 1155, 1156, 1157, in addition to MDL 285 and MDL 333 (both held by Hancock Prospecting P/L).

Waratah Coal is in the process of preparing a Mining Lease Application (MLA) for the Project. The area within the MLA consists of the northern part of EPC 1040 and part of the southern section of EPC 1079. The MLA area is shown at Figure 3. The MDL and MLA application areas are shown in Figure 3.

1.1.3 STUDY AREA

The study area for the mine is depicted in Figure 1 and comprises all of EPC 1040 and part of EPC 1079.

1.1.4 EXPLORATION HISTORY

Prior to the recent drilling programs conducted by Waratah Coal, there had been no exploration activity of significance in EPC 1040 or EPC 1079. The Geological Survey of Queensland (GSQ) conducted the only previous drilling in 1974. This comprised two boreholes, drilled alongside the railway line between Jericho and Alpha. These holes were designated Jericho 1 and 2, with the eastern most being Jericho 2. The cored boreholes were part of a petroleum stratigraphic drilling campaign of the eastern part of the Galilee Basin. The aim was to establish a fully cored and wireline logged section of the Upper Paleozoic strata, in order to correlate with fully cored sections of similar age on the Springsure Shelf and in the Denison Trough.

Since the granting of EPC 1040 in 2006, Waratah Coal has carried out an extensive exploration program within the project area. As of December 2009, Waratah Coal developed 295 chip holes with approximately 41,000 m drilled and 122 core holes with approximately 21,000 m drilled. Prior to any mining activities occurring further exploration drilling will occur to better define the coal resource in accordance with Joint Ore Reserves Committee (JORC) requirements for definition of coal reserves.

1.1.5 RESOURCE DESCRIPTION

The Galilee Basin covers an area estimated at 247,000 km^2 in central Queensland. This basin is entirely intracratonic and is naturally filled with Late Carboniferous to Middle Triassic sediments. These rocks are dominantly fluvial in origin with minor glacial material developed at the base of the succession. The aerial extent of the Galilee Basin is shown in Figure 4.

The Galilee Basin contains extensive coal deposits, however these are largely very deep, except for the eastern margin where the project lies. The Jurassic – Cretaceous Eromanga Basin, almost entirely unconformably overlies the Galilee Basin. The eastern margin of the Galilee Basin is the only exposed component of the Permo – Triassic sequence.

The principal tectonic elements of the Galilee Basin include:

- the east-west trending Barcaldine Ridge, which subdivides the basin into the northern and southern components. The Maneroo Platform and the Beryl Ridge, which results in the development of the western depression termed the Lovelle Depression and the eastern depression termed the Koburra Trough, subdivide the northern component of the basin. The Pleasant Creek Arch. divides the southern part of the basin into the western Powell Depression and the Springsure Shelf.
- The project area lies on the northern side of the Barcaldine Ridge. These features are shown in Figure 5.
- The project area is primarily overlaid by Quaternary alluvial; however, there is no outcrop of coal seams in the region.

Figure 1. Project Regional Concept

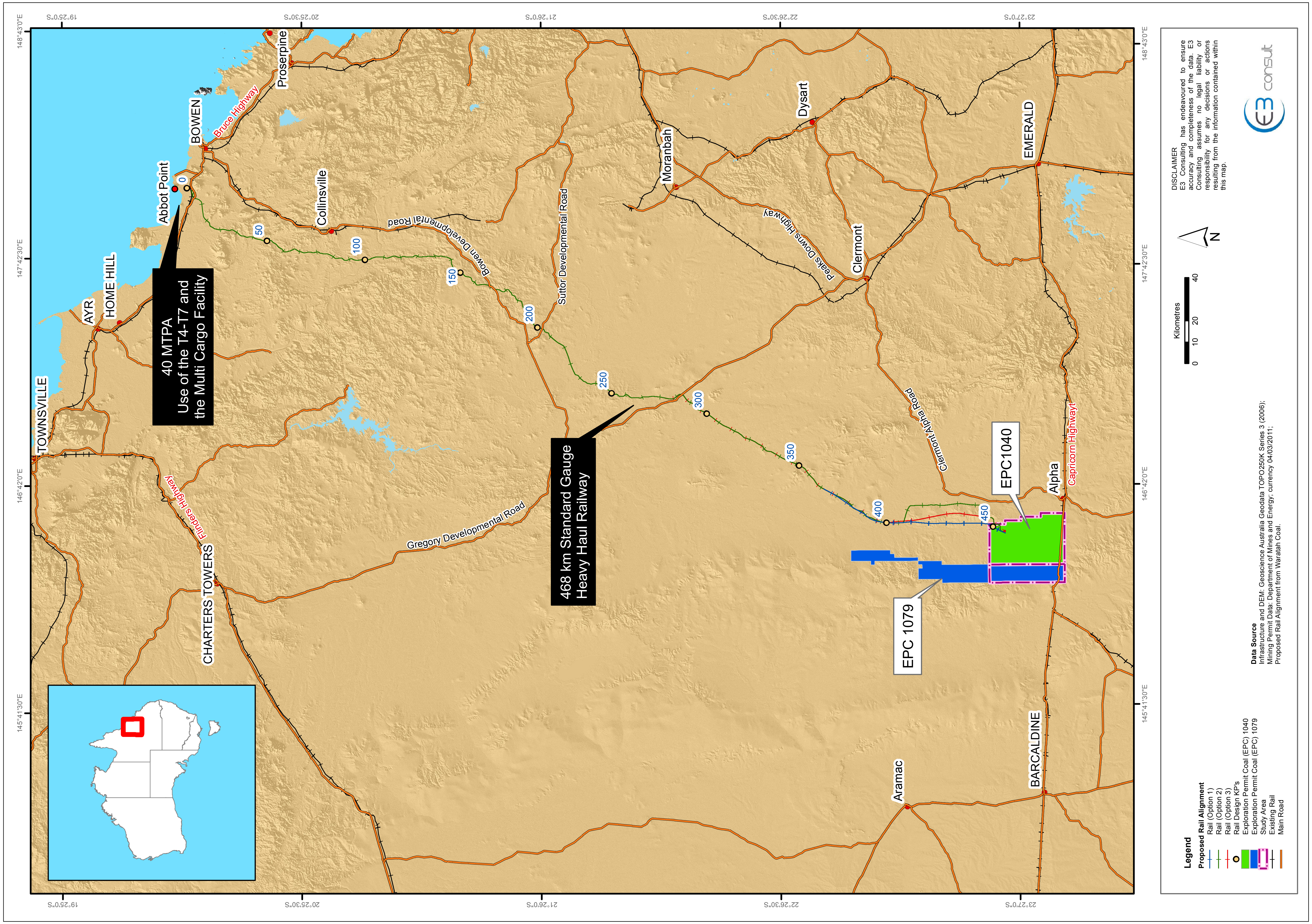


Figure 2. Mine Infrastructure Arrangement

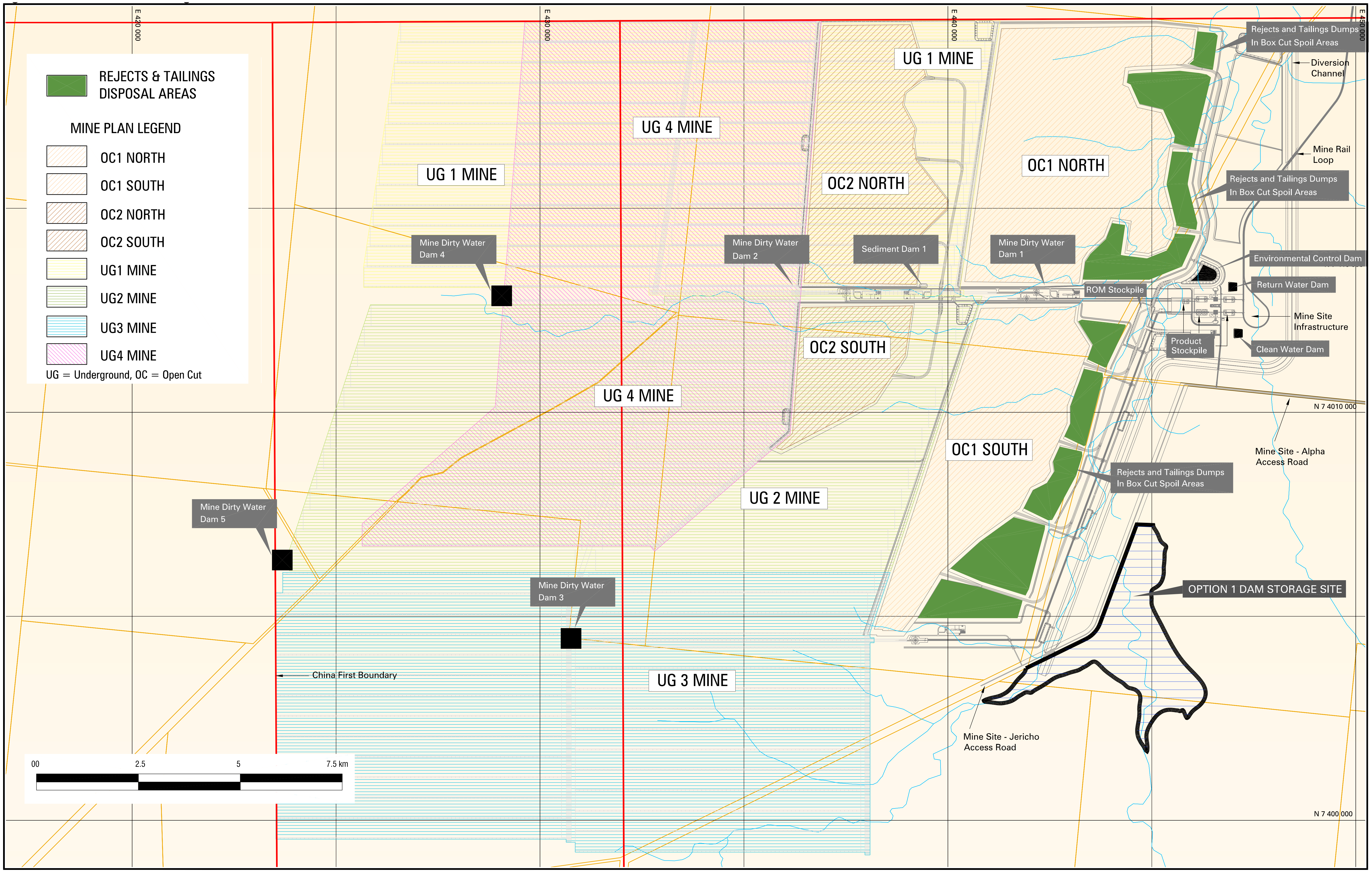


Figure 3. Mining Lease Application Area

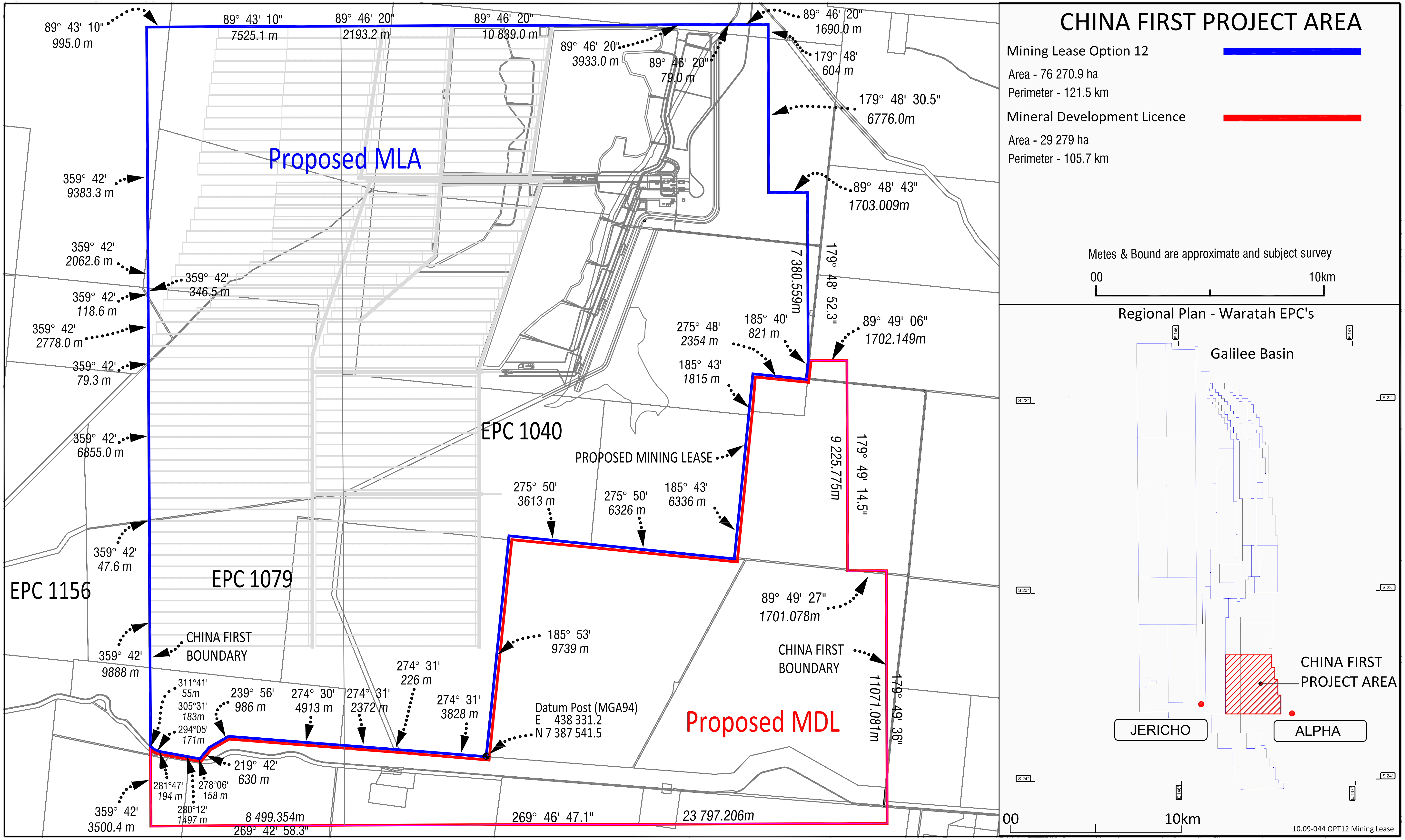
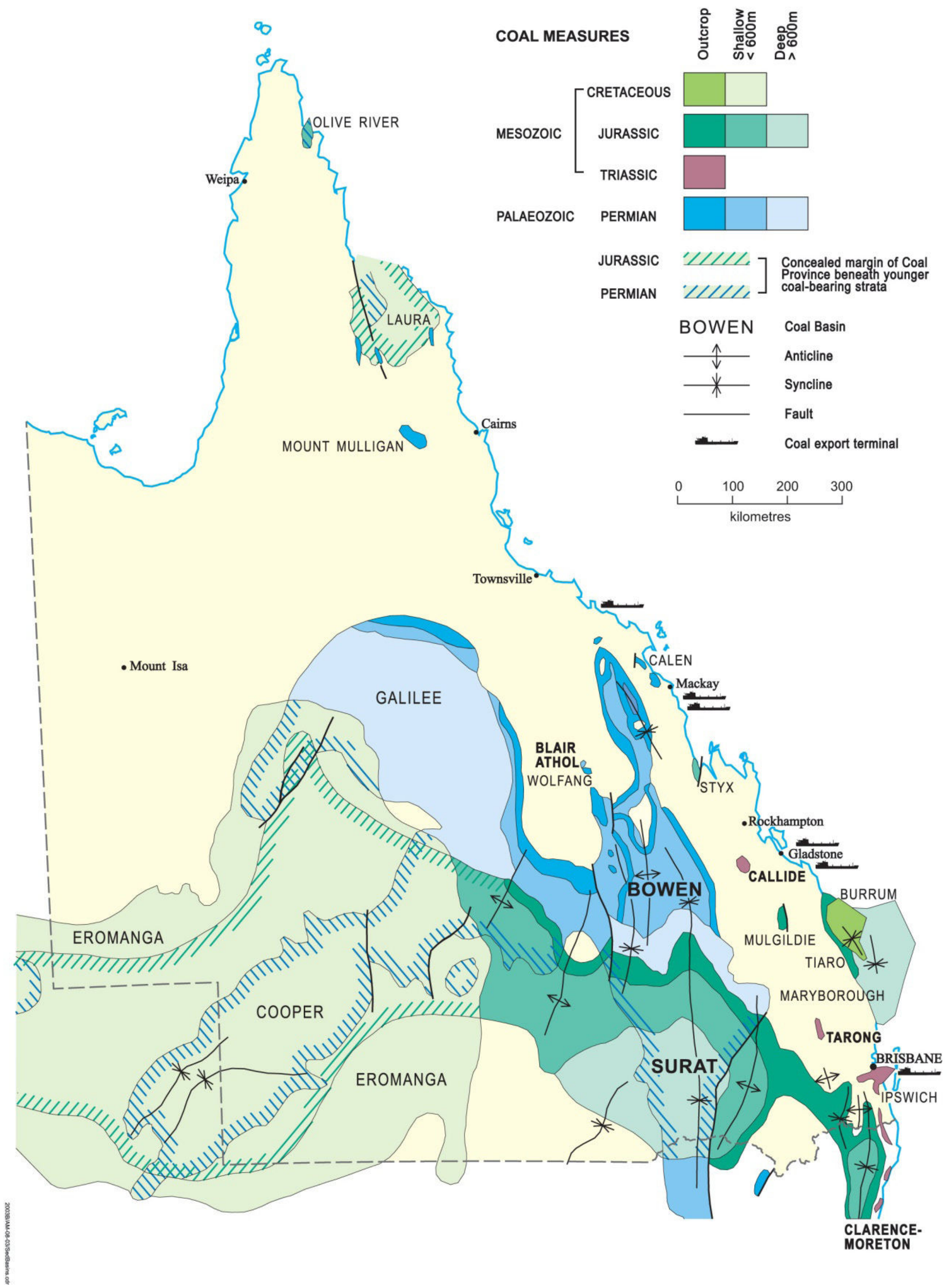
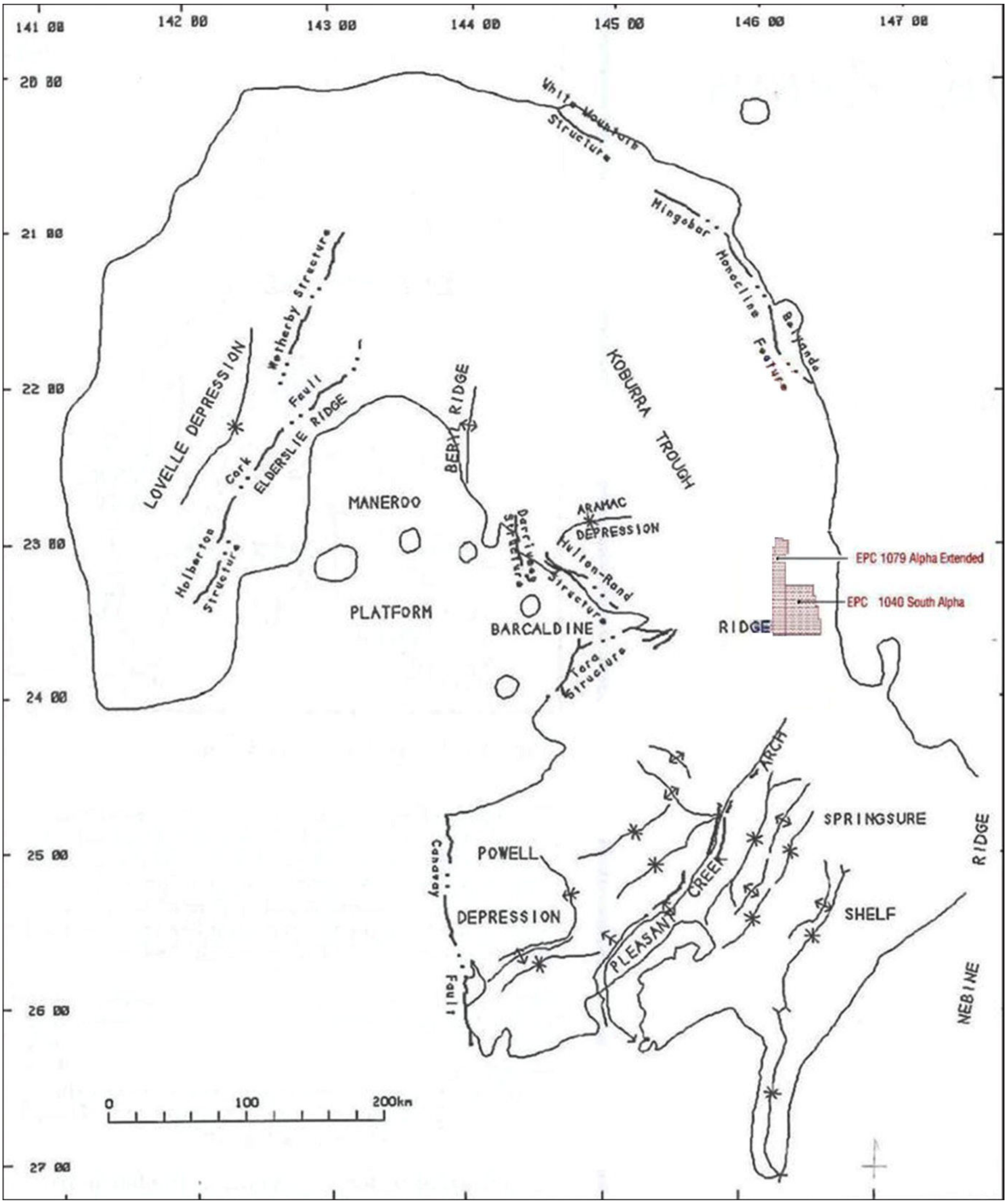


Figure 4. Queensland Coal Measures



Source: Queensland Coals, Physical and Chemical Properties Colliery and Company Information 14th Edition 2003 Ed A J Mutton.

Figure 5. Structural Elements of the Galilee Basin



Source: Scott *et al.*, Galilee Basin in Geology of Australian Coal Basins Geol. Soc. Special Publication No 1, 1995

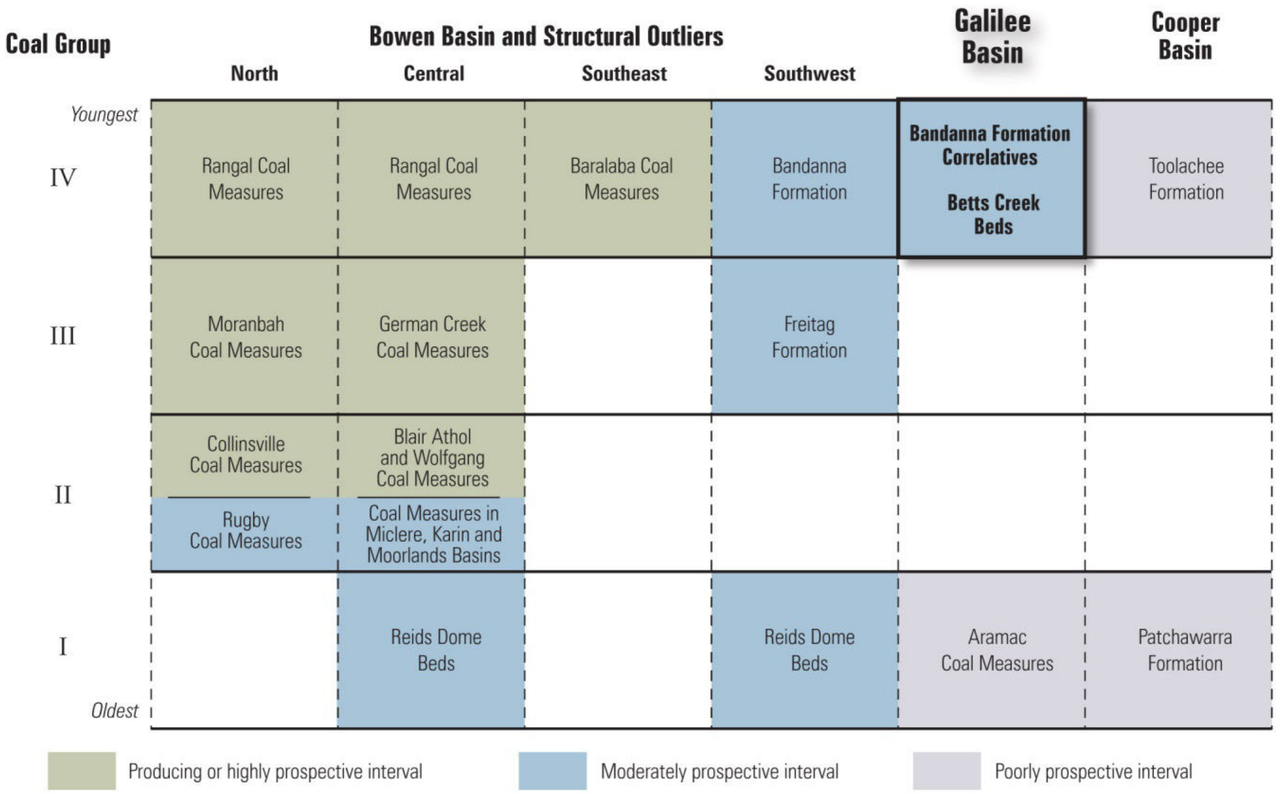
1.1.6 RELATIONSHIP TO OTHER MAJOR COAL BASINS IN QUEENSLAND

The stratigraphic succession of the Galilee Basin is partly related to the sedimentary successions of the Cooper and Bowen Basin's. Major coal deposition occurred in the Galilee during the Early Permian in the Aramac Coal Measures and in the late Permian in the Colinlea Sandstone and Bandanna Formation (and their correlatives the Betts Creek Beds) in the north of the Galilee Basin.

The stratigraphic table for the Galilee, Cooper and Bowen Basins showing the relationship between the major coal units and foundations is shown in Figure 6.

Coal development that has been defined to date is concentrated in the northern part of the basin, as south of the Barcaldine Ridge the identified seams identified to date are thin and sporadic. The coals in the project area occur in the Betts Creek Beds on the northern slope of the Barcaldine Ridge.

Figure 6. Interpreted coal group stratigraphic basin correlations



Source: Queensland Coals, Physical and Chemical Properties Colliery and Company Information 14th Edition 2003 Ed A J Mutton.

1.1.7 STRATIGRAPHY OF THE GALILEE BASIN

The generalised local Galilee Basin Stratigraphy is shown in Figure 7.

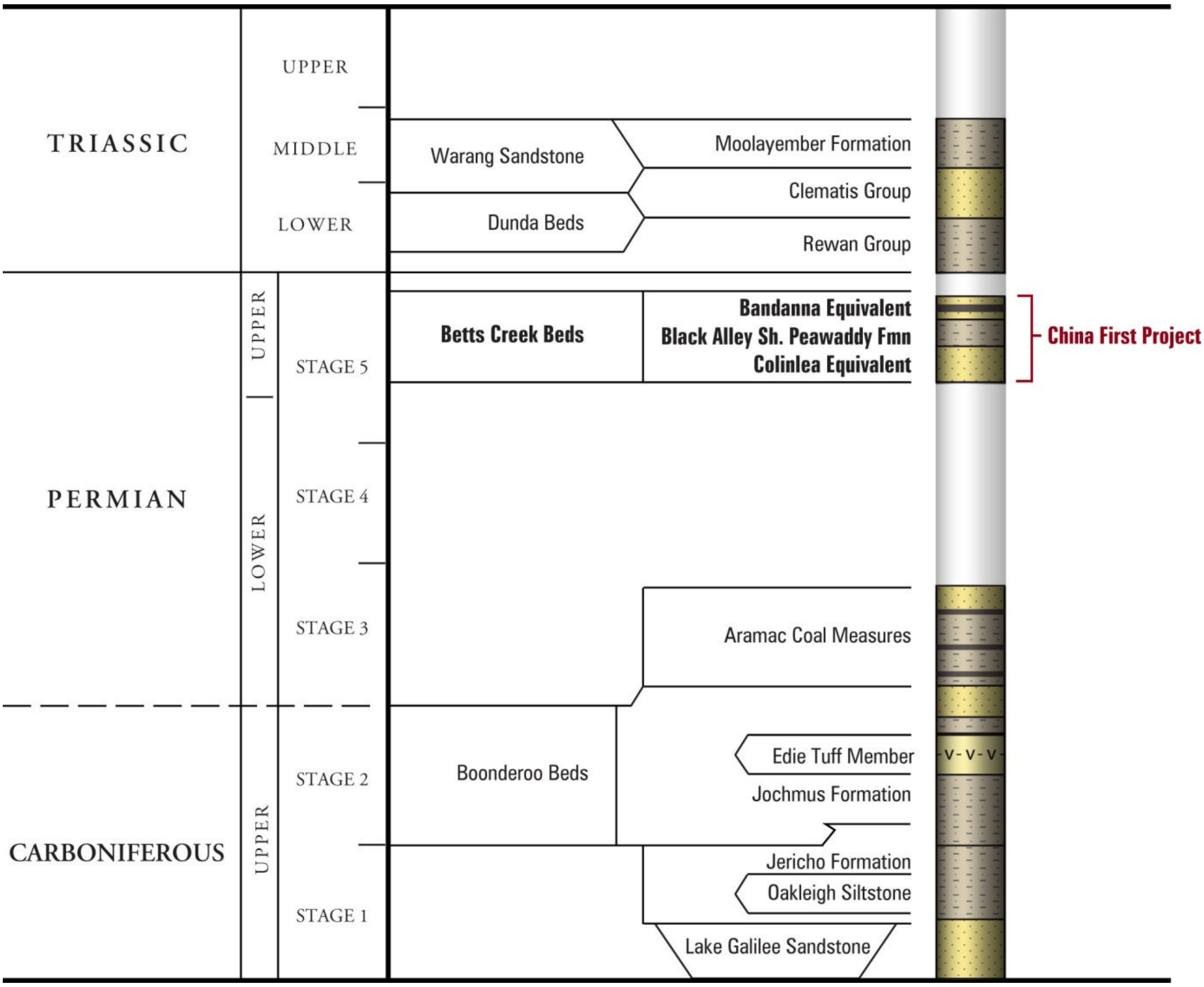
Within the project area, Quaternary alluvials and Tertiary sands, clays and laterites unconformably overlay the distinctive grey-greenish Triassic mudstones and claystones of the Rewan Formation. The Rewan Formation, in turn, unconformably overlays the Late Permian shales, siltstones, sandstones and coal seams of the Bandanna Formation.

The Quaternary sediments comprise of unconsolidated alluvial sands ranging in thickness from 0 metres below ground surface (mbgs) to 30 mbgs. The Tertiary sediments are unconsolidated to semi-consolidated ranging in thickness from 30 mgbs to 125 mgbs. Within the project area, the Quaternary and Tertiary combine to form a thick cover of overburden ranging from 95 mgbs to 125 mgbs over the Bandanna Formation. The Rewan Formation, consisting of Triassic competent claystones and siltstones, is situated unconformably between the overlying Tertiary and the underlying Late Permian Bandanna Formation. The Bandanna Formation and the Colinlea Sandstone comprises of lithic sandstone, siltstone, claystone, carbonaceous mudstone and coal seams.

1.1.8 MINERALISATION

The principal coal seams in the project area contain sub-bituminous high volatile perhydrous coals suitable for use as thermal coal and potentially for liquefaction, gasification and other petrochemical applications. The principal seams have defined continuity and significant resources. The seams dip gently (one to two degrees) to the west, and appear to be structurally continuous with little, if any, faulting. A schematic section is outlined in Figure 8.

Figure 7. Galilee Basin Stratigraphy



Source: Scott *et al*, Galilee Basin in Geology of Australian Coal Basins Geol. Soc. Special Publication No 1, 1995.

1.1.8.1 Mesozoic-Cainozoic Cover

Unconsolidated Cainozoic sediments dominate surface geology of the project area. Unconsolidated sands, silts and clay, lateritised in part, form an extensive blanket over the project area, with thickness of up to 90 m in eastern and central sections. The Permian does not outcrop in the project tenements. There is an assortment of Recent-Quaternary and Tertiary within the Cainozoic blanket but no attempt at demarcation has been established. In the east of tenements, the Cainozoic sits directly on the Permian. This contact is unconformable and represents an extensive time gap; the contact is erosional at least in part.

The Tertiary flood basalts that feature in the cover sequence in parts of the Bowen Basin are absent from the project area.

The Cainozoic tends to thin in the west and Waratah's drilling and previous exploration show the Triassic Rewan Formation rarely at outcrop or shallow near surface in this region. The Rewan Formation is unconformable on the Permian and consists of the greenish sandstones and siltstones well known in association with on the Rangal Coal Measures in the Bowen Basin to the east. Where not removed by the Cainozoic, the contact between the Rewan and Permian sits 20-40 m above the A seam.

1.1.8.2 Permian

The Permian consists of liable sandstones, siltstones, mudstones and claystones with intercollated coal seams. The Permian dips gently to the west at <1°dip and appears to be free of significant structure. The coal seams are currently allocated from the selection process of alphabetical sequence used by previous explorers on the area. The A and B seams are allocated membership of the Bandanna Formation and the sequence for C down the Colinlea Sandstone. It is acknowledged that the E and F seams may belong to a lower formation again. These allocations are tentative and if a definitive relationship can be proven, it will be readily adopted. The provision of Formation / Group membership has no material impact on the resource geology of the deposit.

The combination of a very gentle westerly dip and subdued topography creates relatively broad subcrop zones for each seam. Additionally, the B and C intervals are separated by a 90 m sandstone (vertical thickness); this separation and the dip / surface geometry cause two north-south orientated bands of seam subcrop; the A and B in the west and the C to DL in the east. The E and F Seams sit below the D splits and subcrop further east again, the seam limits often influenced by deeply incised alluvium channels associated with drainage along Sandy Creek. The full C-F sequence continues unbroken under the A and B subcrop zone and all seams continue down dip.

Weathering / oxidation is variable but tends to be deep for a coal Project. The weathering surface is commonly 30-50 m down into the Rewan / Permian rocks. It is noted that this limit to coal occurrence is in addition to the Cainozoic cover discussed above.

1.1.9 COAL SEAMS

Tertiary sediments vary in thickness across the coal deposit ranging from less than 20 meters below ground level (mbgs) in the North of the proposed MLA, but then increasing in thickness to the south to greater than 100 mbgs limiting the open cut potential in this area. The tertiary thickness is displayed in Figure 9. Results from the geological model for the average coal seam thicknesses for each of the seams included in the Resource Estimate are shown Table 1.

Within the B seam, three stone bands (B3, B5 and B7) are planned to be selectively removed as waste during open cut coal mining. Within the DL seam, two stone bands (DLX and DLY) are planned to be selectively removed.

The total coal thickness in each of the open cut mining pits is displayed in Figure 10. Coal thickness ranges from three m to seven m in each mining pit.

Total waste thickness ranges from 20-120 m and is shown in Figure 11. The in-situ strip ratio in each of the open cut mining pits is shown in Figure 12.

Table 1. Average seam thickness results from model

COAL SEAM	AVERAGE THICKNESS (M)	COAL SEAM	AVERAGE THICKNESS (M)
B2	1.26	DU	2.03
B3	0.32	DL1	0.62
B4	0.72	DLX	0.62
B5	0.46	DL2	1.21
B6	0.44	DLY	0.14
B7	0.36	DL3	0.71
B8	2.59	DL Total	3.30
B Total	6.15	Total of all Seams	12.85
C5	1.37		

Figure 8. Stratigraphic Cross-Section of the Project Area

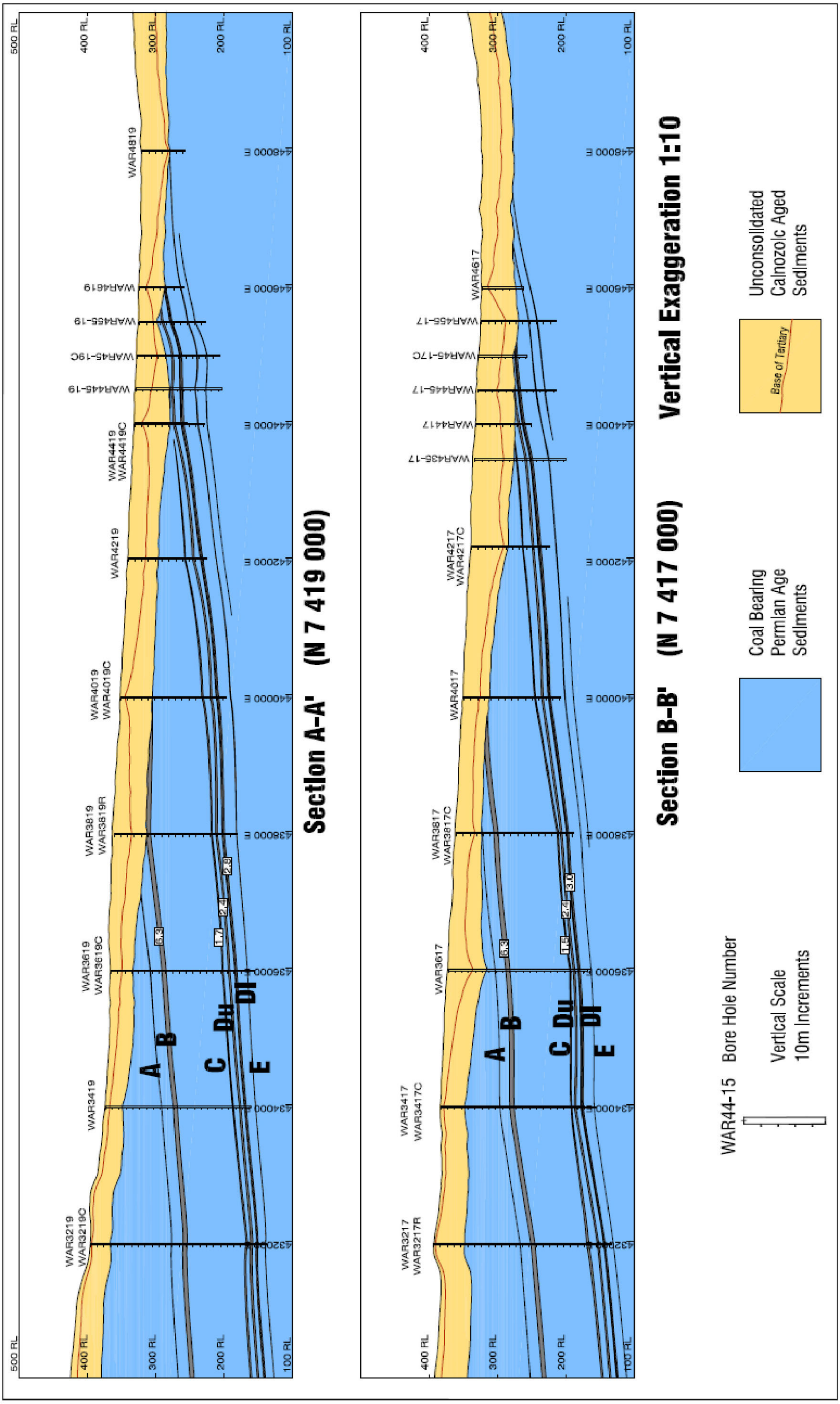


Figure 9. Tertiary Horizon Thickness

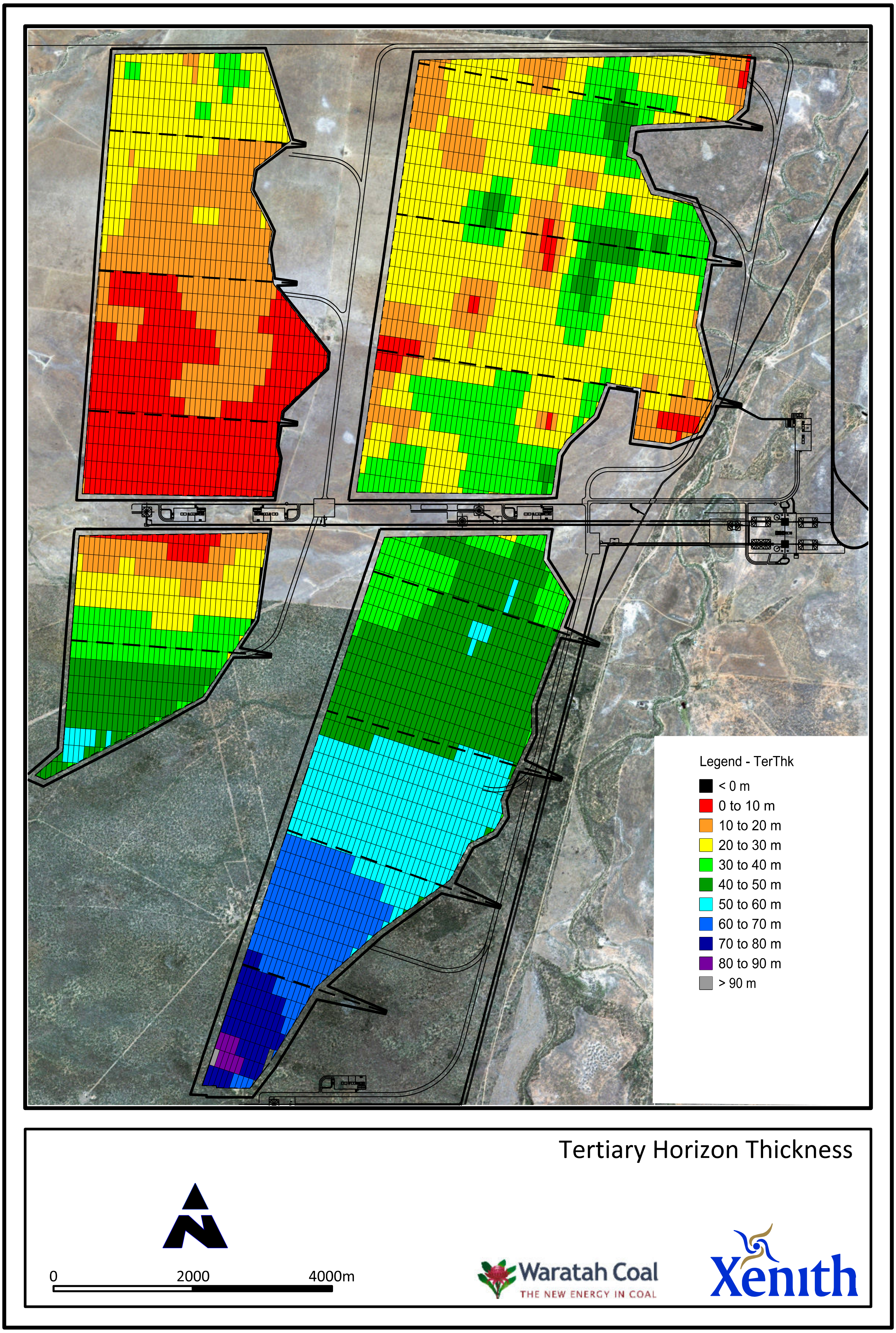


Figure 10. Total Coal Thickness

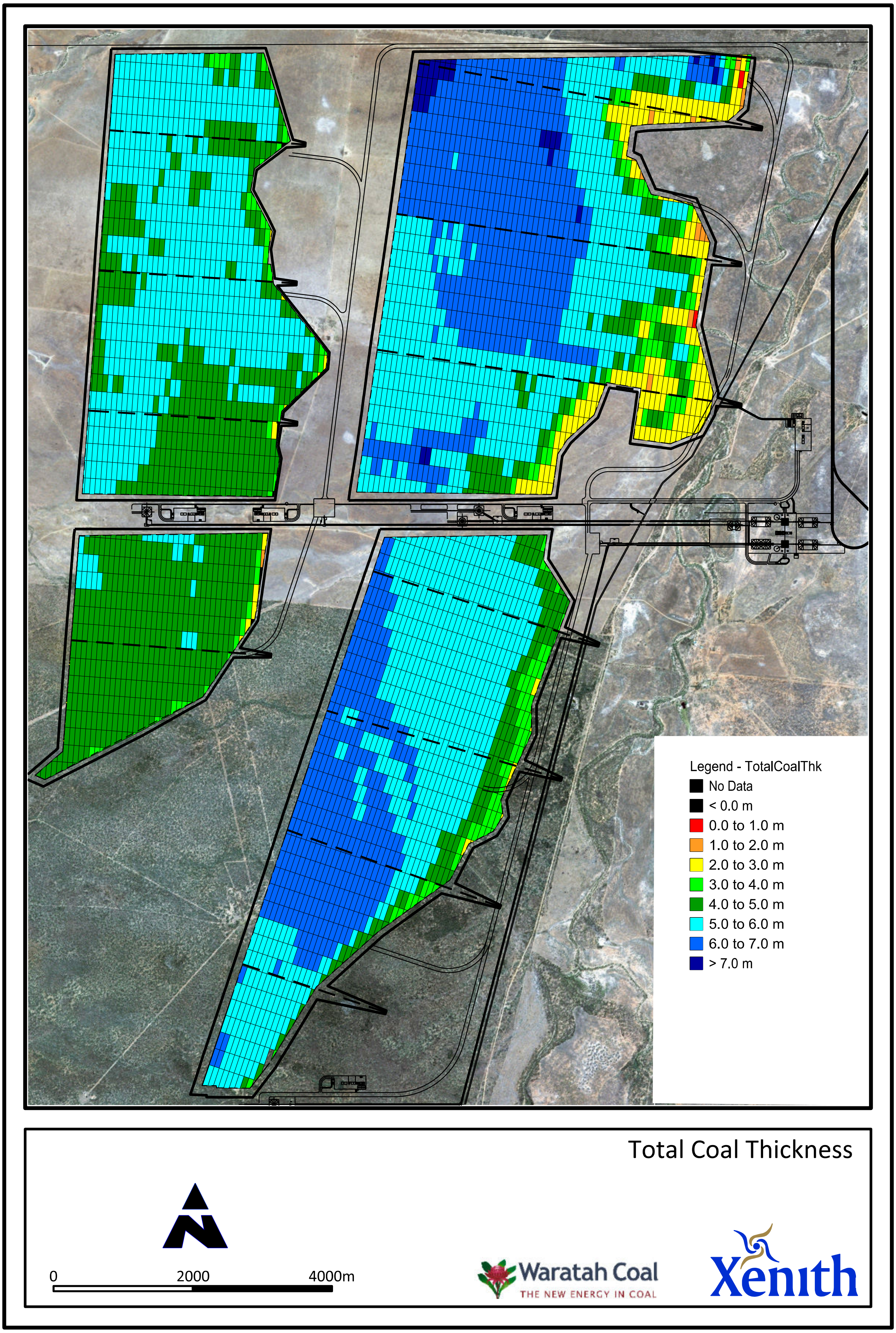


Figure 11. Total Waste Thickness

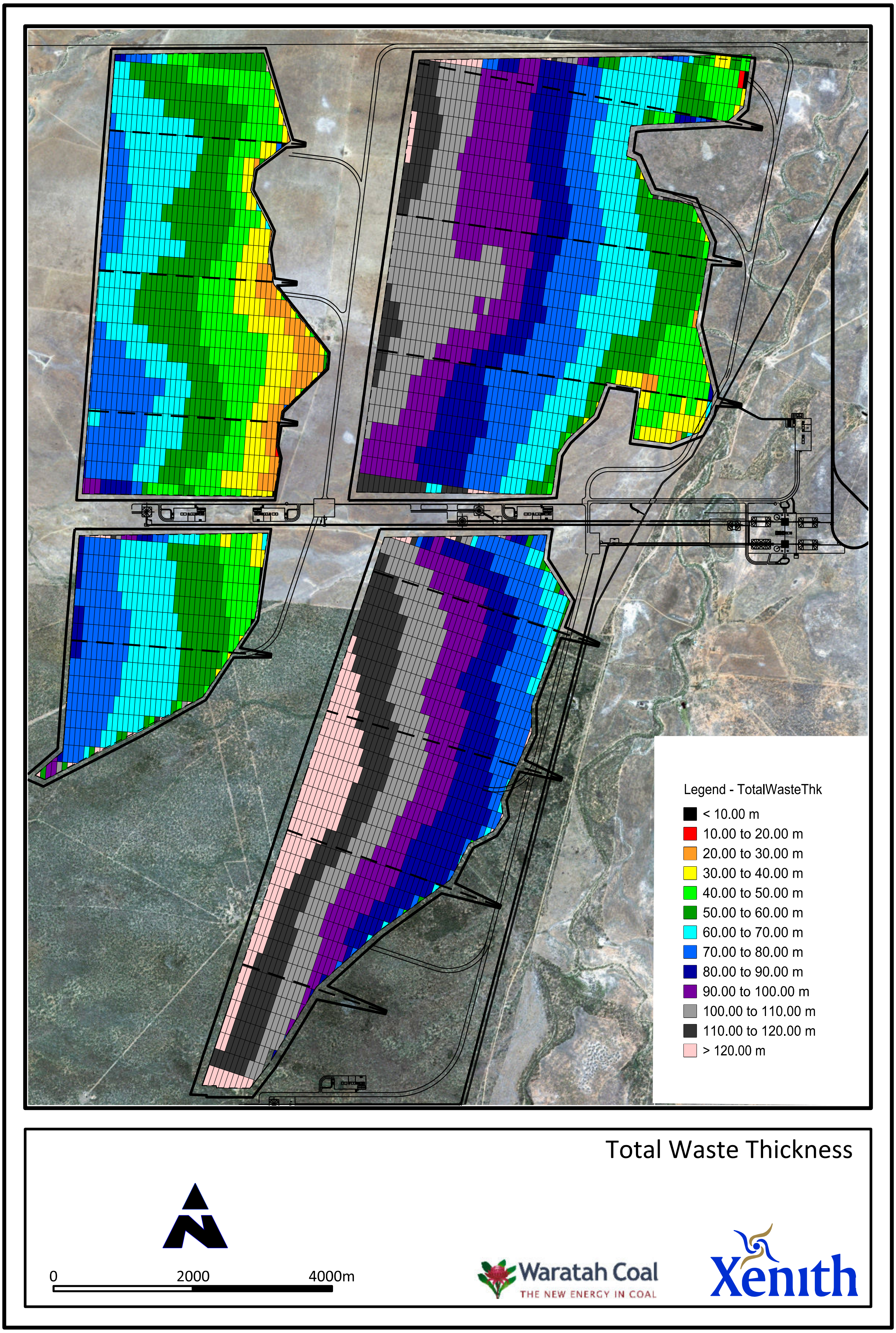
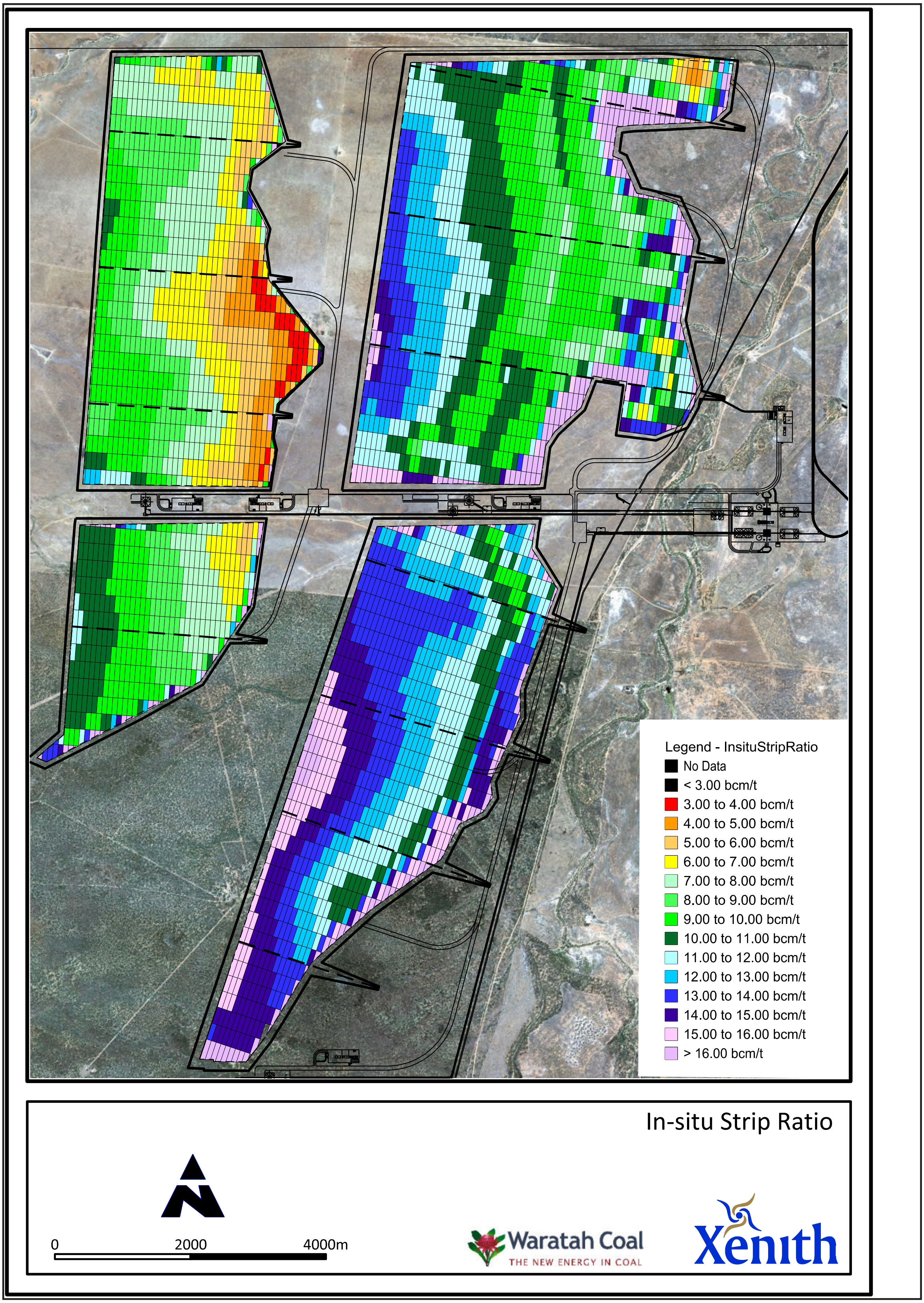


Figure 12. In-situ Strip Ratio



A brief summary of each coal seam is included below and is based on data obtained during the exploration program.

A Seam. The A seam is typically developed to one m thick, with the thickest intersection recognised so far being at around two m and located in the weathered zone in the southern region of the project area. Because of the dip and subcrop geometry, the A Seam only occurs in the far west and is not commonly intersected in drilling to date which has focused the subcrops of the B and C-D seam sets. The A seam tends to be poorly developed and contains considerable carbonaceous shale / mudstone partings.

B Seam. The B seam is the thickest in the set in the project area, typically reaching five m. The B Seam is richly banded with tuffaceous carbonaceous mudstones, especially in the top three m. This banding does influence raw ash of the overall seam and degrade its overall appeal. A distinctive, clean section of 2.0 to 2.8 m dull and bright-banded coal exists at the base of the seam. Selectively, various opportunities exist to mine the seam within this five m section.

C Seam. Thickness range of one to three m arises for C seam at the project area. This is typically developed at two m. A further two m of thinly banded stony coal and carbonaceous mudstone is often developed on the immediate roof of the C seam but is not considered to be of resource potential. The C seam profile is generally clean of bands with a trend of increasing frequency of non-coal weakness planes (penny bands) at the top of the seam near the C Upper (CU) interface.

DU Seam. The D Upper seam lies about 10 to 15 m below the C seam. It has uniform thickness in the order of 1.8 to 2.2 m. The DU seam carries some thin stone bands in the mid section but is generally clean. The DU seam has very sharp roof and floor definition and has a distinctive sharp, square-shouldered roof and floor trace on downhole geophysical logs.

This contrasts for example, with the C seam where increasing frequency of banding towards the roof causes an upwards, step-wise gradation in the geophysical logs at the roof. A variable parting of 1 to 10 m splits the DU seam away from the DL seam. All of the D seam splits are high quality and provide the lowest ash and highest energy, raw or washed, of the Project.

DL Seam. The D lower seam exists as the DL1 and DL2 splits, residing within 0.2 to 0.4 m of each other. The septum is occupied by a carbonaceous mudstone. The DL1 seam is around 0.7 to 0.9 m thick and the DL2 seam is 1.6 to 2.1 m thick. With the split included, the entire DL1 to DL2 interval has a cumulative consideration of around three to four m. The DL splits are also relatively clean intervals; three small penny bands persist in the DL2 dividing it into roughly equal intervals. Coal lithotypes are even mixtures of bright and dull coal for the D seams.

E and F Seams. Both E and F seams are one m thick. The E seam sits 10 to 20 m below the DL seam and the F seam a further 20 m lower again. They are slightly erratic in development tending to split and degrade. They have variable profiles reflecting differing levels of included stone bands. These seams sit outside limits for economic inclusion with any D seam operation, are too thin to support stand-alone development (they are not thick enough to support targeting mining; exist below thick Cainozoic associated with drainage), and so are without real potential.

1.1.10 COAL QUALITY

Product Air Dried Moisture results show a range from 7-9 %. Model results show that the B seams have much higher product ash values than the underlying C and D seams. The B seams have a product ash range from 15-20 %, while the C seam averages 8.5 %, the DU 8.5 % and the DL 8 %.

The B seams also have much lower laboratory yield (i.e. the percentage of coal extracted from a coal section) results ranging from 37 % for the B2 ply (i.e. the section of coal and bonds coupled), to 74 % for the B8 ply. If the B seam was considered as a total seam section (with stone bands included) the yield value is very low at 42 %. The C and D seam laboratory yields are within a tight range of 74 % to 84 %.

Product total sulphur values founded to be less than the raw total sulphur results, indicating the sulphur types are amenable to washing to reduce their levels. Average product sulphur across all seams in the deposit is 0.52 %.

Product coal energy for the B seams are in the 22-24 Mj/Kg range, while for the C and D seams is 26-27 Mj/Kg at a 9% moisture basis. Product coal qualities are displayed in Table 2.

Table 2. Average product quality results

COAL SEAM	PRODUCT AIR DRIED MOISTURE %	LABORATORY PRODUCT YIELD (F1.50) ADB	PRODUCT ASH % @ 9 % MOIST.	PRODUCT TOTAL SULPHUR %@9 % MOIST.	PRODUCT SPECIFIC ENERGY (MJ.KG) @ 9 % MOIST.	APPLICABLE AREA
B2	7.8	36.6	20.6	0.92	22.40	Opencut
B4	7.8	71.4	17.7	0.81	23.52	Opencut
B6	7.6	43.8	19.6	0.40	22.81	Opencut
B8	8.3	74.0	15.7	0.38	24.15	Opencut
B8	6.6	62.5	16.8	0.36	23.53	UG Working Section
B total (B2 – B8 inclusive of stone bands)	6.9	41.6	17.6	0.39	23.26	Total Deposit
C5	9.4	84.7	8.7	0.63	26.42	Opencut
Du	8.5	74.4	9.0	0.62	26.22	Opencut
DU	7.3	82.3	7.5	0.52	27.08	Underground
DL1	7.1	83.6	8.9	0.52	26.49	Opencut
DL2	7.4	79.6	7.3	0.52	27.00	Opencut
DL3	8.1	81.4	7.1	0.53	26.97	Opencut
DL	6.7	75.8	7.3	0.44	27.21	UG Working Section

1.2 KEY COMPONENTS

1.2.1 OVERVIEW AND SCHEDULE

The proposed mine consists of two open cut mines and four longwall underground mines delivering 56 Million tones per annum (Mtpa) Run of Mine (ROM) coal annually. The CHPPs are capable of producing 40 Mtpa of export coal. This will be commissioned for the mine operations. Open cut operations will involve dragline, truck and shovel operations whilst the underground operations will operate via continuous miners and longwall shearers. It is expected that the open cut and underground longwall operations will produce 20 and 36 ROM Mtpa, respectively.

The key components of the mine area are:

- two open cut mines;
- four underground longwall mines;
- two CHPPs;
- associated overland conveyors and transfer stations from mine sites to ROM and CHPP;
- ROM, primary, secondary and tertiary crushers, hoppers, apron feeders and belt and underground feeder conveyors supporting pre-preparation activities;
- four pre-preparation and two product coal storage yards;
- a mine infrastructure area that includes:
  - administration buildings and staff parking;
  - Petrol Oil Lubricant (POL) storage and handling facilities;
  - vehicle and equipment wash down facilities;
  - workshop and stores facilities;
  - laydown areas; and
  - electrical Power Substations and associated facilities.
- raw water supply for potable water production, fire fighting, coal dust suppression and coal washing;
- dragline construction facilities, including workshop, store and maintenance facility to service dragline erections and maintenance;
- a 2,000 person accommodation village including an appropriate scale wastewater treatment plant and irrigation system;
- upgrade of existing Alpha airstrip or construction of new airstrip;
- connections to the proposed 275 kV transmission line and supporting substations;
- internal road network including light-vehicle access roads, heavy-vehicle haul roads and a site access road;

- a water pipeline from a proposed dam site on the Tallarenha Creek to the mine and on-site water retention dams; and
- co-disposal and rejects storage facilities.

The proposed schedule for the development of the mine and associated infrastructure is provided in Figure 13.

1.2.2 MINING METHODS AND SUPPORTING INFRASTRUCTURE

The assessment of possible mining options has confirmed that the coal deposits are suitable for both open cut mining and underground longwall mining. The overall mine plan is to extract 56 Mtpa from two open cut and four underground longwall mining operations over a 25-year period.

The proposed mine arrangement (Figure 2) shows the key components of the selected mining methods, namely:

- topsoil stockpiles;
- water management structures (including sediment dams, levee banks, creek diversion);
- ROM and product stockpiles;
- coal rail loadout facilities;
- coal preparation plant;
- co-disposal dams and reject retention areas;
- overburden dumps;
- waste water treatment facilities;
- refueling and maintenance facilities;
- access and haul roads;
- power lines; and
- mine office, communications, and associated amenities.

The mining operations will commence with the in-parallel development of the open cut pits and the four underground mine portals.

The following sections describe in detail the selected methods for the open cut and underground mines.

1.2.2.1 Open Cut Mining Method

The Project open cut limits are defined by the following:

- eastern boundary is the relevant coal seam sub-crop line and box-cut overburden footprint;
- the extreme northern boundary allows a 50 m surface corridor adjacent to the lease boundary in B pit and a 50 m clearance from the boundary haul road in D pit;
- the southern boundary has been determined by the economic limit, mostly due to the deeper tertiary sediments and weathering profile;
- the western boundary has a 50 m stand-off at coal level from the proposed underground operations;
- a central corridor also exists and divides the open cut into North and South pits. The corridor is excluded to allow for surface infrastructure for the underground mines and conveyors;
- the mining blocks have been designed with a 20 m bench in the advancing highwall at the base of Tertiary level to act as a catch bench for any of the soft tertiary material slumping; and
- batter angle of 45 degrees in Tertiary horizon and 63 degrees in the Permian horizon.

Coal ramps are designed for the open cut mining pits that are spaced along each pit at nominal two km spacing (see Figure 14). Out of pit spoil, dumps are designed for the initial boxcut spoil volumes as well as the tertiary offset volume of the advancing strip. Out of pit spoil, dumps have a maximum height of 40 m above ground level.

Figure 13. Proposed Mine Development Schedule

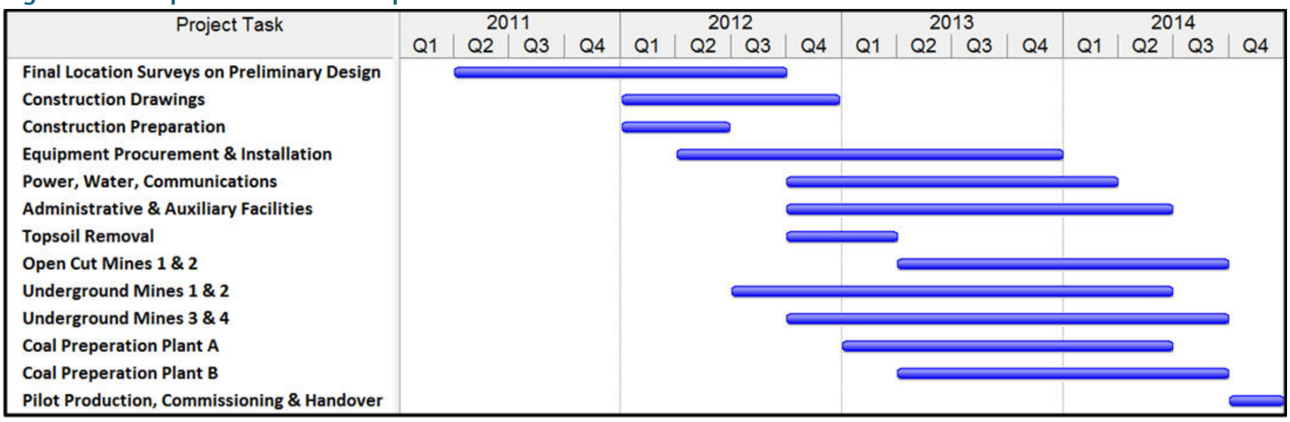
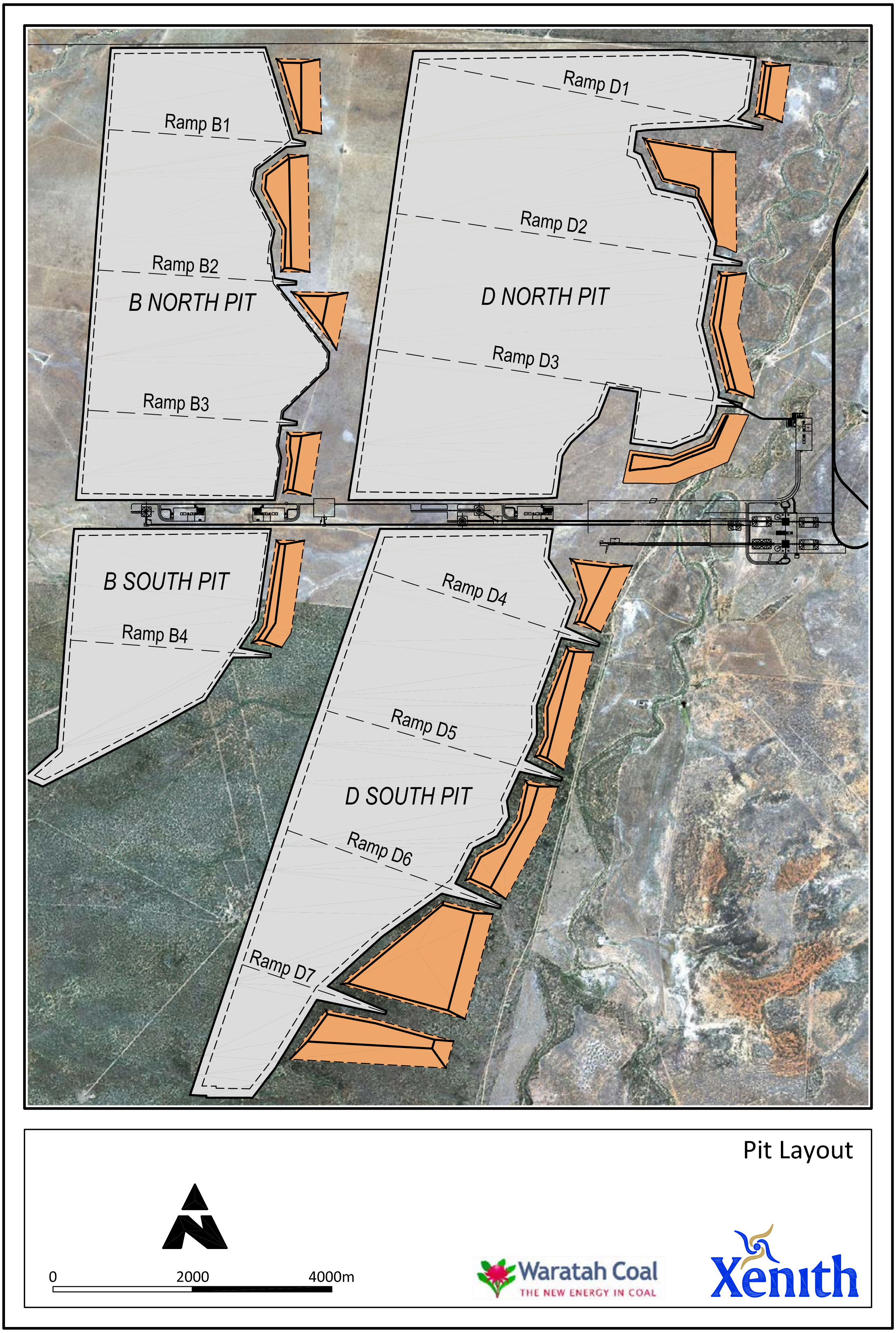


Figure 14. Opencut Pit Layout



The mining method adopted for this conceptual evaluation is a combined:

- topsoil removal and placement by scrapers;
- drill and blast operations to fracture overburden and interburden;
- large draglines removing overburden and uncovering the coal seams (see Plate 1);
- truck shovel fleets handling the overburden material not removed by the dragline including most of the tertiary material (see Plate 2); and
- truck excavator fleets handling the inter-burden between seams and to mine the coal seams.

The tertiary material is assumed to be excavated without blasting. All other overburden is assumed to be drilled and blasted prior to removal.

The dragline operation initially removes the hard blasted Tertiary and Permian material immediately above the coal seams as well as a proportion of the tertiary material. This tertiary material has to be selectively handled by the dragline in an offset strip operation resulting in significant rehandle. As the deposit deepens the proportion of this tertiary material handled by the draglines reduces, which results in less dragline rehandle and therefore more prime material is moved by the draglines. The depth of material allocated to the dragline horizon varies during the schedule with an average of approximately 45 m.

The excavator truck fleets handle the parting material between seams C and DU and between DU and DL1 that are both approximately five to ten m thick. The parting between the C and DU seams is assumed to be hauled out of pit and short dumped to regrade the coal haulage ramps. The parting between the DU and DL1 is will be be dumped in-pit to reduce the trucking requirements. The very thin DLX and DLY partings (i.e. stone bands) have also been allocated to the excavator truck fleets at a decreased productivity.

Coal is will be mined with hydraulic excavators and hauled to the ROM crushing facility for each open cut area.

Plate 1. Typical dragline

Source:photo courtesy of Bucyrus

Plate 2. Typical truck and hydraulic excavator in operation

Source: photo courtesy of Bucyrus

1.2.2.2 Open Cut Mining Development Sequence

The first stage of the mining process is for the vegetation to be cleared and the topsoil to be removed using scrapers and placed on dedicated topsoil stockpiles dumps or placed directly onto reshaped final landform if available.

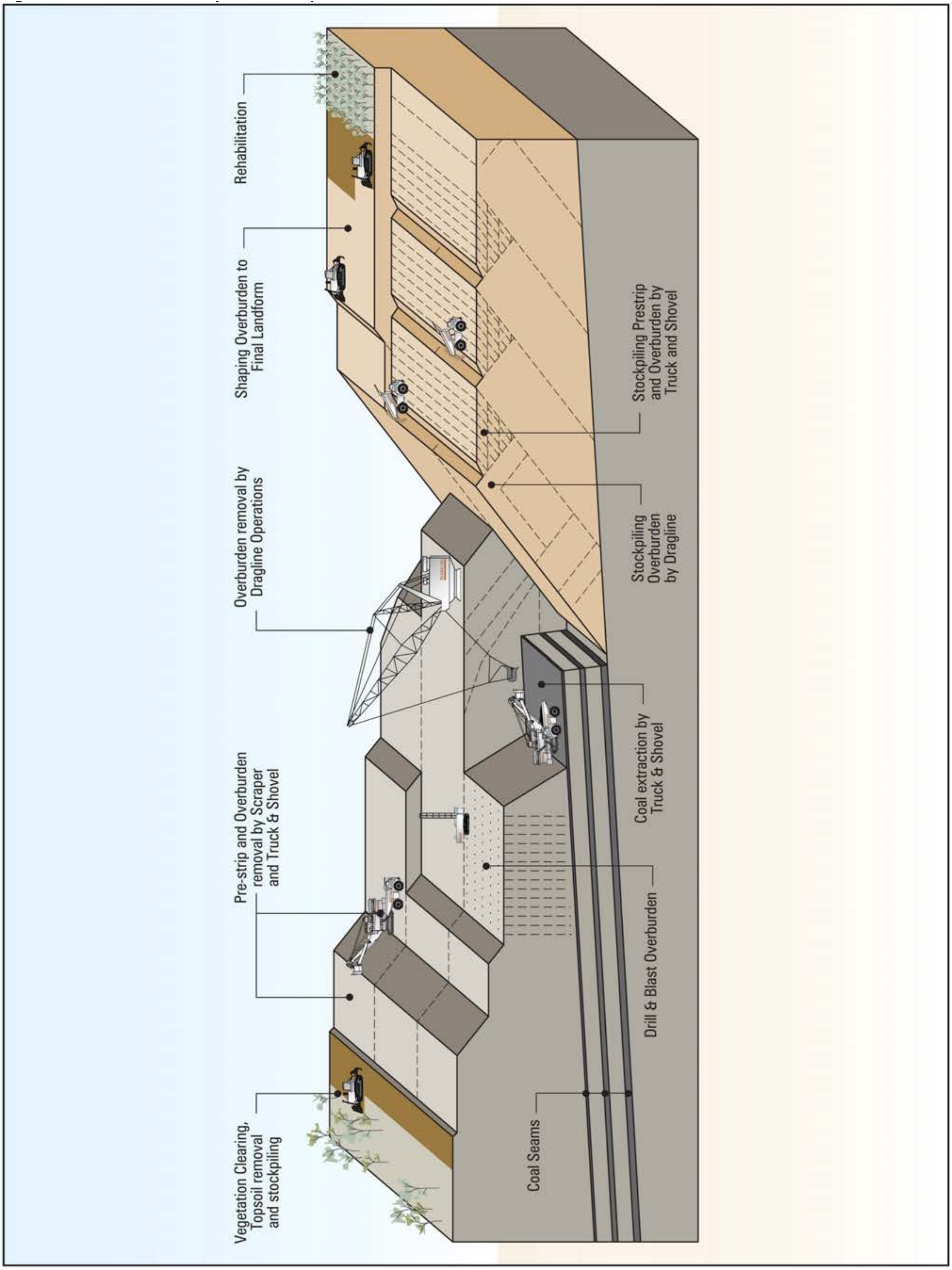
The upper portion of the Tertiary overburden where available is free dug and removed with a scraper and dozer and a truck and shovel fleet as shown at Figure 15. Where Tertiary capping rock and Permian materials become competent and digging operations cease, a drill and blast operation is utilized to fracture strata. The blast operation optimizes overburden removal by throw blasting prime material into the previous open cut void. The blasted Permian material thrown into the previous open cut void provides a substantial founding base for overburden spoil to be safely sited and anchored.

The dragline then enters the strip and the material is used to extend the initial dragline bench. Note that any tertiary material is kept high in the bench and therefore will not result in a weak spoil pile floor. The dragline then begins to remove the main Permian waste from above the coal seams. The remainder of the material above the top coal seam is then removed and used to build the spoil pile. The final material to be removed from the dragline block is from the low wall and coal seam edge, as is shown at Figure 15. The dragline will then move back to the high wall area to begin excavation of the next mining block.

The next step is for the coal mining fleet consisting of excavators, front end loaders and trucks to mine the coal seams, with the coal hauled to the CHPP for washing. Inter-burden waste between the main coal seams is then blasted and this waste is mined by the excavators and hauled by trucks to spoil dumps in the previous strips. The next coal seam is mined in the block, with the coal mining and parting operation planned to be performed in a series of sections up to 200 m in length along the pit.

The completed pit is then available for the next strip's overburden activities to begin the mining sequence again as described above. Progressive rehabilitation can be undertaken once the overburden stockpiles are reshaped by bulldozers and scrapers and the topsoil has been spread.

Figure 15. Initial Mine Concept Plan for the Open Cut Activities



1.2.2.3 Opencut Mine Development Schedule

A 25-year production schedule has been developed to produce 20 Mtpa ROM. Initially this is achieved by allocating two draglines to the D North pit, one dragline in the D South pit and one in the B North pit. Each dragline is scheduled to uncover five Mtpa. In the latter years, the draglines are moved around to balance the ratio of coal from the D and B pits.

Not all the mining blocks are extracted in the B north and B south pits during the 25 year mine plan. Coal access ramps are opened up as required, with the two most southerly ramps in the D south pit not required until year 14 and 15.

The mining sequence is shown in Figure 16.

Open cut stage plans have been developed to show the progress of the mine and the spoil dumps for milestone years – 1, 5, 10 and 20. Stage plans are shown in Figure 17 to Figure 20.

Out of pit spoil, dumps have sufficient capacity for the initial ramp, boxcut strips and the tertiary unit of the second strip after the boxcut. The spoil dumps have a maximum height of 40 m above ground level. After the out of pit spoil dumps are filled up, the spoil then progresses into mined out strips with a maximum height of 40 m above ground level. It is envisaged that most progressing spoil dumps will be at heights between natural ground level and the 40 m above ground, depending on the split of dragline spoil or truck shovel spoil.

The main coal access ramps are regraded regularly with the inter-burden spoil between the coal seams. It is anticipated that final voids with depths up to 120 m will remain in each of the four open cut pits at the completion of mining.

Figure 16. Opencut Mining Sequence

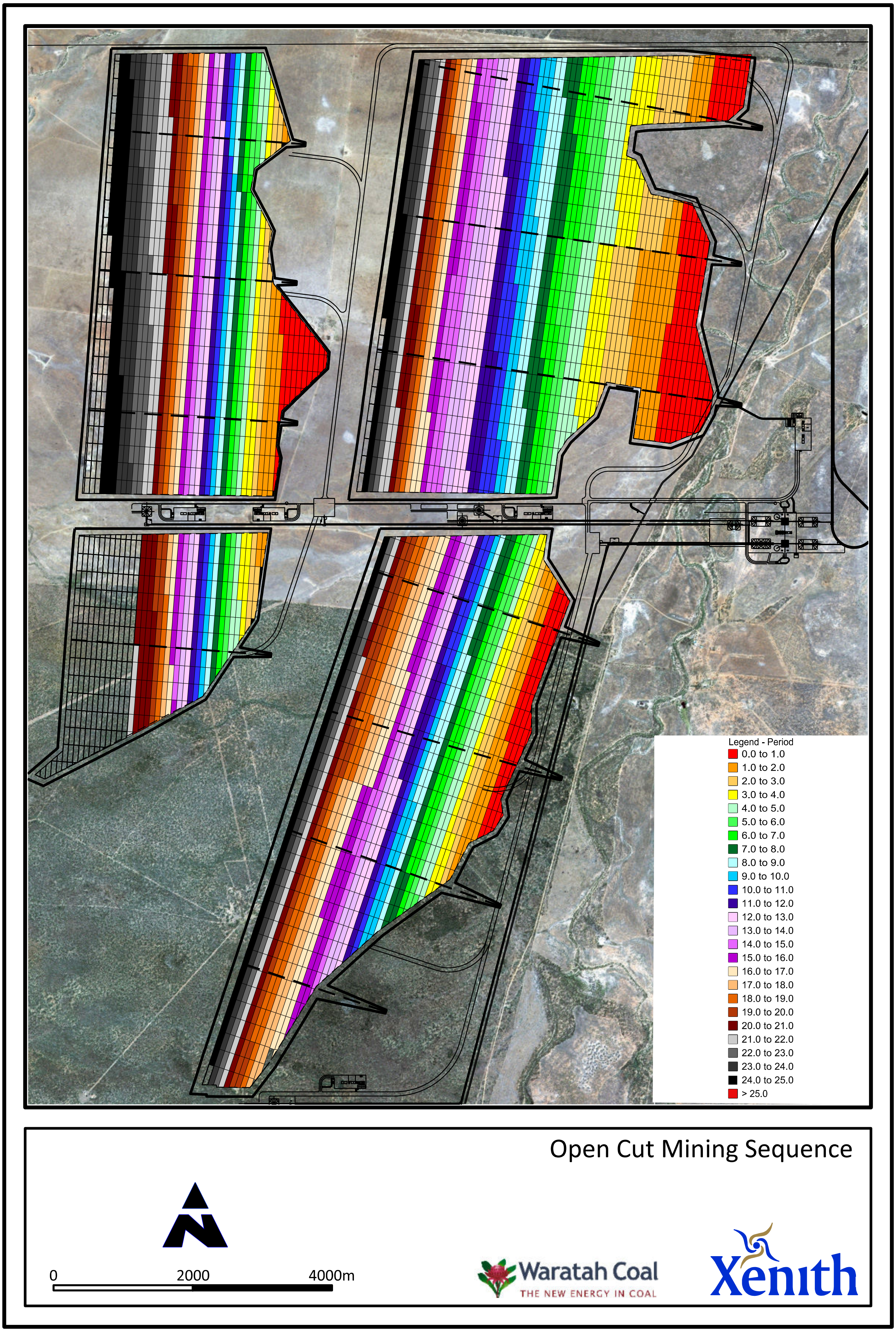


Figure 17. Opencut Year 1 Stage Plan

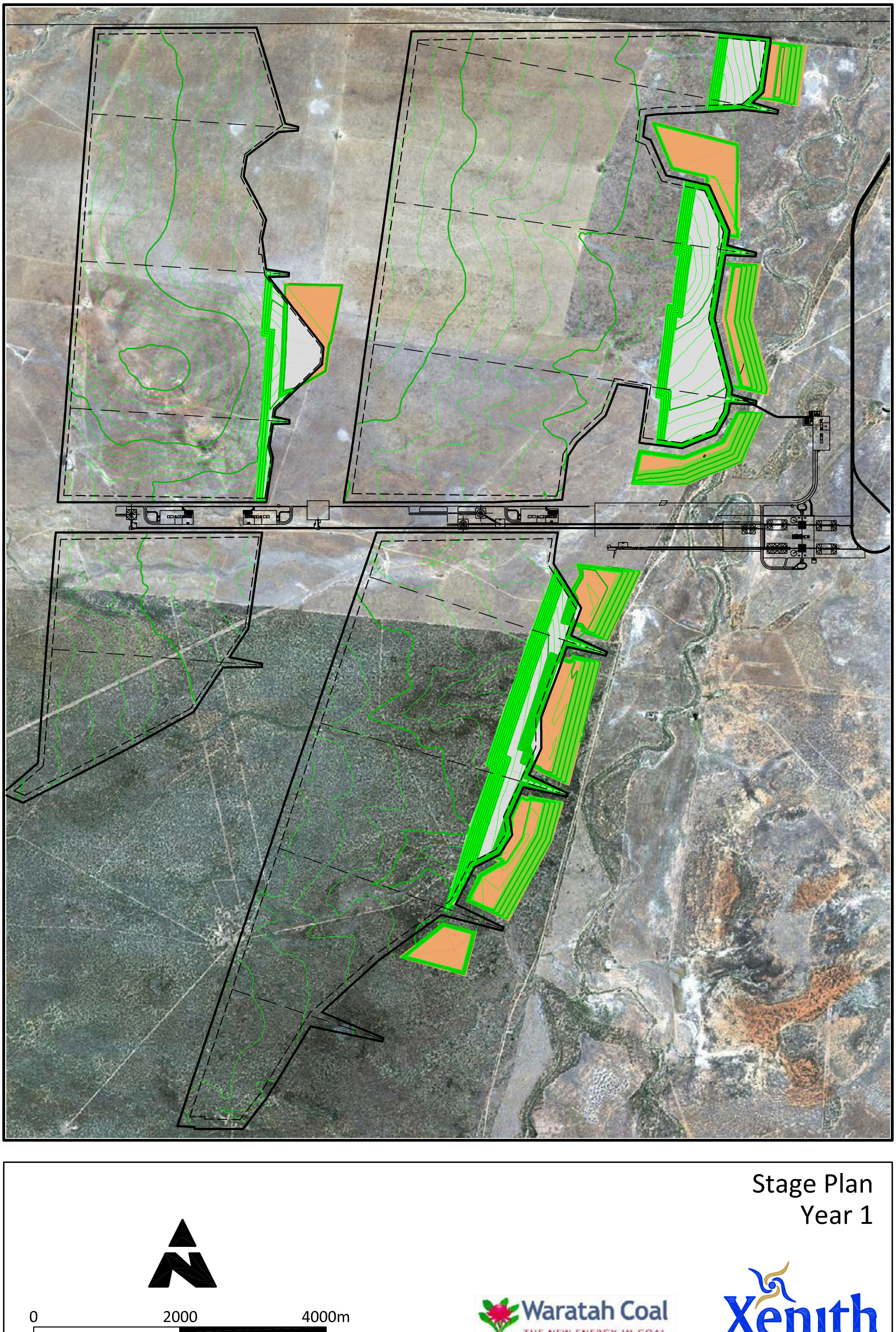


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Figure 18. Opencut Year 5 Stage Plan

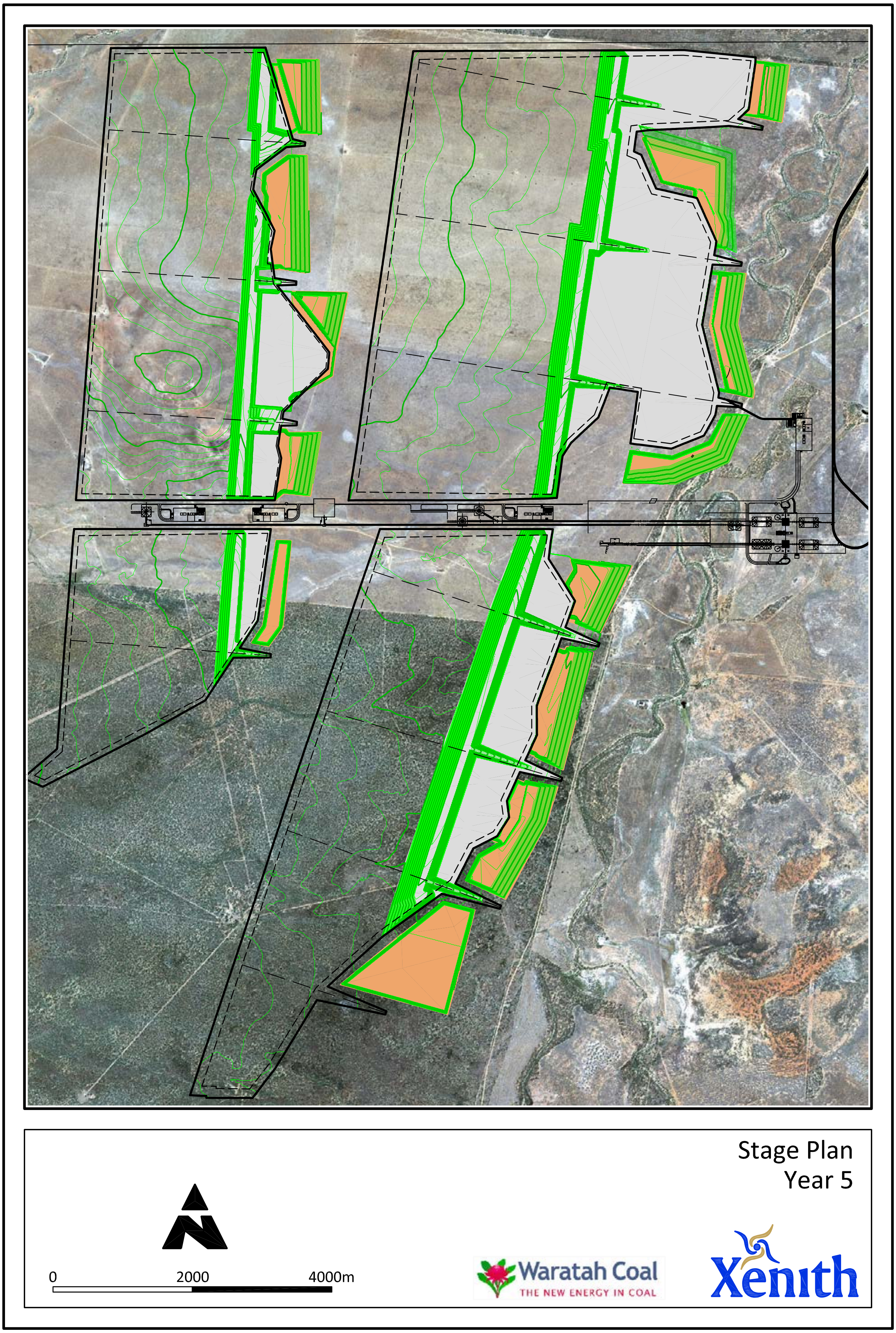


Figure 19. Opencut Year 10 Stage Plan

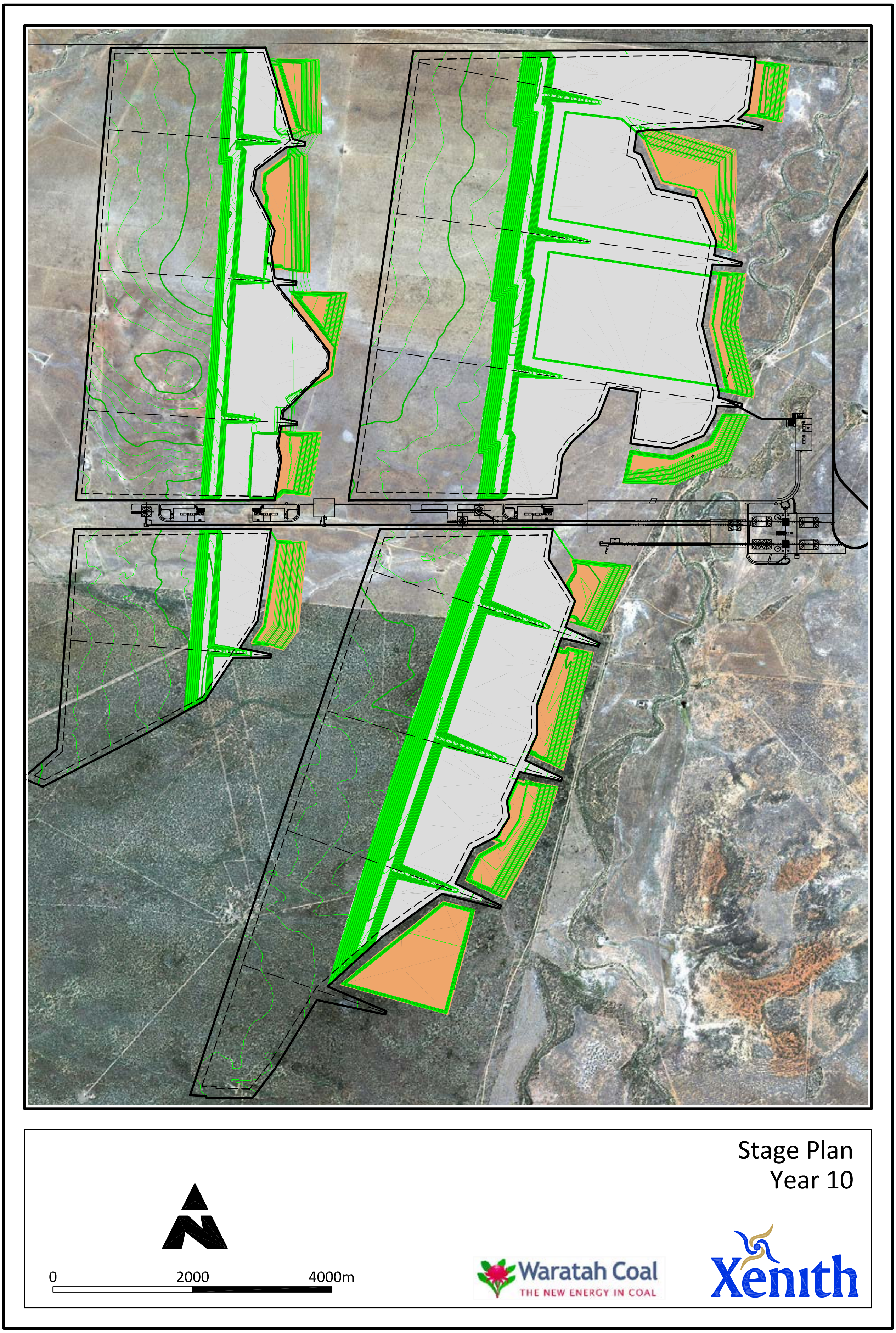
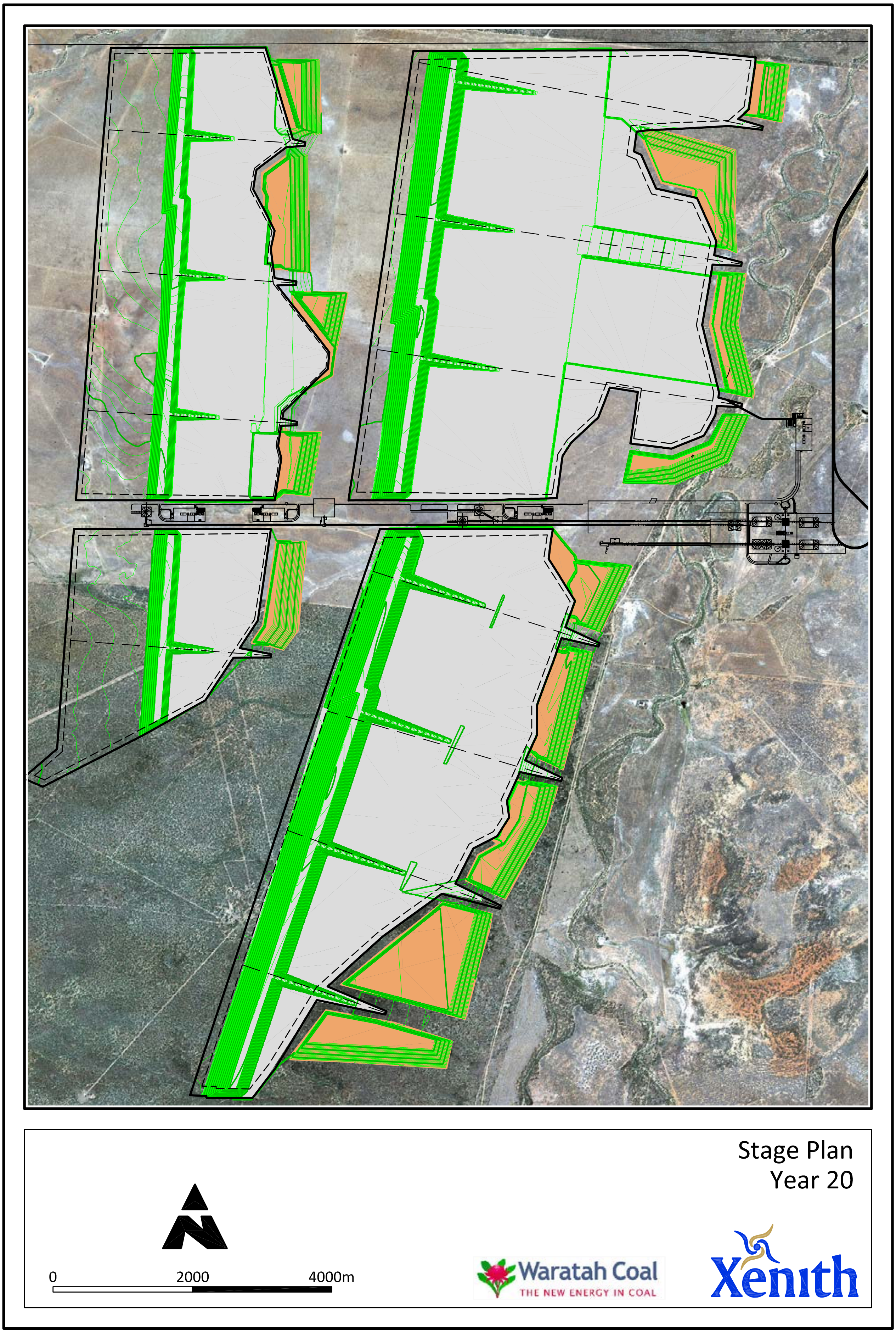


Figure 20. Opencut Year 20 Stage Plan



1.2.2.4 Opencut Waste Volumes

Based on the 20 Mtpa ROM coal schedule, total prime waste steadily increases from approximately 180 Million bank cubic metres per annum (Mbcmpa) in the early years up to 220 Mbcmpa in the latter years as the ROM strip ratio increases. Each dragline system (Dragline, Truck Shovel and Truck Excavator) shows variation in prime waste volumes depending on the ROM strip ratio in each of the mining pits. The potential total generation of prime waste is shown in Figure 21.

The Tertiary waste is the free-dig waste predominantly mined by the truck shovel fleets with smaller amounts handled by the draglines in offset mode. The Tertiary waste averages approximately 80 Mbcmpa over the 25 years (refer Figure 22).

The Permian waste includes the overburden waste above the first coal seam and the interburden waste between the coal seams. The Permian waste increases over the life of the mine as the depth to the first coal seams increases as mining moves down dip. The Permian waste ranges from approximately 90 Mbcmpa in the early years to over 140 Mbcmpa from year 18 onwards (refer Figure 23).

Figure 21. Total Prime Waste

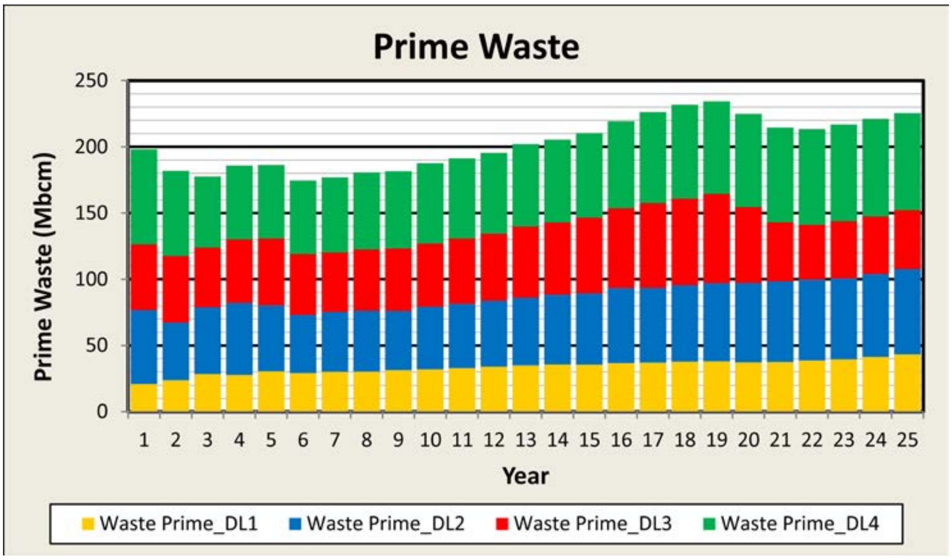


Figure 22. Total Tertiary Waste

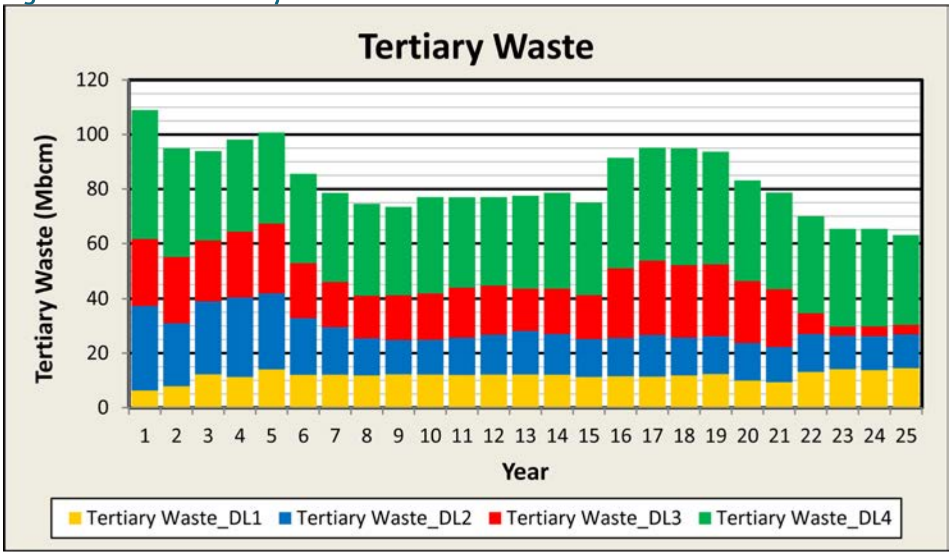
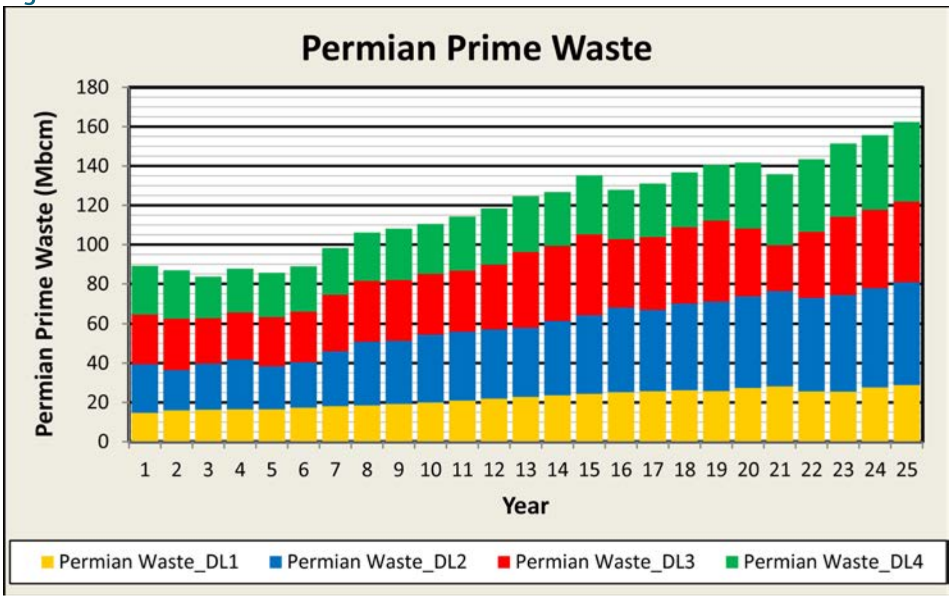


Figure 23. Total Permian Waste



Both the Tertiary and Permian waste is scheduled to be mined by different machine combinations dependant on the dragline capacity versus the overburden requirement for each system to uncover 5 Mtpa of ROM coal. If the dragline has sufficient capacity then it is moved up into the tertiary horizon to maintain its total 28 million m3 capacity. The truck shovel system then removes any overburden waste not handled by the draglines.

A staged ramp up has also been scheduled to allow sufficient time for machine purchase and erection. The estimated life-of-project dragline and truck-shovel is shown at Figure 24 to Figure 27.

1.2.2.5 Run of Mine Strip Ratio

Average ROM strip ratio for the life of the mine is 10:1. Generally, steady increases are observed; however, this can change depending on the final dragline system implemented in each pit. The estimated ROM strip ratio is shown at Figure 28.

1.2.2.6 Blasting

Blasting will be required for the Permian overburden and inter-burden horizons in each of the four mining pits. Blasting will not be required for the coal as generally the coal seams are less than 2.5 m thick.

Figure 24. Dragline Permian Waste

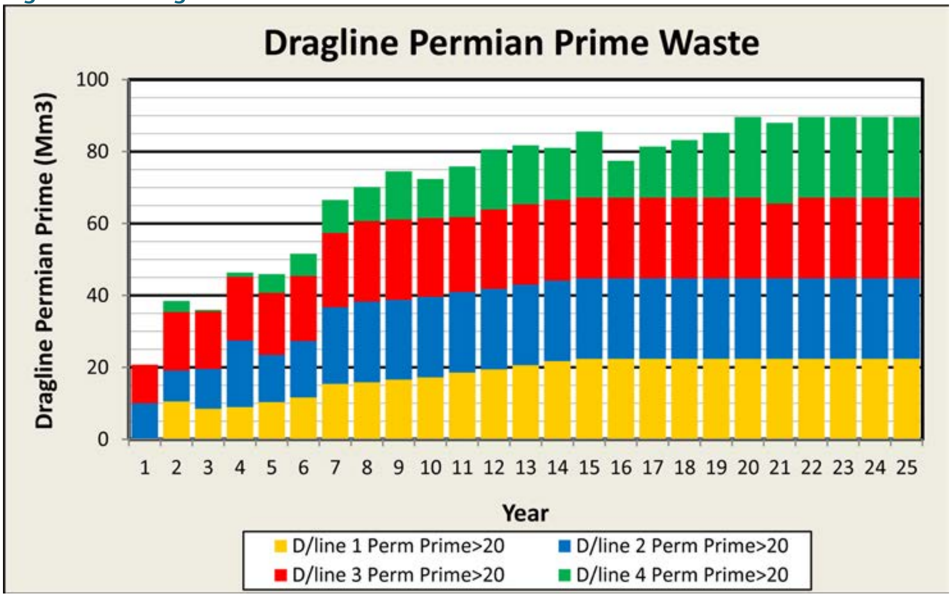


Figure 25. Dragline Tertiary Waste

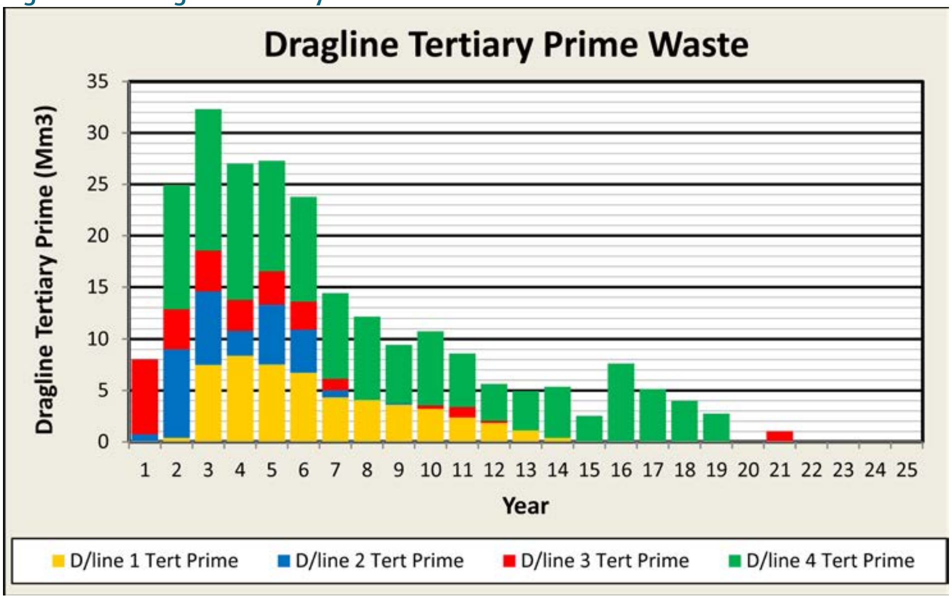
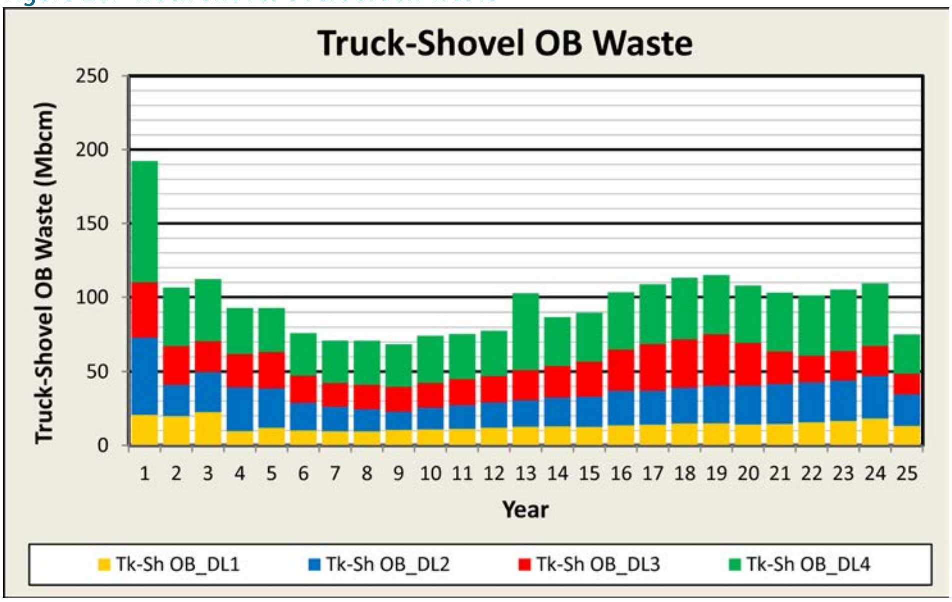


Figure 26. Truck-Shovel Overburden Waste



The range of individual blast sizes will generally be one – two Mbcm for the overburden blasts and 0.1 to 0.2 Mbcm for the interburden blasts. The total number of blasts per week is estimated to be four, with an average weekly blasted volume of 2.4 Mbcm. Table 3 provides a summary of the indicative weekly blasting requirements.

Stemming depths for blasts will typically be five m and initiation delays will most likely be around 50 milliseconds. Blasting design changes may be required when blasting approximately the infrastructure corridors as in some cases they may be inside the typical 500 m buffer zone.

It is envisaged that an explosives contractor will provide the explosives for the site. The preferred option for storage and supply of bulk explosives is for the contractor to store the unmixed chemicals at an approved facility just outside the mining lease boundary, and then transport them to site in specially designed trucks for loading into the blast holes.

Over the life of the mine the amount of bulk explosives used per annum will typically be in the 40,000 - 60,000 tonne range. Overburden and inter-burden blasted quantities are shown in Figure 29 and Figure 30.

Figure 27. Truck-Shovel Inter-Burden Waste

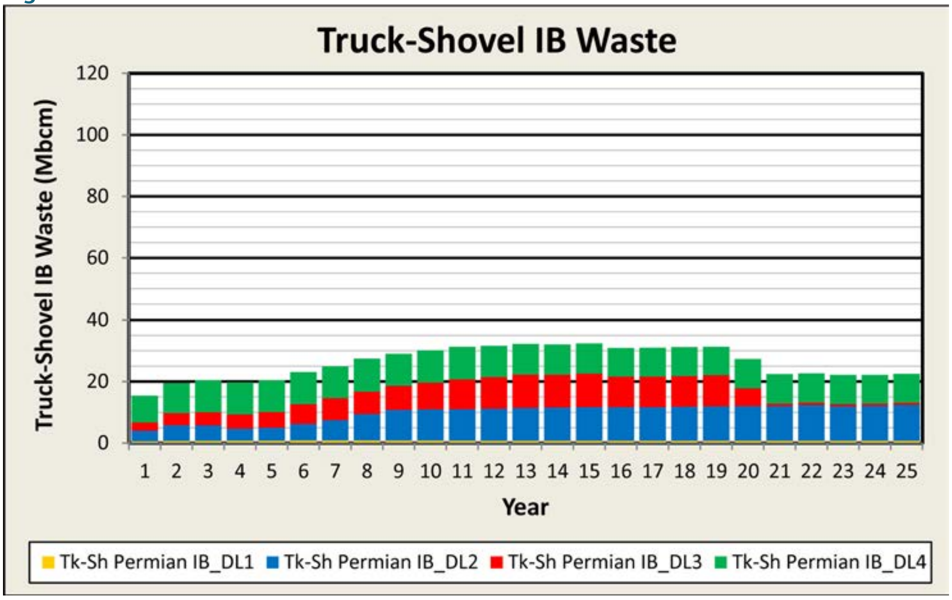


Figure 28. ROM Strip Ratio

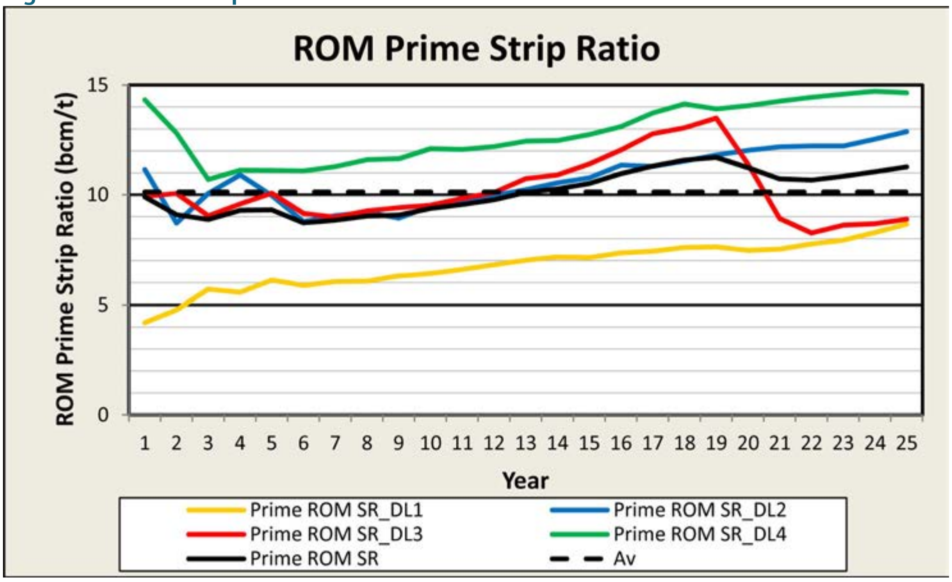


Table 3. Blasting Summary

ITEM	UNITS	ANNUAL	WEEKLY	TYPICAL BLAST SIZE	TYPICAL NUMBER OF BLASTS PER WEEK
Average Blasted OB Volume	Mbcm	93.5	1.9	1.5	1
Average Blasted IB Volume	Mbcm	26.1	0.5	0.18	3
Total Blasted Volume	Mbcm	119.6	2.4		4
Average Explosive Usage for OB	t	37,400	748	600	
Average Explosive Usage for IB	t	9,100	182	63	
Average Total Explosive Usage	t	46,500	930		

1.2.2.7 Underground Mining Method

The underground mines will produce coal by a modern, mechanized, retreating longwall mining system. This mining method is well established, and is used widely in Australia and overseas. Use of the longwall mining method will enable an annual production rate of approximately nine Mtpa ROM from each mining area. Four mining areas are planned to be mined in parallel (Mines 1 to 4), with three mines in the D-Seam, and one mine (Mine 4) in the B-Seam.

The proposed longwall mining blocks are approximately 470 m wide, rib-to-rib. Once extracted, and including the development roadways on either side of the longwall block, the total extracted width is 480 m. The lengths of the longwall blocks will be up to 7,000 m.

Figure 29. Overburden Blast Quantities

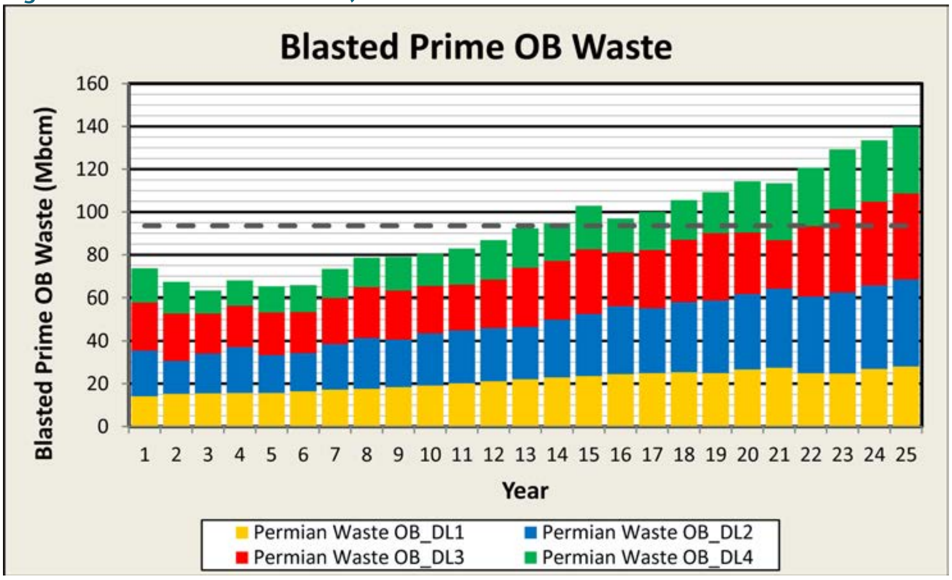
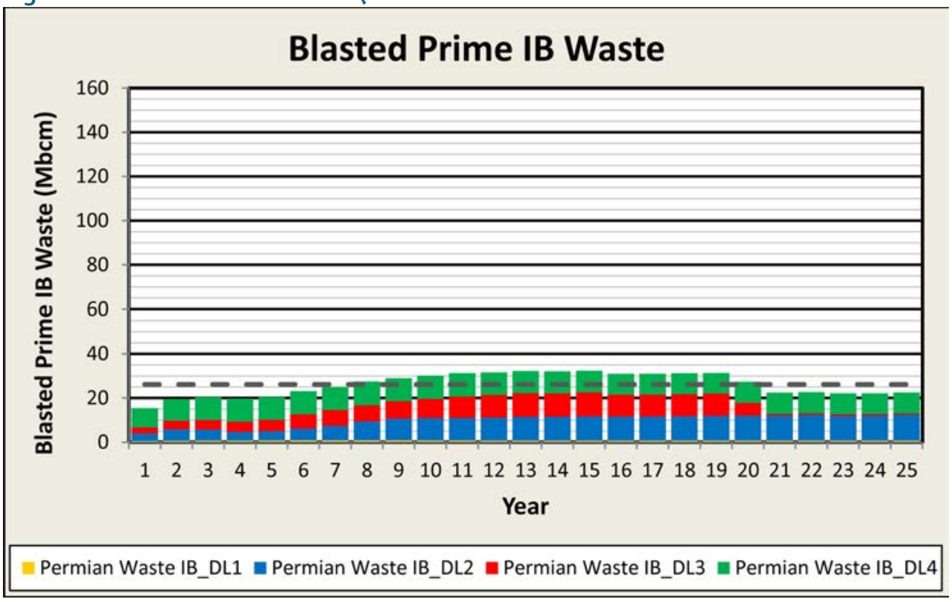


Figure 30. Inter-Burden Blast Quantities

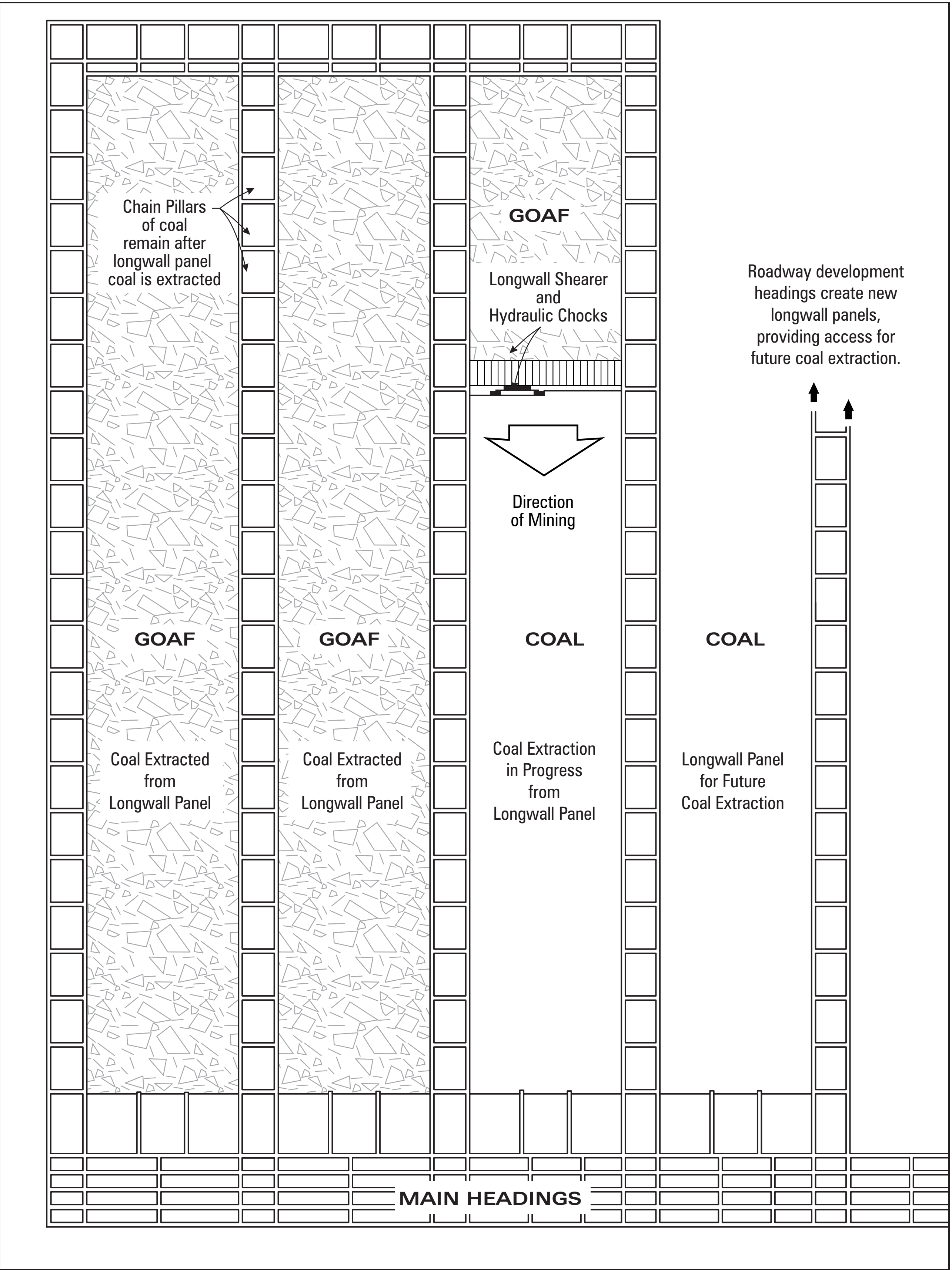


Between each longwall, extraction block and a coal pillar will be left with a total width of 20 m rib-to-rib and a length between cut-through of 95 m rib-to-rib.

The projected mine access roadways will be mined at a width of 5.0 m, and a minimum height of 2.5 m. The gateroads alongside the longwall blocks will be mined as two headings with a centre-to-centre distance of 25 m, and a distance between cut-through of 100 m (centre-to-centre). The main roads will consist of five headings running parallel, with a centre-to-centre distance of 28.75 m and 100 m spacing between cut-through (centre-to-centre).

Illustrated schematic of the proposed development is Figure 31.

Figure 31. Proposed Underground Mining Concept



1.2.2.8 Underground Mining Development Sequence

The underground mines development will initiate via the inclined drifts down from the surface. There will be three drifts per mine. These drifts will separately service personnel and materials, the conveyor and ventilation. The drifts will begin on the surface near the open cut mining areas, and develop in an east-to-west direction to meet the coal seams below ground.

Once the drifts have reached the coal seams, main development headings (consisting of five roadways running parallel to each other), develop in order to reach to mining areas for all the subsequent longwall blocks.

The initial production stage of longwall mining involves the development of roadways around the blocks of coal. This process will extract the coal via longwall mining. The roadways define the boundaries of the block, which known as "gateroads". These roads are also required to provide employee access, machine access, ventilation, electrical supply, communications systems, services lines and coal transport.

The development roadways remove only a minor portion of the coal seam area, and are designed to maintain stability during both the development and longwall extraction phases. The roadways support mechanical strata control, which is not intended to fail or converge significantly during the life of the mine. Consequently, there are no subsidence impacts from development roadway workings ("first workings").

The value of coal extracted with the associated development of roadways does not meet mining costs of extracting this coal. However, the economic returns from investing in roadway development result from the subsequent longwall extraction, utilising previously developed roadways.

Longwall face equipment installation at the end of the longwall block is furthest away from the main headings, where extracting the coal in a "retreating" method back towards the main headings. Upon completion of the mining of each block, the longwall equipment will locate back to the other end of the next block in the series, and the mining process repeats.

Longwall mining totally removes the blocks of coal between the developed roadways. Longwall shearing machinery travels back and forth across the coalface in each block. This machine ("shearer") cuts the coal from the coalface on each pass and a face conveyor, running along the full length of the coalface, carries this away to discharge onto a belt conveyor. A series of belt conveyors then carry the coal out of the mine.

The section in front of the coalface is held up by a series of hydraulic roof supports. These temporarily hold up the roof strata, enable enough space for the shearer, and face conveyor. After each slice of coal is removed (typically one m in width), the face conveyor, hydraulic roof supports and the shearer are moved forward. As the hydraulic roof support moves forward the overlying strata ("roof") behind the equipment collapses in the goaf. The extent of the overlying strata collapse and the associated shearing and cracking of the strata depends upon the strata geology, the longwall block width, the seam height extracted, and the depth of cover.

A cross-section through a typical longwall face is shown in Figure 32. An image of the machinery arrangement in operation on a typical longwall face is shown in Plate 3. The hydraulic roof supports are visible on the right hand side and the coalface on the left hand side of the image. The drum in the background is the rotating cutting head of the coal shearer, and the chain face conveyor can be seen fully loaded with coal in the foreground.

During the longwall mining process, the entire coal seam (or a selected section of it where applicable to the specific mining area), is removed from the ground. In areas where the coal seam has been extracted, the strata immediately above fails into the void, creating what are known as the goaf areas. Due to the breaking up and swelling of the rock mass into this void, the amount by which the overlying strata subsides is less than the height of the coal extracted, with the amount of subsidence movement decreasing with height above the coal seam.

Figure 32. Cross Section of a Typical Longwall Face

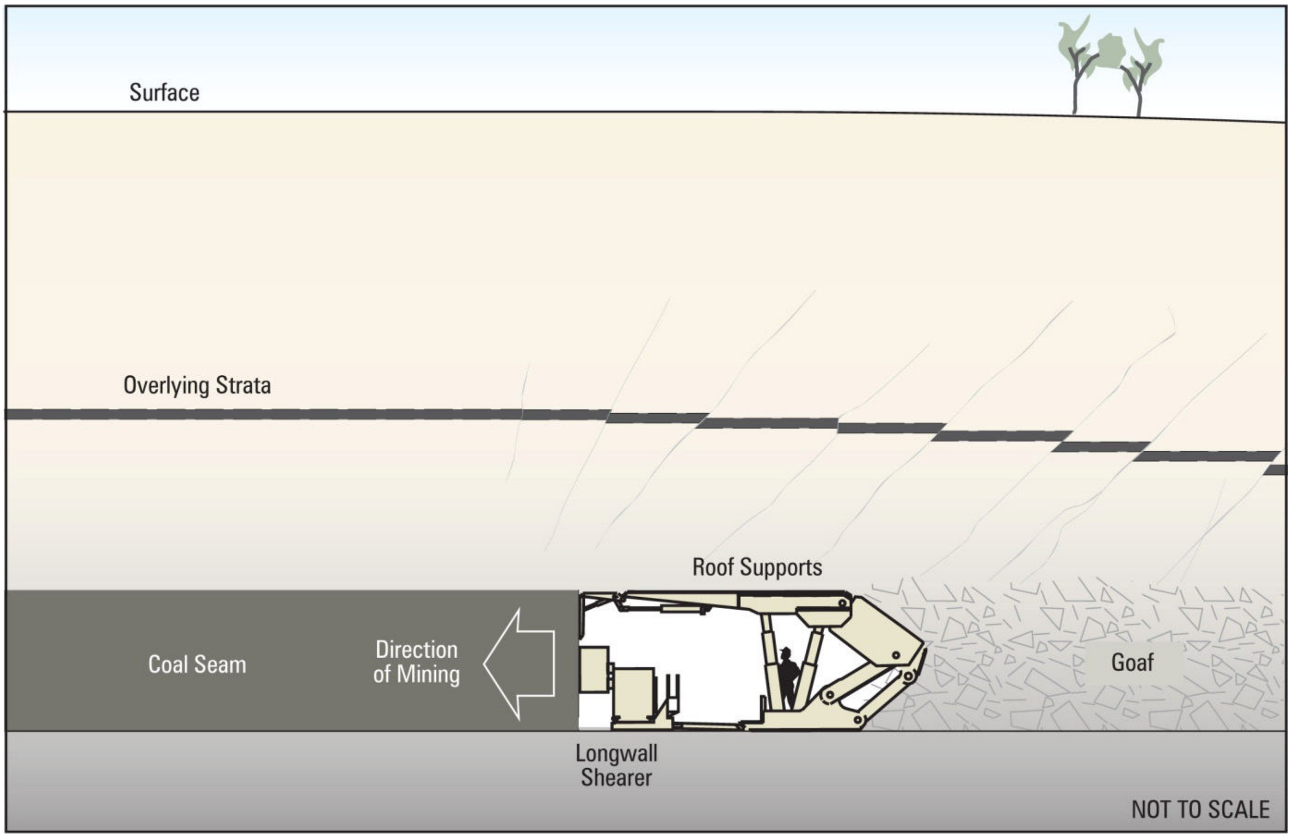


Plate 3. Typical Longwall Face Equipment Arrangement

The five year underground development sequence for the B and D seams are shown in Figure 33 and Figure 34 respectively.

Figure 33. B Seam Mine Development – 5 Year Intervals

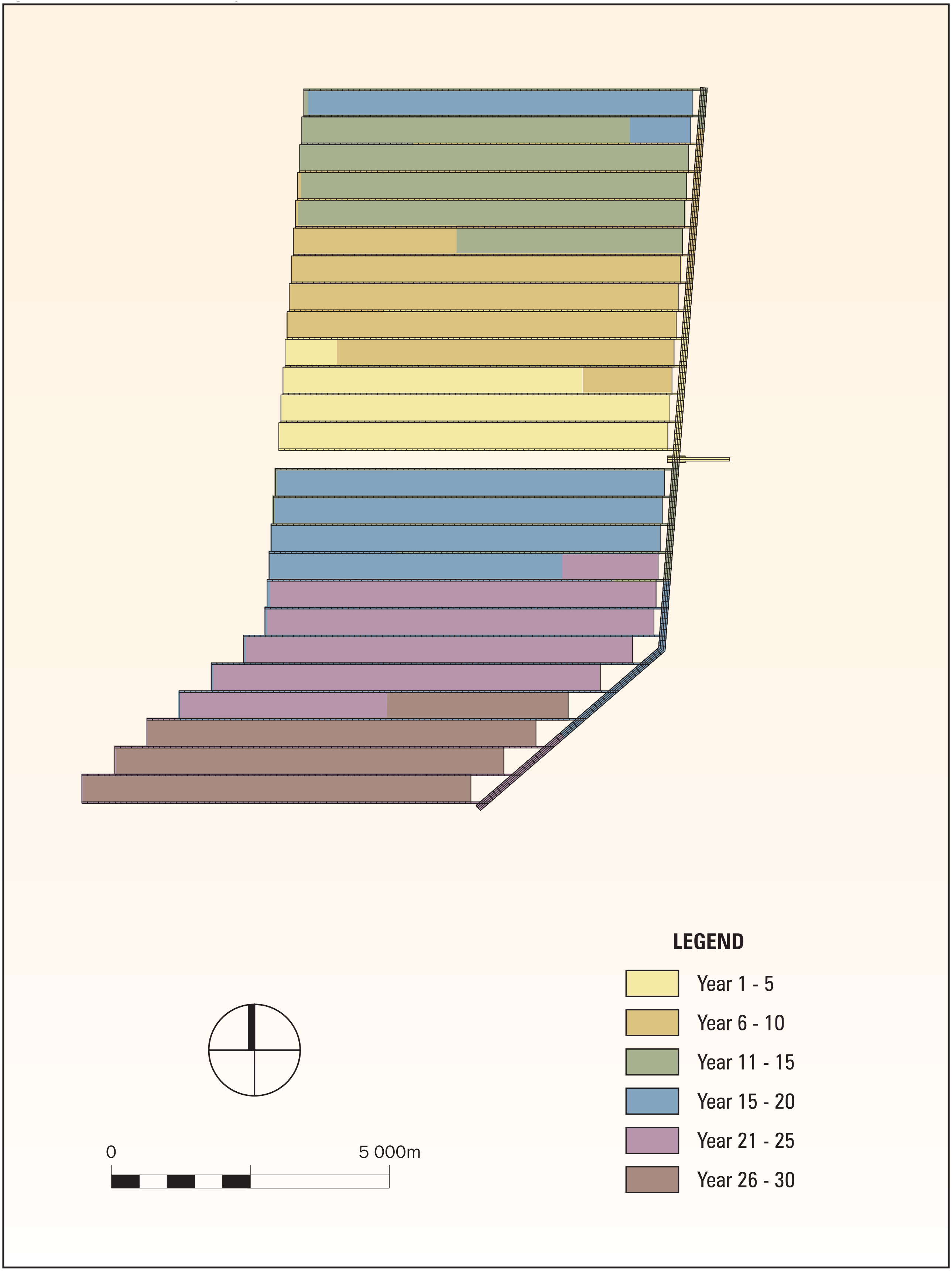


Figure 34. D Seam Mine Development – 5 Year Intervals

1.2.3 COAL HANDLING SYSTEM

The coal handling system consists of a raw coal system, a product coal system and a rejects coal system. This incorporates simultaneous coal feed from four underground mines and four open cut mines supplying two stand-alone CHPPs each capable of treating 4,000 tonnes per hour (tph). Materials handling capacity has been set at 56 Mtpa of raw coal. The product coal handling plant has a capacity of 40 Mtpa. A schematic showing the coal handling system is shown in Figure 35.

The underground longwall mines are designated:

- longwall Mine 1 in the northern area mining the D upper and D lower seams;
- longwall Mine 2 in the central area mining the D lower seam;
- longwall Mine 3 in the southern area mining the D lower seam; and
- longwall Mine 4 in the western area mining the B seam.

The open cut mines have been designated:

- OC1 North mining the C and D seams;
- OC1 South mining the C and D seams;
- OC2 North mining the B seam; and
- OC2 South mining the B seam.

The raw materials handling system provides for four streams feeding the raw coal stockpiles:

- LW1 and LW2 feeding Seam D at 18 Mtpa;
- OC2 and LW4 feeding Seam B at 19 Mtpa;
- OC1 feeding Seams C and D at 10 Mtpa; and
- LW3 feeding Seam D at nine Mtpa.

This effectively rationalises the conveyor systems to two basic feed rates for best design scale.

1.2.3.1 Raw Coal Plant Layout

1.2.3.1.1 ROM Coal – Open Cut

Raw coal from the open cut pits will be transferred to a ROM pad by truck at nominal 600 mm size. The B seam pits OC2 North and South will discharge to a common primary crushing station as will OC1 North and South for seams C and D. There will be one ROM pad, ROM bin and primary crusher arrangement at each of the open cut mines OC1 and OC2. Secondary and tertiary crushing stations will be located immediately after each of the primary crushing stations.

Coal dumped directly into a ROM bin when the CHPP is running at capacity or deposited into a stockpile to allow surge capacity.

Plate 4 shows a typical ROM dump station. Reclaim feed to the ROM bin from the stockpile will be by front end loader. An elevated ROM pad will be constructed using a reinforced concrete design around the crusher pocket. The top level will be nominally 20 m high to allow transfer chute layout within the crushing station.

Primary crushing takes place immediately under the ROM feed bin with the crusher set to 300 mm. The primary sizer is a low speed sizer, a combination of high torque and low roll speeds with a unique tooth profile. Plate 5 shows a typical open cut sizer.

The secondary and tertiary crushing stations are effectively identical to the configuration adopted for the underground ROM coal. That configuration replicates the longwall layout to provide a common CHPP raw coal feed at 50 mm throughout.

1.2.3.1.2 ROM Coal – Underground

Each longwall mining operations will deliver +300 mm coal to dedicated drift stockpiles. Each drift stockpile will be a single cone stockpile 60 m high, providing up to a 450,000 t capacity with additional storage capacity available from dozer push-out.

Each drift stockpile will incorporate a single reclaim tunnel with three reclaim chutes rated at 1,000 tph each to provide 3,000 tph feed capacity to the coal handling and preparation plant stockpile system. Feed from the stockpile is sized at +300 mm. Coal valves and belt feeders will control loading of the drift stockpile ROM reclaim conveyor.

The reclaim chambers and tunnel will be cast *in-situ* with reinforced concrete. The conveyor will be hung from the tunnel roof with access to both sides for personnel and for bobcat machine clean up. Escape tunnels in compliance with code requirements will extend to clear the stockpile footprint. The conveyor tunnel will have induced draft ventilation.

The reclaim conveyor from each drift stockpile will feed coal to a two stage crushing plant, comprising a secondary sizer, roller screen and tertiary sizer, sizing the coal to 50 mm from 300 mm.

In this process, any undersize coal from the reclaim conveyor reports directly to the tail end of a transfer conveyor via lined chutes (Plate 6). A magnet will be installed at the head pulley of the secondary sizer. The magnet will be placed to remove foreign objects from the process. The secondary sizer will size the product from 300 mm to approximately < 150 mm. The product will leave the secondary sizer and discharge onto a roller screen. The roller screen will filter out the product sized to 50 mm and transfer that product through the tertiary sizer directly to the outloading conveyor through chutes.

There will be a secondary and tertiary crushing station dedicated to each underground mining operation.

The conveyed "raw coal" transferred and loaded to an overland conveyor. This process continues to a transfer tower for transportation to raw coal stockpiles.

1.2.3.2 Raw Coal Conveyor Configuration

Conveyor transfers the B seam product to the B overland conveyor. The C and D seams report to the dedicated C and D overland conveyor. The raw coal stockpile configuration and feed to the CHPP shown in Figure 35.

The ROM conveyor configuration is shown in Table 4.

Table 4. ROM conveyor configuration specifications

DESCRIPTION	BELT SPEED (M/S)	BELT WIDTH (MM)	CAPACITY (TPH)
Drift Stockpile Reclaim Conveyors	4.0	1,600	3,000
ROM Reclaim Conveyor	4.0	1,600	3,000
Transfer Conveyor	4.0	1,600	3,000

Plate 4. Typical Open Cut ROM Dump Station

Figure 35. Schematic Representation of the Coal Handling System

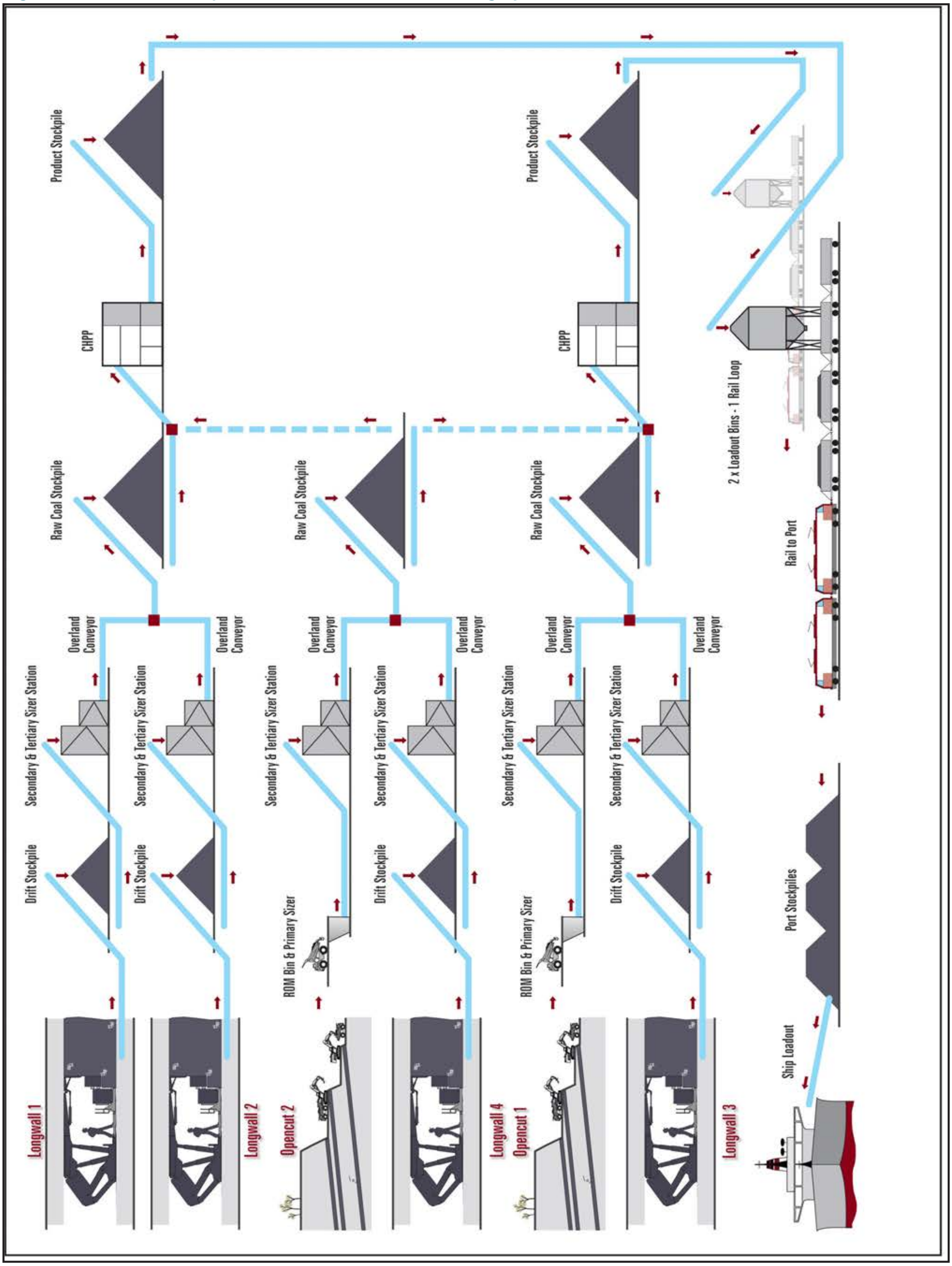


Plate 5. Typical Crusher / Sizer

Plate 6. Typical Trunk or Drift Conveyor

ROM coal conveyors will deliver sized (-50 mm) Raw Coal to one of four overland conveyor (OLC) streams. A separate OLC is dedicated to each of the four coal seams B, C and D and two D. The OLC system from seam D (underground Long Wall 3) will comprise of two separate overland conveyors linked by transfer stations.

The overland conveyors will transfer the raw coal to elevated stockpile tripper conveyors. These rising plant conveyors will discharge onto the Raw Coal Stockpiles via a standard elevated conveyor and tripper arrangement as shown on Figure 35.

The four overland conveyor streams will discharge onto three Raw Coal Stockpiles. The details of these are:

- 400,000 t stockpile – D seam from Long Wall Mines 1 and 2;
- 200,000 t stockpile – B seam from Long Wall Mine 4 and Open Cut Mine 2;
- 400,000 t stockpile – compromising:
  - 200,000 t – seam C and D from Open Cut Mine 1; and
  - 200,000 t – seam D from Long Wall Mine 3.

The 200,000 tonne (t) stockpile will be 140 m long and 35 m high, while the 400,000 t stockpiles will be 280 m long.

The B seam overland conveyor for mines OC2 and LW4 feeds a Raw Coal stockpile of 200,000 t capacity. This conveyor system first elevates the coal to a Transfer Bin fitted with two discharge feeders. Coal is then transferred to the tail end of the main reclaim conveyors feeding each of the CHPP's. This allows the B seam coal to be fed to either Coal Preparation Plant. It will also allow limited blending with the reclaimed coal from either of the D seam and C and D seam stockpiles. The transfer system for B seam coal is not intended to feed both CHPP's in tandem.

The D seam, C, and D raw coal stockpiles each have 400,000 t capacity with the D system dedicated to LW1 and LW2 supply.

Reclamation from the Raw Coal Stockpiles will be via a reclaim tunnel and coal valve arrangement. Two coal valves will be required for the 200,000 t stockpiles and four each for the 400,000 t stockpiles.

A single reclaim conveyor from each of the 400,000 t stockpiles will feed into a single CHPP. Reclaim from the 200,000 t stockpile (B seam) can be diverted to either CHPP via a transfer tower and conveyor discharging onto the head end of either 400,000 t stockpile reclaim conveyor. This provides a simplistic raw coal blending capability.

Each CHPP will have only one feed conveyor, being the feed from one 400,000 t raw coal stockpile. Each CHPP will be fitted with a bunkering system to ensure even coal flow to each of the four operating modules.

1.2.3.3 Product Coal and Train Load Out

Each CHPP will have only one product coal conveyor discharging washed coal to a 400,000 t product coal stockpile. The product stockpiles will be 280 m long and 35 m high. Product coal stacking will again be via conventional elevated gantry conveyor and tripper arrangement.

Product coal reclamation, for each CHPP, will be via bulldozer and coal valve operation discharging coal onto a single reclaim tunnel conveyor. Each product stockpile will be fitted with four reclaim valves. Reclaimed product coal will be conveyed to a train load-out (TLO) bin for loading into trains.

The product coal reclaims and TLO conveyors bins will be rated to 6,000 tph.

1.2.3.4 Rejects

Each CHPP will have a single reject conveyor discharging into a rejects bin. The reject bin will be used to fill mine trucks, which will return the reject coal back to the open cut mine sites for disposal.

The basic design characteristics of the CHPP conveyor are shown at Table 5.

Table 5. CHPP basic design characteristics

DESCRIPTION	BELT SPEED (M/S)	BELT WIDTH (MM)	CAPACITY (TPH)
Overland Conveyors	5.4	1,600	4,500
Raw Coal Conveyors	5.0	1,600	4,000
Product Coal Conveyors Stacking	5.0	1,600	4,000
Reject Coal Conveyors	4.0	1,600	4,000
Product Coal Reclaim Conveyors	6.6	1,600	6,000
Train Load Out Conveyor	6.6	1,600	6,000

1.2.3.5 Coal Handling Preparation Plant

The CHPP facility will operate at a nominal plant feed rate of 8,000 tph as received (ar) to target the required annual plant feed rate of 56 Mtpa ar with a full plant operating hours design allowance of 7,000 hours (h). To maximise modular throughput for the proposed CHPP a desliming screen aperture of two mm chosen and (at this aperture), a capacity of approximately 1,000 tph / module should be achievable for the range of likely feed types to the plant. This modular capacity and the requirement for dual rail load out loops dictated the arrangement for the CHPP facility would be two plants each consisting of four 1,000 tph modules.

A single conveyor will feed each of the two plants and this will require a suitable feed distribution system to be installed to evenly distribute the feed tonnage across the four modules in each plant. The feed will become slurry at this point through addition of water to transport and optimise feed conditions to the desliming screens (Plate 7).

The function of the desliming screen is to remove sub-sized particles (-2.0 mm material) from, and dewater, the dense medium cyclone feed (+2.0 mm material). Screening is achieved by presenting particles to the screen deck surface and moving particles smaller than the aperture through the sieve surface. Vibration of the screen assists this process by stratifying the bed, giving particles more opportunity to present to the screen surface.

Plate 7. Desliming Screen

Plate 8. Dense Medium Cyclone

The CHPP will be based on conventional wet beneficiation processes using proven technology that is used extensively throughout the Australian coal industry. The 2 mm coarse coal fraction will be beneficiated in dense medium cyclones (Plate 8). In this process the 2 mm material from the desliming screens is mixed with a magnetite / water medium and pumped to a single large diameter dense medium cyclone in each module. Dense medium cyclones separate based on density with the high-density non-coal material reporting to coarse rejects and the lower density coal reporting to product after dewatering in coarse coal centrifuges.

The 2.0 mm raw coal slurry from the desliming screens is pumped to classifying cyclones in each module that remove the 0.125 mm material and the bulk of the water from this stream. The <-2 to +0.125> mm fine coal fraction will be beneficiated using spirals in a water based separation. Spirals product is dewatered in fine coal centrifuges (Plate 9) and reports with the dense medium cyclone product to the plant product conveyor. Spirals reject is dewatered on high frequency screens with the coarse spirals reject particles reporting with the dense medium cyclone reject on the plant reject conveyor and the fine spiral reject particles reporting to the tailings thickener.

The 0.125 mm material will be discarded to tailings due to the high operating / capital costs and low marginal value typically associated with coal in this size fraction. The proposed tailings system will be a simple "high-rate" thickener (Plate 10) and tailings dam process. Four 48 m diameter tailings thickeners will be installed as part of the CHPP. Once thickened, the tailings are pumped to the tailing storage facility.

The two proposed tailing systems being reviewed are the traditional co-disposal system and the capital intensive filter press system. Both systems require the sub <0.125 mm particles to be conditioned with flocculants, a process carried out within thickening tanks. The thickening process forms an aqueous tailings slurry allowing tailings to either be transported via a pipe network to a co-disposal or filter press system. Four 48 m diameter tailings thickeners will be installed as part of the Project. The traditional co-disposal system has the tailings slurry being pumped to a sealed specifically created tailings storage containment structure. The tailings are deposited into various cells where excess water is decanted and recycled to the CHPP.

The later filter press method is expensive to setup and utilizes either belt or filter presses to dewater tailings forming a dry paste. The water is recycled to CHPP while the tailings paste is conveyed to the rejects surge bin for disposal in rejects containment structures. Excess water from rejects containment structures is also recycled.

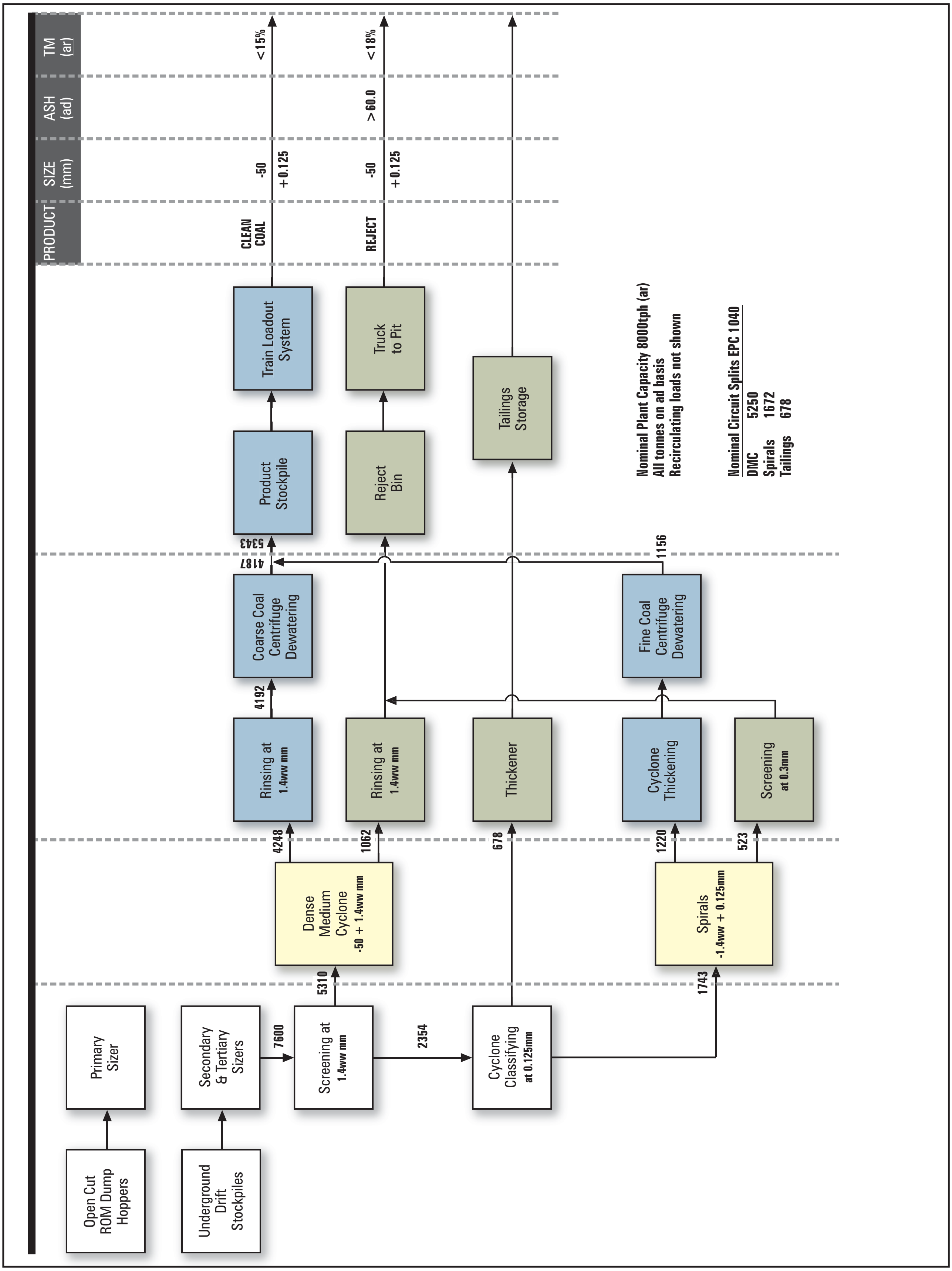
The plant will be controlled from a single computerised control room. The control room is part of a building separated from the CHPP, but adjacent to the CHPP, which also houses all the power supply and motor control panels and PLC hardware.

The nominal CHPP process is shown in Figure 36.

Plate 9. Fine Coal Centrifuge

Plate 10. Tailings Thickener

Figure 36. Block Flow Diagram



1.2.4 SITE WATER MANAGEMENT SYSTEM

1.2.4.1 Water Demands and Sources

The estimated required annual quantity of clean water is 4,550 megalitres per annum (ML/a) of which 2,400 ML/a is needed for the four longwall mines, 2,000 ML/a is required for the CHPP vacuum pumps and potable and fire water usage will be approximately 150 ML/a. Clean water for the mine will be sourced from a proposed dam to be constructed on Tallarenha Creek.

Potable water demand is estimated to range from 1 ML/a to 290 ML/a during mine development and from 100 ML/a to 150 ML/a during operations. Potable water supplies during early construction will come from contracted potable water suppliers carting from an offsite source. Once major construction activities have commenced a package potable water treatment plant will be installed to cater for potable water demands during the remaining construction and operating phases of the mine. This water will be sourced from the Tallarenha Creek Dam.

Raw water will be required for coal washing and dust suppression in the open cut mines. The estimated annual water requirements for these uses are:

- Open cut mine dust suppression: 2,000 ML/a;
- CHPP (coal washing): 11,200 ML/a.

Excess water in the CHPP will be recycled to the Return Water Dam and be available to meet the raw water demands. The quantity of water that can be returned from the CHPP to the Return Water Demand will depend on the method used to dispose of rejects and tailings. Two rejects/tailings disposal options have been identified for the mine:

- Pumping rejects and tailings to disposal cells as a slurry (co-disposal);
- Trucking rejects and filter pressed tailings to disposal cells.

The co-disposal method requires significantly more water and involves higher water losses in the disposal cells. Accordingly, there will be less water returned from the CHPP to the Return Water Dam using the co-disposal method. Preliminary mass flow calculations for the CHPP and disposal cells have identified the following return flows from the CHPP to the Return Water Dam:

- Co-disposal: 9,360 ML/a;
- Trucking rejects and filter pressed tailings: 12,351 ML/a.

The estimated net raw water requirement for the mine (allowing for water returned from the CHPP) will be:

- Co-disposal: 3,840 ML/a;
- Trucking rejects and filter pressed tailings: 849 ML/a.

Preliminary hydrogeological and water balance modelling investigations (AMEC, July 2010) have identified the following raw water sources for the mine (suitable for coal washing and dust suppression):

- Aquifer inflows from open cut pits and underground mines: 4,045 ML/a;
- Rainfall inflows to the open cut pits: 305 ML/a to 863 ML/a depending on stage of mining;
- Catchment inflows to the CHPP environmental control dam: 39 ML/a.

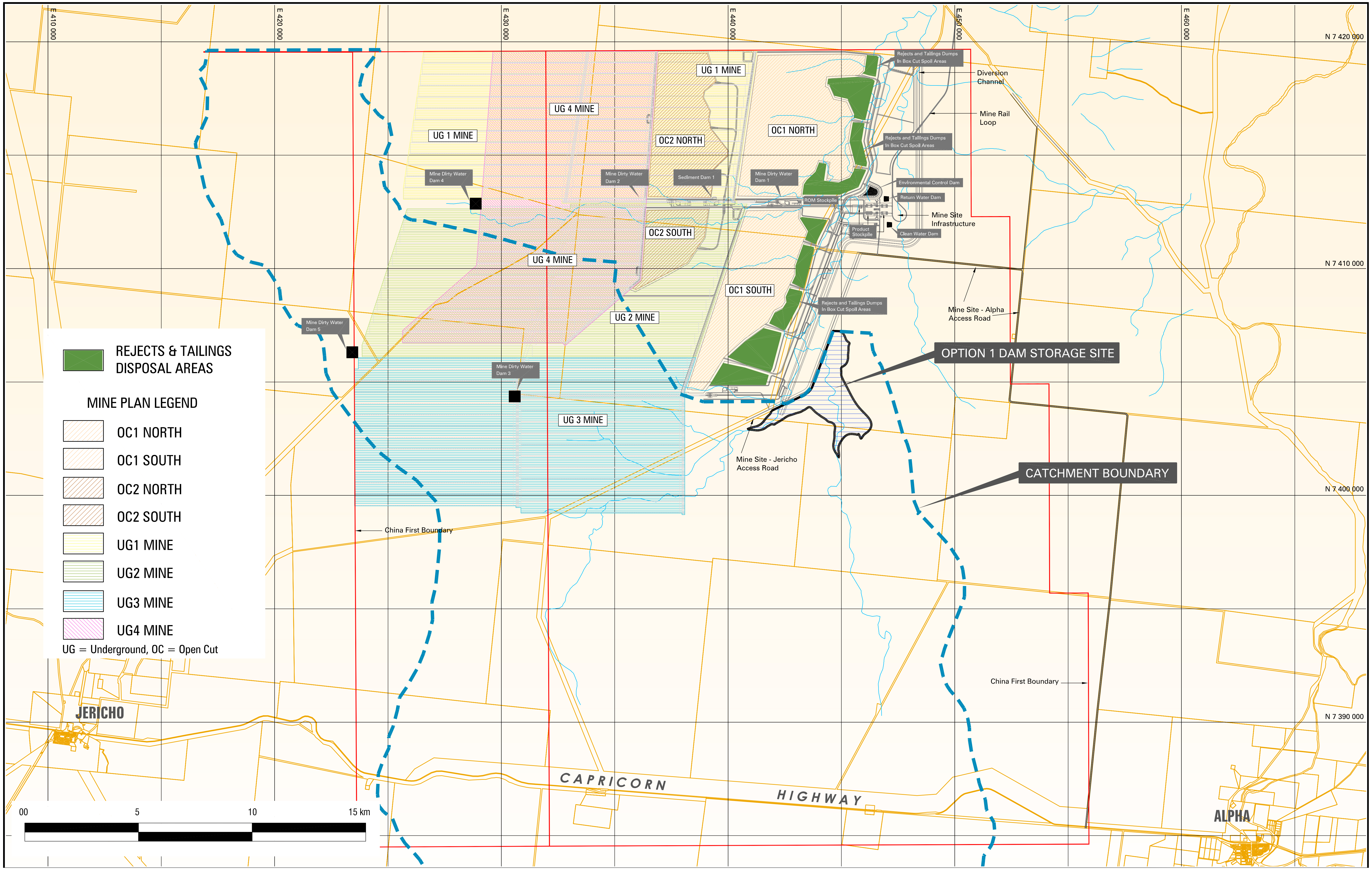
There will be an excess of raw water to meet the operational mine demands.

1.2.4.2 Tallarenha Creek Dam

The clean water supply for the mine (4,550 ML/a) will be sourced from a proposed new dam constructed on Tallarenha Creek (Monklands Dam) at the junction with Beta Creek.

The proposed dam site (see Figure 37), is on Tallarenha Creek at Zone 55, E 444 499 and N 7 404 737 (GDA 94 Datum). The watershed basin is Burdekin, Drainage Division 1. The catchment area is 866 km2 comprising the catchment areas of Beta Creek and Tallarenha Creek. Preliminary investigations (AMEC, November 2010) identified a reservoir storage volume of 18,098 ML corresponding to a full supply level of 345 m AHD and a maximum dam embankment height of 7 m. Tallarenha Creek extends 48 km upstream of the dam site and the Belyando River is 70 km downstream. A detailed engineering investigation is required to determine the suitability and type of impoundment structure required.

Figure 37. Proposed Tallarenha Dam Site Location



A preliminary yield analysis for the storage was undertaken using a computer based water balance model for the historical period 1900 to 2008. This model uses daily 'inputs' and 'outputs' into the storage structure and determines the resultant storage volume, overflows and actual reclaim from the structure for a nominated demand. The actual reclaim is the amount obtained after all other inputs and outputs have been accounted for. The reliability of the supply is therefore a measure of the number of times the required demand is achieved.

Inputs:

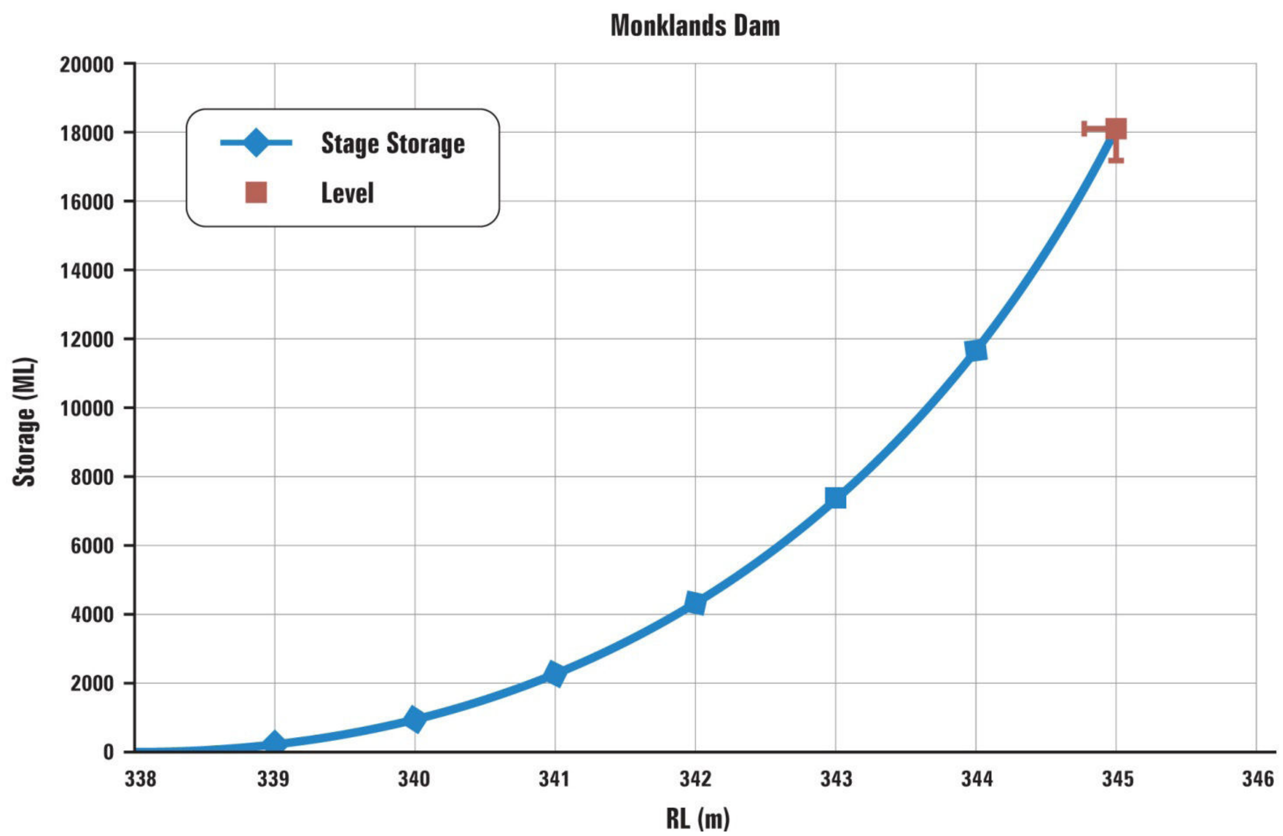
- Daily rainfall falling directly on the storage surface. SILO Data Drill applicable to the site location used.
- Daily runoff from rainfall falling on the catchment that reports to the storage. Determined using AWBM runoff generation model.
- Other daily inflows such as water harvesting – nil.

Outputs:

- Daily evaporation from structure. SILO Data Drill applicable to the site location used.
- Water reclaimed from the structure to meet demand.
- Spillway discharge.
- Seepage losses.

The analyses have been carried out for a range of annual demands ranging from 500 ML to 10,000 ML. A dam site stage storage curve has been generated using available topographic data for the impoundment area. Details of the storage curve used with the water balance model are provided at Figure 38. Full supply volume is 18,098 ML.

Figure 38. Proposed dam site storage curve



The results of the dam yield assessment are shown at Table 7. The preliminary yield assessment indicates that the dam will be able to supply the mine clean water demand of 4,550 ML/a with a reliability of approximately 100 %. If the dam has a lower yield than that identified in the preliminary yield assessment, then additional clean water supplies will be obtained from the following sources:

- Desalination of excess groundwater pumped from the open cut pits and underground mines;
- Proposed SunWater pipeline from Moranbah to Galilee Basin coal mines as part of the Connors River Dam project (if this project proceeds).

The results of the assessment are shown at Table 6.

Under the provisions of the *Water Supply (Safety and Reliability) Act 2008* and *Water Act 2000*, a dam that would, in the event of failure, put a population of two or more people at risk is classified as 'referable'. The population at risk is determined by a dam failure impact assessment which assigns a failure impact rating for the dam as follows:

- Less than 2 people at risk – no failure impact rating.
- 2 to 100 people at risk – Category 1 failure impact rating.
- More than 100 people at risk – Category 2 failure impact rating.

Dams that are given a Category 1 or 2 failure impact rating are classified as 'referable'.

A failure impact assessment will be undertaken for the proposed Tallarenha Creek Dam as part of the engineering investigations and design for the mine. It is likely that the Department of Environment and Resource Management will classify the dam as referable because of the large storage capacity of the dam and the location of the mine industrial area, CHPP, open cut workings, access roads and rail loop in the downstream failure flow path for the dam.

Under the *Sustainable Planning Act 2009* a development permit is required for all new referable dams. The design and operation of the dam will comply with all dam safety conditions imposed by DERM as part of the development permit approving the dam construction, including:

- Submission of a certified Design Plan including Data Book, Design Report and as-constructed documentation;
- Development of Standard Operating Procedures and Operating and Maintenance Manuals;
- Development of an Emergency Action Plan;
- Development of a program for and undertaking dam safety inspections and reviews; and
- Development of a Decommissioning Plan.

Section 76G of the *Fisheries Act 1994* requires that new waterway barriers must adequately provide for fish passage. A development permit is required for the construction of a new waterway barrier under the *Sustainable Planning Act 2009*. A fishway will be incorporated into the proposed Tallarenha Creek Dam to facilitate fish passage. The type and arrangement of fishway will be determined as part of the detailed design of the dam.

Table 6. Water Yield and Reliability Assessment Results – Tallarenha Creek Dam

REQUIRED ANNUAL DEMAND (% AVE, ANNUAL CATCHMENT YIELD)	RELIABILITY	AVERAGE NO. OF DAYS IN A YEAR WITH ZERO YIELD	AVERAGE NO. OF DAYS IN A YEAR WITH YIELD < REQUIRED	RATION AVERAGE SPILL VOLUME/YIELD (AVERAGE ANNUAL SPILL)
	%	DAYS	DAYS	%(ML)
500 (1.1)	99.9	-	-	98 (47,000)
1,000 (2.1)	99.9	-	-	97 (46,800)
2,000 (4.2)	99.9	-	-	96 (46,000)
3,000 (6.3)	99.9	-	-	93 (44,800)
4,000 (8.4)	99.9	-	-	92 (44,200)
5,000 (10.5)	99.9	-	-	89 (43,500)
7,500 (15.8)	99.3	2.4	2.5	84 (41,700)
10,000 (21.0)	97.6	8.6	9.0	81 (40,500)

1.2.4.3 Water Management Flow Sheets

Water balance flow charts indicate that if rejects and filter pressed tailings are trucked to disposal rather than co-disposal pumping, there is annual water saving of 2,991 ML. The flow charts also show that after one year of mining, there is an excess of dirty water excluding evaporation and seepage losses.

Two flow sheets have been prepared for 40 Mtpa of coal production. Figure 39 is a flow chart where coarse rejects and tailings are co-disposed and Figure 40 is a flow chart in which coarse rejects and filter pressed tailings are trucked to dumps.

Evaporation losses have been included for aquifer water reclaimed from open cut pits. Runoff yield volumes are total volumes for 90% probability of exceedance, excluding evaporation and seepage losses.

Total water quantity fed into the CHPP in Figure 39 and Figure 40 is 18,240 ML/a, which includes 5,040 ML in raw coal, 11,200 ML/a from the return water dam and 2,000 ML/a for the vacuum pumps. Product moisture content accounts for 2,880 ML/a. Water is lost in the rejects and tailings disposal processes. Excess CHPP water is recycled to the return water dam.

In comparison, an additional 2,991 ML per year of water is required for co-disposal, compared to trucking coarse rejects and tailings. Further comparison shows that after one year of mining there are 749 ML and 3,740 ML of excess dirty water, excluding evaporation and seepage losses for the co-disposal and filter press options respectively. Excess water (primarily groundwater pumped from open cut pits and underground mines) will be disposed of using evaporation dams or will be desalinated and used to supplement clean water supplies from the Tallarenha Creek Dam.

1.2.4.4 Mine Dewatering

A mine dewatering system will be required to remove water from the open cut and underground workings prior to any mining operations. Sources of water will include groundwater inflows from the coal seam and overlying strata, overland flows and surface water runoff, gas drainage activities.

The dewatering system will consist of compressed air driven pumps that will pump accumulated water from each working face to an electric pod pump connected into a dewatering pipeline. The dewatering pipeline will then typically discharge into a central pumping station where the water will be pumped to the main dewatering dam. The anticipated volume of water able to be recovered through mine dewatering is estimated to be a minimum of 4,550 ML/a.

1.2.4.5 Water Storages

The site water balance model (AMEC, July 2010) indicates that the operations will have a surplus of water. To achieve this surplus, a number of water management dams are required, the location of which are shown at Figure 41.

Water from the Tallarenha Creek Dam will be pumped to the clean water dam which will be located upslope of the return water dam so that reservoir water can gravitate into the return water dam, or be released into creeks through a bywash, during intense rainfall events. The clean water dam will require a high-density polyethylene (HDPE) liner. The return water dam is located next to the CHPP and variable speed pumps will control flow rate in the plant. The environmental control dam is downslope of the CHPP and coal stockpile areas.

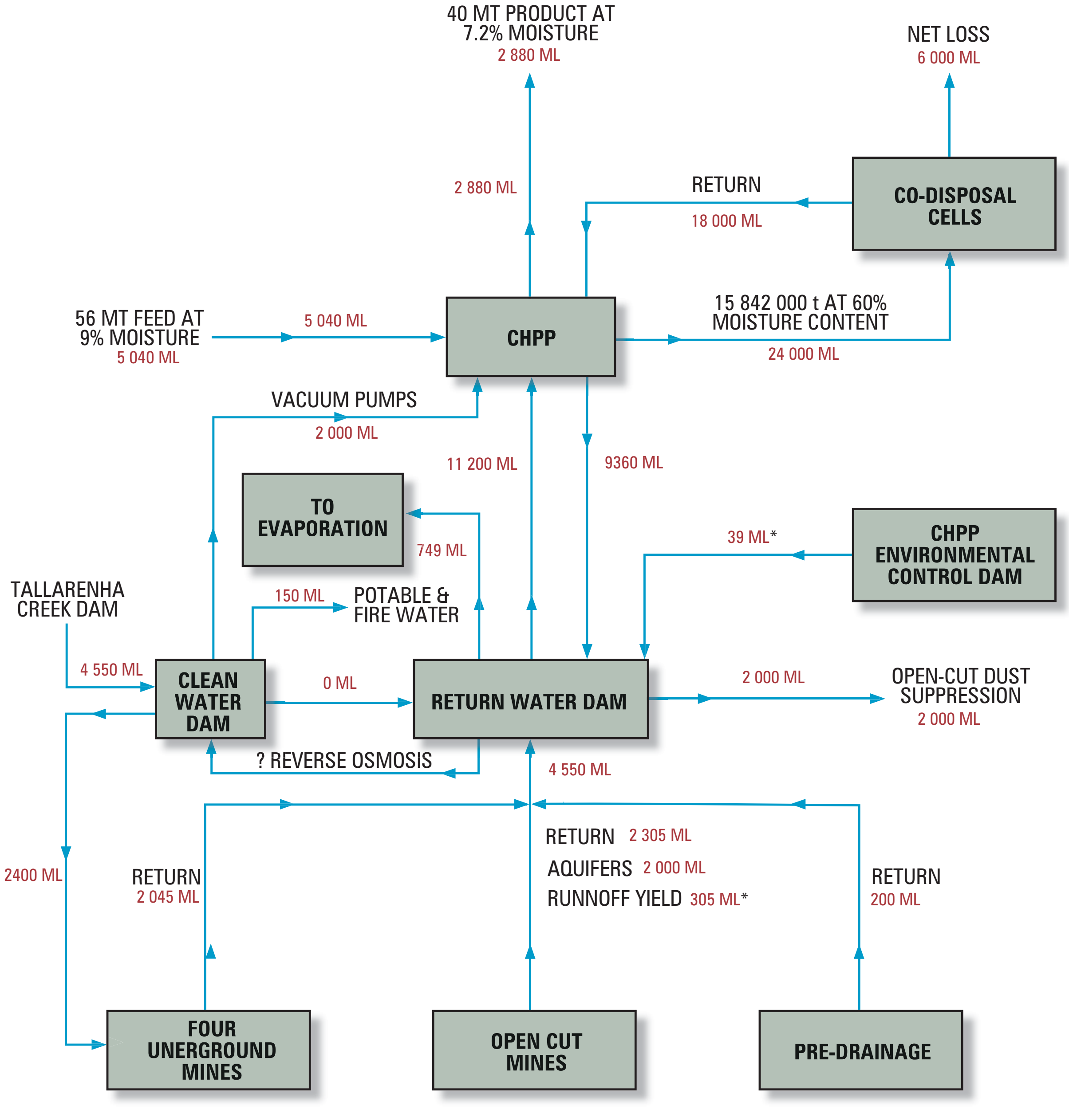
Five mine dirty water sites have been identified and these are shown at Figure 41. Mine water will be pumped from these sites to the return water dam. Additional, temporary dirty water dam sites could be required during mining.

For the OC1 North and OC1 South pits, low wall surface runoff could be initially directed into the rejects and tailings cells prior to transfer to the return water dam. Once the boxcut spoil piles have been topsoiled and rehabilitated, clean runoff water would be directed into the Tallarenha/Lagoon Creek diversion channel away from the CHPP dirty water catchment.

The OC2 North and OC2 South pits require a low wall sediment dam until the boxcut spoil piles have been rehabilitated. The proposed location (as shown in Figure 41) is outside any longwall subsidence area. Additional, temporary low wall sediment dams can be constructed, as required.

A hazard assessment will be undertaken for all dams and levees proposed for the mine in accordance with the DERM Manual for Assessing Hazard Categories and Hydraulic Performance of Dams to determine the likely impacts on downstream waterways and lands in the event of failure of the dams and levees. Dams that are likely to contain contaminated water or solids will be designed with sufficient storage capacity to prevent

Figure 39. Water Management Flow Sheet for Co-Disposal Option



* AFTER ONE YEAR OF MINING, NO EVAPORATION OR SEEPAGE LOSSES

discharges of contaminated water in accordance with the DERM Manual. The design of these dams will ensure that the dams can withstand flow conditions experienced during extreme flood events (both local and regional flooding).

1.2.4.6 Proposed Tallarenha/Lagoon Creek Diversion

Beta Creek and Tallarenha Creek combine at the southern end of the mine site (near south-east corner of OC1 South pit) and discharge into Lagoon Creek which flows in a northerly direction through the main industrial part of the proposed mine area. It will be necessary to divert Tallarenha/Lagoon Creek around the eastern side of the mine industrial area. The proposed diversion channel alignment starts downstream of the Tallarenha Creek Dam spillway and passes around the eastern side of the mine workings, CHPP and rail loop before discharging into Lagoon Creek at the northern mine tenement boundary (refer Figure 37).

The diversion channel will be designed in accordance with relevant design standards and guidelines including:

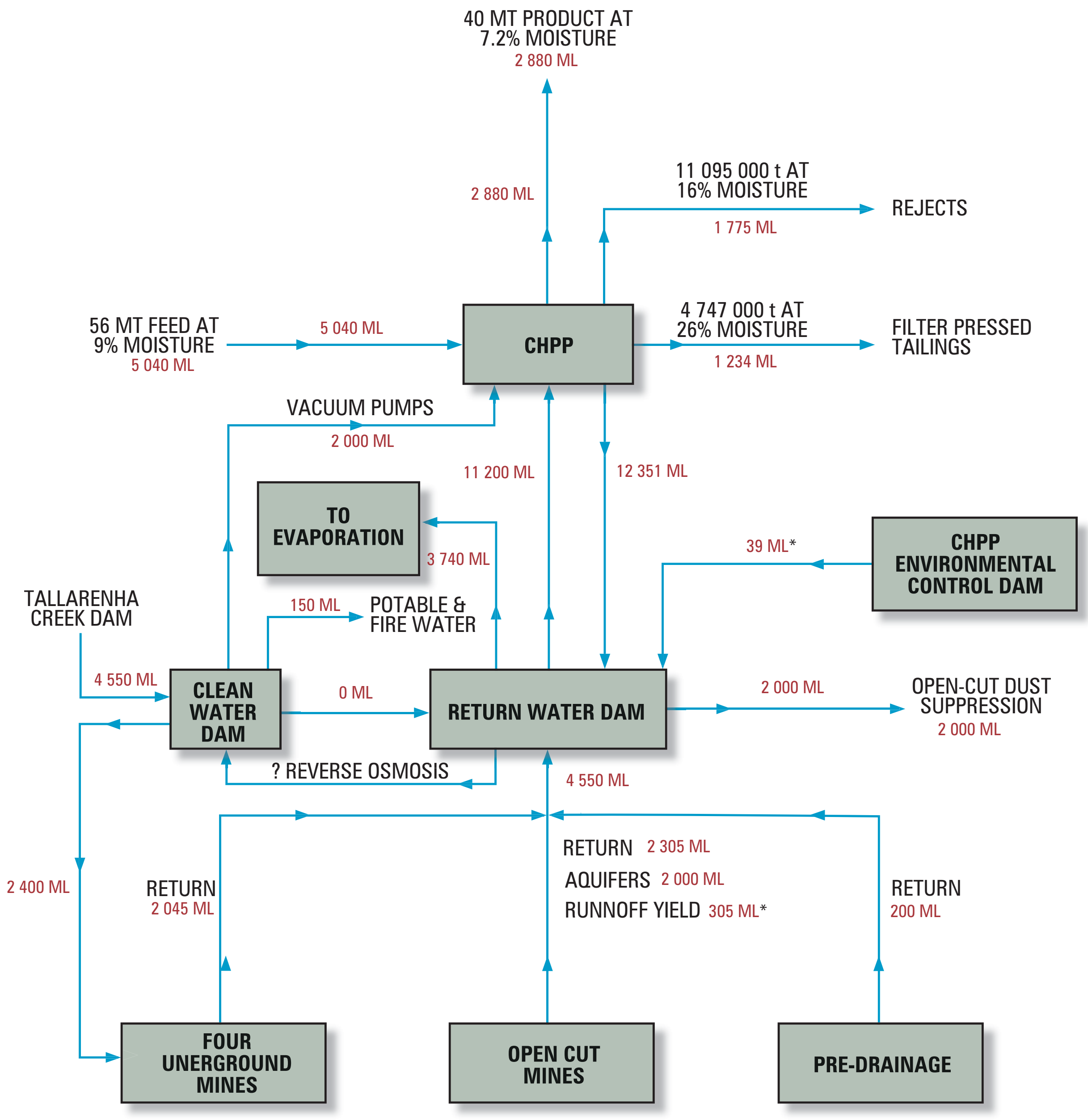
- DERM Manual for Assessing Hazard Categories and Hydraulic Performance of Dams (includes design criteria for levees);

- ACARP Report on Maintenance of Geomorphic Processes in Bowen Basin River Diversions;
- ACARP Report on Monitoring Geomorphic Processes in Bowen Basin River Diversions;

The creek diversion will include a main channel designed to convey the 1 in 100 Annual Exceedance Probability (AEP) catchment discharge. A system of pools and riffles will be constructed into the low flow section of the main diversion channel to provide habitat for aquatic ecosystems and to facilitate fish passage. A levee will be constructed along the western edge of the main diversion channel to protect the mine area (open cut pits, rejects/tailings disposal cells, CHPP, mine industrial area and rail loop) against flooding for flood events larger than the 1 in 100 AEP event.

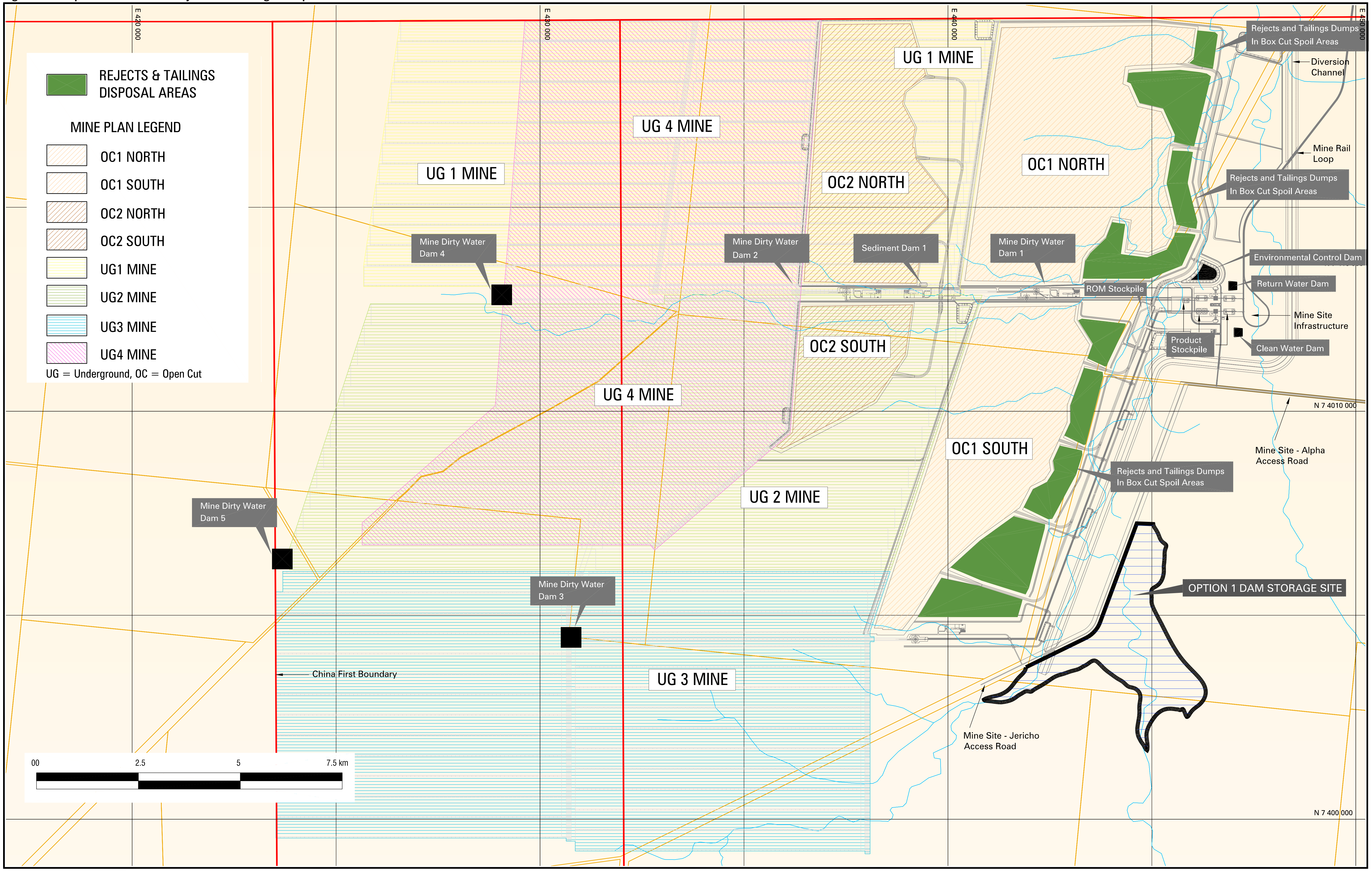
A hazard assessment will be undertaken for all dams and levees proposed for the mine in accordance with the DERM *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams* to determine the likely impacts on downstream waterways and lands in the event of failure of the dams and levees. It is envisaged that the levee will be designed to protect the mine from flood events up to a 1 in 50,000 AEP event in accordance with the DERM Manual.

Figure 40. Water Management Flow Sheet for Filter Press Option



* AFTER ONE YEAR OF MINING, NO EVAPORATION OR SEEPAGE LOSSES

Figure 41. Proposed Locations of Rejects and Tailings Dumps



1.2.5 REJECTS AND TAILINGS DISPOSAL

1.2.5.1 Disposal Alternatives

Two disposal methods are described in this study. The preferred option is to truck rejects and filter pressed tailings to disposal cells. Filter pressing of tailings is a new technique in coal wash plants that is now successfully operating in Australia. Prior to implementation of this method, thorough testing will be undertaken to ensure that effective pressing of tailings occurs, particularly for coal from the open cut mines.

The alternative method is co-disposal of rejects and tailings, using gravel pumps and steel pipework.

1.2.5.2 Trucking Rejects and Filter Pressed Tailings

Coarse rejects from the underflow of the dense medium cyclone will be discharged onto a reject conveyor, as are fine rejects, which are the overflow from the fine coal reject dewatering screen. Coarse and fine rejects will then be conveyed to the reject bin for truck disposal.

The -2 + 0.125 mm fine coal fraction will be beneficiated using spirals with desliming cyclone overflow being pumped to the tailings thickener where flocculent will be added. The thickened tailings are then passed through a filter press where the moisture content is reduced to 26%. The pressed tailings are then discharged onto the rejects conveyor for disposal via the reject bin.

1.2.5.3 Co-disposal of Rejects and Tailings

Co-disposal involves pumping rejects and tailings to cells, using gravel pumps and steel pipework. For co-disposal of rejects and tailings, the total annual quantity of solids is approximately 15,842,000 t, which requires a moisture content of 60% for pumping. Water quantity needed is 24,000 ML of which 75% or 18,000 ML will be recycled. The net annual water loss from this process is estimated to be 6,000 ML.

Rejects and tailings dumps initially will be positioned in close proximity to the CHPP. These will be located in the boxcut spoil areas to allow the co-disposal pipework to be rotated every three months in the case of steel lined pipework or every 12 months if it is basalt lined. This process is to prevent invert abrasion failures.

1.2.5.4 Comparative Assessment of Disposal Methods

For an annual production of 40 Mtpa of washed coal, total rejects and tailings quantity are estimated to be 15,842,000 t. By constructing co-disposal cells, within the boxcut spoil piles using Tertiary Clay and weathered Permian spoil to seal them, final rehabilitation is facilitated. In addition, the floors of the cells comprise impervious, residual clay that prevents water seepage into the environment and downdip to the final voids.

Trucking rejects and filter pressed tailings is the preferred disposal method as these materials can be hauled as back loads to disposal areas using coal haulage trucks. Prior to implementing filter pressing, extensive testing will be undertaken to ensure that excessive quantities of reactive clays are not present. Such clays adversely affect moisture removal.

Co-disposal is labour intensive involving regular rotation of steel pipework, movement of discharge points and installation of decant water pipework. An additional 3,000 ML per year of water is required, compared to trucking rejects and filter pressed tailings.

Rehabilitation is the same for both disposal methods and involves capping with benign spoil, topsoiling and seeding.

1.2.5.5 Chemical Properties

The tailings are expected to have a low capacity to be potentially acid forming. No oxidisable pyrite has been detected in any logged coal samples. Sulphur content in coal samples ranges from 0.4 to 0.7 %, indicating low sulphur content for tailings.

The salinity of tailings is expected to be low. Interseam aquifers have total dissolved salts concentrations ranging from 260 to 1,750 parts per million (ppm). Surface salinity contents of exposed tailings surfaces can increase by oxidisation, capillary action and surface evaporation. Such surfaces will be progressively capped with benign spoil prior to topsoiling.

No deleterious metal concentrations have been detected in any tested coal samples.

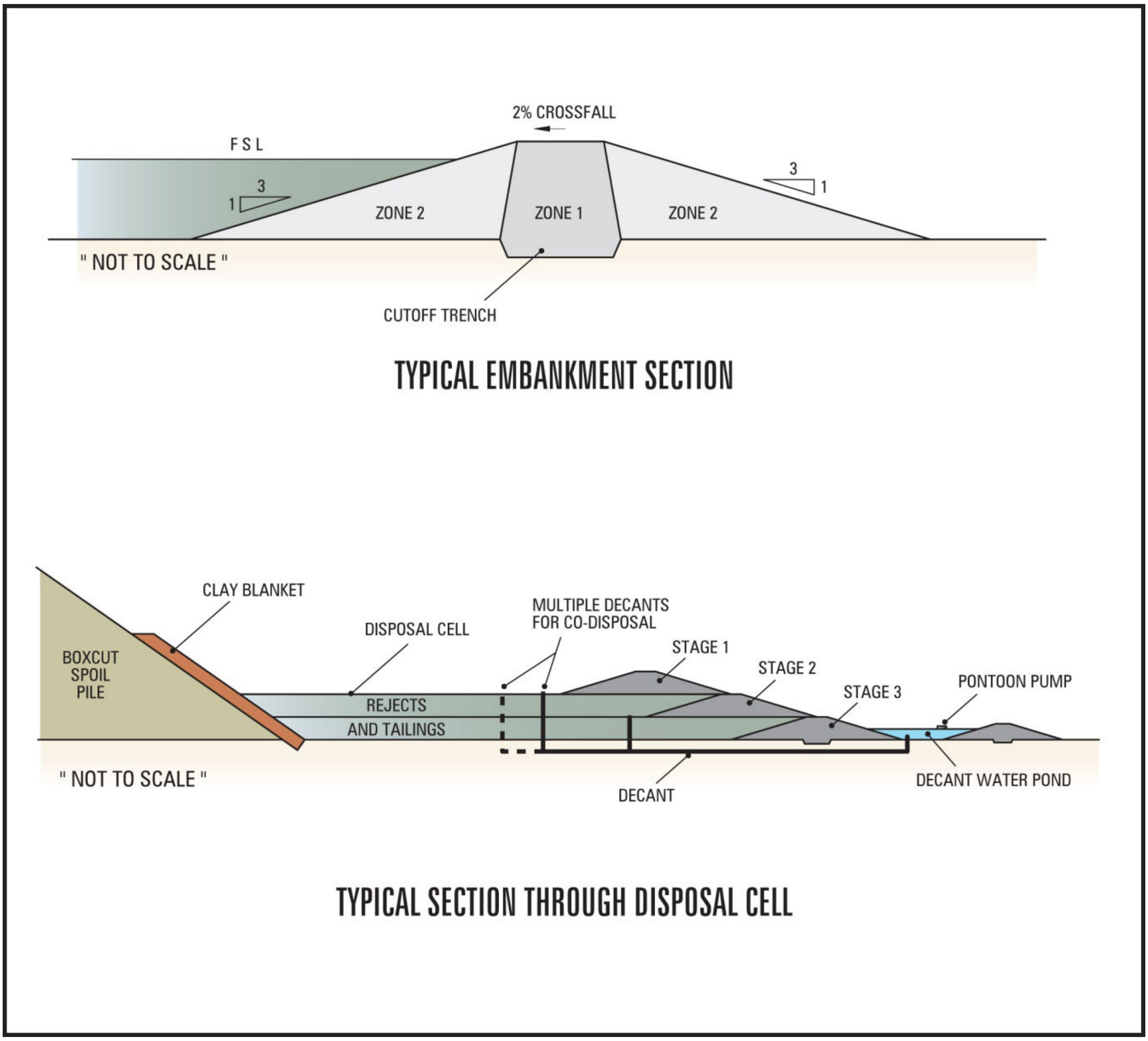
1.2.5.6 Design of Rejects and Tailings Cells

It is proposed to construct cells next to boxcut spoil areas using clayey boxcut spoil as embankment material. The proposed locations of the disposal cells are shown at Figure 42. Boxcut excavations and construction of cells would be completed as a truck and shovel operation. Topsoil removed from the boxcut spoil piles and disposal cells foundations will be stockpiled east of the tailings cells for future rehabilitation use.

The foundation material of the disposal cells generally comprises 15 m to 25 m of Tertiary Clay overlying 15 m to 20 m of weathered Permian strata, both of which are effectively impervious. Downward seepage of decant water is not possible in such materials.

The embankments for the disposal cells and decant water ponds will be constructed to Australian water dam standards. Figure 42 shows a typical embankment section with upstream and downstream batter angles of 1.0 (vertical) to 3.0 (horizontal). Dam height is 7.5 m and crest width is 5.0 m with a 2 % crossfall to the reservoir. The cutoff trench is excavated down to impervious clay. The embankment is zoned with a central core and upstream and downstream shell. Minimum required dry density ratio is 98 % standard compaction at optimum moisture content plus 2 % for cohesive soils and 70 % density index for cohesionless soils. The maximum dry density shall be determined in accordance with Test No. 5.1.1. (Standard Compaction) of AS 1289 for cohesive material and in accordance with Test No. 5.5.1 and 5.6.1 of AS 1289 for cohesionless materials.

Figure 42. General Arrangement for Rejects and Tailings Disposal



Good quality non-dispersive, impervious material termed Zone 1 Clay is required for the dam core. The Zone 1 Clay Core and cut-off trench backfill shall be well-graded sandy / silty clay with a liquid limit (LL) ranging from 30 % to 60 % and plasticity index (PI) ranging from 15 % to 45 %.

The Zone 2 Select Fill material used in the upstream and downstream shell has similar material requirements as for Zone 1 material except that the material classification may be gravelly / sandy / silty clay. Weathered rock may be used for Zone 2 Select Fill if it meets the following criteria. In general the select material shall be in accordance with the following requirements, which are a liquid limit ranging from 25 % to 60 % and a plasticity index of 10 % to 45 %.

1.2.5.7 Disposal Procedures

Rejects and tailings will be deposited in cells constructed between the boxcut spoil piles and dam embankments constructed to the east. The embankments will be raised in stages and clay blankets will be constructed against the boxcut spoil to prevent seepage through spoil piles. Decant structures and decant water ponds will be constructed to remove water from the disposal cells. Decant water will be pumped back to CHPP return water dam from the decant ponds.

The disposal cells and decant water ponds will be classified as Regulated Dams and will be designed with sufficient storage capacity to prevent discharges of contaminated water in accordance with the DERM *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*.

Haul trucks which offload coal at the ROM stockpile will be backloaded at the reject bin to transport rejects and tailings to disposal cells. Dumped material would be dozed and track compacted in layers, with gradients to the decant structures. The decant pipework will direct water to decant water ponds, where pontoon pumps recycle contaminated water to the CHPP return water dam. Decants will be raised as the disposal cells are infilled. Upstream raising of the cell embankments will be undertaken in stages in order to provide effective sealing of the disposal cells.

Water levels within the decant ponds will be undertaken as a controlled operation, supported with a backup monitoring systems. Water levels will be kept at minimal levels at the beginning of the wet season and during the wet season to prevent any overflow. Bypass pipework to in-pit emergency storage will be considered as part of the final design of the return water management system.

Final surfaces in disposal cells will be graded and capped with benign spoil, prior to topsoiling and seeding.

1.2.5.8 Environmental Monitoring

It is proposed to install piezometers downstream of the decant water ponds embankments, to below the dry season groundwater levels. Regular monitoring will be completed to ensure that no groundwater contamination is occurring from the decant water ponds and disposal cells.

All embankment structures will be regularly inspected to ensure structural integrity and watertightness of embankment foundation material. Embankment batters will be topsoiled and seeded, to minimise erosion.

1.2.6 SUPPORTING INFRASTRUCTURE

1.2.6.1 275 kV Power Supply

During the initial phase of construction, portable diesel generators and existing single wire earth return (SWER) lines will be used to supply energy. When available, energy will be supplied to the mine site via a new 275 kilovolt (kV) line being developed by Powerlink. Powerlink is proposing to acquire a suitable site for a substation north of the proposed mine (to be known as Surbiton Hill Substation). An easement is also required for a proposed 275kV transmission line that will run between the Surbiton Hill Substation and Powerlink's existing Lilyvale Substation near Emerald. The transmission line will be approximately 200 km in length. The new line development will incorporate a 275 kV feed into a sub-station to the north of the mine, whereby the power supply will be reduced and reticulated throughout the mine site at various voltages including 66 kV, 22 kV and 11 kV. A Power Allocation (Power Enquiry) has been made to Powerlink by both Waratah Coal and AMCI (proponents of the South Galilee Coal Project located directly to the south of the Galilee Coal Project) seeking confirmation of a regulated or unregulated supply to both mines.

During the Project development, the annual energy consumption is estimated to be up to 20 – 100 Megawatts (MW)/year. This is expected to increase to 150 MW/year during operations. Waratah Coal will develop energy conservation strategies for the construction and operation of the mine. The strategies will be developed to minimise energy consumption throughout the duration of the project.

1.2.6.2 Telecommunications

Waratah Coal proposes to establish a fibre optic cable linking the mine, rail and the facilities at Abbot Point. Communications at the mine will be a combination of fibre optic and connection into the local telecommunication network.

1.3 MINE DECOMMISSIONING AND REHABILITATION

This section describes the broad strategies and methods for progressive and final rehabilitation of areas disturbed by mining and associated infrastructure activities, expected final landforms and the proposed final land uses. The section also describes the decommissioning plan and preferred rehabilitation strategy for the mine and the MIA.

Whilst general information regarding rehabilitation and decommissioning is provided in this section, specific rehabilitation and decommissioning measures to avoid or minimise any impacts will be identified in the Environmental Authority, the Environmental Management Plan (EMP) and the Mine Closure Plan.

It may be the case that the best beneficial use of some of the supporting infrastructure components (i.e. water supply infrastructure, roads, power transmission lines) would be to leave the infrastructure in place to support other local needs. This will be discussed with the relevant authorities and landholders prior to formalizing the decommissioning strategy. If the preferred plan is to leave some of the infrastructure components *in-situ as operating infrastructure, Waratah Coal that facilitates the transfer of operating licences and obligations to the relevant parties will prepare a transitional outcome.*

1.3.1 OBJECTIVES

The overriding mine closure objective is to successfully implement an economically feasible closure that incorporates community priorities, environmental aspects, sustainable rehabilitation and ongoing land uses.

Rehabilitation and decommissioning strategies will be prepared and implemented to ensure that the final landform is:

- returned in a safe manner, with public safety risks reduced to acceptable levels;
- stable and resistant to erosive processes;
- suitable for the post-mining land uses agreed with relevant government agencies;
- within the limits of appropriate and agreed levels of contamination;
- in a condition which satisfies community, agency and landowners expectations;
- in a condition that meets the agreed discharge licence conditions;
- where required, managed under a site specific Site Management Plan (SMP) in place; and
- in compliance with all EMP commitments.

In addition to the EMP, a mine clousure plan MCP will be prepared that establishes the specific operational activities required to be undertaken in order to complete rehabilitation and decommissioning of the Project.

1.3.2 DECOMMISSIONING

The following decommissioning strategies are proposed for various remaining structures post-mine closure.

All infrastructure will be removed unless agreed with the subsequent post-mining landowner. This includes:

- a contaminated land assessment of relevant locations;
- remediating land from any contamination;
- removal of all items of the mine infrastructure area, and any temporary buildings and facilities;
- ripping, topsoiling, and seeding of this land; and
- establishing safety bunds and fencing of final void areas.

1.3.2.1 Decommissioning Action Plans

The following action plans (based on the above strategies) will be undertaken.

1.3.2.1.1 Mine Industrial Area, Conveyors and Accommodation Facilities

All items of the infrastructure area and including conveyors and any temporary buildings and facilities will either be removed from site or, if agreed by the landholder, left operational on site. After all external structures, concrete bases and footings have been removed; these areas will be investigated for contamination and remediated where necessary, ripped, profiled, topsoiled and seeded. Protection of these areas from re-compaction (i.e. vehicles or grazing animals) after ripping is required to allow the soil structure to reform. Drainage control through ripping, profiling or the provision of erosion control structures will also be undertaken.

1.3.2.1.2 Mine Water Storages

The mine water storages will be removed including removal of dam embankments and contaminated sediments within the dam storage area.

The decommissioning strategy for the Tallarenha Creek Dam will be determined in consultation with relevant authorities and landholders. Potential decommissioning strategies include:

- Full decommissioning – removal of dam embankment and associated pumping facilities.
- Partial decommissioning – retention of a smaller dam structure as a water supply for landholders or other third parties.
- No decommissioning – sale or donation of the dam to landholders or other third parties to be used as a water supply.

1.3.2.1.3 Mine Water Supply Pipelines

The decommissioning strategy for the water supply pipeline will be either:

- abandonment – where the pipeline is purged, and physically disconnected from the point of supply, and sealed (capped) at both ends; or
- beneficial re-use – where sale or donation of the infrastructure to a third party occurs for other beneficial use.

Before deciding if abandonment (after capping) or beneficial re-use is the preferred option, Waratah Coal will liaise with relevant authorities and landholders in order to determine the most appropriate desired outcome. Once the relevant authorities agree the desired outcome, a decommissioning plan that takes into account the desired outcome will be prepared.

1.3.2.1.4 Power Supply and Transmission Lines

The power supply will be dismantled and removed off site unless a beneficial re-use can be identified. The transmission lines and poles may be retained for future use by local government.

1.3.2.1.5 Waste Management Facility

Any landfills established as part of the mine operations will be decommissioned at the conclusion of mining, and a contaminated land assessment (which will include mitigation measures) consistent with the requirements of the *Queensland Environmental Protection Act 1994* (EP Act) will be undertaken on the landfill site.

1.3.3 REHABILITATION

Waratah Coal supports the 'Enduring Value – the Australian Minerals Industry Framework for Sustainable Development' principles and desired outcomes. Waratah Coal has incorporated the intent of these principles, and in particular, Element 6.3 'Rehabilitate land disturbed or occupied by operations in accordance with appropriate post-mining land uses' in the preparation of its post mining rehabilitation strategies.

The following sections provide the general rehabilitation goals, objectives and strategies of the Project rehabilitation strategy, and have been developed with consideration given to DERM's *Guideline 18 Rehabilitation requirement for mining projects* (EPA,2007) (Guideline 18) and *Leading practice sustainable development program for the mining industry: Mine Rehabilitation* (Commonwealth Department of Industry, Tourism and Resources,2006).

1.3.3.1 Rehabilitation Hierarchy

The Department of Environment and Resource Management (DERM) has established a rehabilitation hierarchy to minimize environmental harm. The rehabilitation hierarchy, in order of decreasing capacity, is to:

- avoid disturbance that will require rehabilitation;
- reinstate a 'natural' ecosystem as similar as possible to the original ecosystem (where the Project is occurring on previously natural vegetated land);
- develop an alternative outcome with a higher economic value than the previous land use;
- reinstate the previous land use (e.g. grazing or cropping); and
- develop lower value land use.

1.3.3.2 Rehabilitation Goals

The four general rehabilitation goals of Guideline 18 are rehabilitation of areas disturbed by mining to result in sites that are:

- safe to humans and wildlife;
- non-polluting;
- stable; and
- able to sustain an agreed post mining land use.

Waratah Coal's desired outcome of the rehabilitation strategy is to ensure that post mine land use outcomes meet regulatory and other stakeholder expectations.

1.3.3.3 Rehabilitation Objectives

The objectives for rehabilitation throughout the construction, operational and decommissioning phases of the Project are to:

- return the land to a post-mine land use that will be stable, self-sustaining and require minimal maintenance;
- create stable landforms with rates of soil erosion not exceeding the pre-mine conditions; and
- maintain downstream water quality, during the construction, operational and post operation phases of the Project.

1.3.4 REHABILITATION INDICATORS

To ensure that the objectives of mine closure, decommissioning and rehabilitation (both progressive and final) are achieved, Waratah Coal will establish criteria and performance indicators which, once achieved, demonstrate that decommissioning and rehabilitation strategies have been undertaken successfully and that desired outcomes have been achieved.

The EMP will establish in detail, performance indicators to demonstrate the successful completion of the closure process, and provide timeframes within which completion is to be achieved. Indicative performance indicators are included in Table 8.

Successful mine closure, decommissioning and rehabilitation will be considered completed when conditions within the Project area meet the pre-determined performance indicators to the satisfaction of regulatory authorities and tenement relinquishment is obtained.

1.3.5 COMPLETION CRITERIA

The ultimate aim of the defined objectives is to create sustainable landforms that require no more resources to maintain than a similar landuse in an area that has not been mined.

Rehabilitation success is defined as the achievement of objectives set out in Section 1.3.3.3, and performance indicators shown in Table 7. A completion criterion is used to define the successful rehabilitation, and relate specifically to the environmental, social and economic context of the Project site.

Completion criteria will be developed in consultation with landowners, indigenous groups, community groups and Government agencies closer to the time of mine closure and presented in a Final Rehabilitation Strategy. The completion criteria will be based on field trials and monitoring program findings, industry research and the standards of the day, which will be at least equitable to current completion standards.

1.3.5.1 Rehabilitation Action Plans

Final land uses proposed for each mine component have been based on a land suitability assessment in accordance with the *Technical Guidelines for Environmental Management of Exploration and Mining in Queensland* (DME, 1995).

Progressive rehabilitation of worked areas will be undertaken within two years of becoming available or as soon as practicable thereafter. Rehabilitation strategies will take into consideration physical and biophysical attributes such as the geology, groundwater and surface water hydrology and ecology of the site. Action plans will be prepared that support desired end land-use strategies to guide the rehabilitation activities.

An investigation into the rehabilitation of disturbed areas will be undertaken and a report will be submitted to the administering authority proposing acceptance criteria for landform design and final land use. The timing of the report will be agreed with the administering authority.

Table 7. Draft performance indicators for the decommissioning and rehabilitation program

MINE COMPONENT	ASPECT	
Mine voids	Landform	Benches and faces stable, minimal evidence of erosion, revegetation successful.
	Safety	Access controlled via fencing and protective barriers.
	Surface water quality	Water quality in local waterways not to be adversely affected by mining activities (if discharge evident from final voids). Monitoring program implemented.
	Groundwater quality	Local groundwater quality not to be adversely affected. Monitoring program established.
Overburden and waste rock dumps	Landform	Landform stable, minimal evidence of active erosion.
	Safety	Access controlled via fencing and protective barriers.
	Revegetation	Dumps successfully revegetated in accordance with agreed criteria and supported with ongoing monitoring and maintenance program.
Co-disposal Infrastructure	Landform	Landform stable, minimal evidence of erosion, revegetation successful.
	Safety	Access controlled via fencing and protective barriers.
	Surface water quality	Water quality in local waterways not to be adversely affected by mining activities (if discharge evident from final voids). Monitoring program implemented.
	Groundwater quality	Local groundwater quality not to be adversely affected. Monitoring program established.
	Revegetation	Dumps successfully revegetated in accordance with agreed criteria and supported with ongoing monitoring and maintenance program.
Mine Industrial Area	Removal	All mine related infrastructure dismantled and removed from the Project site.
	Revegetation	MIA successfully revegetated according to agreed criteria and supported with ongoing monitoring and maintenance program.
Water storage dams	Landform	Landform stable, minimal evidence of erosion, revegetation successful.
	Safety	Access controlled via fencing and protective barriers.
	Surface water quality	Water quality in local waterways not to be adversely affected by mining activities (if discharge evident from final voids). Monitoring program implemented.
Haul roads and access tracks	Landform	Landform stable, minimal evidence of erosion, revegetation successful and sediment control devices in place and monitored as per license conditions.
	Revegetation	Successful revegetated according to agreed criteria and supported with ongoing monitoring and maintenance program.

1.3.5.1.1 Final Voids

A single final void will remain after completion of mining for each pit. The banks of the final void (i.e. the high wall, low wall and end walls) will be reshaped to achieve long term geotechnical stability. Ramps will be levelled to similar grades as the surrounding wall slopes.

The final slope gradients of each void, including the outer boxcut spoil slopes, low wall of the final voids, and high wall slopes will be assessed and recommended by a suitably qualified person based on the risk of long term geotechnical instability.

The voids will be externally drained so that water from the overburden piles drains away from the voids. Final void modelling will be conducted to establish the required parameters for long term void stability and water quality. A Final Void Plan will be prepared prior to completion of mining in the first pit, based on the final void modelling and detailing the design parameters for each final void. The Final Void Plan will include assessment of groundwater hydrology and properties, surface water hydrology and pit wall stability.

These studies will be undertaken during the life of the mine, and will include detailed research and modelling. In the final five years of mine life, the capability of the void to support endemic flora and fauna will be ascertained.

Final voids are unlikely to be suitable for agricultural use, and will be investigated for alternative beneficial uses such as wetlands.

At the end of the mine life, the final voids remaining will be bunded and fenced to inhibit access to the area. The integrity of the bund will be the responsibility of the subsequent landowner.

Waratah Coal will conduct an investigation into residual voids and a report will be submitted to the administering authority proposing acceptance criteria for final voids. The timing will be agreed with the administering authority.

1.3.5.1.2 Mine Infrastructure Areas

Following decommissioning, infrastructure areas will be returned to the pre-mining landform, where practicable. Where this is not practicable, bench cuts will be removed, any steep grades reduced and the landform returned to a profile similar to that of landforms in the region.

Land used for infrastructure components will be returned to improved pasture grazing land or dry land cropping land, and will generally be able to be used for beef cattle grazing or potentially for fodder cropping if the water pipeline is left commissioned.

Building end use will be assessed at the time of closure, as alternative uses may be available.

1.3.5.1.3 Overburden Stockpiles

The following measures apply to both the in-pit overburden placed by dragline, and elevated out of pit overburden stockpiles.

Overburden stockpiles will be progressively rehabilitated over the life for the mine, and rehabilitation will commence within two years of the land becoming available for rehabilitation. Progressive rehabilitation will function to reduce erosion potential and improve the water quality runoff from overburden stockpiles. Runoff from overburden stockpiles will pass through sediment dams in the Water Management System.

Overburden stockpiles will be reshaped to stable landforms in accordance with agreed end outcomes. The stockpiles will be designed to reduce the catchment area and drainage ways through the overburden.

Low gradient sections of overburden stockpiles will be rehabilitated to grazing land, and generally be able to be used for low stock rates of beef cattle grazing, or alternatively for nature conservation in areas supporting agreed offset and / or connectivity outcomes.

Steeper gradient overburden stockpiles, and overburden stockpiles that trials show are unsustainable for cattle grazing, will be used for nature conservation outcomes.

1.3.5.1.4 Creek Diversions and Levee Banks

Creek diversions will be retained following mine closure, as they will have been designed to provide stable landforms and by time of mine closure, would be established with riparian vegetation and aquatic habitat. At the conclusion of mining, the creek diversions will be left in a stable and sustainable condition in line with the creek diversion rehabilitation plan. The levee banks of all constructed diversions will be maintained and the landforms merged in with overburden stockpiles.

Post-mining, the creek diversions will be retained in a nature conservation land use.

1.3.5.1.5 Water Storage Dams

Water storage dams will either be retained for the subsequent agricultural use or rehabilitated.

The rehabilitation process will entail dewatering, removal of any embankments, revegetation and monitoring. Rehabilitation will also vary depending on the storage history. Dams that have contained saline water may require remediation. The membrane liner of the dam and any saline material inside the dam will be removed during rehabilitation and will be disposed of by appropriate methods in accordance with the accepted management of saline overburden material.

If not retained as water storages, water storage dams will be rehabilitated to improved pasture grazing land and will generally be able to be used for beef cattle grazing.

1.3.5.1.6 Tailings Dam

Opportunities for coal recovery from tailings (reprocessing of the tailings to extract additional coal) will be investigated during the life of the mine. If recovery is not viable, the tailings dam will be rehabilitated.

Tailing dam rehabilitation will be undertaken after drying of the dam. The tailings surface will be covered and capped with benign overburden material to prevent further rainwater ingress into the tailings, and will be topsoiled and vegetated with native species.

The cover will be designed to provide a relatively flat low gradient final landform. The rehabilitated tailings dam will be vegetated with deep rooted grass species or alternate native vegetation and will be placed on the DERM Environmental Management Register (EMR). Preference will be given to using endemic flora during rehabilitation programs.

The post-mining land use of tailings dam areas is proposed to be beef cattle grazing, or for conservation purposes (i.e. habitat connectivity).

If coal recovery is undertaken, following the coal recovery, the tailings dams will be filled and then closed, capped and rehabilitated.

1.3.5.1.7 Haul Roads and Access Tracks

A number of the haul roads may be retained for use by future landowners post mine closure and rehabilitation. A number of additional haul roads will also be temporarily retained following rehabilitation as access roads for rehabilitation monitoring purposes. This will be determined in consultation with stakeholders and local council.

The majority of haul roads and access tracks across the Project area will be highly compacted. As such, rehabilitation will require a combination of deep ripping, profiling, topsoiling and seeding activities. Drainage construction will be applied where necessary.

Land used for roads that are not required by future landowners will be rehabilitated to improved pasture grazing land and will generally be able to be used for beef cattle grazing.

For those roads to be left operational, either permanently or temporarily, containment measures to minimize potential erosion and sediment entering into waterways will be installed.

1.3.5.2 Implementation of Rehabilitation Strategy

1.3.5.2.1 Program

A Plan of Operations will be developed for the mine to guide implementation of progressive rehabilitation.

The Plan of Operations will include a schedule of rehabilitation activities that are proposed within the life of the Plan of Operations. Based on the approved mine plan, detail will be provided regarding the types and areas of land that will be disturbed within the Project area for the term of the Plan of Operations, along with proposed rehabilitation activities.

1.3.5.2.2 Rehabilitation Monitoring

Monitoring and assessment of progressive rehabilitation processes will be undertaken throughout the planning, construction, operational and decommissioning phases of the Project. If monitoring and assessment results indicate that the rehabilitation objectives may not be achieved, then the rehabilitation strategy will be modified.

Non-compliance with the established objectives will trigger a review of processes such as planning and design, and / or repair and maintenance of failed rehabilitation work.

As rehabilitation technologies, strategies and monitoring techniques change and / or are improved over time, Waratah Coal will regularly review and update the Project's rehabilitation and monitoring procedures to include the most effective processes and strategies.

1.3.5.2.3 Rehabilitation maintenance

Two types of rehabilitation maintenance will be performed in rehabilitated areas:

- progressive maintenance (on a planned basis); and
- failure mitigation maintenance (conducted as ongoing required).

Progressive maintenance is planned as part of rehabilitation scheduling. It will comprise repairs that are necessary following the initial construction and adjustment of planning processes if needed.

Following initial rehabilitation, new processes such as erosion, soil formation, vegetation cover and infiltration rates will develop on the modified landform. These processes may be sustainable in the long term, or more likely they may represent an intermediate stage before final landforms / ecosystems are achieved.

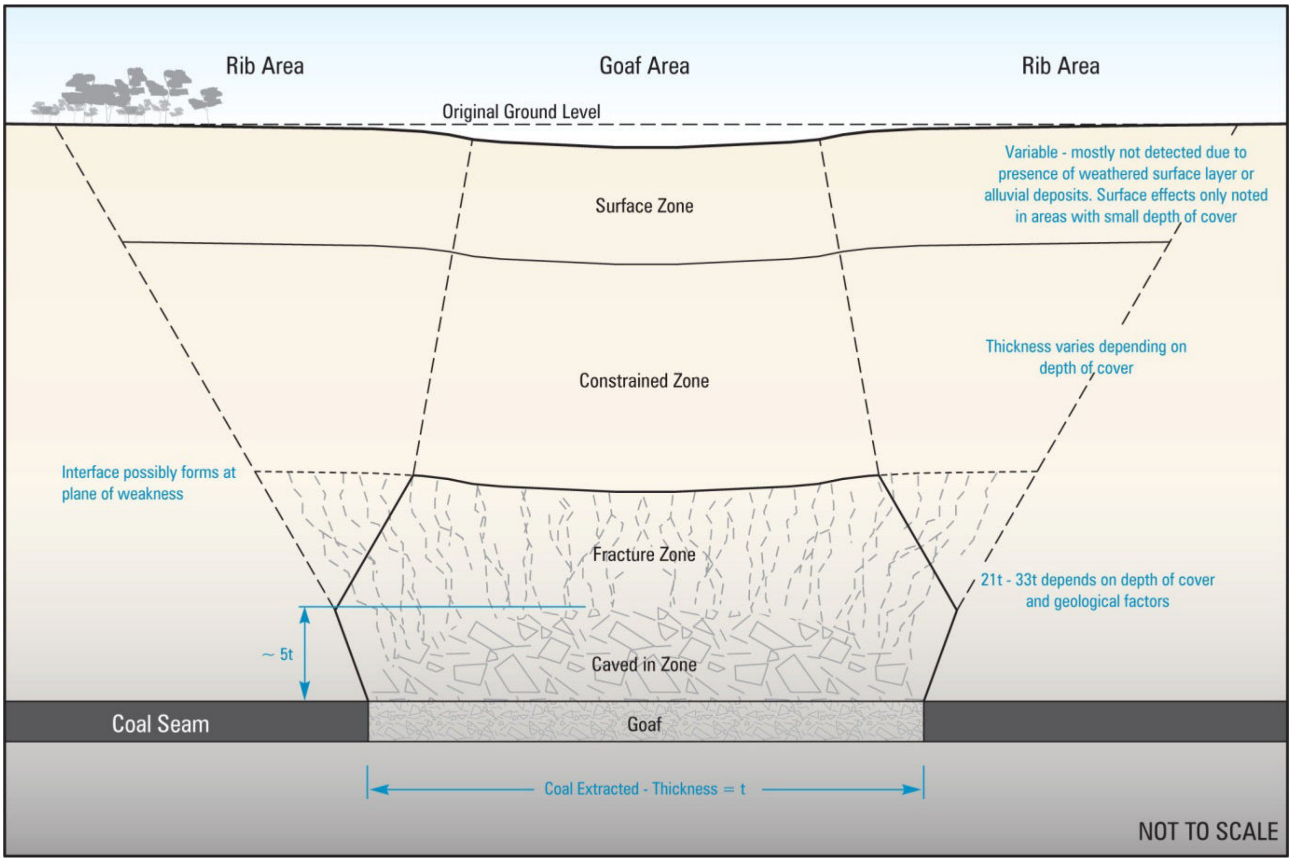
Progressive maintenance activities will be scheduled to transfer intermediate landforms into permanent, long term stable landforms. The type of construction maintenance activities that will achieve this outcome will include removal of graded banks, and repair of areas where excessive erosion has removed the protective capping and exposed spoil.

Rehabilitation failure mitigation will be carried out where the established landforms are not achieving the rehabilitation objectives. The aim of the monitoring and maintenance program will be to identify any systematic issues that may result in broad scale failure of rehabilitated areas. Failure in this sense is defined as non-achievement of the rehabilitation objectives as outlined above.

1.3.6 SUBSIDENCE MANAGEMENT AND REHABILITATION

The underground longwall mining activities will result in surface subsidence. A schematic drawing of the ground effects above the extracted blocks of coal in a longwall mining system is shown in Figure 43.

Figure 43. Schematic of Potential Ground Impacts Associated With Underground Mining



As coal seams are removed by the longwall mining method, a void remains, which is the thickness of the longwall seam, and covers the entire mining block area. Ground immediately above (called the "roof strata") collapses into this void. The overlying strata (or "overburden") then sags down onto the collapsed material, resulting in an elongated subsidence "bowl" developing on the surface.

The act of this strata failure into the void is integral to the success of the longwall mining method, as it relieves the stress that is being loaded onto surrounding mining blocks and development roadways.

The cavity, which remains behind the retreating longwall face and is subsequently filled with the collapsed overlying strata, is commonly called the "goaf" or "gob".

Above this goaf area the strata fails in a generally similar manner to that shown in Figure 44, with progressively less effects as the fracturing moves further above the coal seam.

The extent of the overlying strata collapse and the associated shearing and cracking of the strata depends upon the strata geology, the longwall block width, the seam height extracted, and the depth of cover.

The strata immediately above the longwall goaf collapses into the open void, and hence moves down by a height equal to the thickness of the seam, which was extracted. Due to the way the broken strata material "bulks" or "swells" as it breaks into the cavity, the cavity is eventually filled with broken material (shown as "caved zone" on the diagram above) and a physical cavity no longer exists. However, the vertical displacement in the strata continues to propagate upwards in the strata. Cracking and strata damage do not continue to move vertically beyond the "fractured zone", even though the ground strata all the way to the surface may be displaced vertically.

When the ground stratum moves downwards sufficiently that the vertical movement reaches the surface, the surface of the land may also move downwards over the extracted mining areas. This movement is called "subsidence".

The amount of subsidence witnesses at the surface is dependent on a large range of factors such as:

- thickness of coal seam extracted (mining height);
- depth of cover;
- properties and rock types of ground strata (i.e. overburden strength);
- stiffness and bulking characteristics of the collapsed strata;
- width and length of longwall block;
- dimensions of the gate road coal pillars; and
- the maximum subsidence usually occurs in the middle of the extracted longwall panel.

For the case of single seam mining, the maximum subsidence is expected to be 60 % of the mining height. This is a general average for longwall coal mines in the NSW and Qld coalfields of Australia.

Super-critical Mining Geometries

The combination of the physical properties of the mining situation, particularly panel width and depth of cover, determines whether a single longwall panel will be sub-critical, critical or supercritical. In the Australian coalfields, sub-critical or (spanning) behaviour generally occurs when the panel width (W) is <0.6 times the cover depth (H). If massive strata exist, then sub-critical spanning behaviour can occur for panel W/H ratios up to 1:4. The maximum subsidence for this scenario is usually significantly < 60 % of the extraction height and could range between 10 % and 50 %.

Beyond the sub-critical range, the overburden is unable to span and fails or sags down onto the collapsed or caved roof strata immediately above the extracted seam (i.e. the panel is critical or super-critical).

Critical panels refer to panels with widths where maximum possible subsidence starts to develop, and supercritical panels refer to panels with widths that cause complete collapse of the overburden.

In the case of super-critical panels, maximum panel subsidence does not usually continue to increase significantly with increasing panel width. A panel is considered supercritical when the ratio of panel width to depth of cover is greater than 1:2. The longwall associated with the project will primarily exhibit super-critical behaviour due to the panel widths being greater than the depth of cover for all blocks.

The surface subsidence 'bowl' extends outside the limits of extraction for a certain distance (i.e. the angle of draw). It is usually assumed equal to half the depth of cover in the Queensland coalfields.

Table 8. Longwall block details for each underground mine

UNDERGROUND MINE	NUMBER OF LONGWALL BLOCKS	TOTAL EXTRACTED PANEL WIDTH	PANEL LENGTH RANGE	DEPTH OF COVER RANGE	EXTRACTED THICKNESS RANGE
No. 1	26	480 m	7,000 m	150 – 330 m	1.8 – 4.2 m
No. 2	26	480 m	7,000 m	130 – 350 m	1.8 – 3.8 m
No. 3	26	480 m	7,000 m	100 – 300 m	1.8 – 2.8 m
No. 4	25	480 m	7,000 m	80 – 210 m	1.8 – 3.4 m

Subsidence Surface Impacts

The number of longwall blocks and the key dimension and parameters for each underground mine are shown in Table 8.

Subsidence Estimates

Surface subsidence will develop progressively within each longwall block and will present on the landform surface as a series of trough like depressions. An assumption has been made about the amount of subsidence that will occur on the land surface in comparison to the thickness of the coal seam removed underground. For the purposes of this study, this ratio has been set to 60 %. Assumed vertical movement of the surface will be 60 % thickness of the coal seam removed from underground.

The greatest (maximum) total subsidence will occur in the surface areas which are affected by the operations in both the B-seam and D-seam operations. Based on these assumptions, the maximum depth of subsidence impact from the mining operations will be in the areas where mining in the B-seam and D-seam overlap, and in the centre region of the longwall blocks in these area. This area occurs in the north western section of the underground mine foot print. The total cumulative subsidence in this area is predicted to reach a maximum depth of 3.27 m. Average subsidence across the bulk of the underground mine areas is expected to range between 1.3 m to 1.61 m.

It has been assumed that the coal pillars, which remain in the development gateroad areas, will undergo significant failure once goaf has formed on both sides of the gateroads. It is assumed that these pillars will go into a yield condition and that the floor and roof strata around the pillars will fail. Due to these factors, it has been assumed that the pillars will be compressed to 30 % of their pre-mining seam height.

As discussed previously, it is usual for the surface subsidence 'bowl' to extend outside the limits of extraction by a distance equal to half the depth of cover. This assumption has been utilised in the subsidence predictions for the underground mines. This assumption equates to an angle of draw of 26.5 degrees.

The area where subsidence will likely occur has little topographical relief, and consists of both cleared (chain pulled and blade ploughed) and remnant open woodland, both of which are currently used for cattle grazing. The area where maximum subsidence will occur consists of cleared, improved pasture, to the north-west of the study area.

Potential impacts resulting from subsidence in a rural location would usually result in a change of drainage patterns due to a depression in the ground which may have an effect on the existing hydraulics of surface waters near the mine. Surface waters located above the underground mine include unnamed tributaries of Tallarenha Creek that currently drain eastwards. Subsidence can also cause increased cracking in clays. The generally sandy soils identified over the underground mining are considered unlikely to be significantly impacted by any minor subsidence however the maximum predicted level of 3.27 m has the potential to result in some cracking.

Subsidence will potentially affect surface drainage and groundwater quality and carrying capacity in these areas. Each of these potentially affected aspects is discussed in detail below.

1.3.6.1 Surface Drainage

The creation of surface depressions associated with subsidence can affect surface drainage through the modification to the local drainage patterns. Monitoring of impacts associated with alterations to the drainage regime will be conducted on a regular basis and where necessary rectification works will be undertaken to mitigate affected areas. A range of techniques can be implemented to re-establish drainage patterns and these include the ripping, ploughing and reseeding of surface cracks and earthworks to redirect drainage and address erosion.

Progressive earthworks to re-establish drainage within the subsidence area will be undertaken and will typically involve cut-fill earthworks to address depression and ponding issues, and the excavation of drainage channels. Drainage channels will have sufficient capacity to cater for incoming catchment flows and will be connected to existing drains. There may be a requirement to harden drainage channels to cater for greater than predicted flows and the need for these earthworks will implement the outcomes of the regular subsidence trough monitoring.

Materials excavated will be stockpiled, this will ensure the separation of topsoil from the lower strata soils and stored outside of drainage lines. Where appropriate, use of excavated materials will address issues associated with subsidence and ponding.

Flood modeling undertaken at the mine site has concluded that the subsidence will have minimal impact to the upstream and downstream processes. As such, the low velocity flows are not likely to initiate significant erosion on subsided areas that maintain a vegetation cover. A detailed flood assessment is located at Volume 2, Appendix 17.

1.3.6.2 Groundwater

The groundwater assessment concluded that given the predicted level of subsidence, cracking of the overlying geology is likely to occur. This cracking may result in rapid infiltration of rainfall into the aquifers surrounding the mine, potentially leading to increased rates of flow into the goafs requiring increased dewatering

1.3.6.3 Land Use

Current land uses within the area that may potentially be affected by subsidence are cattle grazing and nature conservation. With the implementation of mitigation measures to address possible drainage issues, and with the ongoing presence of a stable vegetation cover, there is unlikely to be any significant impacts that prevent the continuance of the current grazing regime. The impacts to the natural values are discussed below.

1.3.6.4 Natural Values

Whilst the predicted levels of subsidence can be quantified, the impacts of those changes on natural features such as stream flow, groundwater regime, water discoloration, habitat alteration and vegetation die-back are less easily quantified. These changes can lead to alteration of species habitats and the ecological function of communities. Species and ecological communities dependent upon aquatic and semi-aquatic habitats are particularly susceptible to the impacts of subsidence. Effects can be temporary or long-term.

Given the lesser level of subsidence above the open woodland areas (i.e. expected to range between 1.3 m to 1.61 m as opposed to 3.27 m above the north-west corner of the study site) and sandy nature of the soils in this area there is not expected to be any substantial cracking. The surface above the underground mining area will not be cleared of vegetation, but it is acknowledged that there may be long-term impacts to the surface vegetation communities due to changes in hydrology and subsidence because of the underground operations.

A Subsidence Management Plan will be prepared prior to the commencement of underground mining operations. The plan will be risk based, flexible, responsive and capable of dealing with unexpected changes or uncertainties. The plan will consider and include if necessary the mitigation measures outlined above to re-establish drainage patterns and included the ripping, ploughing and reseeding of surface cracks and earthworks to redirect drainage and address erosion. In addition, Waratah Coal will provide compensation for unavoidable impacts of subsidence within the Bimblebox Nature Refuge.

1.4 MINE WORKFORCE

A construction workforce of approximately 2,500 contractors will be required at peak construction period. The workforce will be predominantly fly-in / fly-out (FIFO); however, expectation is there will be a portion of local workers in this project. Accommodation will be provided at a purpose built 2,000 person workers village adjacent to the site. The mine development is expected to operate on a two shift, seven day rotating roster.

A proposed workforce of 2,360 permanent employees / contractors will be required during the mine operations. This will comprise 2000 workers at the mine site of which 1978 will be FIFO, and 28 will be housed in Alpha.

The remaining 360 workers will be required for the rail (275) and the port operations (185).

As per the construction phase, the mine workforce is to be housed in the workers village and it is expected that external contractors will from time to time stay at the workers village whilst on site. The operational workforce will likely be structured on a two shift, seven day rotating roster.

Transportation of construction and operational workers between the accommodation village and the mine site will be by bus.

At this stage it is not possible to identify the likely workforce number for the decommissioning and rehabilitation phases, and these numbers are unknown at present, therefore final decisions will be made at the end of the Project around which infrastructure will remain commissioned.

1.4.1 WORKFORCE ACCOMMODATION

The majority of the workforce for the construction and operational phases will be FIFO. To cater for the estimated workforce levels during both phases, a temporary 2,000 person workers village will be established at the mine site (Figure 44). The workers village at the mine site is considered able to accommodate the rail line construction workers also; however, this will depend on the level of available accommodation.

The workers accommodation village will require potable and non-potable water supplies. Water for the workers accommodation village will be derived from a water treatment plant located at the mine site.

The Tallarenha Creek Dam will supply 4,550 ML of raw water reporting to a clean water dam located near the Mine Infrastructure Area (MIA) and the CHPP (refer Figure 41). A water treatment plant located at the MIA will process 150 ML of water from the clean water dam. Potable water produced from the water treatment plant will be piped to the workers accommodation village storage header tanks ready for consumption.

Raw water will be required at the workers accommodation village for uses such as dust suppression and toilet flushing. Raw water will be supplied via a pipeline connecting the clean water dam at the MIA to the raw water header storage tanks at the workers accommodation village. The raw water header storage facility will be of sufficient size and height to satisfy the village consumption requirements.

Power to the site will be sourced from the Powerlink grid system. Power will be supplied to the workers village from the mine site substation that will be located near the mine infrastructure area or the CHPP. The contractor will be required to obtain all required approvals relevant to the power supply.

Package sewage treatment plants (STP) suitable for 2,000 equivalent persons will be used at the workers village. Effluent from the STP will be fed to the dedicated STP waste disposal area. The dedicated waste disposal area will be determined in greater detail during the detailed design phase, but will consist of irrigated pastures (or similar vegetation) and will be located at sufficient distance from the camp to provide buffer from odour, and waterways to ensure adequate buffering of instream values. The irrigation areas will be of sufficient size that the treated effluent can be applied a suitable rate to prevent runoff into local waterways. No storage is of treated effluent is proposed other than the storage tank associated with the sewage treatment plant.

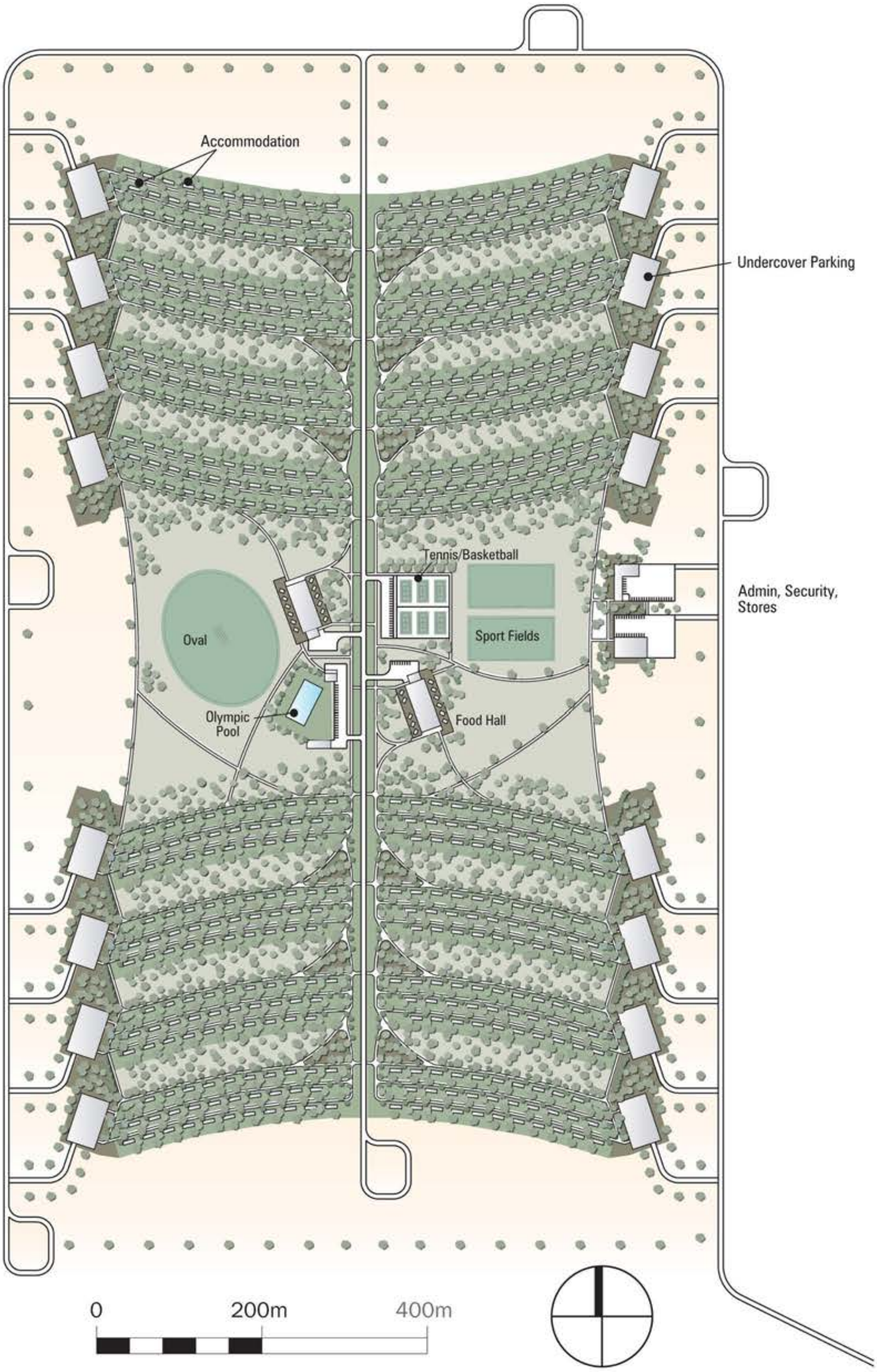
In order to minimise the amount of waste taken to landfill, a dedicated waste management area will be constructed to enable the separation of wastes in accordance with the adopted waste hierarchy. Where possible waste will be re-used on site; however, a registered waste disposal company will be engaged to remove waste to appropriate off-site treatment facilities.

The management of storm water will be considered as part of the design of the workers village. The design and intent of the storm water management system will be to avoid ponding and flooding from overland flows. Where storm water capture is able to be included in the design, storm water discharge points will be engineered to avoid affecting the natural flow system.

The actual footprint of the workers village and associated infrastructure is still being considered. Prior to finalizing the location of the accommodation village, Waratah Coal will liaise with the appropriate local authorities and landowner/s as well as take a range of operational, environmental and community factors into consideration. Preference will be given to locating the workers village on disturbed land; however, other factors that will be considered include:

- the proximity to the rail easement to minimise travel distances;
- minimizing the amount of vegetation clearance required;
- avoiding locations that are flood and bushfire prone;
- minimise impacts to local communities; and
- proximity to existing infrastructure (i.e. power and water supplies and waste treatment facilities).

Figure 44. Likely Mine Site Workers Camp Configuration



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3.1 INTRODUCTION

This chapter provides an assessment of topography, geology, soils and landform for the mine study area of the Project. This chapter describes the existing physical environment at the mine and assesses the likely changes and potential impacts to soils, geology and landforms resulting from the Project. The assessment describes the approach to be taken by Waratah Coal to minimise potential impacts.

3.2 LEGISLATIVE AND PLANNING FRAMEWORK

State Planning Policies (SPPs) are planning instruments implemented under the Sustainable Planning Act 2009 (SP Act) that the planning Minister (or any Minister in conjunction with the planning Minister) can make to protect things that are of interest to the state.

This includes:

- agricultural land;
- separating agricultural land from residential land;
- development within close proximity to airport land; and
- protecting development from adverse effects of bushfire, floods and landslides.

SPP 1/92 – Development and Conservation of Agricultural Land is relevant to the soils and geology aspects of the project.

3.3 ASSESSMENT METHODS

3.3.1 DESKTOP ASSESSMENTS

A desktop review was undertaken of publicly available databases, digital resources including Geosciences Australia's Mapconnect and grey literature relevant to geology, soils and landforms in the project study area.

3.3.1.1 Topography

Topography and landscapes were reviewed with reference to CSIRO Australian Soil Resource Information System (ASRIS) datasets, Queensland Department of Employment, Economic Development and Innovation (DEEDI) –Department of Minerals and Energy (DME) resource and tenure maps and Environment and Resource Management (DERM) records, local government mapping, cadastral data and State Planning Policies (i.e. *SP1/92 - Development and Conservation of Agricultural Lands (SPP1/92)*) mapping.

3.3.1.2 Geology

Geology and landforms were identified using mapping sourced from the ASRIS and Geological and Topographic mapping series sourced from Geosciences Australia.

The Shear zones, faults and dykes have been identified as these areas may have increased geotechnical risks.

3.3.1.3 Soils

The occurrence and distribution of the major soil groups have been mapped for the project area. The typical soil profile characteristics of the main soil groups mapped have been compiled from field observations and various sources including:

- CSIRO ASRIS Mapping (CSIRO, 2006);
- CSIRO *Regional land systems and soils mapping* (1967, 1968, and 1974);
- Geosciences Australia 1:250,000 map series (1968); and
- Atlas of Australian Soils (Isbell *et al*. 1967).

Data obtained from previous field investigations has also been reviewed including studies undertaken by AMEC (2009), Coffey Mining (2009) and the land resources digital atlas data sets including the CSIRO land research series.

3.3.1.4 Landforms

Landforms were mapped using landscape units that provided a basis for the describing of the physical environment. The information reflects the distribution of geological areas, landforms and the associated soil types. Landscape units are a combination of several map units including:

- broad landform (slope and relief), geology and lithology;
- dominant soil orders;
- local climate, drainage networks and related soil profile classes;
- regolith materials; and
- similar geomorphological systems.

3.3.1.5 Good Quality Agricultural Land

An assessment of Good Quality Agricultural Land (GQAL) was undertaken to assess the current and potential agricultural land use. The assessment was based upon a four class system that is described in the DEEDI and

Department of Housing and Local Government (DHLG) planning guidelines for the identification of GQAL. These guidelines describe land as one of the following:

- Class A: Crop land, being land suitable for current and potential crops with limitations to production which range from nil to moderate;
- Class B: Limited Crop Land, being land that is marginal for current and potential crops due to severe limitations, but is suitable for pastures. The land may require improvement before it is suitable for sustainable cropping / cultivation;
- Class C: Pasture Land, being land suitable for improved or native pastures due to limitations which preclude continuous cultivation for crop production. Some areas may tolerate short-term cultivation for improved pasture and forage crop establishment. Other areas are primarily suited to grazing of native pastures, with or without the addition of improved pasture species without ground disturbance. Elsewhere the land is suited to restricted light grazing of native pastures in accessible areas, otherwise very steep hilly lands more suited for forestry, conservation or catchment protection; or
- Class D: Non-agricultural land, being land not suitable for agricultural uses due to extreme limitations. This may comprise undisturbed land with significant habitat, conservation and/or catchment values, or land that may be unsuitable because of very steep slopes, shallow soils, rocky outcrops or poor drainage conditions.

Data sources used in the assessment of GQAL included:

- DERM Regional Compilation of Mapping (1:250 000) Central West Region – GQAL; and
- local government planning documents including the Planning Scheme for Barcaldine Regional Council (BRC).

The local government GQAL mapping from the various planning schemes was used to undertake the desktop review of GQAL. This information was supplemented with site specific sampling.

3.3.1.6 Land Suitability

The Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland – Land Suitability Techniques (Department of Minerals and Energy, 1995) provide several criteria for the assessment of land use. These criteria are described via five Land Use Suitability class definitions and eight Land Capability Classifications. These landuse suitability classifications are assessed separately for broad acre cropping and beef cattle grazing, with the provision of criteria for the following land attributes:

- nutrient status;
- soil physical factors;
- soil workability;
- salinity;
- rockiness criteria;
- micro-relief (presence of melon holes associated with gilgai micro-relief);
- wetness criteria;
- topography;
- water erosion;
- flooding; and
- vegetation re-growth management.

A correlation exists between the guidelines for GQAL and the Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland – Land Suitability Techniques. This correlation is shown in Table 1.

Table 1. Correlation of pre-mining land capability classes with GQAL land classes

<table>
<tr><th colspan="2">PRE-MINING LAND CAPABILITY CLASSES</th><th colspan="2">GQAL LAND USES</th><th colspan="2">PRE-MINING LAND SUITABILITY CLASSES</th></tr>
<tr><th>CLASS</th><th>DESCRIPTION</th><th>CLASS</th><th>DESCRIPTION</th><th>CLASS</th><th>DESCRIPTION</th></tr>
<tr><td>1</td><td>Land suitable for all agricultural and pastoral uses.</td><td rowspan="2">Class A</td><td rowspan="2">CROP LAND:
land suitable for current and potential crops. Limitations to production range from none to moderate levels. All crop land is considered good quality agricultural land.</td><td>1</td><td>Agricultural - Suitable with negligible limitations - Land which is well suited to a proposed use.</td></tr>
<tr><td>2</td><td>Land suitable for all agricultural uses with slight restrictions to cropping.</td><td>2</td><td>Suitable for agriculture with minor limitations - land which is suited to a proposed use but which may require minor changes in management to sustain use.</td></tr>
<tr><td>3</td><td>Land suitable to all agricultural uses with moderate restrictions to cropping.</td><td rowspan="2">Class B</td><td rowspan="2">LIMITED CROP LAND:
land marginal for current and potential crops; and suitable for pastures. Land which is marginal or un-suitable for most current and potential crops due to severe limitations. Further engineering and/or agronomic improvements may be required before land would be considered suitable for cropping. Land marginal for particular crops of local significance is considered to be good quality agricultural land.</td><td rowspan="2">3</td><td rowspan="2">Suitable for agriculture with moderate limitations - land that is moderately suited to a proposed use but which requires significant inputs to ensure sustainable use.</td></tr>
<tr><td>4</td><td>Land primarily used for pastoral uses but can be carefully cropped occasionally.</td></tr>
<tr><td>5</td><td>Land primarily used for pastoral uses but can be cropped if limitations are removed.</td><td rowspan="3">Class C</td><td rowspan="3">PASTURE LAND:
Land suitable only for improved or native pastures. Limitations preclude continuous cultivation for crop production but some areas may tolerate a short period of ground disturbance for pasture establishment. In areas where pastoral industries are the major primary industry, land suitable for improved or high quality native pastures may be considered to be good quality agricultural land.</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>6</td><td>Land is not suitable for cultivation but well suited to pastoral production.</td></tr>
<tr><td>7</td><td>Land is not suitable for cultivation and only careful pastoral use possible.</td><td>4</td><td>Agriculturally marginally suitable land – land which is marginally suited to a proposed use and would require major inputs to ensure sustainability. These inputs may not be justified by the benefits to be obtained in using the land for the particular purpose and is hence considered presently unsuited.</td></tr>
<tr><td>8</td><td>Land not suitable for agricultural or grazing uses.</td><td>Class D</td><td>NON-AGRICULTURAL LAND:
Land not suitable for agricultural uses.
This may be disturbed land with significant habitat, conservation and/or catchment values.
Severe limitations preclude any interference with land resources for the production of agricultural goods.</td><td>5</td><td>Agriculturally unsuitable land with extreme limitations – land which is unsuited for a proposed use.</td></tr>
</table>

3.3.1.7 Contaminated Land Assessment

In order to adopt an appropriate ranking system to assess the large number of properties across the study area for contaminated land risk, a tiered / ranking approach was adopted to assess lots with moderate or high potential for contamination and to select lots with potential impacts to the project area for more detailed investigation. These lots were then selected for Preliminary Site Investigations (PSIs). The ranking order of lots across the study area was classified accordingly to a system of High to Medium and Low risk.

The following summarises the approach of the of the ranking risk assessment:

- a search of DERM's Queensland Valuation and Sales System (QVSS) was conducted to establish primary landuse activities to group into high, medium or low;
- lots ranked as a high risk included industrial land use, (e.g. transport terminals, transformers, airfields, extractive industry). Lots ranked as medium risk include cattle and stock agribusinesses (potential for stock / cattle dips) and contractors / builders yards. Lots ranked as low risk include parks, gardens and residential land as it is unlikely potentially contaminating activities would have been carried out on that land;
- all sites ranked as high risk were subject to a search on the Environmental Management Register (EMR) / Contaminated Land Register (CLR). Medium risk sites were subjected to aerial imagery investigations; and
- EMR / CLR searches were not carried out on low risk sites as lots subject to residential land use were considered the most sensitive land use in terms of public use and exposure. Therefore they would have a low probability of being impacted by contamination.

Further detail on the tiered ranking risk assessment is provided in the Contaminated Land Technical report at Volume 5, Appendix 7.

3.3.2 FIELD INVESTIGATIONS

The dominant soil types intersected by the project were assessed, with emphasis on soils in the mine footprint and potentially dispersive soils at waterways. Desktop assessment of major soil types used dominant soils mapping to refine the scope of field investigations to ensure all of the major soils types within the project area were represented by the sampling. The field investigations included:

- characterisation of soil types;
- assessment of depth and quality of useable soils;
- assessment of dispersivity and erosion potential; and
- assessment for potential as a regrowth medium.

A soil survey of representative sites within the project footprint was conducted with reference to the physical soil stability and the chemical properties of the materials that influence erosion potential, storm water run-off quality, rehabilitation and agricultural productivity of the land.

Soil profiles were mapped by initially reviewing the aerial photography and regional mapping and assigning soil areas based upon common photo tones and topography. Representative samples were then collected from these areas for assessment.

An appraisal of the depth and quality of useable soil was undertaken by using a hand auger and test pitting to a maximum depth of approximately two m from the surface. Sample cores were split into two to three sub-samples depending on the number of soil horizons encountered at each site. Samples were selected for laboratory analysis in order to characterise all soil types within the study area. Data was then interpreted to assess the extent of different soil types.

Ten sample locations were used to characterise soils within or near the mine footprint with 17 sub-samples taken from these locations. Nine samples were sent to the laboratory for analysis.

3.3.2.1 Soil Observations

Visual observations of soil type and structure were undertaken at a number of the waterways that will be disturbed by construction works. These observations were carried out in order to address erosion potential at waterways within the mine site. Characteristics noted on site included dominant soils type, stream morphology, bank vegetation and signs of existing erosion / disturbance. Nine sites were observed at the mine site.

3.3.2.2 Laboratory Analysis

Samples were submitted to laboratories with National Association of Testing Authorities (NATA) accredited methods for the analyses. The laboratory analyses included:

- pH;
- Calcium (Ca) and Magnesium (Mg) Ratios;
- Chlorides (ppm);
- Electrical Conductivity (EC);
- Emerson Crumb Dispersive Analysis;
- Exchangeable Sodium Percentage (ESP); and
- Sodium Absorption Ratios (SAR).

A Detailed description of the tests carried out can be found at Volume 5, Appendix 7.

3.3.2.3 Contaminated Land

Sites with an identified potential for contaminant impacts to the project area were selected for field investigations. The field studies were conducted in November 2009 and April 2010. The following summarises the rationale and methodology for field investigations:

- selection was based upon the results of EMR searches of lots following the tiered risk assessment of land uses and the result of aerial and ground inspections;
- soil samples were collected from targeted locations based upon principals described in AS4482.1 – 2005: *Guide to sampling and investigation of potentially contaminated soil* (Part 1: Non volatile and semi volatile compounds) and AS4482.2-1999: *Guide to sampling and investigation of potentially contaminated soil* (Part 2: Volatile compounds);
- sampling was conducted with either a hand auger to a maximum depth of 0.9 metres below ground level (mgbl) into the soil profile or using a hand trowel to collect soil samples. Two types of samples were collected, either a surface sample (0.0 mgbl) or samples at depths of 0.3 mgbl, 0.6 mgbl and 0.9 mgbl, respectively; and
- the toxicant parameters analysed for both rounds of soil sampling is as follows:
  - livestock dip or spray race operation included Organochlorines (OC) and Organophosphate pesticides (OP); and
  - petroleum product or oil storage included Total Petroleum Hydrocarbons (TPH) C_6-C_9, TPH C_{10}-C_{36} and Poly Aromatic Hydrocarbons (PAH).

3.3.2.4 Overburden Testing

An assessment of topsoil, overburden, interburden and coal (as potential reject material) was undertaken to assess the potential for environmental issues arising from handling and treatment of these materials.

The geochemical testing program used samples collected from groundwater assessment boreholes emplaced in shallower overburden in the area of the mine. The presence of a uniform geology with little structural influence suggests the samples from the shallow soil, overburden, interburden and the coal layers would be representative of the whole layer.

Coal was assessed to allow for coal reject from a CHPP that may be placed in waste containment structures. There are currently no regulatory requirements in Queensland specifying the number of samples to be collected and assessed for overburden or potential reject materials at mines. The number of samples (14) is based upon availability for sampling during the groundwater investigations undertaken at the mine.

The samples were assessed for Acid Neutralising Capacity (ANC), Nett Acid Production Potential (NAPP), Net Acid Generation (NAG), total sulphur and eight priority metals (arsenic, cadmium, chromium, copper, lead, nickel, zinc and mercury).

3.4 DESCRIPTION OF EXISTING ENVIRONMENTAL VALUES

3.4.1 TOPOGRAPHY

The topography at the mine rises gently to the west up to 400 m Australian Height Datum (AHD) to outcrops of the Great Artesian Basin (GAB) sediments 20 km to 40 km west of the mine (Figure 1). Gently undulating plains occur throughout the majority of the mine area with strongly undulating to hilly land in the north-east corner of EPC 1040.

3.4.2 GEOLOGY

The geology at the mine is taken from the *South Alpha Project – Mine News 00201AA Resource Estimate Report (2009)* (Coffey Mining, 2009).

Surface geology of the mine is dominated by unconsolidated Cainozoic sediments. Unconsolidated sands, silts and clay, lateritised in part, form an extensive blanket over the mine area, with thickness of up to 90 in the eastern and central sections. There is an assortment of recent-Quaternary and Tertiary within the Cainozoic blanket but no attempt at demarcation has been made. In the east of South Alpha, the Cainozoic sits directly on the Permian. This contact is unconformable and represents an extensive time gap while the contact is erosional at least in part.

The target geology is held within the Permian interval of the Galilee Basin. The Galilee Basin is an intracratonic basin filled with dominantly fluviatile sediment. The Galilee Basin is geographically large, covering nearly 250,000 km^2 of central Queensland. The Galilee is connected to the Bowen Basin over the Springsure Shelf (south east of Alpha). In the project area, the target geology is held within the Bandanna Formation and Colinlea Sandstone, correlatives of the Bowen Basin's Group IV Permian Rangal Coal Measures.

The Tertiary flood basalts that feature in the cover sequence in parts of the Bowen Basin are absent from project area. The Cainozoic tends to be thin in the west and drilling and previous exploration show the Triassic Rewan Formation as rarely outcropping or identified in the shallow near surface in this region. The Rewan Formation is unconformable on the Permian and consists of the greenish sandstones, siltstones with some shale layers in association with the Rangal Coal Measures in the Bowen Basin to the east. Further west, outcrop of the Lower Triassic sedimentary sequences including the Dunda Beds, Rewan Formation and Moolayember Formation are present.

Much of the western and southern Galilee Basin is concealed under the Jurassic-Cretaceous Eromanga Basin. The north eastern edge of the basin (including the project area) is free of the Eromanga cover and contains some of the shallower Permian occurrences within the Galilee. The earliest Permian Aramac Coal Measures are not recognised within the South Alpha area. The mine's surface geology is shown on Figure 2. Table 2 provides a key to the geology figures for the mine site area.

Table 2. Mine site geological key

GEOLOGICAL SYMBOL	ERA	PERIOD/EPOCH	FORMATION NAME	LITHOLOGICAL DESCRIPTION
Qa	Cainozoic	Quaternary	-	Alluvium, some gravel
Czs	Cainozoic	Quaternary	-	Sand, gravel, rubble
Czc	Cainozoic	Tertiary	-	Argilaceous sandstone, sandy mud stone, lime stone: partly lateralised
Rsl	Mesozoic	Lower to middle Triassic	Clematis Sandstone	Quartz sandstone, shale layers, minor siltstone and mudstone
Rsdu	Mesozoic	Lower Triassic	Dunda Beds	Labile sandstone, siltstone, mudstone
Rsmo	Mesozoic	Lower Triassic	Moolayember	Sandstone, siltstone, shale
Psb	Paleozoic	Lower Permian	Colinea Sandstone	Labile and quartz sandstone, minor siltstone and coal
Cpj (not outcropping)	Paleozoic	Upper Carboniferous to lower permian	Joe Joe Formation	Mudstone, labile sandstone, siltstone, shale

The Permian horizons consist of liable sandstones, siltstones, mudstones and claystones with intercalated coal seams. These horizons dip gently to the west at <1° dip and appear to be free of significant structure. The seams have been allocated the alphabetical sequence used by previous explorers of the area (Figure 3).

The A and B seams are allocated membership of the Bandanna Formation and the sequence for C down the Colinlea Sandstone. It is acknowledged that the E and F seams may belong to a lower formation again. These allocations are tentative and if a definitive relationship can be proven it will be readily adopted. The provision of Formation / Group membership has no material impact on the resource geology of the deposit.

Figure 1. Mine Site Topography

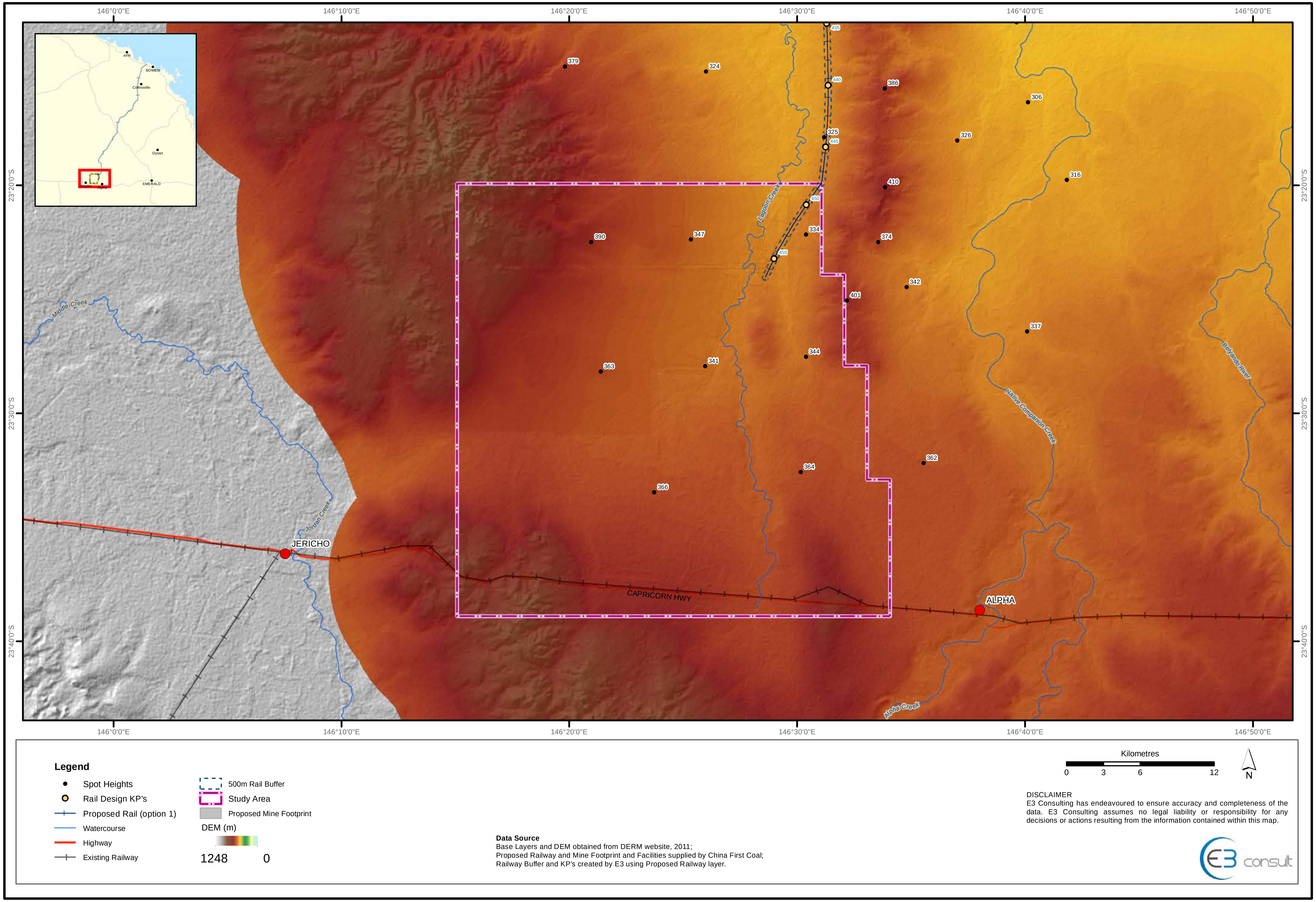


Figure 2. Mine Site Surface Geology

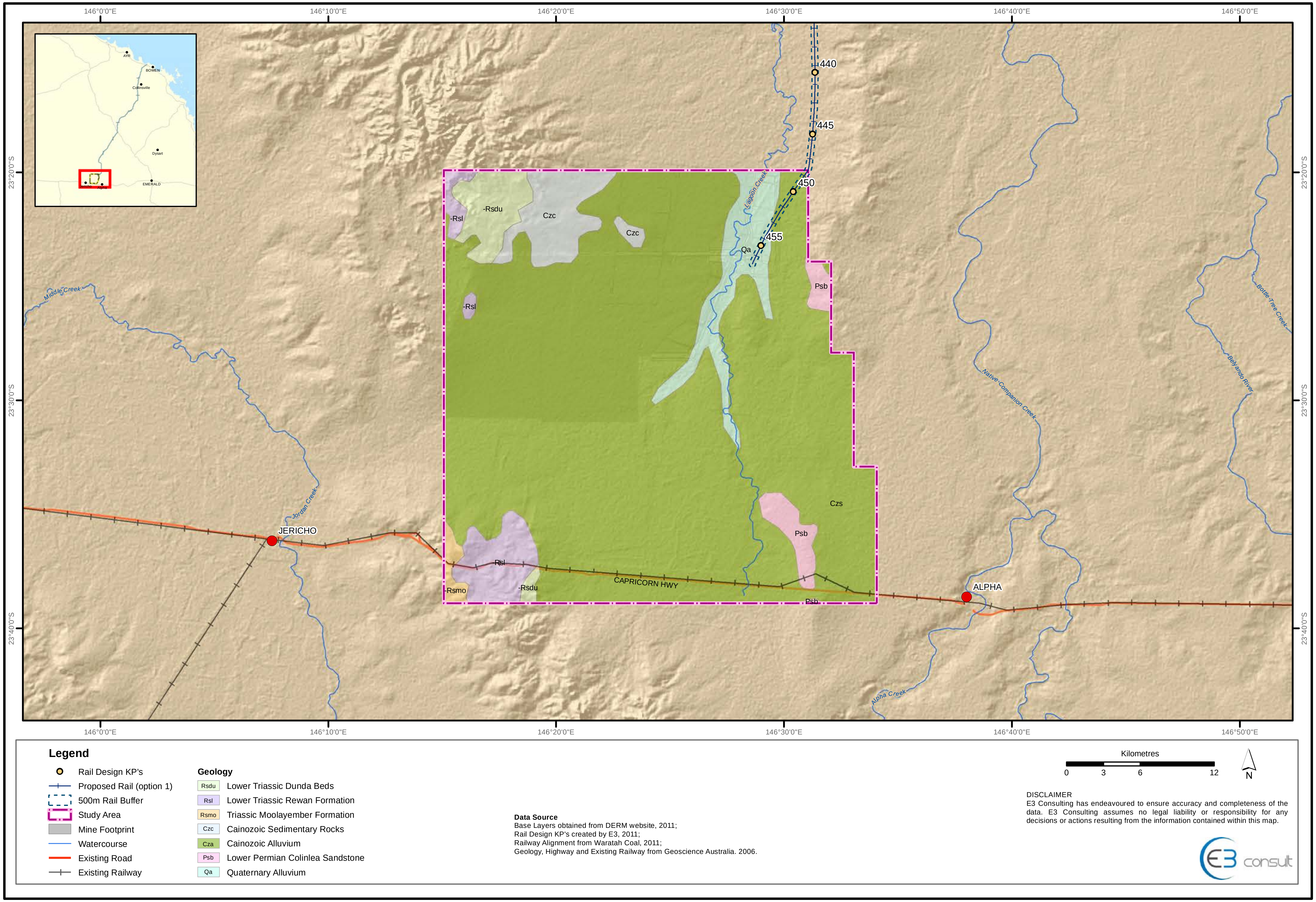
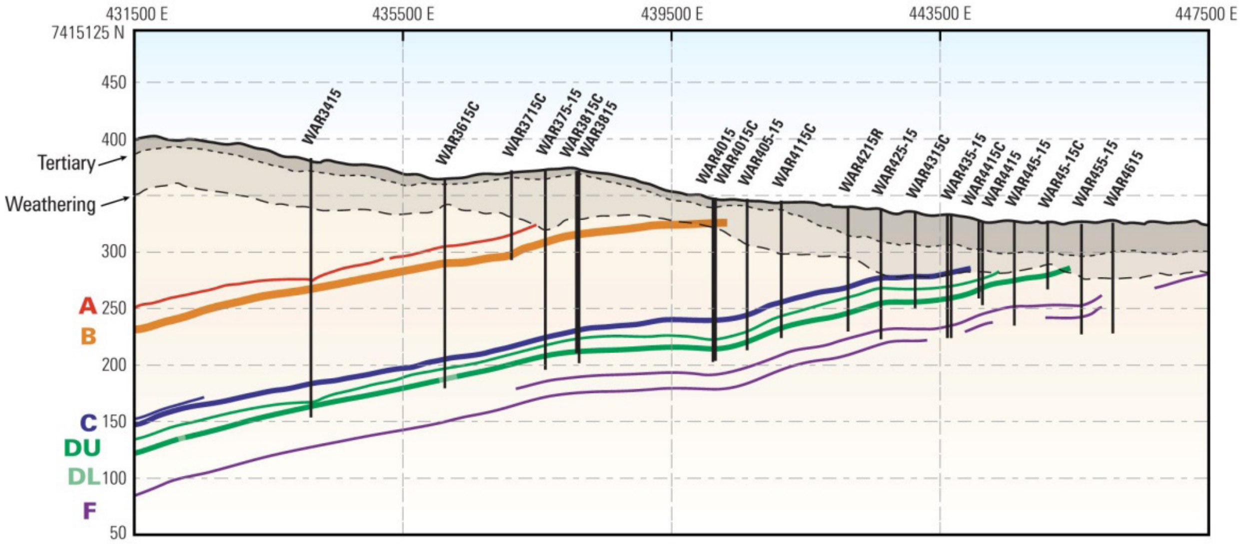


Figure 3. Diagrammatic Representation of the Geological Stratigraphy Throughout the Project Area



Source: Coffey Mining 2009. Note: Vertical Scale has been exaggerated by a factor of greater than 5:1.

The combination of a very gentle westerly dip and subdued topography creates relatively broad subcrop zones for each seam. Additionally, the B and C intervals are separated by a 90 m sandstone (vertical thickness); this separation and the dip / surface geometry causes two north-south orientated bands of seam subcrop; the A and B in the west and the C to DL in the east. The E and F Seams sit below the D splits and subcrop further east again, the seam limits often influenced by deeply incised alluvium channels associated with drainage along Sandy Creek. The full C-F sequence continues unbroken under the A and B subcrop zone and all seams continue down dip. Previous drilling has identified a recognised continuum of the seams down dip for at least 30 km to the west and to over 1,000 m cover.

3.4.2.1 Mine Resource Geology

The Project's coal deposit lies within the Galilee Basin which is a sedimentary basin formed by down-warping of a large area west of the Anakie Inliers during the Upper Carboniferous, Permian and Triassic periods. The Galilee Basin is underlain by the Drummond Basin and overlain by the Eromanga Basin.

Weathering / oxidation is variable but tends to be deep for a coal project. The weathering surface is commonly 30-50 m down into the Rewan / Permian rocks, and:

- the target geology is held within the Permian interval of the Galilee Basin;
- the target mineralisation is late Permian thermal coal; and
- in the project area, the target geology is held within the Bandanna Formation and Colinlea Sandstone that are correlatives of the Bowen Basin's Group IV Permian Rangal Coal Measures.

The coal resource is found in five principal seams from shallowest to deepest with other subordinate coal horizons present. A full description of the coal seams is provided in Volume 2 Chapter 1. The identified coal seams are allocated the alphabetical sequence used by previous explorers of the area. Further sub-division of the seams has occurred during Waratah's exploration including:

- a dirty top ply of the C seam is recognised but not considered economic due to high ash (C Upper 'CU');
- D seam is typically found in two splits – D Upper ('DU') and D Lower ('DL'); and
- DL is further divided into DL1 (upper split) and DL2 (lower split).

The coal resource is summarised as follows.

- **A Seam:** The A seam is typically developed to one m thick, with thickest intersection recognised so far being around 2 min the weathered zone in the southern region of the project. Because of the dip and subcrop geometry, A Seam only occurs in the far west. The A seam tends to be poorly developed and contains considerable carbonaceous shale / mudstone partings.
- **B Seam:** The B seam is the thickest in the set at South

Alpha, typically reaching six m. The B Seam is richly banded with tuffaceous carbonaceous mudstones, especially in the top three m. These banding impacts on raw ash of the overall seam and degrade its overall quality. A distinctive, clean section of 2.0 to 2.8 m dull and bright banded coal exists at the base of the seam.

- C Seam: Thickness range of one to three m is found for the C seam at the project site, typically developed at two m. A further two m of thinly banded stony coal and carbonaceous mudstone is often developed on the immediate roof of the C seam (CU Unit) but is not considered to be of resource potential. The C seam profile is generally clean of bands, with a trend of increasing frequency of pennybands at the top of the seam near the CU interface.
- DU Seam: The D Upper seam lies about 10 to 15 m below the C seam. It has fairly uniform thickness in the order of 1.8 to 2.2 m. The DU seam carries some thin stone bands in the mid-section but is generally clean. The DU seam has very sharp roof and floor definition and has a distinctive sharp, square shouldered roof and floor trace. This contrasts for example, with the C seam where increasing frequency of banding towards the roof causes an upwards, step-wise gradation in the geophysical logs at the roof. A variable parting of one to ten m splits the DU seam away from the DL seam. All of the D seamsplits are high quality and provide the lowest ash and highest energy, raw or washed, of the project area coals.
- DL Seam: The DL seam exists as the DL1 and DL2 splits, residing within 0.2 to 0.4 m of each other. The septum is occupied by a carbonaceous mudstone. The DL1 seam is around 0.7 to 0.9 m thick and the DL2 seam is 1.6 to 2.1 m thick. With the split included, the entire DL1 to DL2 interval has a cumulative consideration of around three to four m. The DL splits are also relatively clean intervals; three small pennybands persist in the DL2 dividing it into roughly equal intervals. Coal lithological types are even mixtures of bright and dull coal for the D seams.
- E and F Seams: Both E and F seams are one m thick. The E seam sits 10 to 20 m below the DL seam and the F seam a further 20 m lower again. They are slightly erratic in development and want to split and degrade. They have variable profiles reflecting differing levels of included stone bands. These seams sit outside limits for economic inclusion with any D seam operation and are too thin to support stand-alone development (they are not thick enough to support targeting mining; exist below thick Cainozoic associated with drainage) and so are without real potential.

The A and B seams are allocated membership of the Bandanna Formation and the sequence for C down the Colinlea Sandstone. The E and F seams may belong to a lower formation. These allocations are tentative. The provision of Formation / Group membership has no material impact on the resource geology of the deposit.

The combination of a very gentle westerly dip and subdued topography creates relatively broad sub-crop zones for each seam. Additionally, the B and C intervals are separated by 90 m of sandstone (vertical thickness) and this separation and the dip / surface geometry causes two north-south orientated bands of seam sub-crop; the A and B in the west and the C to DL in the east. The E and F Seams sit below the D splits and sub-crop further east, the seam limits often influenced by deeply incised alluvium channels associated with drainage along Sandy Creek. The full C-F sequence continues unbroken under the A and B sub-crop zone and all seams continue down dip. Previous studies have recognised a continuum of the seams down dip for at least 30 km to the west and to over 1 km of overlying stratigraphy.

The coal deposit is estimated to contain 3.93 billion tonnes (Bt) of coal resources. Of this 1,975 million tonnes (Mt) are measured, 565 Mt are indicated and 1,140 Mt are inferred. Of the resource total, 830 Mt would be mined as open cut mines and 3,095 Mt as underground areas (Coffey, 2009). Underground areas typically show only modest cover of 120-200 m with very gentle dips and relatively benign structural geology. The coal present is capable of producing a blended export style thermal coal with low moderate sulphur. The lower seams would make acceptable quality without blending.

3.4.2.2 Geological Structural Features and Faults

The basinal sediments in the mine area are characterised by gently dipping sedimentary units with little or no recognised faulting. The units generally dip towards the west at about 1°.

3.4.2.3 Overburden

The heavy metal concentrations of samples of overburden and interburden tested were below environmental investigation levels (EILs) for all metals with the exception of total chromium which exceeded the EIL for trivalent chromium in two samples. These results were within 10 % of the background range for total chromium.

The majority of samples have very low sulphur content (<0.1%) and therefore have a very low potential for acid generation. This is confirmed by the negative Nett Acid Production Potential NAPP results ranging from -0.7 to -23.6 which indicate the samples were non-acid forming (NAF). Geotechnical investigations also indicated that the majority of the rock material is NAF. It is anticipated that there will be minimal waste generation during construction works, as the NAF material can be used to construct mine structures including tailings storage facilities, mine levee walls and the Overburden Emplacement Facility (OEF).

Given these results, overburden and interburden material is not expected to pose a risk of causing acid rock drainage. Acid production potential of overburden, interburden and coal reject is discussed further in the Waste Technical Report Volume 5 Chapter 12.

3.4.2.4 Fossil Potential

The Permian and Tertiary periods represented by the geology in the mine area were periods when flora and fauna including amphibians (Permian) and mammals (Tertiary) were present in the general fossil record. There are records of *Glossopteris Sp*. (an extinct group of seed plants) fragments in the Joe Joe Formation, a Permian formation that underlies the projects coal measures. The Peawaddy formation, which also underlies the project coal measures, is also known to contain Permian plant fragments (DEEDI, 1973). The Peawaddy Formation was deposited in lacustrine and fluvial environments, which is similar to the terrestrial to lacustrine and fluvial environments that the project geology may have been deposited in.

While no record of fossils have been reported in the project area (Parfrey, 1996); there is potential for similar fossils as described above in the stratigraphy in the mine area due to the similar depositional environments.

3.4.3 SOILS

The mine study area is dominated by Kandosol soils with Rudosols in areas of elevated terrain in the north-western and south-eastern portions of the site (Figure 4).

Kandosols are structureless, mostly well drained permeable soils although some yellow and most grey Kandosols have impeded sub-soil drainage. Most Kandosols have low fertility and land use is limited to grazing and native pastures. Grazing lands are susceptible to surface soil degradation such as hard setting and crusting even when grazing intensity is low.

Rudosols are soils with minimal soil development. These are relatively young soils where soil forming factors have had little time to pedalogically modify parent rocks or sediment. There are a wide variety of Rudosols in terms of texture and depth with many being stratified and some hypersaline. Rudosols are apedal or only weakly structured and show no pedological colour change apart from darkening of the top horizon. Commercial land use is generally limited to grazing of native pastures due to the soil properties or occurrence in arid regions, or both.

Ten soil samples were collected to assess the mine site area. A description of these samples is provided in Table 3. The physical results of the soil investigation indicate that Kandosols are the dominant soil type in the mine area.

Table 3. Mine site description of soil samples

SAMPLE	SAMPLE LOCATION	SOIL
SS49	North east end – near rail alignment	Sandy clay, fine grain, hard, dry, non-plastic, some gravel (sub angular (9 mm), underlain by gravelly, clayey sand, fine to medium grain, dry, loose, friable, brown /orange, sodic.
SS50	North east end – Tallarenha Ck	Clayey silt, dry, firm, loose, non-plastic, dark brown A horizon, Pale gray B horizon.
SS51	North east end – near rail	Sandy gravels, dry, hard, friable, loose, orange, underlain by sandy gravelly clay, fine grain, friable, loose.
SS52	South east of mine site	Silty clay, dry, firm, pale grey / brown A horizon and pale grey B horizon.
SS53	Central east side of mine site	Silty clay, hard, non-plastic, dark brown underlain by soft silty clay, non-plastic with orange and red colour.
SS54	Central northeast mine site / Tallarenha Ck	Sandy clay, fine to medium grain, hard, non-plastic, brown underlain by silty clay, soft, non-plastic, orange.
SS55	Central north west mine site	Clayey gravelly sand, fine grain, firm, non-plastic, orange and yellow underlain by silty clay, firm, non-plastic, dark red.
SS56	North west of mine site	Silty clay, dry, hard, dark down.
SS57	Central mine site	Silty clay, dry, hard, loose, dark brown / orange underlain by silty clay, dry, firm, loose, dark orange / red colour.
SS58	Central west of site	Sandy clay, fine to medium grain, dry hard, loose, non-plastic.

3.4.3.1 Soil Summary

An analysis of particle size distributions for topsoil indicated that 52 % to 71 % of the samples passed through a 75 µm sieve size. This suggests that the soils were generally sandy to silty. These sand/silt dominated soils have low Cation Exchange Capacity (CEC) as they have lower clay content and therefore a lower surface area with less room to carry cations. This results in lower ESP and SAR and reflects lower fertility of the soils. As there is lower clay content in the soils; these results on their own cannot be used to assess dispersivity. The Emerson Crum test results provide an assessment of dispersivity and indicate some soils have the potential for dispersion.

3.4.3.2 Soil pH

Soil pH has a strong influence on the solubility and form of chemical compounds, the availability of ions in the soil solution as well as microbial activity. The optimum pH range for plant growth varies between species with a pH of 5.5 – 7.0 considered optimal for many native plants and pH 6.0 – 7.0 optimal for pasture grass. Soil pH ranged from 5.7 (SS58 = 0.0 - 0.3 mgbl) to 6.8 (SS53 = 0.0 - 0.3 mgbl) which is slightly acidic but within the range that is optimal for plant growth.

3.4.3.3 Cation Exchange Capacity (CEC)

CEC is a useful indicator of soil fertility as it demonstrates the soils ability to supply three important plant nutrients: calcium (Ca), magnesium (Mg) and potassium (K). A low CEC usually indicates low fertility. Guidelines for exchangeable cation test results specific to Queensland do not exist; however, the NSW Department of Environment Climate Change and Water (DECCW) provide guideline values for the interpretation of laboratory cation analysis (DECCW, 2008).

Comparisons of the results from the mine site to the guidelines indicate that the soils in the vicinity of the mine site are likely to have very low fertility.

3.4.3.4 Soil Salinity

Elevated levels of salt within the soil reduce the availability of water to plants which can affect germination, plant growth and the availability of essential plant nutrients. Salinity in the soils was measured by the concentrations of soil chloride and EC. These values were compared to values listed in the Guidelines for the Assessment and Management of Saline / Sodic Wastes (DERM, 1995).

Assessment against the guidelines identified the soils as having low salinity.

Figure 4. Mine Site Soil Types

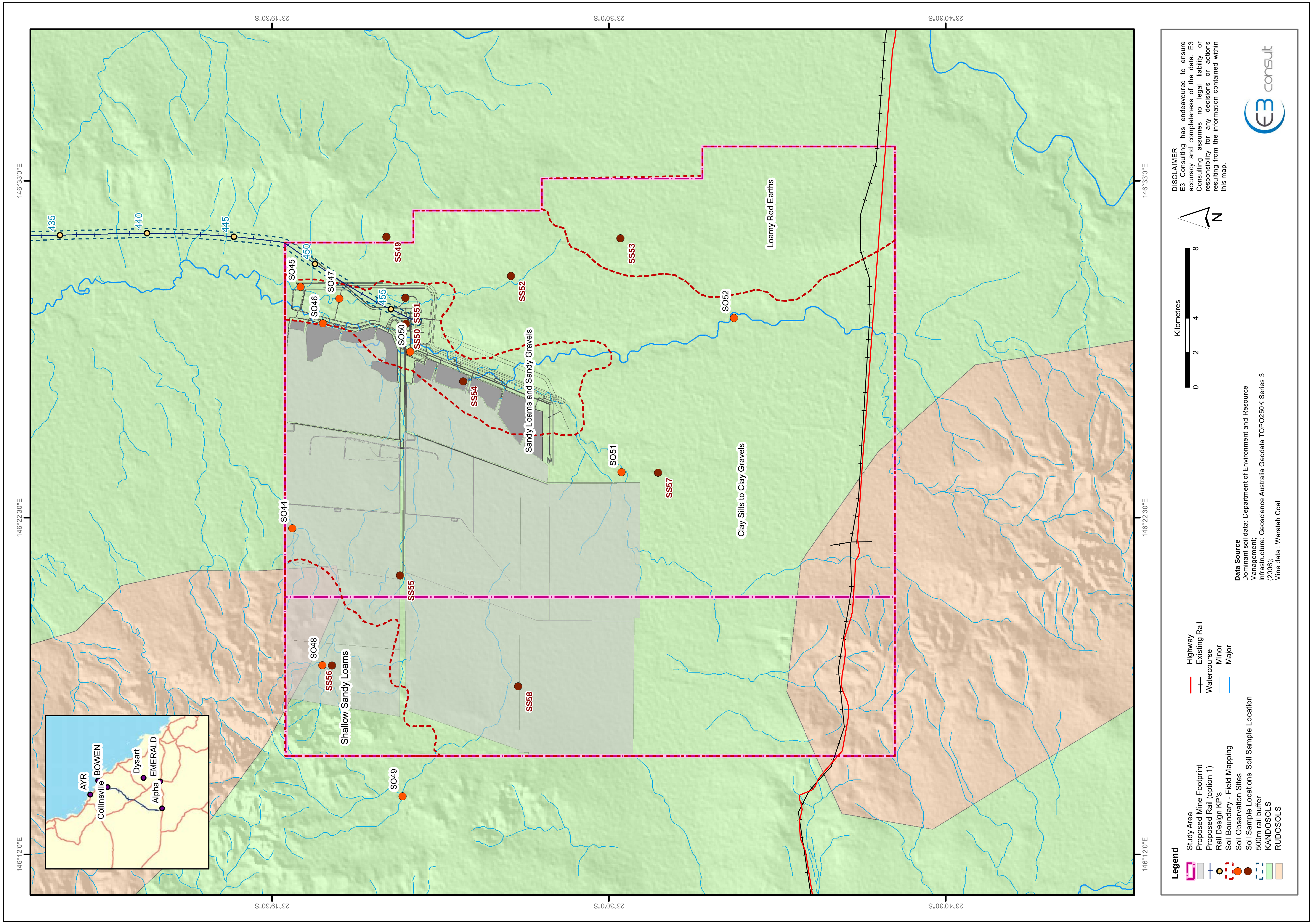
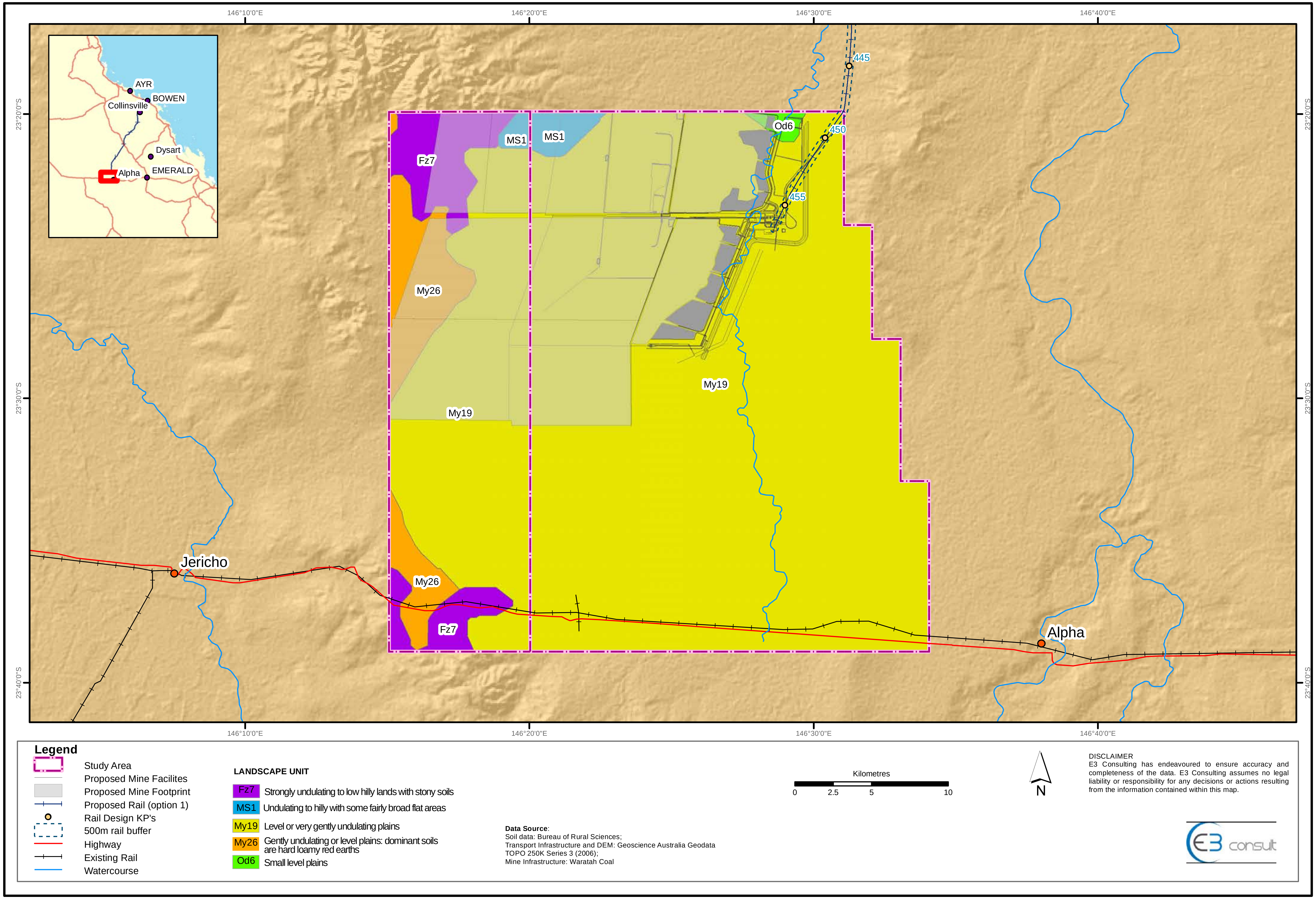


Figure 5. Mine Site Landscape Units



3.4.3.5 Soil Sodicity and Dispersion

Exchangeable Sodium Percentage and Ca: Mg ratios are provided in the DERM Guidelines (1995), the DECCW (2008) ranking for laboratory exchangeable cation test results and Northcote and Skene (1972).

Exchangeable Sodium Percentage in and around the mine site is generally very low to low except at one location. Generally low ESPs indicate that clay soils are less prone to dispersion. The SAR was low and this suggests a low risk of erosion, compaction, and / or development of hard setting crusts in the soil and subsequent effects on soil fertility in clay soils. However, sandy soils typically have lower SAR than clayey soils and the very low Ca: Mg ratios indicate that these soils may be associated with dispersive soils. The results suggest that there is the potential for dispersive soils both at samples near the mine open cuts and in higher ground west of the mine open cuts; however Emerson Crumb dispersion tests provide a further insight into these results.

3.4.3.6 Emerson Crumb Dispersive Soil Analysis

Three samples were collected from two locations within the mine site for the assessment of dispersion characteristics using the Emerson Crumb dispersion tests. The results of the Emerson Crumb indicated:

- SS49 at 0.0 – 0.3 mgbl returned an Emerson Class of 2;
- SS49 at 0.3 – 0.6 mgbl returned an Emerson Class of 3; and
- SS50 at 0.0 – 0.3 mgbl returned an Emerson Class of 2.

The Emerson Crumb results and the Ca: Mg ratios suggest that soils located at the north east part of the mine area are likely to be dispersive and will require management to avoid erosion issues. The Rudosols on the higher areas in the northwest and southeast of the mine are generally shallow and rocky and will erode on slopes or scour where present in valleys. They are therefore considered to have a moderate to high potential for erosion.

3.4.3.7 Soil Observations

Nine waterways were visually assessed within the mine area to determine their erosion potential. Two sites (SO44 and SO46) were identified as having a moderate to high potential for erosion, while four sites (SO48 to SO51) were thought to have a high potential for erosion. All six sites are dominated by either sand or silts. The sites with high potential were classified accordingly either due to their appearance as an already degraded and eroded channel. The remaining three sites were assessed as having a low potential with no evidence of erosion or significant disturbance.

3.4.3.8 Top Soil Resources

The suitability of top soil resources in the mine area for rehabilitation of lands disturbed during the development required an assessment of suitable topsoil and proposed stripping depths. The useable topsoil resources are generally limited to the surficial "A" horizon which contains seed stocks, organic matter, nutrients and biota necessary for plant growth although they can also occur in the upper "B" horizon. The mine site area soils are dominated by structureless soils (Kandosols) or soils with minimal soil development (Rudosols), generally in areas of higher relief. This soil classification is supported by both surface geology mapping and landscape unit mapping for the mine site project area. Data obtained through field investigations indicates that the soils are predominantly sandy and gravelly clays, silty clays and sandy soils of low fertility.

Useable topsoil resources are likely to be restricted to the top 0.3 m of the soils on the eastern and central portion of the mine with the lower horizons likely to be too gravelly or clay dominated with little organic matter.

3.4.4 LANDFORMS

The mine landscape units reflect the project area topography with landforms being predominantly gently undulating or level plains over most of the two EPCs rising to strongly undulating to low hilly lands in the north-west and south-west corners. A detailed description of the landscape units that are observed within the EPC are outlined in Table 4. Mapped Landscape units are shown on Figure 5.

3.4.5 GOOD QUALITY AGRICULTURAL LAND (GQAL) AND LAND SUITABILITY

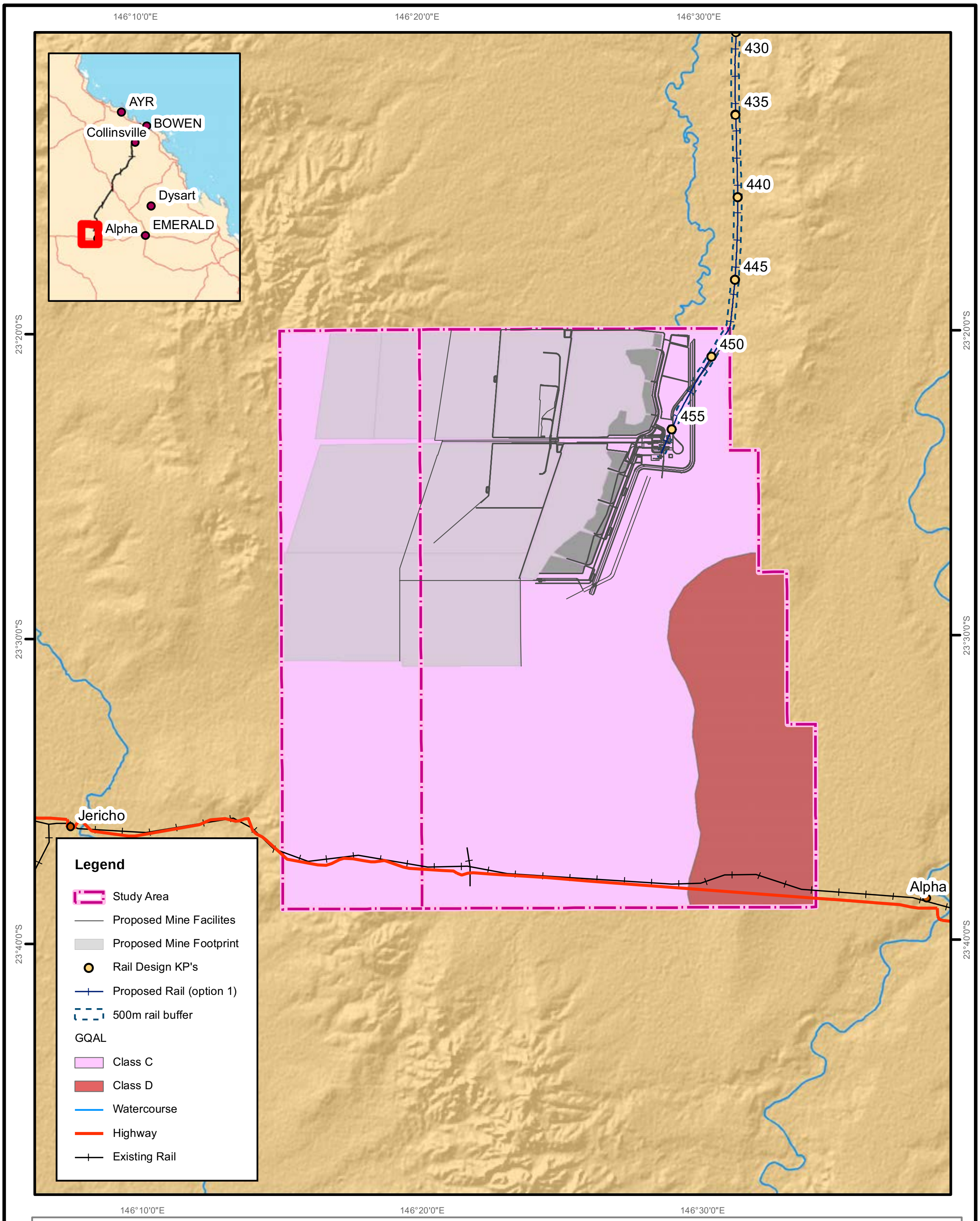
Based on the results of soil sampling the majority of the land within the mine footprint would be considered Class C GQAL (Figure 6), which is described as being "Pasture land: land suitable only for improved or native pastures". There is some land that may be considered Class D land: non Agricultural land in the east of the EPC.

The land would generally be considered Class 4 or 5 – marginally suitable or unsuitable for agriculture – under the DME (1995) land suitability guidelines.

Table 4. Mine Site Landscape Units

LOCATION	LANDSCAPE UNIT	LANDFORM	SOILS	REMARKS
North West and South West Corner of site	Fz7	Strongly undulating to low hilly lands	Dominant soils are shallow stony loams. Associated are shallow sandy soils and small areas of sandy red earths are included in the unit.	On some slopes, shallow duplex soils occur
North Central	MS1	Undulating to hilly with some fairly broad flat areas often broken by rocky knolls and ridges some of which may be steep	Dominant soils are sandy acid yellow earths sandy acid and neutral red earths and shallow sandy soils on the ridges and slopes where ferruginous rock and ironstone gravels are common. Associated are flatter and lower lying areas generally of various hard setting (D) soils. Some slopes are flatter and in some expressions of the unit there are cracking clays and small areas of soils associated with basaltic flat tops and ridges.	This is a broadly defined and complex unit
North West and Central West	My26	Gently undulating or level plains	Dominant soils are hard loamy red earths and yellow earths. The red and yellow earths may vary locally in dominance, the former occurring mainly on slightly higher sites.	Included in the unit are some low laterite or sandstone scarps with shallow stony loams, and occasional eroded mottled rock pavements
North, North East, South East and Central	My19	Level or very gently undulating plains	Dominant soils are sandy or loamy red earths with some yellow earth. In other depressed areas shallow red earths are underlain by a clay D horizon. Small areas of clay soils may be included.	Often in the form of low dunes
North East	Od6	Small level plains	Dominant are sandy or loamy-surfaced red duplex soils. Small areas of grey cracking clays. Also occurring are small areas of sandy or loamy red and yellow earths.	Occasional low sands

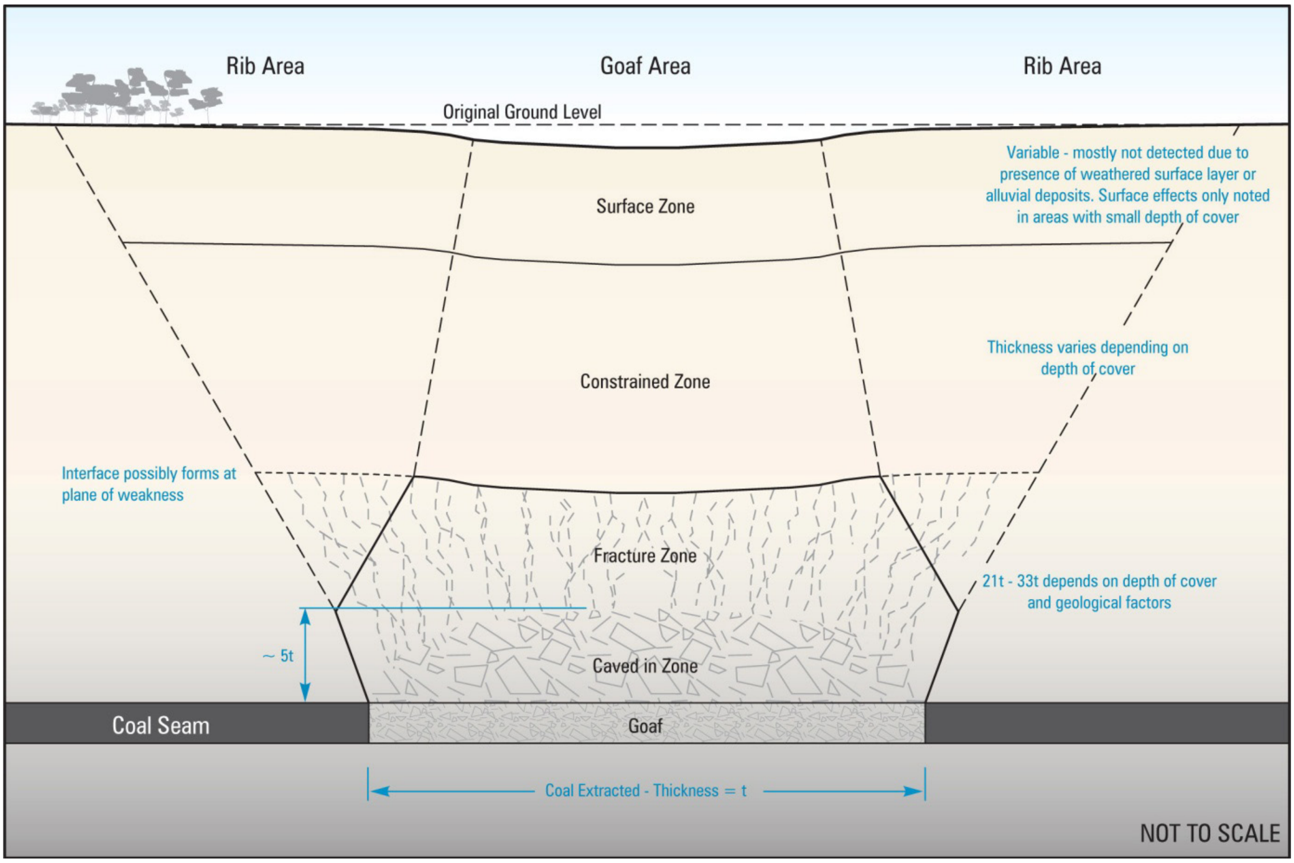
Figure 6. Good Quality Agricultural Land



Data Source:
Transport Infrastructure and DEM: Geoscience Australia Geodata TOPO 250K Series 3 (2006);
Good Quality Agricultural Land (GQAL): based on field sampling;
Mine Infrastructure: Waratah Coal

DISCLAIMER
E3 Consulting has endeavoured to ensure accuracy and completeness of the data. E3 Consulting assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

Figure 7. Schematic of Potential Ground Impacts Associated with Underground Mining



3.4.6 SUBSIDENCE

It is likely that underground longwall mining activities will result in surface subsidence. A schematic drawing of the ground impacts above the extracted blocks of coal in a longwall mining system is shown in Figure 7.

As the coal seam is removed by the longwall mining method a void the thickness of the longwall seam remains. The ground immediately above collapses into this void. The overlying strata (or "overburden") then sags down onto the collapsed material, resulting in an elongated subsidence "bowl" developing on the surface.

The act of this strata failure into the void is integral to the longwall mining method, as it relieves stress on the surrounding mining blocks and development roadways.

The cavity which has been left behind the retreating longwall face and is subsequently filled with the collapsed overlying strata is commonly called the "goaf" or "gob".

The extent of the overlying strata collapse and the associated shearing and cracking of the strata depends upon the strata geology, the longwall block width, the seam height extracted, and the depth of cover.

The strata immediately above the longwall goaf collapses into the open void, and hence moves down by a height equal to the thickness of the seam which was extracted. Due to the way the broken strata material "bulks" or "swells" as it breaks into the cavity, the cavity is eventually filled with broken material (shown as "caved zone" in Figure 7) and a physical cavity no longer exists. However, the vertical displacement in the strata continues to propagate upwards in the strata. Cracking and strata damage do not continue to move vertically beyond the "fractured zone", even though the ground strata all the way to the surface may be displaced vertically.

When the ground strata move downwards sufficiently that the vertical movement reaches the surface, the surface of the land may also move downwards over the extracted mining areas. This movement is called "subsidence".

The amount of subsidence witnesses at the surface is dependent on a large range of factors including:

- thickness of coal seam extracted (mining height);
- depth of cover;
- properties and rock types of ground strata (i.e. overburden strength);
- stiffness and bulking characteristics of the collapsed strata;
- width and length of longwall block;
- dimensions of the gate road coal pillars; and
- the maximum subsidence usually occurs in the middle of the extracted longwall panel.

3.4.6.1 Subsidence Estimates

Estimates of subsidence at the mine site can be found in the detailed description of the mine construction and operations in Volume 2, Chapter 1. In summary the greatest total subsidence will occur in the surface areas which are affected by the operations in both the B-seam and D-seam operations. This area will be on the surface in the north western section of the mine foot print. The total cumulative subsidence in this area is predicted to reach a maximum depth of 3.27 m. Average subsidence across the bulk of the mine site is expected to range between 1.3 m to 1.61 m.

3.4.6.2 Contaminated Land

A total of seven lots cover the EPC mine footprints. Based on the tier risk assessment:

- five were considered high risk outside the MLA boundary of the mine site and comprised of existing rail lots recorded with a land use of "Transport Terminal" and one lot adjacent to the existing rail line with a land use recorded as "Transformer";
- one of the "Transport Terminal" lots is listed on the EMR for possible high level of Arsenic; and
- one lot classed for rural land use and ranked as medium risk.

High risk rail corridor Lot 273 SP108314 was selected with targeted soil sampling. This lot was representative of other rail line lots in the area. Lot 6 on MX95 was not primarily assessed as it was not listed on the EMR and furthermore, Lot 6 is located approximately 30 km south of the mine site. Therefore, it was considered a low risk to the project.

During an inspection of the mine site Lot 1 BF72 containing an Above Ground Storage Tank (AST) and cattle stockyard was observed. This lot was selected for a PSI targeted soil sampling. Lot 1 is currently located over Waratah Coal's mine infrastructure arrangement of Underground Mine 1, Open Cut 1 and 2 North and Open Cut 1 and 2 South with reject and tailings disposal areas located north-east of Lot 1 boundary, Figure 2, Chapter 1.

The locations of the lots identified above can be seen on Figure 8.

The only site with the potential to be impacted by the mine is Lot 1 BF72 which contains an Above Ground Storage Tank (AST) and cattle stockyard.

The findings from the PSI for this lot are summarised below. A detailed account of the findings from PSIs is presented in the Contaminated Land Technical Report (Volume 5, Appendix 7).

Lot 1 BF72:

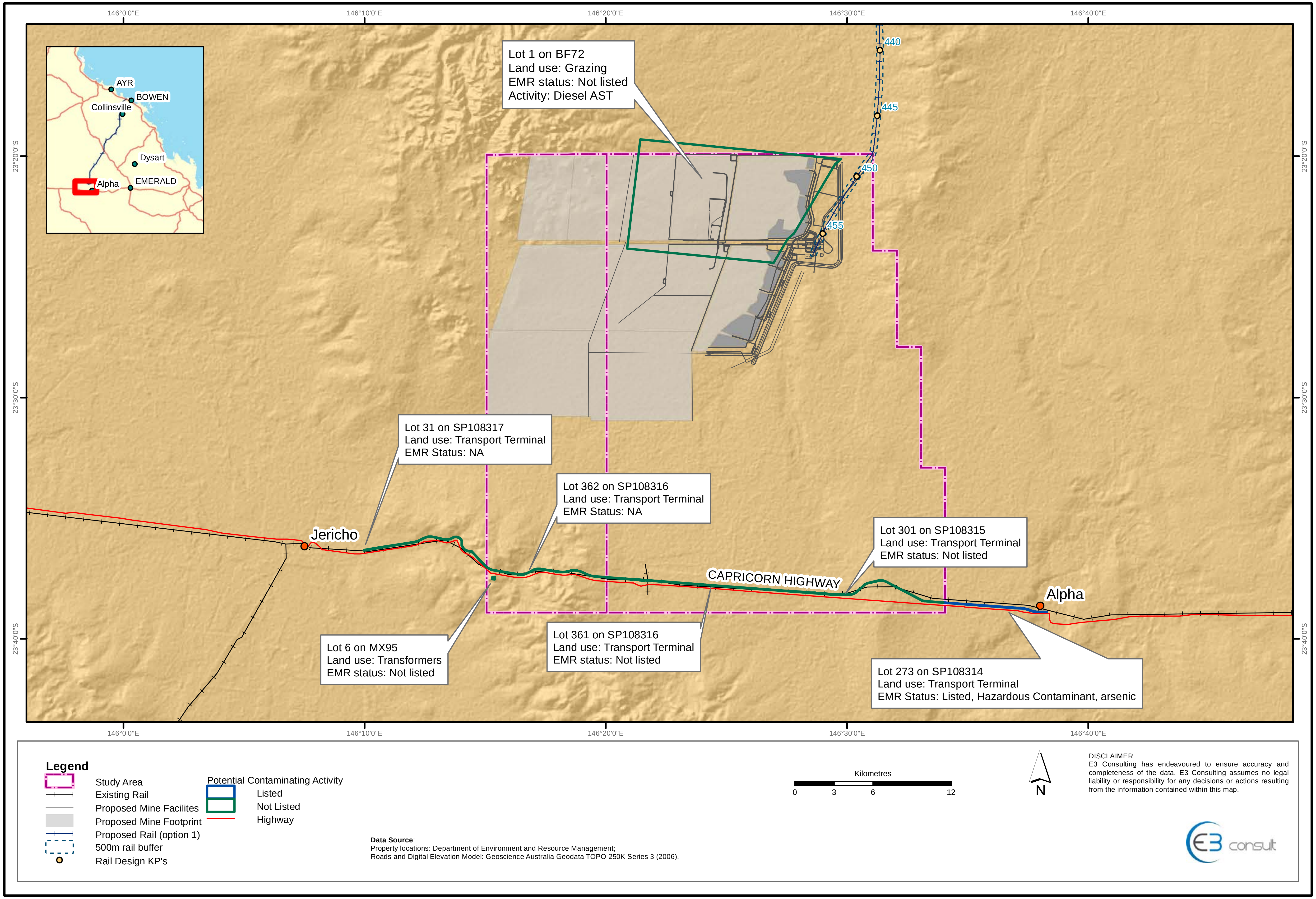
- Lot 1 BF72 is a grazing property located approximately 35 km northwest of the township of Alpha;
- the lot comprises a portion of the mine footprint and contains a residence, farm sheds, farm bores, a vehicle / equipment storage area, cattle yards and a diesel Above ground Storage Tank (AST). The site did not contain a cattle dip or spray race;
- the lot is currently under freehold title and the present activities include cattle grazing and breeding;
- a cattle stockyard and AST were present on the site;
- resource exploration on the site has resulted in an extensive drilling program. In addition to the fuels and oils used in any plant, drilling requires the use of specialised fluids designed to maintain drill hole integrity and circulation during the drilling process;
- adjacent land uses predominantly include creeks and vacant land / rural properties;
- the local geology comprises silts, shales and sandstone with coal seams held within the Triassic and Permian intervals of the Galilee Basin;
- the nearest sensitive receptor to the AST and Stockyards at the mine site is a creek >1 km east of this infrastructure. The closest residential centre is Alpha, 30 km away;
- an interview with personnel from 'Kiaora Station' indicated that mine footprint does not include a cattle dip; however, site infrastructure does include an AST and a stockyard with an associated crush;
- no information was found from local historical sources regarding potential contaminating activities at the mine site;
- flammable and combustible goods licences are not reported for Lot 1 BF72;
- historical aerial imagery for the area was available from 1951 to 2001. No significant changes for potential site contamination were present beyond those areas as identified from the site inspection;
- a review of current and historical certificates of title indicates that Colleen and Lancelot Sypher are the current registered owners. Historical certificates of title were not available;
- preliminary soil sampling was conducted in April 2010. Two primary samples were collected within Lot 1 BF72 and include:
  - Sample CL3-A (collected from stockyard); and
  - Sample CL4-A (collected from the AST).
- the sample from the AST was analysed for the major contaminants of concern for diesel, being TPH and PAH. The sample from the cattle yards were analysed for potential pesticide residues including OC / OPS;
- the laboratory results for Petroleum Hydrocarbons reported C_{10}-C_{14} chain lengths of 240 mg/kg and C_{15}-C_{28} chain lengths of 31,900 mg/kg, which exceed the Draft Guidelines of a magnitude of 100 mg/kg and 1,000 mg/kg, respectively. No detectable C_6-C_9 hydrocarbons were reported. The absence of light end hydrocarbons (C_6-C_9) reflects the typical composition of diesel fuel. The laboratory results detected pyrene; however, Total PAH and benzo(a)pyrene results were below the DERM HIL-'F' criteria; and
- the laboratory results reported below DOE's 'HIL-F' trigger values for Heptaclor of 50 mg/kg (OC's) with no exceedances for OP's. The area of observed hydrocarbon staining was of a limited area (<2 m^2). Petroleum Hydrocarbons are volatile but biodegrade naturally. Therefore, remnant impacts are often minimal where significant time has elapsed since the use of the compounds. No obvious odours were detected during sampling.

Evaluation of Risk

The laboratory results from the samples taken adjacent to the rail line and stockyards indicate no detectable concentrations of the analytes tested were present. This suggests low potential for impacts from these sources. However, the association of arsenic contamination with rail activities and the extensive rail network indicates that the presence of arsenic along other extents of the rail alignment may be likely.

The hydrocarbon impacts to soils based upon site observations of staining and the clay content of the soils present suggest a low potential for significant impacts. Based upon the extent of observed staining, distance to the nearest creeks and prior experience of spills / leakage from similar sized ASTs the potential for impacts to penetrate more than a few decimeters below ground is considered low. It is therefore considered that the impact is unlikely to comprise serious or material environmental harm and presents a low risk.

Figure 8. Contaminated Land



3.5 POTENTIAL IMPACTS

3.5.1 TOPOGRAPHY / LANDSCAPE

The mine site comprises level to gently undulating topography falling from low hills to small creeks. The mining activities will result in topographical changes to the mine area during mine operation and post-mining through the removal of existing topography during stripping of overburden and mining and the creation of new topographic highs through the placement of spoil and construction of dams. Changes to the location of Tallarenha Creek and the width of its floodplain will occur as a result of mining and creek diversions.

3.5.2 SUBSIDENCE

Surface subsidence will develop progressively within each longwall block and will present on the landform surface as a series of trough like depressions. An assumption has been made about the amount of subsidence that will occur on the land surface in comparison to the thickness of the coal seam removed underground. For the purposes of this study, this ratio has been set to 60 %. Assumed vertical movement of the surface will be 60 % thickness of the coal seam removed from underground.

The greatest (maximum) total subsidence will occur in the surface areas which are affected by the operations in both the B-seam and D-seam operations. Based on these assumptions, the maximum depth of subsidence impact from the mining operations will be in the areas where mining in the B-seam and D-seam overlap, and in the centre region of the longwall blocks in these area. This area occurs in the north western section of the mine foot print. The total cumulative subsidence in this area is predicted to reach a maximum depth of 3.27 m. Average subsidence across the bulk of the mine site is expected to range between 1.3 m to 1.61 m.

It has been assumed that the coal pillars, which remain in the development gateroad areas, will undergo significant failure once goaf has formed on both sides of the gateroads. It is assumed that these pillars will go into a yield condition and that the floor and roof strata around the pillars will fail. Due to these factors, it has been assumed that the pillars will be compressed to 30 % of their pre-mining seam height.

As discussed previously, it is usual for the surface subsidence 'bowl' to extend outside the limits of extraction by a distance equal to half the depth of cover. This assumption has been utilised in the subsidence predictions for the underground mines. This assumption equates to an angle of draw of 26.5 degrees.

The area where subsidence will likely occur has little topographical relief, and consists of both cleared (chain pulled and blade ploughed) and remnant open woodland, both of which are currently used for cattle grazing. The area where maximum subsidence will occur consists of cleared, improved pasture, to the north-west of the study area.

Potential impacts resulting from subsidence in a rural location would usually result in a change of drainage patterns due to a depression in the ground which may have an effect on the existing hydraulics of surface waters near the mine. Surface waters located above the underground mine include unnamed tributaries of Tallarenha Creek that currently drain eastwards. Subsidence can also cause increased cracking in clays. The generally sandy soils identified over the underground mining are considered unlikely to be significantly impacted by any minor subsidence however the maximum predicted level of 3.27 m has the potential to result in some cracking.

3.5.3 GEOLOGY / SOILS

The heavy metal concentrations of samples of overburden and interburden tested were below EILs for all metals with the exception of total chromium which exceeded the EIL for trivalent chromium in two samples. These results were within 10% of the background range for total chromium. The excavation and stockpiling of overburden is expected to have a low risk of producing heavy metal contamination by leachate or surface runoff based upon these results.

3.5.4 FOSSILS

Investigations suggest there is a low risk for fossilised material being discovered by works as there is no record of fossils being identified in the project area. There are records of Permian plant fragments being located in the geology underlying the project's coal measures; however, these areas will not be impacted by the excavations. While no record of fossils have been reported in the geology affected by the mine, excavation and mining activities do have the potential to uncover fossils.

3.5.5 TOPSOIL

Topsoil will be removed in the creation of the open cut mining areas as well as for some of the supporting infrastructure such as the CHPPs. Topsoils at the mine were found to have low salinity, optimal pH conditions for cultivation, low Cation Exchange Capacity CEC, and generally low ESP. The fertility of the soils is indicated to be low and the low ESP suggest that hard setting crusts could occur which would inhibit seedling growth in the area. With amendment by nutrients and use of appropriate seed stock, the soils could be made suitable as a growth medium.

3.5.6 SOIL EROSION

Some soils identified in the areas of the open cut mine area, including clays subsoils, have a high erosion potential with Emerson Crumb ratings of one or two; are sodic soils and exhibit a moderate to high potential for erosion due to dispersion. Where the topsoil of these areas is disturbed by the project’s activities and where the subsoils are exposed, there is a greater potential for increased erosion. Where such disturbance occurs, at creek crossings and where sediment runoff is allowed to enter these waterways, the impact of increased sediment load could impact the health of the waterways.

3.5.7 AGRICULTURAL LAND USE / GQAL

During the operation of the mine, existing land uses, such as grazing may be able to continue within the areas not directly impacted by the open cut mines and supporting infrastructure. Areas required for the operation of the mine will be disturbed and no longer available for the existing land use. The land is not considered to have high value for agriculture and as such, the mine would not be expected to have a significant impact on agriculture in the region.

Impact to land suitability, final landforms and the appropriate mitigation measures typically include an evaluation of the future potential cropping and grazing classes of the land and limitations due to compaction of land used for roads, or use of the rehabilitated final void, stockpiles and tailings dams. Often stockpiles and tailings dam are unsuitable land for cropping or grazing until management measures have been undertaken, whereby they may become suitable for higher classes of cropping and grazing. Final voids may be suitable for wetlands or recreational land use following rehabilitation.

As discussed in Section 3.4.3.8, top soil resources and, management measures will be documented, monitored and maintained for the construction and operational phases of the mine. Reconciliation of top soil excavation and quantities used for rehabilitation will be maintained. Excess topsoil will be used in project areas with topsoil deficits. If required, Waratah coal will source further top soil from local suppliers in the project area.

3.5.8 CONTAMINATED LAND

Based upon the qualitative risk assessment, the following potential impacts are identified from identified contaminated or potentially contaminated land during the construction and operation works associated with the mine:

- there is a low potential for significant contaminated soils to be encountered during earthworks which could lead to contamination being spread across the site;
- the identified hydrocarbon impact may be delineated by completing a Stage 1 and Preliminary Stage 2 ESA;
- the anticipated extent of hydrocarbon impact is considered to be unlikely to be a significant impact under the EP Act and excavation, land farming and validation of hydrocarbon impacted soils may be undertaken on Lot 1 BF72 under a remedial plan;
- should the extent of the impact be greater than anticipated, then the site may be listed on the EMR and a site management plan (SMP) / remediation action plan (RAP) prepared to control the remediation and validation of the impact;
- demolition of site buildings has the potential to impact soils with hazardous materials if not appropriately assessed and managed; and
- spills and leaks from various contaminating sources such as petrol and other chemicals stored on site during operations should be managed properly. These sources may have the potential to leach and migrate into sensitive receptors such as waterways and permeate into the existing soil profile.

Where soil contamination may exist Waratah has committed to undertaking soil investigation in accordance with *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland (EPA, 1998)* and the *National Environment Protection (Assessment of Site Contamination) Measure 1999*. Furthermore, within the mine EMP (Volume 1, Chapter 7), Waratah Coal has committed to various management strategies to be implemented during the mine operation to limit the potential for contamination.

3.5.9 DECOMMISSIONING AND REHABILITATION PHASE

Operational decommissioning of the mine, and associated ongoing long term management and maintenance of infrastructure post-mining. will be phased accordingly to the projects sustainability indicators described in Volume 2, Chapter 1. Individual EMPs and a Mine Closure Plan will be developed to mitigate measures for decommissioning and rehabilitating phases of the project. It may be the case that the best beneficial use of some of the supporting infrastructure components (i.e. water supply infrastructure, roads, power transmission lines) is leaving the infrastructure in place to support other local needs. This will be discussed with the relevant authorities and landholders prior to formalising the decommissioning strategy. If the preferred outcome is to leave some of the infrastructure components *in-situ* as operating infrastructure, Waratah Coal that facilitates the transfer of operating licences and obligations to the relevant parties will prepare a transitional plan. Decommissioning and rehabilitation action plans, objectives and indicators are further discussed in Volume 2, Chapter 1 for the mine site and surrounds.

3.6 MANAGEMENT AND MITIGATION MEASURES

The following management measures will be put in place to mitigate potential impacts on geology, soils and landforms:

- to minimise impacts of excavation and spoil dumps on topography and surrounding landscapes, Waratah Coal will implement the following:
  - maintain concave slope profiles over the site;
  - maintain average slope gradients at 4 % or less (the erosion potential of longer slopes will need to be considered);
  - when stockpiling maintain irregular dump shapes (e.g. with uneven heights, ridgelines and spurs);
  - minimise spoil dump height; and
  - minimise slopes gradients adjacent to creeks;
- mitigation measures for mine subsidence include ripping and backfilling of areas with soil cracking. Where short term elevation changes occur, earthworks are required to minimise these elevation changes;
- geotechnical sampling results suggest that there is a low to negligible risk of acid rock drainage occurring. Despite these results, the following measures are proposed during operations (as appropriate):
  - an overburden material sampling regime will be conducted to confirm its acid generation potential prior to removal. Laboratory characterisation will be in accordance with the *Assessment and Management of Acid Drainage (Department of Primary Industries, 1995)* and/or other relevant guidelines;
  - any material that is visually assessed at the time of mining as containing pyrite, will be assessed for acid producing potential;
  - potentially acid forming material identified by visual assessment or laboratory characterisation, will not be used as capping material. Potentially acid forming material will be buried within the waste rock dump together with waste rock that has a positive acid neutralising capacity.
- where there is the potential for fossils to be uncovered during earthmoving activities, the significance of the fossils will be assessed through a contingency plan including the following measures:
  - works are to be ceased immediately;
  - consult with the Queensland Museum for identification of fossils;
  - if there are significant finds of small fossils, obtain representative samples of the media and both set aside for further analysis and contact the Queensland Museum;
  - if significant finds of large fossils are observed, contact and seek an expert's advice as to the possible extent of the fossils and stop work immediately; and
  - contingency in the Run of Mine (ROM) plan is maintained to allow for stoppages due to potential fossil finds;
- the main land disturbance areas in the mine area will be as a result of open cut excavations, construction of waste emplacement facilities, dams, mine

infrastructure and haul roads. Mitigation measures to limit the impacts of land disturbance include:

- the topsoil in these areas should be recovered and records maintained to ensure useable soils are retained and a log of soil stockpiles is kept to reconcile predicted and actual soil volumes;
- topsoil should be stripped and stored separately from subsoils and kept moist during stripping;
- stripping depths should be surveyed and marked to avoid stripping potentially dispersive subsoils;
- where the ROM plan allows, the topsoils will be stripped and placed directly onto rehabilitation areas or stored for the minimum time possible to make maximum use of seed stocks; and
- stockpiling of topsoils should be minimised or avoided where possible. Where topsoils are stockpiled, the height of stockpiles will not exceed three m;

- an Erosion and Sediment Control Plan (ESCP) will be prepared to address the potential issues arising from the field investigations. Erosion in active construction or development areas cannot be eliminated; however, impacts can be controlled and minimised through the following management actions:
  - limiting the area of disturbance and progressively clearing areas immediately before construction;
  - strip and stockpile topsoil prior to construction;
  - divert surface water runoff around construction areas;
  - minimise the period that exposed soil is left open during construction;
  - place sediment traps and silt fences to minimize off-site impacts;
  - place organic mulch and / or plant exposed soils to reduce dust generation and wind erosion; and
  - maintain a site monitoring program recorded in an EMP to assess erosion control measures;
- areas of identified dispersive soils should be closely monitored to assess the efficacy of the erosion control measures;
- where land is disturbed progressive land rehabilitation will occur as use of those areas ceases;
- post disturbance regrading should be undertaken to produce slopes that are suitable for the proposed land use;
- a drainage design that addresses runoff volumes and erosion minimisation will be put in place;
- erosion from surface water runoff can be minimised by using contour banks at intervals along the constructed slopes;
- where possible use lighter vehicles and / or larger wheel / track size to reduce compaction;
- should areas of saline soils be intersected these will be set aside for specific rehabilitation with salt tolerant plant species; and
- the land use in the mine area is generally Class C agricultural land suitable for grazing. All impacts are to be kept within the mine footprint and at the completion of the mining operation; the site will be rehabilitated to a state suitable for grazing.

Measures employed to manage land contamination issues at the mine site will include:

- where site contamination is present and remedial measures are required a SMP / RAP will be prepared in line with possible construction techniques that will minimise excavations for site preparation;
- where ROM handling and preparation plants generates contaminating materials and liquids from reject tailings and groundwater seepage, tailings/rejects will be placed in the Overburden emplacement facility (OEF);
- Potentially Acid Forming (PAF) material will be located at a level that is below the projected post-mining water table and covered with sufficient overburden;
- where contaminated tailings/rejects occur onsite it will be managed in accordance with the Reject Disposal Plan;
- where site contamination must be excavated, the work will be completed under a RAP and validated to assess the effectiveness of the remediation. A validation report will be prepared suitable for submission to DERM to assess the effectiveness of the remediation, the proposed management measures (if any), and allow a site suitability statement to be issued for the lot by DERM;
- no contaminated soils will be removed from a lot without a DERM disposal permit;
- remedial measures will include (in order of preference) risk assessment, on-site containment, on-site treatment and / or off-site treatment or disposal.

3.7 CONCLUSION

A complex of soil units were identified across the project area, including areas of Kandosols and Rudosols. Some are prone to erosion and dispersion. The majority of the soils are also unsuitable as topsoils.

The mine is currently used for low (Class C/D) intensity cattle grazing. As a result of this historical and current land use of low intensity cattle grazing, there has been extensive tree clearing throughout some of the project area.

The main potential impacts of the project in relation to land include changes to agricultural land capability, and increased risk of erosion in areas of construction and / or operation. In addition, some soils encountered will be sodic and / or dispersive and this may affect excavation conditions at the mine. Potential impacts to the topography, geology, soils and landform of the project and management strategies and commitments to mitigate these impacts have been identified. Further detailed investigations are required to fully manage some potential impacts. This will delineate areas of potential impacts and assess the appropriate scale of mitigation or management.

During an inspection of the mine site Lot 1 BF72 containing an AST and cattle stockyard was observed. This lot was selected for a PSI with targeted soil sampling.

Based upon the historical review and site inspection the potentially contaminating activities are associated with cattle grazing and breeding, and ongoing maintenance and weed management associated with the existing rail line.

Most cattle grazing or breeding properties have small fuel and farm chemical storage facilities. This may result in localised impacts around storage and handling areas. A cattle stockyard and AST were present on the site. Fuel handling has the potential for impacts from spills and leaks from petroleum hydrocarbons. Cattle stockyards are areas of potential impacts from farm chemicals such as pesticides used in treating cattle.

The contaminants of concern associated with the above activities include arsenic, OC and OP within the cattle yards, petroleum hydrocarbons from the AST, and Arsenic, herbicides and pesticides associated with the rail line.

The hydrocarbon impacts to soils based upon site observations of staining and the clay content of the soils present suggest a low potential for significant impacts. Based upon the extent of observed staining, distance to the nearest creeks and prior experience of spills / leakage from similar sized ASTs the potential for impacts to penetrate more than a few centimetres below ground is considered low. It is therefore considered that the impact is unlikely to comprise serious or material environmental harm and presents a low risk.

3.8 COMMITMENTS

Waratah Coal commit to undertaking the following actions:

- identify specific access areas and determine goals for rehabilitation of disturbed land to minimise areas that will have lower land use quality post-mining;
- manage lay down areas in a manner that will not result in a reduction in land quality;
- further characterise overburden and interburden material to assess its qualities for reuse. Opportunities for reuse may include using materials for road building, rock armour for protection and stabilisation of drainage lines and construction of rumble-pads for heavy vehicle cleaning;
- prepare and implement erosion control measures and continue to monitor and maintain the measures implemented;

ESCPs will be developed and put in place prior to the commencement of construction works for all areas of the project that may cause erosion: topsoil management measures will be documented, monitored and maintained with a reconciliation of top soil excavation and rehabilitation maintained. Excess topsoil will be used in project areas with topsoil deficits. Waratah coal will source further top soil (if required) from local suppliers in the project area;

- prior to construction carry out soil sampling at waterways to better identify erosion risk and put in place appropriate management measures;
- prior to construction undertake soil resistivity surveys of high risk areas, record the current salinity status of these areas and implement measures to ensure no further significant salinisation occurs due to the project activities;

- where contamination is present within the project footprint, Waratah Coal will enter into agreements with the owner of the contamination to assess and appropriately manage or remediate the contamination;
- any building / structures to be demolished will be assessed for hazardous material content with preparation of demolition management plans for the appropriate demolition and disposal of the hazardous materials;
- where contamination is identified it will be managed and/or remediation under the EP Act with DERM approved SMPs and / or RAPs in order to make the sites suitable for the proposed use;
- Waratah Coal will appoint a third party reviewer to assess all contaminated land assessment and remediation work;
- any Notifiable Activities that are required for the project will be implemented and managed under relevant legislation and guidelines once construction commences and also during the operational phase. The Notifiable Activities may include:
  - storing hazardous mine or exploration wastes, including, mine tailings, overburden or waste rock dumps containing hazardous contaminants;
  - coal handling and preparation plant waste characterisation of exposed contaminated materials and liquids during operational phases;
  - exploring for, or mining or processes, minerals in a way that exposes faces, or releases groundwater, containing hazardous materials;
  - petroleum product or oil storage; and
  - chemical storage;
- establish a set of environmental investigation protocols to manage gross or previously unidentified contamination encountered during project construction.

Submitter No.	364	Issue Reference:	12027 / 17157
Submitter Type		TOR Category	Project Description
Name	DEEDI (Mining and Petroleum Operations)	Relevant EIS Section	Volume 3 – 1.1.2.4

DETAILS OF THE ISSUE

Dust control methods for rail wagons.

To eliminate coal dust emission along the rail corridor, the proponent should investigate the use of an environmentally friendly surface veneer which would provide full coverage of coal in rail wagons.

PROPONENT RESPONSE

In addition to the commitments presented in Section 10.4 of the EIS, Waratah Coal commits to the following dust control measures:

- Waratah Coal proposes to use tippler wagons (gondola) rather than the more traditional bottom dump coal wagons. With the use of tippler wagons, coal hang–up should be negligible or eliminated. Bottom dump wagons are more frequently associated with coal hang up, particularly in wet weather, and
- In addition to the tippler wagons, Waratah Coal's solution to mitigation of coal dust is to provide a cover to the top of the wagons. It is intended these covers will be made of fibreglass. These covers have been proven in service, operating in conditions ranging from -40°C to +40°C. The railcar cover system meets the criteria for a "closed transport vehicle" specified in the United States Code of Federation Regulations (CFR), Title 49, Transportation (Subsection 173.403(c)).

In addition to significantly reducing coal dust, these commitments provide:

- Reduction in emissions from fuel consumption as using covers provides better train aerodynamics, which reduces fuel consumption, and associated emissions
- Elimination of the need to use chemicals for veneering
- Elimination of the need for more than 50 million litres of water required to apply the chemical veneering.

Examples of successful use of covers elsewhere

The covers proposed to be used on the Waratah Coal rail coal wagons are waterproof, which will be a key feature in the North Queensland tropical region where major operational issues can occur when the moisture content rises above specification. Whilst the covers do not achieve a hermetic seal between the cover and the rail coal wagon, the result is a very effective seal eliminating virtually all dust or material losses from the tops of the wagons. The fact that the seal is very effective is evidenced by the style of proposed covers receiving approval from the Unites States Department of Transport for a project hauling low level radioactive waste[1].

The proposed rail coal wagon covers are constructed from fibreglass, generally have a curved profile in the transverse direction and can operate in environmental conditions ranging from -40°C to +40°C and including extreme weather conditions such as strong winds and heavy snow. This provides light but strong wagon covers with improved train aerodynamics, particularly in the unloaded condition where considerable fuel savings are expected which in turn results in lower emissions.

1 The US Department of Transportation is quoted as follows, "The Department of Transportation (DOT) has determined that the Ecofab Railcar Cover System meets the criteria for a closed transport vehicle specified in Title 49 CFR 173.403(c)." (*http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=788aad24d2a46d0a744d93ea1875af72&rgn=div8&view=text&node=49:2.1.1.3.9.9.25.2&idno=49*)

It is essential that the application of the covers to rail coal wagons does not in any way add to the train cycle times or cause any delays to the trains either at the loading or unloading sites. Consequently the covers and handling equipment are designed as a system to match the speed of loading or unloading the coal trains.

The specifications for these rail coal wagon covers are Commercial in Confidence and cannot be provided, however covers for rail wagons have been in commercial use within Australia for over 10 years.

The types of wagon covers proposed by Waratah Coal are similar to the type that have been fitted to tippler wagons operations within Australia in NSW, South Australia and Queensland. These covers are used in some very demanding environments for 'dusty' commodities such as lead, zinc and copper concentrates. These operations are still in service today after over 10 years of continuous operations. The operations in Queensland involve the concentrate wagon covers being removed with fork-lifts at the loading sites and removed with fork-lifts or automated equipment at the unloading sites. In Townsville fully automated wagon cover handling equipment has been incorporated into the tippler wagon operating systems.

The efficacy of the proposed covers for coal operations is evidenced by the manufacturer of these rail wagon covers currently executing a project in the United States to cover all coal train wagons that are operating in the Powder River Basin (PRB) region in Wyoming. This region hosts the two largest coal mines in the world where each produce more than 100Mtpa and load more than 2000 coal wagons daily. This region has a common section of triple and quad track (160km) that connects all the mines in the region, which is why this section of track is regarded as the busiest section of freight rail line in the world.

In 2006 there were two major derailments on this common section of rail line due to a combination of rain, snow and track ballast being contaminated with coal dust which prevented the track from draining, resulting in major failures in the sub-grade. These derailments led to closure of the common section of rail line resulting in major disruptions to train operations and power utilities which relied on this coal for domestic electricity generation. The need to eliminate the emission of coal dust from these trains led to the requirement to cover the coal wagons.

Coal train in Queensland demonstrating use of covers similar to those proposed for use by Waratah Coal

The volume of operations in the PRB region requires high speed coal loading systems. Due to the long term development of the PRB region, there are not only large numbers of wagons loaded each day at the mines, but there are at least 19 different types of wagons with different dimensions and capacities. Waratah Coal's rail wagon cover supplier has designed and developed a fully automated coal wagon cover system to suit these large scale operations. Their technology has been designed to operate in parallel with existing train loading and unloading operations, and not slow down or interrupt train loading or unloading. Consequently our supplier has developed a patented design for fully automated rail wagon covers that can be used on these US coal trains (both bottom dump and tippler unload) or similar wagons around the world including the Galilee Basin.

SUBMITTER NO.	**364**	ISSUE REFERENCE:	**13018**
SUBMITTER TYPE	Government	TOR CATEGORY	**Project Description**
NAME	**DEEDI (APSDA Branch)**	RELEVANT EIS SECTION	Volume 4, Chapter 2, p17: 2.2.2.6 Land Use, Existing Environment

DETAILS OF THE ISSUE

The EIS currently makes the following statement:

> "The utilisation of the proposed coal terminal and multi-user infrastructure corridor by Waratah is consistent with the strategic direction of the APSDA and the development scheme.
>
> Future industry to be developed with the central portion of the APSDA will be assessed by NQBP as part of an Environmental Impact Assessment and DEEDI in accordance with the Development Scheme".

These statements are misleading. This section should clarify:

- All development within the APSDA that constitutes a material change of use will require a subsequent approval by the Coordinator-General under Section 84 of the *State Development and Public Works Organisation Act 1971* (SDPWO Act)
- The Development Scheme for the APSDA is a regulatory document for material change of use applications in the APSDA
- NQBP intends to manage the EIS process for the proposed coal terminal (T4-T9)
- NQBP's proposed EIS management will be for T4-T9 rather than for the whole central portion of the APSDA.

PROPONENT RESPONSE

Given the Queensland Government directive to defer the approval process for the expansion of Abbot Point until the end of 2012, and the associated uncertainty over the T4-T9 and MCF proposals, the limit of the assessment for the project is now defined as the boundary of the APSDA.

However, all future development within the APSDA that constitutes a material change of use will be submitted to the Coordinator-General to gain the relevant approvals. This will be done in accordance with the SDPWO Act, but will not be part of the scope of this SEIS.

Submitter No.	419	Issue Reference:	4111
Submitter Type	Government	TOR Category	**Project Description**
Name	**DERM**	Relevant EIS Section	Executive Summary, Section 3.1.16, Waste (p45)

DETAILS OF THE ISSUE

The sources of waste streams listed in this Section 3.1.16 include mention of water management structures including dams, levee banks and sediment traps. No clear information is presented regarding the water types, or the anticipated water quality of these water types (i.e. concentrations). Since an identified risk is 'the storage, seepage and overtopping of potentially contaminated water such as tailings water or pit process water in dams and basins at the mine', the water quality information of the various water types should be clearly presented in the EIS. This information is necessary to enable an assessment of likely environmental risk.

PROPONENT RESPONSE

A site water management system for the site has been developed (refer to the *Mine Site Water Management System* report) with the focus on the separation of "clean" and "dirty" water. The site has significant operational requirements for water including underground workings, coal preparation, dust suppression and raw water demand. Water requirements will be preferentially sourced from "dirty" water run-off collected on site where possible. The water within the mine site has been classified into the following four classes:

- Contaminated Water – surface runoff from CHPP, ROM and stockpile areas and water contained within open-cut pits which could potentially contain hydrocarbons, saline and/or acidic or other chemical contaminants. These will be directed adequately sized dams to prevent discharge as well as meet on site demands
- Dirty Water – surface runoff from spoil dumps and rehabilitated spoil areas that could contain sediments but typically not with elevated contaminant levels. This runoff will be directed to sediment containment dams for reuse onsite and limit discharge
- Clean Water – Surface runoff from natural catchments or groundwater pumped from underground water dewatering and aquifer pre-drainage. Surface runoff from natural catchments will not be contained onsite and will pass through the site via the proposed creek diversions. Clean groundwater will be stored and reused in underground workings to prevent discharge offsite
- Raw Water – Imported low-salinity water required for mine demands that require a high water quality specification (e.g. CHPP vacuum pumps, wash-down, drinking water supply).

A site water balance model has been developed (refer to the *Mine Site Water Management System* report contained in the *Appendices – Volume 2* of this SEIS) using historic climate data to simulate realistic climatic conditions and hydrological processes, as well as assessing the performance of proposed dams and impacts to the hydrological regime.

The results of the water balance modelling indicate all dams that will contain contaminated water have been adequately sized to prevent discharge over the entire modelling period while the sediment dams only discharge in high rainfall years.

Submitter No.	**1840**	Issue Reference:	**4112**
Submitter Type	Council	TOR Category	**Project Description**
Name	**Barcaldine Regional Council**	Relevant EIS Section	

DETAILS OF THE ISSUE

With the projects understanding of the dispersive soils , what is the appropriate landform design (slopes) to help manage the landform from erosive impacts?

What is the principle and parameters of the drainage design to minimise erosion, considering the soil types?

What is the design criteria for the contour banks?

What are the sediment dams design criteria?

The above mentioned drainage, erosion and sediment control measures are generic. If the appropriate soil science has been completed, then the detailed design criteria should be undertaken to ensure that the proposed measures will work for the proposed landforms on the known soil types.

PROPONENT RESPONSE

A revised mine site infrastructure layout has been prepared to detail the site features and is included with Issue Reference 6017, and the design of the mine water management system has been further progressed. The *Mine Site Water Management System* report (contained in *Appendices – Volume 2* of this SEIS) describes the proposed site water management system and the results of water balance modelling undertaken to assess the performance of the system. In addition, plans have been provided detailing the location of all dams, waterways and associated stormwater infrastructure.

The *Mine Site Water Management System* report provides additional detail relating to the design requirements of water and stormwater related infrastructure.

For soils related information and requirements, refer to the *Soils and Land Suitability* report and the *Supplementary Soil Survey for the Open Cut Area* report (contained in *Appendices – Volume 2* of this SEIS). Commitments for further work are discussed in Section 6 of the *Soils and Land Suitability* report.

Submitter No.	**419**	Issue Reference:	**19106**
Submitter Type	Government	TOR Category	**Project Description**
Name	**DERM**	Relevant EIS Section	All sections

DETAILS OF THE ISSUE

The EIS should describe the activities and infrastructure associated with a project in sufficient detail that would allow the potential environmental impacts:

1. To be assessed against acceptance criteria
2. Be managed through setting appropriate conditions of any issued environmental authority.

The submitted EIS identifies likely ‘acceptance criteria’ and commits to meeting those criteria. The EIS for the most part, does not identify in sufficient detail the activities and infrastructure such that the potential environmental impacts can be adequately assessed.

The EIS should as a minimum:

- Undertake a preliminary design for the purpose of sizing and locating infrastructure, overburden dumps, tailings dams and associated diversions and flood levees
- Identify and assess the potential environmental impacts of proposed developments.

PROPONENT RESPONSE

A revised mine site infrastructure layout has been prepared to detail these features (see Figure 1).

1. Figure 1 shows the location, relative size and shape of the final voids. The total area of footprint for the open-cut mines is 7437 ha. The individual size for each open-cut mine is:
   - Open-cut No. 1 North: 2803.03 ha
   - Open-cut No. 1 South: 2077.41 ha
   - Open-cut No. 2 North: 1776.20 ha
   - Open-cut No. 2 South: 780.22 ha

   The proposed size and shape of the final voids will be detailed in the Environmental Authority, the EM Plan and the Rehabilitation and Decommissioning Plan – refer to Issue Reference 4040 in Part C – 19 – Decommissioning and Rehabilitation for more detail.
2. The location and footprint of essential plant is shown on Figure 1. The footprint area for the CHPP, stockpiles and loading facilities is 120ha.
3. The location and size of the overburden encapsulation areas is shown on Figure 1. The collective size of these areas is 1816ha.
4. Proposed containment systems for the management and permanent storage of tailings and rejects are detailed in the *Tailings Storage Facility Update* report (contained in *Appendices – Volume 2* of this SEIS). The tailings will be dewatered using filter press conveyors and the tailings paste and rejects will be trucked to disposal cells constructed initially within the box-cut spoil piles and later within the in-pit spoil piles.

A mine water management system has been designed to facilitate the containment and re-use of runoff and other water produced or impacted by mining activities during the life of the mine . The performance of the water management system has been assessed using water balance modelling. The site water management system is described in the *Mine Site Water Management System* report (contained in *Appendices – Volume 2* of this SEIS).

Diversion channels and levees designed to prevent the mine workings from flooding are described in the *Mine Site Creek Diversion and Flooding* report (contained in *Appendices – Volume 2* of this SEIS).

The Final Rehabilitation and Decommissioning Plan will provide more information as to the final landforms, including voids, to be remaining on site come closure. A *Rehabilitation and Decommissioning* section of the *Draft Mine EM Plan* has been prepared (see *Appendices – Volume 2* of this SEIS).

Submitter No.	**419**	Issue Reference:	**6017 / 4049 / 4113 / 6051 / 6052 / 17016 / 19008**
Submitter Type	Government	TOR Category	EMP / **Project Description**
Name	**DERM**	Relevant EIS Section	All sections

DETAILS OF THE ISSUE

The EIS does not provide the necessary details on the proposed containment system proposals for the mine site. The EIS and EM plan should describe and identify on maps at suitable scale the location and form of all necessary mining infrastructure on the mine site.

The EIS and EM plan should detail, as a minimum:

1. The location and size of open-cut pits, including proposed size and shape of final voids
2. The location and footprint of essential plant, including the coal preparation plant, stockpiles and loading facilities
3. The location and size of overburden dumps
4. A containment system for the management and permanent storage of tailings
5. A containment system for the management of runoff and seepage from overburden rock dumps
6. A site water management system for the management of runoff from around the site and the surrounding catchments that would normally pass through the site
7. Any associated diversion channels, levees and dams required to control and store contaminants generated by the mining activities or to protect the mine workings from flooding

The EIS and EM plan should as a minimum:

1. Undertake a preliminary design for the purpose of sizing and locating infrastructure, overburden dumps, tailings dams and associated diversions and flood levees
2. Include a site water management system for the management of runoff from around the site and the surrounding catchments
3. Identify and assess the potential environmental impacts of proposed developments.

PROPONENT RESPONSE

A revised mine site infrastructure layout has been prepared to detail these features (see Figure 1).

1. Figure 1 shows the location, relative size and shape of the final voids. The total area of footprint for the open-cut mines is 7437 ha. The individual size for each open-cut mine is:
   - Open-cut No. 1 North: 2803.03ha
   - Open-cut No. 1 South: 2077.41ha
   - Open-cut No. 2 North: 1776.20ha
   - Open-cut No. 2 South: 780.22 ha

   The proposed size and shape of the final voids will be detailed in the Environmental Authority, the EM Plan and the Rehabilitation and Decommissioning Plan – refer to Issue Reference 4040 in Part C – 19 – Decommissioning and Rehabilitation for more detail.

2. The location and footprint of essential plant is shown on Figure 1. The footprint area for the CHPP, stockpiles and loading facilities is 120ha.

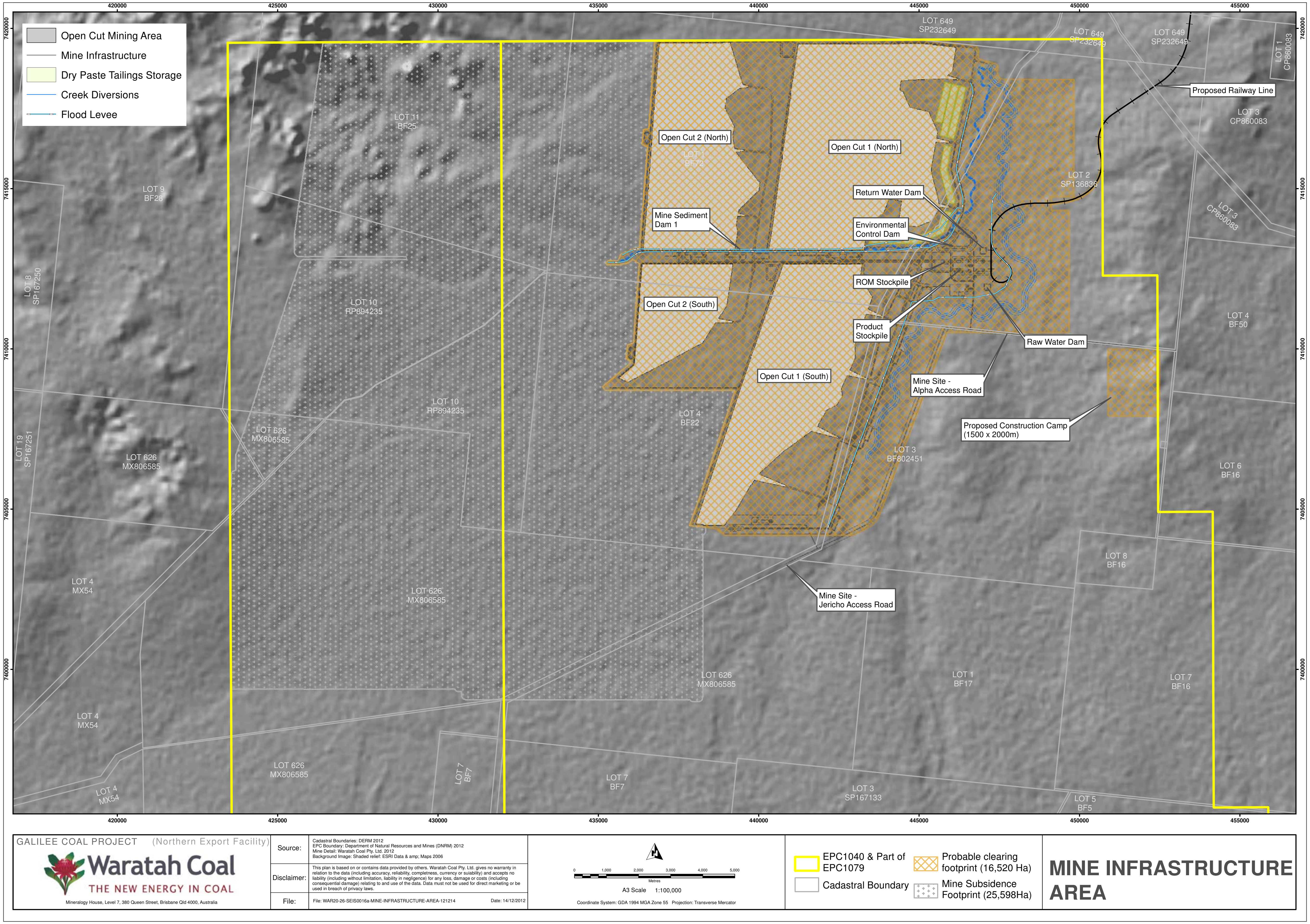
3. The location and size of the overburden encapsulation areas is shown on Figure 1. The collective size of these areas is 1816ha.
4. Proposed containment systems for the management and permanent storage of tailings and rejects are detailed in the *Tailings Storage Facility Update* report (contained in *Appendices – Volume 2* of this SEIS). The tailings will be dewatered using filter press conveyors and the tailings paste and rejects will be trucked to disposal cells constructed initially within the box-cut spoil piles and later within the in-pit spoil piles.

A mine water management system has been designed to facilitate the containment and re-use of runoff and other water produced or impacted by mining activities during the life of the mine. The performance of the water management system has been assessed using water balance modelling. The site water management system is described in the *Mine Site Water Management System* report (contained in *Appendices – Volume 2* of this SEIS).

Diversion channels and levees designed to prevent the mine workings from flooding are described in the *Mine Site Creek Diversion and Flooding* report (see *Appendices – Volume 2* of this SEIS).

The *Draft Mine EM Plan* (contained in *Appendices – Volume 2* of this SEIS) contains more information – refer to sections 1, 2, 7 and 10.

Figure 1. Mine Infrastructure Plan



Submitter No.	**419**	Issue Reference:	**17017 / 19016**
Submitter Type	Government	TOR Category	EMP (Project Description) / **Project Description**
Name	**DERM**	Relevant EIS Section	Chapter 7 – EMP: Mine, Section 7.4, Project Characteristics (p113)

DETAILS OF THE ISSUE

The EM plan does not include the proposed mining sequence for both proposed pits/longwalls and seams.

The EM plan should be revised to include the following:

- The proposed sequencing and timing of mining of each seam within the mining lease
- The use of different mining techniques in areas of different topographic or geo-technical character
- The estimated area to be disturbed at each major stage of the project

PROPONENT RESPONSE

The requested information for proposed sequencing and timing of mining of each seam and the different used of mining techniques is contained and clearly detailed in the original EIS submission as follows:

- **Open-cut:** Please refer to EIS Vol 2, Section 1.2.2.1 Open-cut Mining Method, pages 22-24; Section 1.2.2.2 Open-cut Mining Development Sequence pages 25-26; and Section 1.2.2.3 Open-cut Mine Development Schedule pages 27-32, which includes the proposed 25 years sequencing summarised in Figure 16 on page 28.
- **Underground:** Please refer to EIS Vol 2, Section 1.2.2.7 Underground Mining Method on pages 36-37 and Section 1.2.2.8 Underground Mining Development Sequence on pages 38-41, which includes the proposed sequencing summarised in Figures 33 and 34 on pages 40 and 41.

The estimated gross area disturbed for each mine at the major stages of the project is summarised in the following table. Please note that the areas given are the total areas estimated to be disturbed. The amount of disturbed land at any given time will be significantly less than the amounts below as rehabilitation is planned to be completed within two years of mining. All detail will be contained in the final Mine Rehabilitation Plan.

Table 1. Estimated gross area of disturbed land

Year	Open-Cut Mines				Underground Mines	
	OC 1 Nth	OC 1 Sth	OC 2 Nth	OC 2 Sth	B Seam	D Seam
1-5	1125.5	650.8	418.0	111.6	1033.8	2295.8
6-10	799.4	424.9	419.9	114.8	1596.6	4144.2
11-20	1148.8	1299.5	644.4	245.2	3235.4	8692.6
21-25	171.2	88.9	624.7	395.0	1690.3	6365.2
26-30	–	–	–	–	1227.3	5929.5
Total Area	2803.0*	2077.4*	1776.2*	780.2*	8783.4	27427.3

* Please note total area is less than the sum of the individual areas as some areas will overlap in footprint.

The *Draft Mine EM Plan* provides further details – refer to Section 2 for Project Description; Section 7 for Mineral Waste; and Section 9 for Rehabilitation. The *Draft Mine EM Plan* is contained in *Appendices – Volume 2* of this SEIS.

Submitter No.	787	Issue Reference:	17148
Submitter Type	NGO	TOR Category	Project Description
Name	GVK Resources	Relevant EIS Section	

DETAILS OF THE ISSUE

- Query regarding the ability to transport 400 Mtpa without major congestion
- GVK will not accept at-grade rail to rail crossings, only grade seperated crossings
- No consideration of train dynamic forces.

PROPONENT RESPONSE

The rail corridor will be capable of transporting 400Mtpa at less than one hour headways. Adequate planning for maintenance needs to be considered as part of the total corridor design. The congestion may occur at the loading and unloading points unless sufficient loading and unloading facilities and train holding roads are provided.

There will be no at-grade rail crossings with any railway line. A heavy haul system needs to be isolated from all other railway lines.

Train dynamics and train dynamic forces are complex and need to be considered for a range of inputs to provide for a safe, efficient and cost effective railway system. Issues such as rolling contact fatigue, maximising wheelset kilometrage and minimising impact on rollingstock and infrastructure, are not appropriate nor need to be considered as part of an EIS process.

Submitter No.	1840	Issue Reference:	17153, 17154
Submitter Type	Council	TOR Category	Project Description
Name	Barcaldine Regional Council	Relevant EIS Section	1.1.1 - Summary Intro

DETAILS OF THE ISSUE

Underground mines at 9 Mtpa = 36, 2 open-cut pit mines 10 Mtpa = 20, 2 prep plants at 28 Mtpa = 56 Mtpa = 40 Mtpa of sales. However, the introduction conflicts with section 1.1.1, which states there are four surface mining pits at 10 Mtpa each?

Is there 16 Mtpa of rejects and washery fines plus water to be managed each year? Please confirm correct mining operations and rates. Please clarify production quantities and mining operations with rates.

PROPONENT RESPONSE

The mine arrangement will be as follows:

- 2 Open-cut pits at 10 Mtpa = 20 Mtpa
- 4 Underground mines at 9 Mtpa = 36 Mtpa
- 2 Coal Preparation and wash plants with 4 modules each rated at 1,000 tonnes per hours: 2 x 4 x 1000 = 8,000 tphr plants will be available for production for 7,000 hr/a which results in 56 Mtpa ROM (8,000 tph x 7,000 hr/a).

Therefore total Mine ROM = 56 Mtpa

The 56Mtpa ROM will wash down to 40 Mtpa resulting in 16 Mtpa of fines and water to be managed. See also Figure 1 Mine Infrastructure Arrangement presented in Issue Reference 6017 of this Chapter.

Submitter No.	418	Issue Reference:	17155
Submitter Type	Government	TOR Category	**Project Description**
Name	**Dept. of Local Government and Planning (DLGP)**	Relevant EIS Section	Executive Summary, 2.1.1.1 Mine

DETAILS OF THE ISSUE

Workers Accommodation. It is unclear whether there is intended to be both a 'purpose built 2,000 person workers village adjacent to the site' and a 'temporary 2,500 person workers village at the mine site' or just one of these.

Clarify the following in tabular format:

- Number of workers accommodation villages with capacity of each and in total
- Estimated driving time (minutes) and distance (kms) between each accommodation village and Alpha town
- Which accommodation villages are to be permanent and which are to be temporary, and the estimated timeframe of use of the accommodation villages
- A map which shows the intended locations of workers accommodation villages will also clarify the issue.

PROPONENT RESPONSE

There will be one accommodation camp near the mine site that will accommodate both the construction workers and the fly-in, fly-out permanent mine operations staff. A permanent accommodation village of 2,000 beds will be the long term accommodation infrastructure near the mine site (See Figure 1 at Issue Reference 6017 of this Chapter) and the basis as to how the temporary accommodation will be integrated and built to suit the peak construction and operations accommodation requirements. These requirements will be subject to ongoing and continuous review.

It is expected that a peak accommodation requirement of 2,500 beds will be required in the first 2 years of construction which is then expected to increase by another 1,500 permanent mine operations staff to a total requirement of 4,000 beds during the third year. After the initial construction phase of 3 years, the requirements will reduce down to approximately 2,000 beds (1,500 operations + 500 contractors) for the next 5 to 10 years depending on world demand for thermal coal.

Submitter No.	419	Issue Reference:	17156
Submitter Type	Government	TOR Category	**Project Description**
Name	**DERM**	Relevant EIS Section	Volume 2, Section 4.2.3, Land Tenure (p142) and Volume 3, Section 1.4.5, Bulk Earthworks (p26)

DETAILS OF THE ISSUE

DERM Forest Products is responsible for the administration and sale of State-owned terrestrial quarry material under the provisions of the *Forestry Act 1959*.

As outlined in Table 4 of Chapter 1 of Volume 3 of the EIS, the project needs access to very large quantities of quarry material, including ballast, for the proposed rail line from Alpha to Abbot Point. On page 26 of the EIS the following statements are made: 'Where suitable construction material cannot be sourced from within the railway cuttings, a series of borrow pits will need to be established, or the material hauled from nearby quarries. The location and spacing of borrow pits have not been established, but will be located away from sensitive environments such as significant vegetation and surface drainage.'

As well as requiring significant quantities of quarry material for the construction and subsequent maintenance of the proposed rail line, it is anticipated that the project will also require significant additional quantities of quarry material for haul roads and other relevant infrastructure within the proposed coal mine and for the coal terminal facilities in the Abbot Point State Development Area.

This EIS does not provide specific details as to the proposed locations of the:

- Required series of "borrow pits" or gravel quarries, but these are suspected to be located adjacent to the proposed rail line corridor
- New hardrock quarries required to source ballast and other quarry material.

As the majority of the proposed 'borrow pits' and the proposed new hardrock quarries required for the project are expected to be located on State-owned land where the ownership of the quarry material is reserved to the State. DERM Forest Products is likely to receive applications in regard to the project for permits to search for quarry material and/or for sales permits to purchase quarry material.

To date, Waratah Coal has only advised DERM Forest Products of its interest in obtaining a sales permit to source hardrock quarry material from a nominated part of Surbiton South Pastoral Holding, which is over Lot 3533 on PH56 near Alpha.

DERM Forest Products is dealing with enquiries and applications from other parties also interested in quarry material in the Alpha to Abbot Point region to service the quarry material demand in relation to the other projects being proposed for this region including the Alpha Coal Project, the Carmichael Coal Project, the South Galilee Coal Project, the Multi Cargo Facility at the Port of Abbot Point and the development of the Abbot Point State Development Area. Collectively the required demand for quarry material to service these proposed projects is massive.

PROPONENT RESPONSE

Waratah Coal has engaged AMEC (Australian Mining Engineering Consultants) to carry out a geological survey along the length of the corridor to identify potential quarry and borrow areas for sand and gravel. A total of 29 potential quarry sites and 24 potential sand sites were identified. In addition to these sites, discussions have been held with existing quarry operators in central west Queensland and potential future quarry operators around Bowen for the production of rock and rail ballast.

In this regard, it may be that the majority of rock and rail ballast (approximately 1 million cubic metres – refer to Volume 3, Chapter 1, Table 4 page 26 of the EIS) will be sourced from commercial quarries. Quantities of sand and borrowed material will depend on final designs and it is intended to continue our discussions with DERM Forest Products in detail as quantities on all material and locations are progressed.

Submitter No.	364	Issue Reference:	17160
Submitter Type	Government	TOR Category	**Project Description**
Name	**DEEDI (APSDA Branch)**	Relevant EIS Section	Executive Summary 1.1.2 Rail, p5; Volume 2 Mine, Chapter 1 – Project Description, p5; Volume 3, Rail.

DETAILS OF THE ISSUE

Reference is made to rail maintenance and provisioning facility being constructed on a site adjacent to the railway for refuelling and servicing, servicing rolling stock etc without any detail in relation to the maintenance yards, crossing of rail lines, freight etc or location of the facility.

The proposed rail maintenance facility site is not identified on the mapping and there is no assessment of how it relates to other proposals in the immediate area.

The information provided is inadequate to assess this aspect of the EIS.

PROPONENT RESPONSE

The proposed preferred location of the marshaling yard is situated alongside the proposed rail corridor in Lot 24 on RP805036 (see Figure 2). The following provides a description of the remnant regional ecosystems within and around the footprint of the proposed marshaling yards:

- Small patches of RE 11.3.9 – *Eucalyptus platyphylla*, *Corymbia* spp. woodland on alluvial plains – VMA status least concern – present as unique polygons
- Small patches of RE 11.3.25 – *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines – VMA status least concern – present as unique polygons
- Majority of the proposed location overlays a large patch of mixed polygon 11.3.32/11.3.30/11.3.33 (polygon comprised of 70/25/5 % respectively)
  - RE 11.3.32 – *Allocasuarina luehmannii* open woodland on alluvial plains – VMA status least concern – dominant component of mixed polygon comprising 70% of the mixed polygon vegetation.
  - RE 11.3.30 – *Eucalyptus crebra*, *Corymbia dallachiana* woodland on alluvial plains – VMA status least concern – sub-dominant component of mixed polygon comprising 25% of the mixed polygon vegetation.
  - RE 11.3.33 – *Eremophila mitchellii* open woodland on alluvial plains – VMA status Of Concern – sub-dominant component of mixed polygon comprising 5% of the mixed polygon vegetation.
- Edge of a patch of mixed polygon 11.3.32/11.12.1/11.3.10/11.12.9 (polygon comprised of 70/20/5/5 % respectively)
  - RE 11.3.32 – *Allocasuarina luehmannii* open woodland on alluvial plains – VMA status least concern – dominant component of mixed polygon comprising 70% of the mixed polygon vegetation.
  - RE 11.12.1 – *Eucalyptus crebra* woodland on igneous rocks – VMA status least concern – sub-dominant component of mixed polygon comprising 20% of the mixed polygon vegetation.
  - RE 11.3.10 – *Eucalyptus brownii* woodland on alluvial plains – VMA status least concern – sub-dominant component of mixed polygon comprising 5% of the mixed polygon vegetation.
  - RE 11.12.9 – *Eucalyptus platyphylla* woodland on igneous rocks – VMA status least concern – sub-dominant component of mixed polygon comprising 5% of the mixed polygon vegetation.

Waratah Coal note that RE 11.3.25b *Eucalyptus camaldulensis* or less often *E. tereticornis* open-forest to woodland fringing drainage lines and RE 11.3.30 *Eucalyptus crebra*, *Corymbia dallachiana* woodland on alluvial plains, are included in the 17 Regional Ecosystems that the southern subspecies of Black-throated Finch (*Poephila cincta cincta*) has been recorded from in Northern Queensland since 1994 (BTF Recovery Team *et al*., 2007[2]). However, the mapping shows that only a small proportion of the site is comprised of these REs and the site is considered to be the most desirable location for the marshaling yards of its proximity to labour and service resources as well as the suitability for general layout and operation. As such, Waratah Coal have chosen to locate the marshaling yards in this location, and will pay particular attention to groundtruthing this section of the rail when they do their ecological assessment of the rail in 2013. Should the location reveal suitable Black-throated Finch habitat, or other significant environmental constraints, Waratah Coal will relocate the marshaling yards to the proposed alternative location, or other more environmentally suitable location further down the track.

2 Black-throated Finch Recovery Team, Department of Environment and Climate Change (NSW) and Queensland Parks and Wildlife Service. 2007. *National recovery plan for the black-throated finch southern subspecies Poephila cincta cincta* . Report to the Department of the Environment and Water Resources, Canberra. Department of Environment and Climate Change (NSW), Hurstville and Queensland Parks and Wildlife Service, Brisbane.

Figure 2. Lot 24 RP805036 – Remnant Vegetation

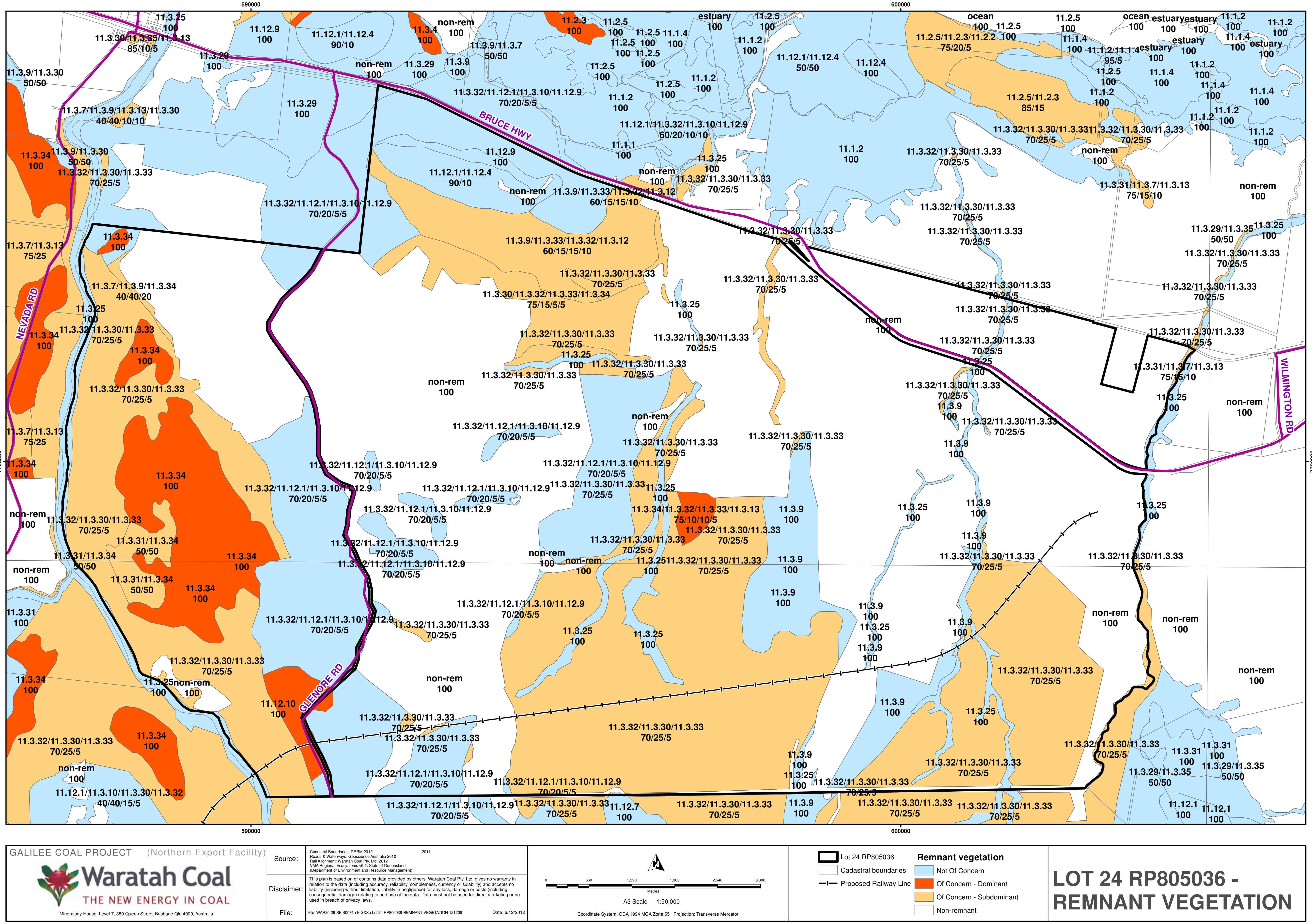
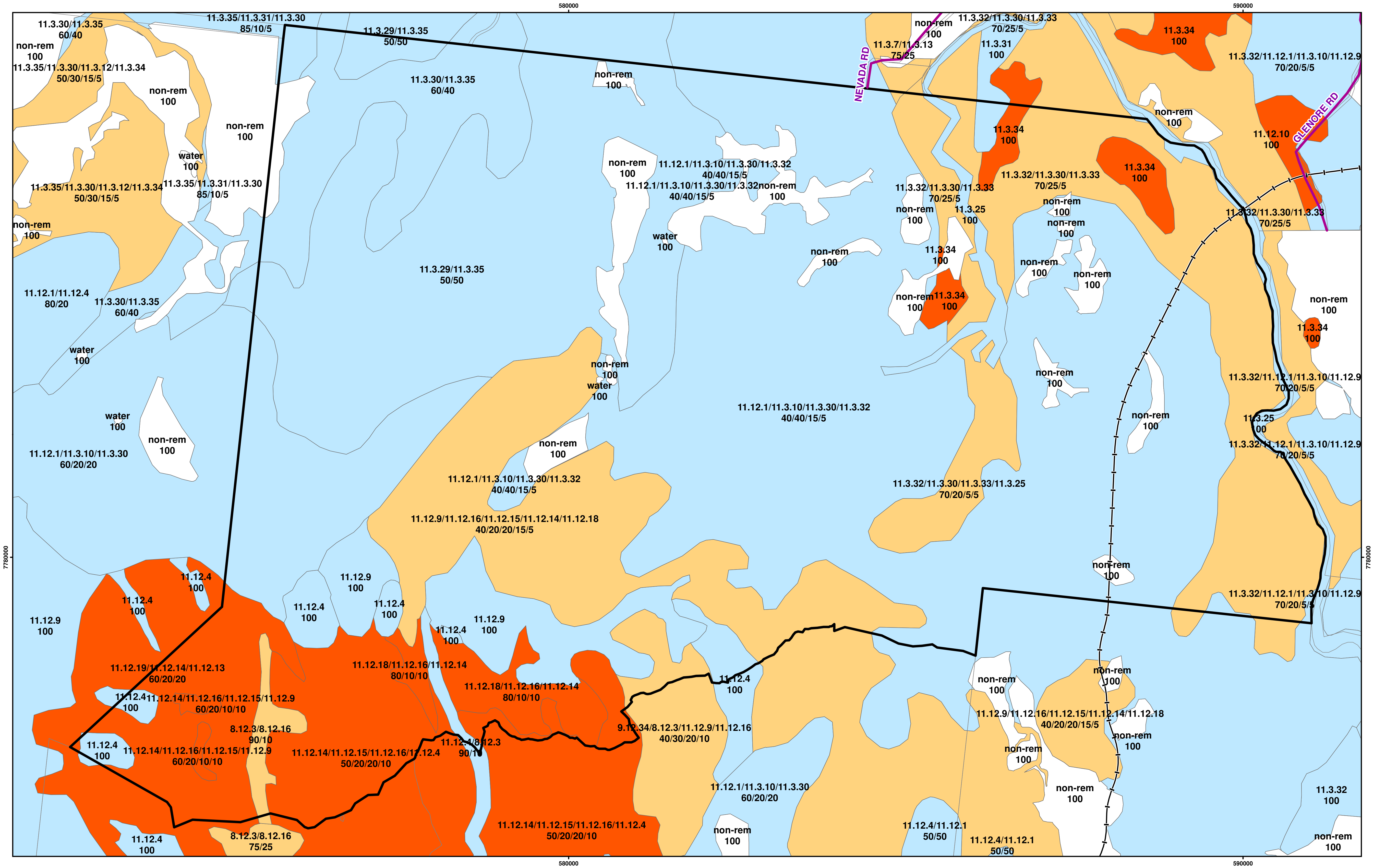


Figure 3. Lot 4 SB687 – Remnant Vegetation



GALILEE COAL PROJECT (Northern Export Facility)		
Waratah Coal THE NEW ENERGY IN COAL	Source:	Cadastral Boundaries: DERM 2012; Roads & Waterways: Geoscience Australia 2010; Rail Alignment: Waratah Coal Pty. Ltd. 2012; VMA Regional Ecosystems v6.1: State of Queensland (Department of Environment and Resource Management) 2011
Mineralogy House, Level 7, 380 Queen Street, Brisbane Qld 4000, Australia	Disclaimer:	This plan is based on or contains data provided by others. Waratah Coal Pty. Ltd. gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to and use of the data. Data must not be used for direct marketing or be used in breach of privacy laws.
	File:	File: WAR20-26-SEIS0052a-FIGXXa-Lot 4 SB687-REMNANT-VEGETATION-121207 Date: 7/12/2012

0 500 1,000 1,500 2,000 2,500 3,000 Metres
A3 Scale 1:50,000
Coordinate System: GDA 1994 MGA Zone 55 Projection: Transverse Mercator

infra_Streets
Lot 4 SB687
Cadastral boundaries
Proposed Railway Line

Remnant vegetation
- Not Of Concern
- Of Concern - Dominant
- Of Concern - Subdominant
- Non-remnant

LOT 4 SB687 - REMNANT VEGETATION

The proposed alternative location for the marshaling yard is situated alongside the proposed rail corridor in Lot 4 on SB687 (see Figure 3). This area contains the following least concern remnant regional ecosystems:

- RE 11.12.1 – *Eucalyptus crebra* woodland on igneous rocks – co-dominant regional ecosystem on the site comprising 40% of the site vegetation;
- RE 11.3.10 – *Eucalyptus brownii* woodland on alluvial plains – co-dominant regional ecosystem on the site comprising 40% of the site vegetation;
- RE 11.3.30 – *Eucalyptus crebra*, *Corymbia dallachiana* woodland on alluvial plains sub-dominant regional ecosystem on the site comprising 15% of the site vegetation;
- RE 11.3.32 – *Allocasuarina luehmannii* open woodland on alluvial plains – sub-dominant regional ecosystem on the site comprising 5% of the site vegetation.

As for the preferred site, Waratah Coal note that RE 11.3.30 *Eucalyptus crebra*, *Corymbia dallachiana* woodland on alluvial plains, is one of the 17 Regional Ecosystems that the southern subspecies of Black-throated Finch (*Poephila cincta cincta*) has been recorded from in Northern Queensland since 1994 (BTF Recovery Team *et al.*, 2007[3]). However, as the mapping shows that only 15% of the site is comprised of this RE, Waratah Coal have chosen to locate an alternative to the preferred location for the marshaling yards at this site, and will pay particular attention to groundtruthing this section of the rail when they do their ecological assessment of the rail in 2013. Should both the preferred location and this alternate location reveal suitable Black-throated Finch habitat, or other significant environmental constraints, Waratah Coal will relocate the marshaling yards to a more environmentally suitable location further down the track.

Submitter No.	364	Issue Reference:	17165
Submitter Type	Government	TOR Category	**Project Description**
Name	**DEEDI (Resource Planning, Geological Survey of Qld)**	Relevant EIS Section	Volume 3, Rail (Chapter 1 –Project Description) 1.2.1 – Rail Development

DETAILS OF THE ISSUE

A rail development of the proposed magnitude will be a major consumer of extractive materials, particularly high quality construction aggregates for rail ballast and concrete aggregates. However, despite the potential impacts on local markets, the environmental impacts of extraction, and the significant implications for the project timelines that extractive industry development approvals may have, no data is provided on the volumes of materials likely to be required for construction, nor where it will need to be sourced.

PROPONENT RESPONSE

Waratah Coal has engaged AMEC (Australian Mining Engineering Consultants) to carry out a geological survey along the length of the corridor to identify potential quarry and borrow areas for sand and gravel. A total of 29 potential quarry sites and 24 potential sand sites were identified. In addition to these sites, discussions have been held with existing quarry operators in central west Queensland and potential future quarry operators around Bowen for the production of rock and rail ballast.

In this regard, it may be that the majority of rock and rail ballast (approximately 1 million cubic metres – refer to Volume 3, Chapter 1, Table 4, page 26 of the EIS) will be sourced from commercial quarries. Quantities of sand and borrow material will depend on final designs and it is intended to continue our discussions with DERM Forest Products in detail as quantities on all material and locations are progressed.

3 Black-throated Finch Recovery Team, Department of Environment and Climate Change (NSW) and Queensland Parks and Wildlife Service. 2007. *National recovery plan for the black-throated finch southern subspecies Poephila cincta cincta*. Report to the Department of the Environment and Water Resources, Canberra. Department of Environment and Climate Change (NSW), Hurstville and Queensland Parks and Wildlife Service, Brisbane.

Submitter No.	364	Issue Reference:	17166
Submitter Type	Government	TOR Category	**Project Description**
Name	**DEEDI (Resource Planning, Geological Survey of Qld)**	Relevant EIS Section	Volume 3, Rail (Chapter 1 –Project Section 1.4.4 Description); Establishment of Quarries and Gravel / Sand Extraction Points

DETAILS OF THE ISSUE

This section states a preferred option of using existing quarries to provide material for the development of the embankment and rail formation although no quarry operations were specifically identified.

The proponent should identify existing extractive operations that may be sourced to provide construction material for the rail line construction.

Where adequate existing operations are unavailable, the draft EIS should be amended to address the identification of greenfield resources and the impacts of their extraction.

PROPONENT RESPONSE

Waratah Coal has engaged AMEC (Australian Mining Engineering Consultants) to carry out a geological survey along the length of the corridor to identify potential quarry and borrow areas for sand and gravel. A total of 29 potential quarry sites were identified. In additional to these sites, discussions have been held with existing quarry operators in central west Queensland and potential future quarry operators around Bowen for the production of rock and rail ballast.

In this regard it maybe that the majority of rock and rail ballast (approximately 1 million cubic metres – Refer Volume 3, Chapter 1, Table 4, p26 of the EIS) will be sourced from commercial quarries. Quantities of quarry material will depend on final designs and it is intended to continue our discussions with DERM Forest Products in detail as quantities on all material and locations are progressed.

Submitter No.	364	Issue Reference:	17167 / 1011
Submitter Type	Government	TOR Category	**Project Description** / Economy
Name	**DEEDI (Economic Policy Division)**	Relevant EIS Section	Volume 3, Rail (Chapter 17 – Economic Impact Statement): 17.4.1 – Impacts on Industry

DETAILS OF THE ISSUE

Existing quarries are proposed to be used to source construction materials. The impact on extractive industry and the community of the potential depletion of limited extractive resources is poorly addressed by the draft EIS.

The draft EIS should discuss the potential impact on the normal supply/demand of extractive resources in the regions impacted by the project, both during and after rail line construction, including any mitigation measures.

PROPONENT RESPONSE

Waratah Coal intends to use a combination of new quarries and existing quarries to source its extractive materials for the project construction. A total of 29 potential quarry sites and 24 potential sand sites have been identified along the length of the corridor during a geological survey. Discussions have also been held with existing quarry operators in central west Queensland and potential future quarry operators around Bowen for the production of rock and rail ballast. Waratah Coal does not expect any of its extractive requirements to affect in any way the ability of existing and future quarry customers to have their ongoing quantity requirements satisfied. Waratah Coal expects that the production of new quarries and extractive sites will actually assist the community and other users by having more sites available and at a competitive price particularly where the upfront development costs have been met by Waratah Coal during the execution of this project.

The quantity of extractive material required by Waratah Coal is minor compared with the potential sources available and whilst the extractive resources are considered to be an important resource, the quantities required by Waratah Coal does not place that industry under any adverse risks. The final quantities of sand and borrow material will depend on final designs and discussions with DERM Forest Products will continue, however, quantities required for the project are currently estimated at rail ballast, approximately 1 million cubic metres (Refer to EIS Volume 3, Chapter 1, Table 4 on page 26); aggregate, 90,000 cubic metres; and sand, 45,000 cubic metres.

Practically, there is an expectation that only one railway line will be constructed, with connecting spur lines to all other Galilee Basin mines, which are expected to be constructed during different time periods. This should result in an even demand for quarry material. Whilst the demand overall will be high, the total available supply well exceeds the forecast demand.

It is acknowledged that potential offset areas may include areas which have conflicting land uses. Waratah Coal commits to liasing with the Forest Products Group of DAFF to ensure this does not occur.

Submitter No.	**364**	Issue Reference:	**20000**
Submitter Type	Government	TOR Category	**Project Description**
Name	**DEEDI (Office of Advanced Manufacturing)**	Relevant EIS Section	Volume 3, Rail (Chapter 4 –Project Description), Section 4.2.4.3 – Exploration Permits and Leases

DETAILS OF THE ISSUE

The draft EIS states that “The rail alignment is designed to avoid Hancock Coal’s proposed infrastructure within MLA 70426” and also “Negotiations with Hancock Coal will continue to be undertaken to seek mutually satisfactory outcomes.”

However, the proposed rail corridor passes close to the planned accommodation village for the Hancock Coal Alpha Project and it is important that this potential conflict is resolved before the final rail route is determined.

The proponent needs to achieve an agreed outcome with Hancock Coal on the rail route through the southern section of MLA 70426, particularly as it relates to potential impacts on the planned accommodation village for the Hancock Coal Alpha Project.

PROPONENT RESPONSE

A report is provided in the *Appendices – Volume 2* (of this SEIS) responding to this submission, and detailing the history of rail alignment designs by Waratah Coal since the inception of the Project in 2008.

Submitter No.	**1841**	Issue Reference:	**21000**
Submitter Type	Government	TOR Category	**Project Description**
Name	**Commonwealth DSEWPaC**	Relevant EIS Section	Executive Summary; Appendix 11 – Terrestrial Ecology

DETAILS OF THE ISSUE

There are still some inconsistencies with the description of the project, for example, in the executive summary the railway design corridor is described as being 60-80m wide although it "may be larger through significant cuttings." It does not become apparent what this means until in Appendix 11 Terrestrial Ecology – Rail documents when it is made clear that at various points along the rail alignment the cuttings will expand the width to 150m. Appendix 11 describes the rail corridor as actually being 150m in areas where cross-slopes require cutting, although it would seem that they have averaged the clearance width to 100m. This should be clarified to explain the circumstances properly. Clearing is projected to be about 2,688ha of remnant vegetation based on RE mapping, but is this based on the average clearing rate? If so, then potentially, where the cuttings will be wider, there will be a greater impact on vegetation communities (i.e. habitat). The report also states that the width of the clearance could be reduced to 50m, but in the executive summary (and Appendix 26) it states that the corridor could be reduced to 40m. Which is the truer statement?

PROPONENT RESPONSE

Since submission of the EIS Waratah Coal has commissioned a concept design of the alignment of the 453km of rail corridor (from the boundary of the APSDA to the beginning of the rail loop at the mine site) – see *Railway Concept Design* report in *Appendices – Volume 2* of this SEIS. This engineering provides the vertical alignment of the rail, which in turn provides the width required for the rail easement. At present, 421km of the rail vertical alignment has been engineered (with the balance 32km awaiting the completion of the Digital Terrain Model (DTM)), which will be completed as soon as possible.

The final railway easement will be an average width of 49.5m[4]. In relatively flat terrain the rail will be 40m wide and in areas where cross-slope cuttings are required the width of the easement will be wider – up to a maximum width of 184m (however there are only two areas exceeding 150m). The easement includes both the rail and a service road. In the 32km of the corridor which have not yet been engineered, a footprint area of 40 m was assumed based upon the relatively flat topography. There are no Endangered or Of Concern REs, or TECs within this 32km section of the rail easement. Within the easement all existing vegetation will need to be cleared to facilitate construction and operation of the rail.

The amounts of remnant vegetation and Threatened Ecological Communities (TECs) that would need to be cleared to faciltiate the rail are 33 ha of Endangered RE and 104 ha of Of Concern RE. Within these, the following areas, also classified as TECs, will require clearing:

- 30 ha of TEC – Brigalow (*Acacia harpophylla* dominant and co-dominant);
- 23 ha of TEC – Weeping Myall Woodlands;
- 2 ha of TEC – Coolibah Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions;
- 21 ha of TEC – Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin.

Regional ecosystem calculations were undertaken by overlaying the Queensland Vegetation Management Act 1999 protected remnant Regional Ecosystems (RE) over the rail easement and calculating areas and types requiring clearing. TEC (as defined from the RE analogues listed in the SEWPaC Species Profile and Threats (SPRAT) database) analogues were overlaid over the the rail easement to enable a derivation of areas of TECs to be cleared. A more detailed

4 Average width calculated by dividing the total area of the rail footprint (2215 ha) by the length of the rail (453 km).

description of the areas with environmental values to be cleared to facilitate the rail corridor is presented in Section 5 of the *Biodiversity Offset Proposal* in the *Appendices – Volume 2* of this SEIS.

It should also be noted that initial aerial photography interpretation does indicate that the mapping of REs along the rail easement may be altered in terms of line work and polygon descriptions following further field work.

Submitter No.	**1841**	Issue Reference:	**21001**
Submitter Type	Government	TOR Category	**Project Description**
Name	**Commonwealth DSEWPaC**	Relevant EIS Section	Executive Summary

DETAILS OF THE ISSUE

Again in the executive summary, direct and indirect impacts should be clearly summed up, not provided sporadically throughout the document. In the executive summary it describes direct clearing impacts of 4,594.68ha. It does not provide an indication of indirect impacts associated with potential subsidence. Vol 5B Appendix 10 describes the mine footprint as surface footprint 14,615ha and underground longwall area is 29,755ha.

PROPONENT RESPONSE

The areas to be impacted at the mine can be described as the open cut mining area, which are the areas required to be cleared to facilitate the open cut mines and the mine infrastructure areas. This area is 16,519.99ha. The areas that overlay the underground mining areas, and could be subject to impacts resulting from subsidence, amount to 25,598.10ha (See Figure 1 in Issue Reference 6017 in this chapter).

In terms of vegetation to be cleared, Table 2 gives the break-down of the amounts of vegetation protected under the Queensland *Vegetation Management Act 1999* (VM Act) to be cleared to facilitate the open cut mines (direct impacts), and the amounts which may be affected by subsidence from underground mining activities (indirect impacts).

Table 2: Amounts of vegetation (ha) to be cleared or potentially affected by subsidence within the Mining Lease Application Area (VMA status)

	E dominant	E subdominant	OC dominant	OC subdominant	LC	Non-remnant	Total
Open Cut	0	0	0	0	4,877.49	11,642.50	**16,519.99**
Underground (subsidence)	0	0	0	197.42	12,462.34	12,938.34	**25,598.10**

E = Endangered; OC = Of Concern; LC = Least Concern at present.
Based on the DEHP Regional Ecosystem Mapping (Version 6.1).

As can be seen from Table 2, the open cut mines will require disturbance to 16,519.99ha, of which 4,877.49ha is covered by REs classified as Least Concern under the VM Act. The remaining 11,642.50ha is comprised of pasture grass and other areas already cleared of native vegetation.

A further 25,598.10ha may potentially be affected by subsidence as a result of underground mining operations. Of this area, 12,462.34ha is covered by REs classified as Least Concern (LC) under the VM Act. A further 197.42ha is covered by vegetation that is classified as Of Concern (OC) subdominant under the VM Act. The Of Concern elements of this 197.42ha are 11.67ha of RE 10.10.3, and 16.15ha of RE 10.10.7.

The remaining 12,938.34ha overlying the areas potentially subject to subsidence is comprised of pasture grass and other areas already cleared of native vegetation.

Field surveys have confirmed that there are no vegetation communities within the mine site study area that are listed under the EPBC Act.

Waratah Coal has developed a *Biodiversity Offset Proposal* which seeks to cover the unavoidable impacts associated with both the mine site and rail corridor, and makes additional voluntary provision for the Bimblebox Nature Refuge. Information on the project's offsets is contained in the *Biodiversity Offset Proposal* in *Appendices – Volume 2* of the SEIS.

Submitter No.	**1841**	Issue Reference:	**21005**
Submitter Type	Government	TOR Category	**Project Description**
Name	**Commonwealth DSEWPaC**	Relevant EIS Section	Volume 3 – Rail

DETAILS OF THE ISSUE

More information is required to understand the potential impacts associated with each of the rail options, clearly demonstrating why one is to be chosen above the others.

PROPONENT RESPONSE

Options 1 and 2 of the rail alignment between KP410-460 have been removed leaving the former Option 3 as the sole option for this section of the rail alignment (see Sheet 5 of Figure 4). This is the option that most closely follows cadastral boundaries, and as such, minimises impacts upon affected landowners.

The desktop options assessment of all three options presented as Appendix 5A of the EIS concluded that the impacts from each of the options would be essentially the same or very similar. As a result, Option 1 was disregarded as this has the potential to impact upon the Alpha Coal (Hancock Coal) Mine Infrastructure Area. Option 2 was disregarded for both social and environmental reasons. Option 2 runs through the middle of property boundaries and hence constitutes the most impact of any option to the landholders in the Surbiton Area. Whilst all options have the potential to impact Weeping Myall Woodlands, Option 2 has the added potential to impact upon protected Brigalow communities (*Acacia harpophylla* dominant and co-dominant); and the Vulnerable flora species – *Acacia ramiflora*.

Hence Option 3 was selected as it is the option that, along with Option 1 has least potential to impact upon environmental values, but in addition, has least impact upon Hancock Coal's proposed operations, and it is the option that most closely follows cadastral boundaries and hence limits impacts on landholders in the Surbiton area.

Since the EIS, there have been some minor changes to the initial Option 3 alignment as requested by the landowners to better align with the property boundaries. There has also been a change in alignment between KP 432-448 to accommodate the Hancock/GVK Alpha Project mine layout. This revised alignment through the Alpha and Kevins Corner Project areas has been discussed with both Hancock/GVK and the Department of Natural Resources and Mining and some further changes to the alignment through the mine area of the Alpha and Kevins Corner may be necessary once the final rail alignments, final land property boundaries and final infrastructure locations are determined. The optimum alignment is currently shown in Figure 4.

This selected alignment does not sterilise the coal deposits of either Alpha or Kevins Corner. The general area of the alignment is where the coal seams E and F are located. These seams will not be mined as evidenced in the EIS reports for both Alpha and Kevins Corner where it is stated that mining these seams is uneconomic.

Waratah Coal has included Option 3 in their calculations for the *Biodiversity Offset Proposal* (contained in *Appendices – Volume 2* of this SEIS), and has commissioned ground truthing of Option 3 to verify the presence or absence of the potential environmental values (including MNES) detailed in the options assessment in Appendix 5A of the EIS.

The *Rail Alignment through MLAs 70426 and 70425* report contained in the *Appendices – Volume 2* of this SEIS provides the detail of the rail alignment designs by Waratah Coal since the inception of the project in 2008.

Figure 4. Project changes since EIS lodgment (Sheet 1 of 5)

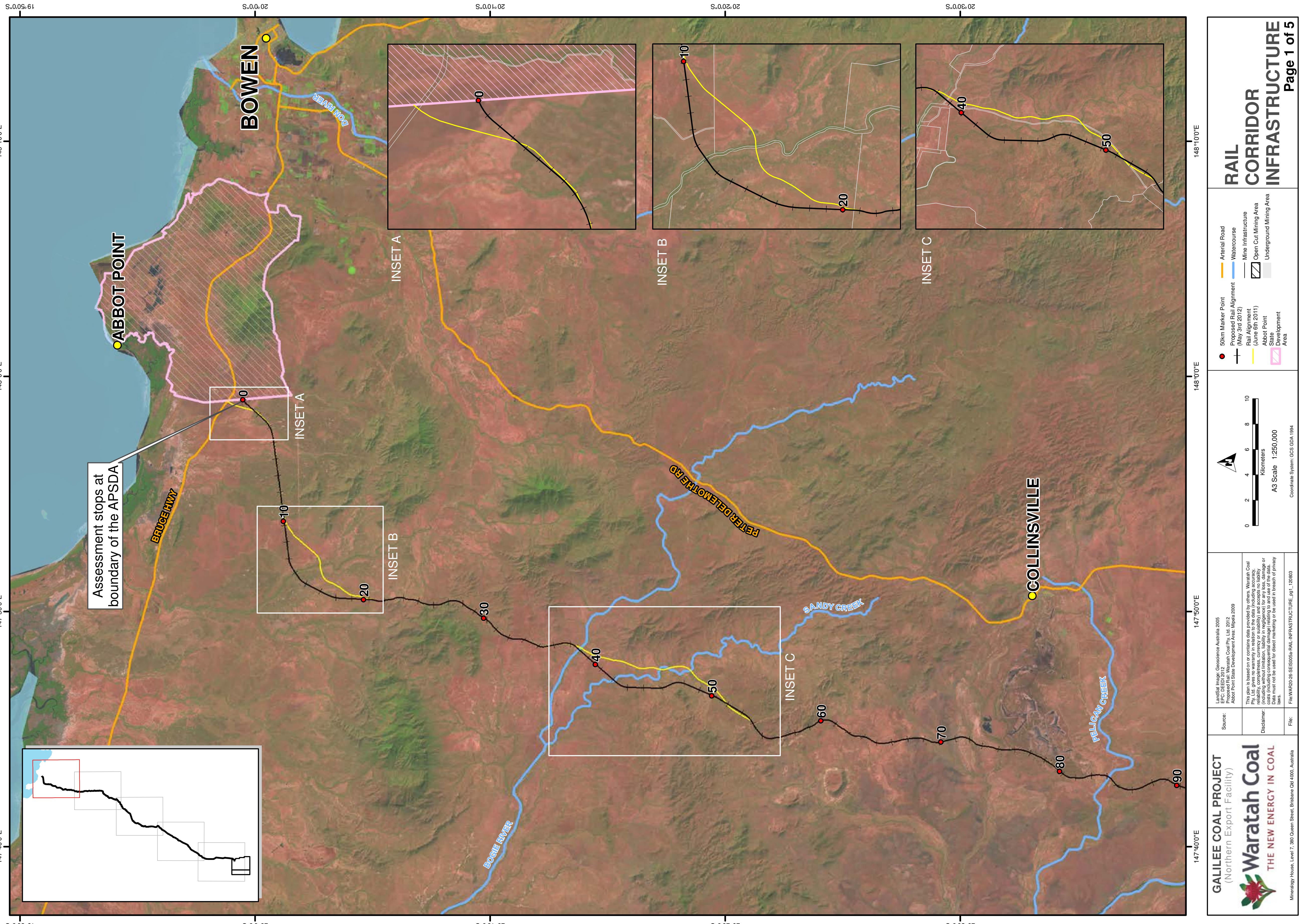


Figure 4. Project changes since EIS lodgment (Sheet 2 of 5)

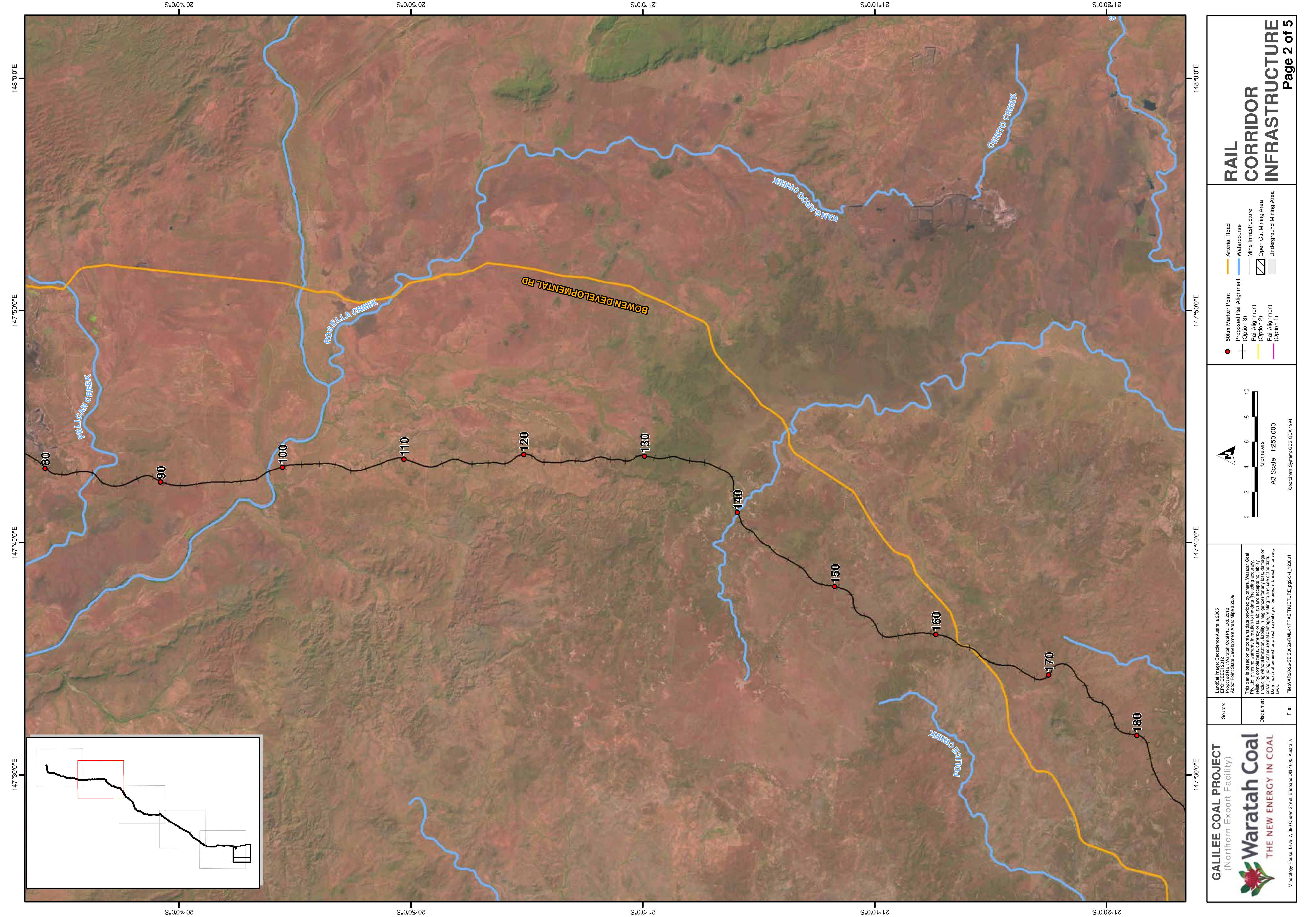


Figure 4. Project changes since EIS lodgment (Sheet 3 of 5)

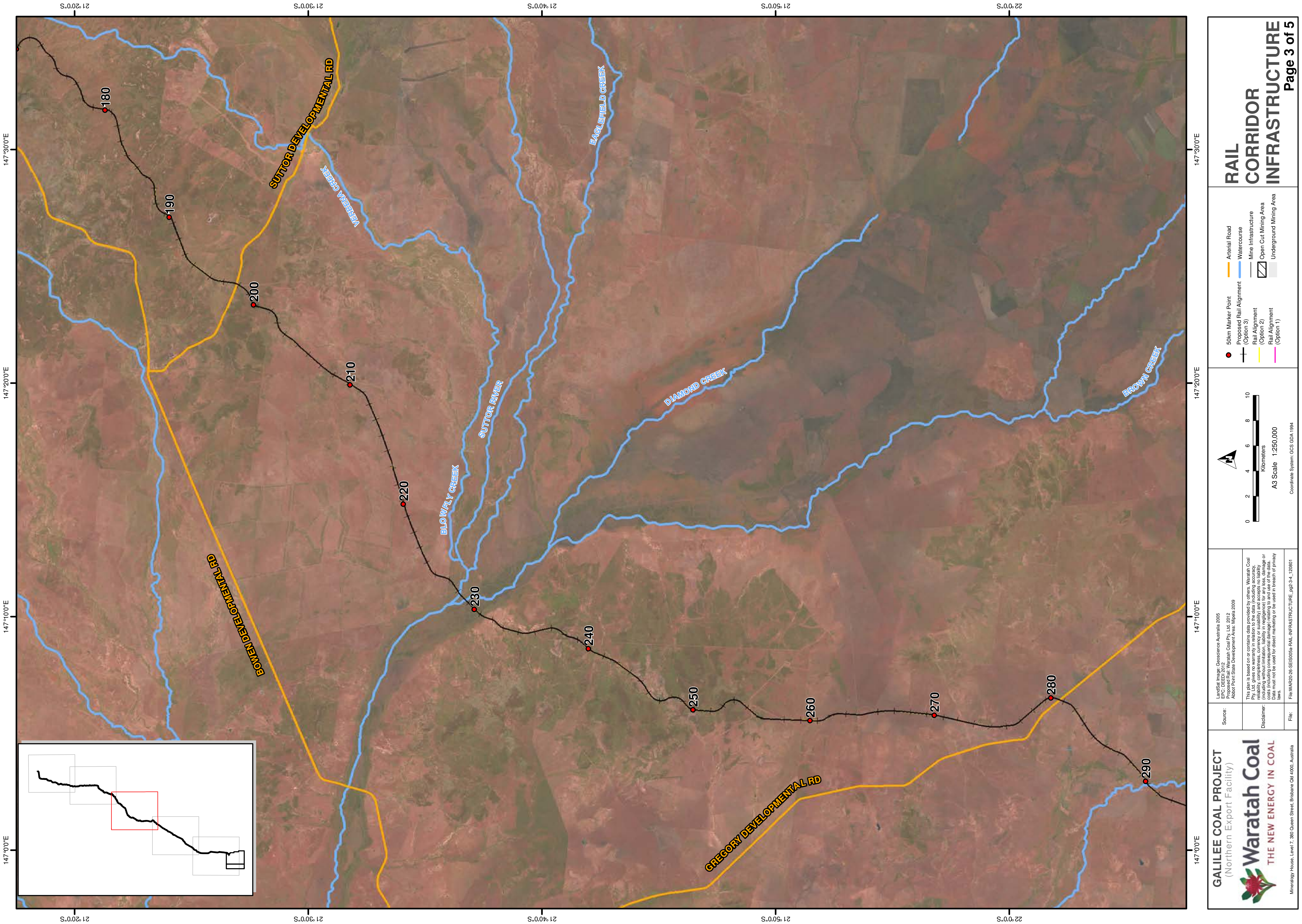


Figure 4. Project changes since EIS lodgment (Sheet 4 of 5)

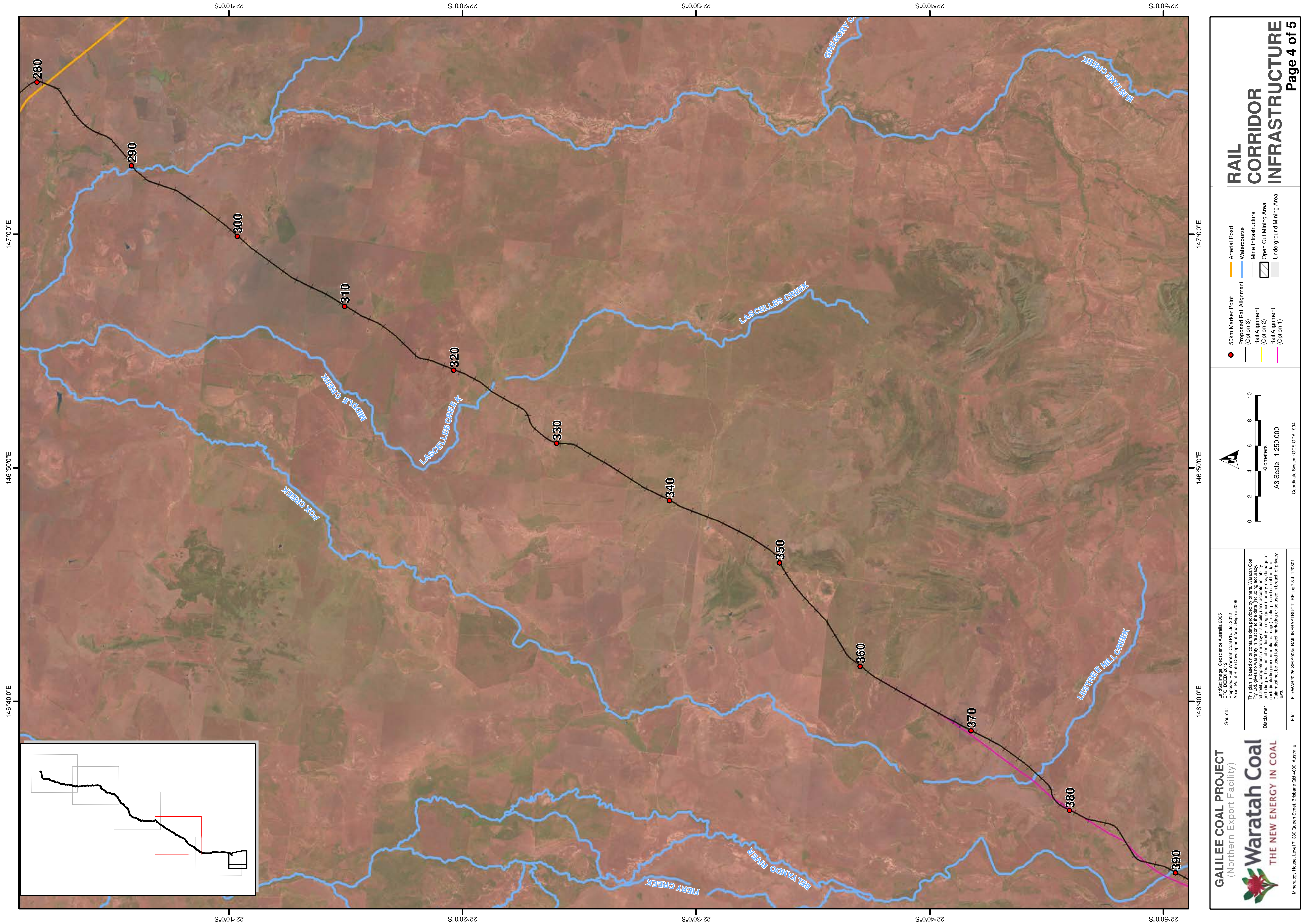
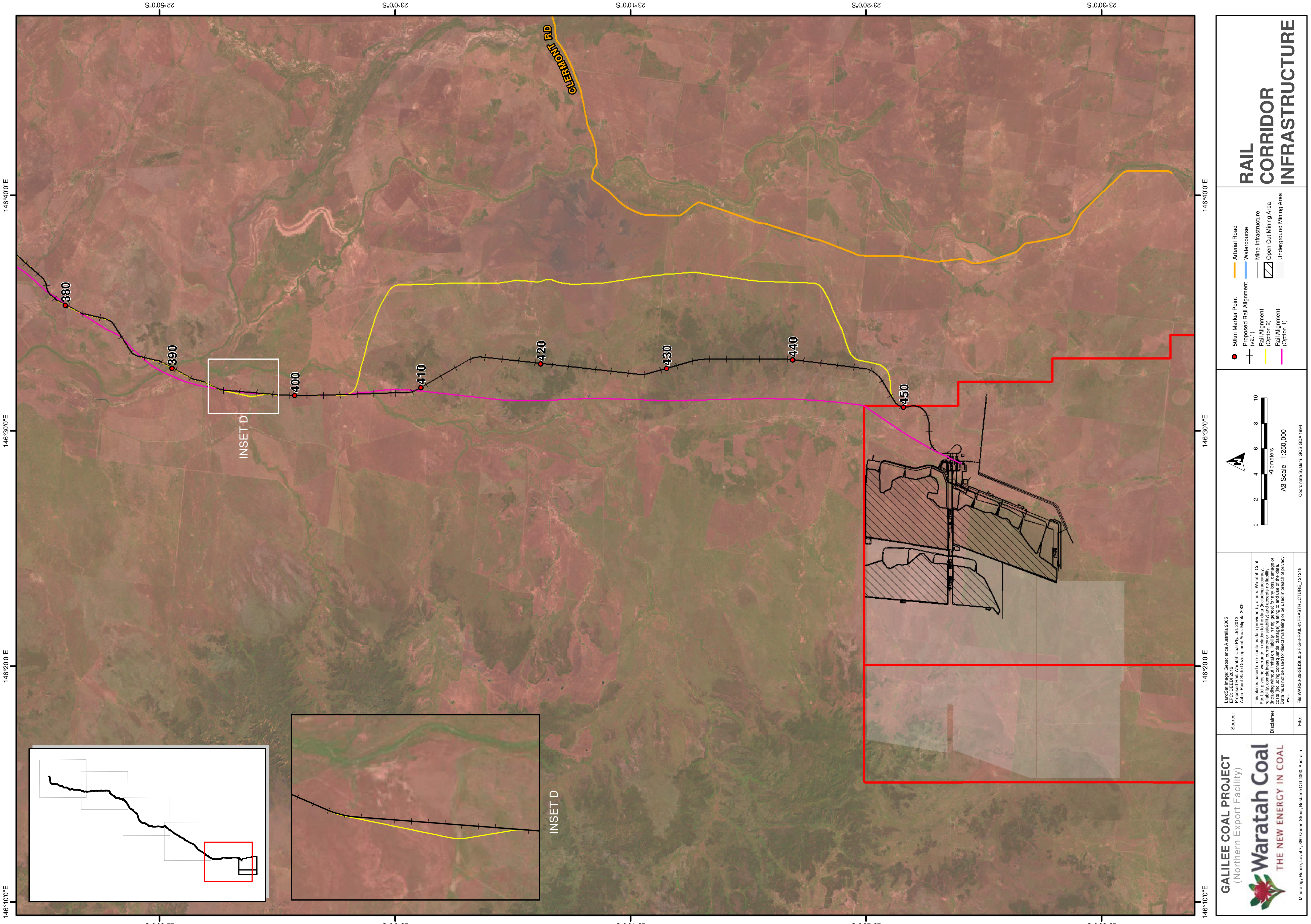


Figure 4. Project changes since EIS lodgment (Sheet 5 of 5)



Submitter No.	1841	Issue Reference:	21024
Submitter Type	Government	TOR Category	Project Description
Name	Commonwealth DSEWPaC	Relevant EIS Section	Appendix 26 – MNES Section 2.2.1.2

DETAILS OF THE ISSUE

Report indicates that the majority of changes are within the 1.6km rail corridor, need information on how many are outside and where? Waratah are committed to undertaking detailed surveys of all remnant vegetation prior to finalisation of the alignment, SEWPaC cannot approve the project if there is still so much uncertainty.

PROPONENT RESPONSE

The alignment changes referred to and the footprint of the rail corridor has been refined since lodgment of the EIS.

Since submission of the EIS Waratah Coal has commissioned a concept design of the alignment of the 453km of rail corridor (from the boundary of the APSDA to the beginning of the rail loop at the mine site) – see *Railway Concept Design* report in *Appendices – Volume 2* of this SEIS. This engineering provides the vertical alignment of the rail, which in turn provides the width required for the rail easement. At present, 421km of the rail vertical alignment has been engineered (with the balance 32km awaiting the completion of the Digital Terrain Model (DTM)), which will be completed as soon as possible.

The final railway easement will be an average width of 49.5m.[5] In relatively flat terrain the rail will be 40m wide and in areas where cross-slope cuttings are required the width of the easement will be wider – up to a maximum width of 184m (however there are only two areas exceeding 150m). The easement includes both the rail and a service road. In the 32km of the corridor which have not yet been engineered, a footprint area of 40m was assumed based upon the relatively flat topography. There are no Endangered or Of Concern REs, or TECs within this 32km section of the rail easement. Within the easement all existing vegetation will need to be cleared to facilitate construction and operation of the rail.

The amounts of remnant vegetation and Threatened Ecological Communities (TECs) that would need to be cleared to facilitate the rail are 33ha of Endangered RE and 104 ha of Of Concern RE. Within these, the following areas, also classified as TECs, will require clearing:

- 30ha of TEC – Brigalow (*Acacia harpophylla* dominant and co-dominant)
- 23ha of TEC – Weeping Myall Woodlands
- 2ha of TEC – Coolibah Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions, and
- 21ha of TEC – Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin.

Regional ecosystem calculations were undertaken by overlaying the Queensland *Vegetation Management Act 1999* protected remnant Regional Ecosystems (RE) over the rail easement and calculating areas and types requiring clearing. TEC (as defined from the RE analogues listed in the SEWPaC Species Profile and Threats (SPRAT) database) analogues were overlaid over the the rail easement to enable a derivation of areas of TECs to be cleared. A more detailed description of the areas with environmental values to be cleared to facilitate the rail corridor is presented in Section 5 of the *Biodiversity Offset Proposal* in the *Appendices – Volume 2* of this SEIS.

It should also be noted that initial aerial photography interpretation does indicate that the mapping of REs along the rail easement may be altered in terms of line work and polygon descriptions following further field work.

Ecological survey of the rail will be undertaken in early 2013, during or immediately after the wet season to ensure suitable conditions, and hence adequate survey data can be collected from all vegetation communities along the rail corridor.

5 Average width calculated by dividing the total area of the rail footprint (2215ha) by the length of the rail (453km).

Submitter No.	1841	Issue Reference:	21025
Submitter Type	Government	TOR Category	Project Description
Name	Commonwealth DSEWPaC	Relevant EIS Section	Appendix 26 – MNES report – Section 2.2.1.3 – Changes in Alignment

DETAILS OF THE ISSUE

Alternative rail alignments have been assessed through desktop analysis for options 2 and 3, using original field assessment for Option 1. Have surveys been undertaken considering all these other options?

PROPONENT RESPONSE

As detailed in the Executive Summary, Section 1.1.2.2 of Chapter 1 of the Rail Volume (Vol 3) (this being the section that discusses the options assessment), and Section 3.5 and Section 4 of the Options Assessment presented in Appendix 5A of the EIS, no surveys had been undertaken of the Options 2 and 3 at the time the EIS went to publication. However, the findings of the Options Assessment were taken in to account, and Waratah Coal have since elected to have Option 3 as the preferred option. As such, Waratah Coal have commissioned additional fieldwork to verify the presence or absence of MNES. The planned survey program will be undertaken during or immediately after the 2012/2013 wet season to ensure suitable conditions, and hence adequate survey data, can be collected from all vegetation communities along the rail corridor.

Submitter No.	1841	Issue Reference:	21054
Submitter Type	Government	TOR Category	Project Description
Name	Commonwealth DSEWPaC	Relevant EIS Section	Fig 3-17

DETAILS OF THE ISSUE

Aquifers

A data gap analysis undertaken by Bradshaw and Bradshaw (2010) suggested that there was evidence of the vertical movement of groundwater between different sedimentary layers and aquifers. However Fig 3-17 indicates that "leakage does not contribute a significant amount of water to deeper aquifers at this site." Further monitoring and analysis of sites within and in a buffer zone around the proposed mine footprint is required to determine the extent of groundwater movement between aquifers and therefore potential drawdown impacts.

PROPONENT RESPONSE

The question of vertical movement of groundwater has been addressed by installation of seven VWP sites with 25 pressure sensors in and around the mine footprint to give the natural vertical hydraulic gradients. Model calibration of these vertical profiles will allow quantification of vertical permeabilities. See the *Groundwater Assessment* report contained in *Appendices – Volume 2* of this SEIS.

The completed program of laboratory measurement of vertical permeability in cores will assist as well.

There will certainly be movement of water vertically. However, the low permeabilities of coal measure lithologies as a rule would suggest only minor quantities of water movement, except in the fractured zone above mined panels.

A *Longwall Mining Subsidence* report (in *Appendices – Volume 2* of this SEIS) has recently been completed and gives details of the fractured zones and will be taken into account in the revised modelling.

Submitter No.	1841	Issue Reference:	21055
Submitter Type	Government	TOR Category	Project Description
Name	Commonwealth DSEWPaC	Relevant EIS Section	

DETAILS OF THE ISSUE

Previous advice from earlier correspondence. Specific comments on the draft EIS

Mapping

Mapping will require refinement to facilitate the assessment process. In its current state it is too broad and vague for sufficient analysis, also there are some discrepancies between the maps and discussion of the listed EPBC species.

PROPONENT RESPONSE

Mapping has been refined as part of the completed supplementary technical studies (see *Appendices – Volume 2* of this SEIS). Mapping for MNES fauna species is included in the *Fauna Assessment* report (Appendice – Volume 2 of this SEIS). There are no MNES flora species or TECs at the mine site. Mapping for the MNES species and TECs along the rail alignment will be finalised after the planned ecological survey program that will be undertaken during or immediately after the 2012/2013 wet season to ensure suitable conditions, and hence adequate survey data, can be collected from all ecological communities along the rail corridor.

Submitter No.	364	Issue Reference:	7014
Submitter Type	Government	TOR Category	Project Description
Name	DEEDI (APSDA Branch)	Relevant EIS Section	Volume 4 Chap 2 Port p15, Figure 1 Volume 4, Chapter 2, Volume 4, Port, Chapter 1, p5 p23, Volume 4, Figure 3 Volume 4, Port, Chapter 1, p6 p23, Volume 4, Figure 3

DETAILS OF THE ISSUE

All maps and figures need to be amended to clarify that the APSDA is not part of the EIS.

Reference to the proposed multi-user transport corridor is incorrect and should be replaced with proposed multi-user infrastructure corridor (MUIC).

The rail planning in the APSDA shown is a working option and indicative only and should be noted as such.

The indicative development parcels, and indicative road layout shown in this map are not included in the legend and could be misleading. These should be identified in the mapping legend, annotated or further explained in the text of the report as indicative.

PROPONENT RESPONSE

All maps and figures that reference the APSDA in this SEIS note that the APSDA is the limit of the assessment for this SEIS. No indicative development within the APSDA is presented.

Submitter No.	418	Issue Reference:	7015
Submitter Type	Government	TOR Category	**Project Description**
Name	**Dept. of Local Government and Planning (DLGP)**	Relevant EIS Section	All appendices

DETAILS OF THE ISSUE

The Appendices need to include up to date information relating to the APSDA (numerous maps, figures and references have been superseded).

Given the EIS stops at the boundary of the APSDA, all appendices need to be updated or amended to state that the information relating to the APSDA is for illustrative purposes only and not part of the EIS.

PROPONENT RESPONSE

Wherever relevant, the Appendices of the SEIS are clear that the boundary of the APSDA is the limit of the assessment for this SEIS.

Submitter No.	664	Issue Reference:	17011
Submitter Type	Council	TOR Category	**Entire EIS (General Comment)**
Name	**Whitsunday Regional Council**	Relevant EIS Section	

DETAILS OF THE ISSUE

Further investigations / Management plans. Several investigations and management plans are required for review prior to approval:

- Detailed flora and fauna survey for final alignment of the corridor
- Significant Community/Species management plans
- Geotechnical investigation
- Earthworks schedule for cut/fill balance, volumes, destination and source of material
- Hydraulic study and modelling for final route
- Soil and erosion management plan (Erosion and sediment control plan) – for construction and post construction stages for the rail corridor (including bridges and waterway crossings) and all temporary facilities
- Sediment program for pre, during and post construction of water crossing locations
- Water quality monitoring program that includes pre, during and post construction
- Stormwater management plan for temporary camps, waterway crossings and structures
- Acid Sulfate soil investigation and ASS management plan
- Weed and pest management plan
- Fire management plan
- Cultural Heritage Management plans
- Final designs of culverts and bridges, stabilisation of beds and banks
- Decommissioning and rehabilitation management plan
- Details of monitoring programs of water and soil quality, impacts to flora and fauna

- Hazardous materials and waste management plan, and
- Biodiversity offset strategy.

PROPONENT RESPONSE

This SEIS provides details with reference to all of these issues. Please refer to the appropriate Chapters and Appendices.

Submitter No.	779	Issue Reference:	17019
Submitter Type	Individuals	TOR Category	Entire EIS (General Comment)
Name	Names withheld	Relevant EIS Section	Exec Summary 1.4.1; Vol 1, Ch 1, p5; App 10, 4.5; 4.4; - 3.2.2; 3.5.3

DETAILS OF THE ISSUE

1. The BNR, its values and the likely impacts on it are incompletely, inconsistently and incorrectly described throughout the EIS. Particular issues with lack of detail being provided in the Executive Summary
2. BNR described as being of Local significance under the State Biodiversity Planning Assessment when it is of State significance
3. The submitter believes the project rationale is 'out-of-line with current thinking'
4. Submitter believes Waratah Coal's environmental policy is very general and difficult to comprehend
5. Issues with 'readability' and lack of a "functional search term capability", as well as size of documents slowing down scroll functions on some computers
6. Issue with the summary presented in the executive summary
7. Inability to copy and paste
8. Submitter contends that the document is difficult to navigate due to not having an index or logical layout
9. The submitter points out seven errors (omissions, faulty references to other sections of the EIS and typos) that they contend lead to difficulty in comprehension and navigation.

PROPONENT RESPONSE

1. Waratah Coal disagrees with the submitter, and believes that overall they have provided an accurate statement of the ecological values throughout the area. The Executive Summary (and to a lesser extent the EIS chapters) is just that – a summary – and as such, provides an overview. As acknowledged by the submitter the detailed information regarding the ecological values is present within the EIS and the consultant's reports in the Appendices, which is where the detail should be. Note that further, more detailed flora and fauna assessments have been completed on the BNR since the submission of the EIS. Refer to the *Mine Site Fauna Assessment* report and the two *Flora and Vegetation* reports contained in the *Appendices – Volume 2* of this SEIS.
2. Waratah Coal acknowledges that there was an erroneous description of the BNR being of Local Significance in the Executive Summary, but this was obviously not intended to be deliberately misleading, as the proper description of the BNR being of State Significance, is given in Volume 2, Chapter 6, pg 4 and in Volume 5 Appendix 10B, pg 33. Further ecological work to enable description of the values of the BNR and surrounds was undertaken as part of the SEIS. This work can be found in Part C – Nature Conservation and the associated Appendices – *Mine Site Fauna Assessment* report and the two *Flora and Vegetation* reports – Volume 2 of this SEIS.
3. This is an opinion-based statement that does not need to be addressed.
4. This is an opinion-based statement that does not need to be addressed.

5. The size of the EIS files is a function of the content, which is required by the ToR. It was made clear that, if requested, hard copies of the EIS could be provided to users without high speed broadband or unlimited download capacity access and also copies were placed in several libraries throughout Queensland. The size of the files are comparable with that of other EISs for a project of this scale.
6. Waratah Coal contend that the Executive Summary does, as specified in the ToR "convey the most important aspects and options relating to the project to the reader in a concise and readable form". The details of the elements that the submitter believes should be in the Executive Summary are in the body of the EIS, where the details should be.
7. It is not the function of the EIS, nor a requirement of the ToR, to provide an uncontrolled document that people can cut and paste from.
8. An index is not a requirement of the ToR *per se* – a table of contents was provided. All future publications will be laid out in accordance with the ToR.
9. It is not unreasonable to expect a few mistakes in a document that contains 79 chapters and several thousand pages – this SEIS has been well reviewed and edited as will be all future publications.

Submitter No.	**1840**	Issue Reference:	**17021**
Submitter Type	Government	TOR Category	**Entire EIS (General Comment)**
Name	**Barcaldine Regional Council**	Relevant EIS Section	1.3.2

DETAILS OF THE ISSUE

MLA 70426 in which name has this Application been made?

Further studies required within the SEIS?

PROPONENT RESPONSE

The Mining Lease Application for 70426 has been made in the name of Hancock Coal. Please refer to their Alpha Coal EIS, SEIS and SEIS Addendum for information relating to this area.

Submitter No.	**775**	Issue Reference:	**17025**
Submitter Type	Individual	TOR Category	**Entire EIS (General Comment)**
Name	**Name withheld**	Relevant EIS Section	App27 s 5.2 p29, V5-App27 s 7.1 p39

DETAILS OF THE ISSUE

There is no evidence anywhere in the EIS that Waratah have attempted to – avoid, minimise and mitigate any environmental impacts. The mine plan layout on BNR appears to be dictated purely by the underlying geology.

Waratah must produce evidence that they have attempted to "avoid, minimise and mitigate the environmental impacts" in laying out their mine plan. For example, what areas have been avoided, and what activities have been minimised, that would have otherwise been part of the mine plan?

PROPONENT RESPONSE

The overall mine plan has been developed to limit potential environmental impacts that can reasonably be avoided. For example, the placement of mine infrastructure area to, as well as is practicably possible, limit impacts upon Tallarenha Creek, and the limiting of the mine open-cut footprint to limit potential ecological impacts.

The project is unviable if the reserves under the Bimblebox Nature Reserve (BNR) are not mined.

Due to the distance to market for coal from the Galilee Basin mines, there is a critical volume and quality of coal required to make each project economically viable, such that the capital costs of the rail and port infrastructure are justified.

For the Galilee Coal Project, the reserves beneath the BNR are critical as they are the most cost effective of all reserves within the mining lease to recover, being the shallowest of all the reserves. In addition, the coal reserves under the BNR are of superior quality compared with other coal within the mining lease. This superior coal is required for blending with the other comparatively inferior coal to give an overall coal product with an energy level of 6350k/cal, which makes the product competitive on the world coal market. The coal from the Galilee Coal Project has been presold at these energy levels.

If the BNR is not available for mining, in addition to reduction in coal quality being likely to result in the loss of the contract for the pre-sale, it is estimated that the loss in coal reserves for the open-cut operations will be over 42% (167 million tonnes) and for the total mine operations (both open-cut and underground) almost 40%. This represents a reserve of almost 410 million tonnes of coal which makes cost recovery to build the rail, mine and port infrastructure unlikely. It is also worth noting that the reduction in royalties to the Queensland Treasury would be almost A$3 billion (based on $100/tonne coal price). Additional reductions in royalties would also result due to reduced sale prices from the comparatively inferior product that would result without the reserves from under the BNR being available for blending.

Submitter No.	**354**	**Issue Reference:**	**17020**
Submitter Type	NGO	**TOR Category**	**Project Description**
Name	**AMCI**	**Relevant EIS Section**	Vol 3 Ch 17, Exec Summary; Vol 3 Ch 1, Exec Summary

DETAILS OF THE ISSUE

- There needs to be one rail alignment from the Galilee Basin
- Is the rail project of suitable initial capacity and can the capacity be expanded in the future?
- Will there be an effective and timely third party access regime?

PROPONENT RESPONSE

One rail alignment

Since the submission of the EIS, the Government has announced its intention for one rail corridor from the Galilee Basin and in doing so has given preference to an East-West corridor and a North-South corridor. However, the preferred North-South alignment, proposed by Hancock Coal only, caters for 60Mtpa, therefore does not meet the requirement for all Galilee Basin proponents, and Waratah Coal is therefore proceeding with its proposed rail component.

In addition, Waratah Coal's rail alignment has been designed to be immune to impacts of flooding up to an event with an Average Recurrence Interval (ARI) of once in 100 years. It is Waratah Coal's understanding that the alignment proposed by Hancock/GVK is flood immune up to an event with an ARI of once in 50 years and once in 20 years for minor culverts. Waratah Coal believe that the rail alignment out of the Galilee Basin should be designed to be flood immune to a once in 100 year ARI event to reduce the likelihood of supply chain breakages in flood events.

Initial capacity and future expansion

Planning for the Waratah Coal corridor is for an ultimate capacity of 400Mtpa which is the basis of the EIS and for which approvals are being sought. Whilst the overall planning is for 400Mtpa, the initial design and construction of the railway is for 60Mtpa.

Third party access

It is the clear intention of Waratah Coal for the railway to be available to all Galilee (and Bowen Basin) coal producers under agreed commercial arrangements in a timeframe to suit the other third party users.

The third party access regime falls under the *Competition and Consumer Act 2010* (formerly known as the *Trade Practices Act 1974*), where the Australian Competition and Consumer Commission (ACCC) enforces the Australian Consumer Law (ACL) which is included under the Act.

Submitter No.	425	Issue Reference:	17142
Submitter Type	Individuals	TOR Category	Project Description
Name	Names withheld	Relevant EIS Section	

DETAILS OF THE ISSUE

Property requirements: All vehicles and equipment must be washed down before entering property. Certificate of inspection to be produced before entry.

No firerms, no living, no camping, no rubbish, no fires and no dogs.

PROPONENT RESPONSE

Waratah Coal abides by a Code of Conduct which sets out requirements for appropriate behavior on landowners properties. Waratah Coal also use experienced contractors who are also bound by Waratah Coal's Code of Conduct.

Waratah Coal has a Weed Management Strategy and Safe Operating Procedures (for site operations) that highlight the need and gives direction on how to control the spread of weed and seed. All employees are aware of their obligations as set out the Exploration Code, State Legislation and regulations.

Waratah Coal respect that certain landowners require a wash down certificate prior to entry. In very remote locations along the rail this can be difficult due to remoteness from certified wash down stations. In these instances Waratah Coal will negotiate with the landholder to ensure an acceptible solution. These may include:

- leaving the vehicle at the property boundary and utilising a vehicle from within the property
- mobile wash station and presence of employee trained in how to conduct certified washes by a third party who is authorised to inspect. Employees then sign a purpose-made duplicate book to certify and record that the vehicle has been cleaned to comply with a certified wash.

Submitter No.	**364**	Issue Reference:	**17158**
Submitter Type	Government	TOR Category	**Project Description**
Name	**DEEDI (Mining and Petroleum Operations)**	Relevant EIS Section	Vol 2 1.1.5

DETAILS OF THE ISSUE

Resource mapping – The current state of resource knowledge in JORC terms should be stated clearly and the selection of particular seams for longwall mining justified.

PROPONENT RESPONSE

The target coal seams in the project area (EPC 1040 and part of 1079) are found in the Late Permian age Bandanna Formation and the Colinlea Sandstone.

The coal is found in four major seams – B, C, DU, and DL.

The total resources for the Galilee Coal Project as of 24th February 2010 are estimated to be 3.684 Billion tonnes (Bt) of JORC compliant coal resources. The resources are quantified and categorized as 1.975Bt of measured resources, 569 Million tonnes (Mt) of indicated and 1.140Bt of inferred resources. The estimate has found there is approximately 0.6Bt in the concept open-cut and the remaining 3.1Bt in the concept underground.

The Galilee Coal Project open-cut mining areas will mine seams B, C, DU, and DL. These seams will be mined to an economic depth of cover extent, which include 579Mt of coal. Beyond this economic cut off limit, underground operations will commence.

The Galilee Coal Project underground mining areas will selectively mine seams which can be mined safely and efficiently, without endangering the lives of workers. The seam selection criteria are based on geological conditions, geotechnical conditions, hydrogeological conditions, longwall mining technique, coal quality, and geographical location.

There are four longwall mining areas which will selectively mine various seams. Underground longwall mine 1 will extract DU seam, based on the superior coal quality and coal thickness within the northern section of mining tenure. The estimate of coal to be extracted within underground 1 operation is 300Mt. Seams C and DL within the foot print of underground 1 mining area will be left due to interburden thickness rendering extraction unsafe.

Underground longwall mine 2 will extract DL seam, utilising longwall mining operations. The DL seam is selected due to superior coal quality, working section height and geotechnical conditions. An estimate of coal to be extracted through this system is 340Mt. Within the footprint mining area of longwall two seams C and DU are left due to insufficient interburden thicknesses rendering extraction unsafe.

Underground longwall mine 3 will extract DL seam, utilising longwall mining operations. Similar to underground two DL seam is selected due to superior coal quality, working section height and geotechnical conditions. An estimate of coal to be extracted through this system is 340Mt. Within the footprint mining area of longwall two seams C and DU are left due to insufficient interburden thicknesses rendering extraction unsafe.

Underground longwall mine 4 will extract B8 seam, utilising longwall mining operations. The B8 seam is selected due to superior coal quality, working section height and geotechnical conditions. An estimate of coal to be extracted through this system is 320Mt.

The total estimate of underground coal to be extracted from undergrounds 1, 2, 3 and 4 will be 1,300Mt of coal. The quantity of underground coal being estimated as JORC resources is shown in the Table *Resource Estimate Summary by Conceptual Mining Type* shown in Issue Reference 17037 in Part C – 02 – Land. Refer also to this response for further details.

Submitter No.	**418**	Issue Reference:	**17244**
Submitter Type	Government	TOR Category	**Project Description**
Name	**Dept. of Local Government and Planning (DLGP)**	Relevant EIS Section	Page 19, Volume 4, Chapter 2; 2.2.3.2 Nature and Conservation reserves

DETAILS OF THE ISSUE

The reference to the Parsons Brinckerhoff report is incorrect and needs to be updated.

The correct reference for this paragraph is : Office of the Coordinator-General, Land and Infrastructure Study for the Central Portion of the APSDA, 2010.

PROPONENT RESPONSE

If required in future correct reference will be made to this report.

Submitter No.	**356**	Issue Reference:	**17015**
Submitter Type	Government	TOR Category	**Project Description**
Name	**DTMR**	Relevant EIS Section	Vol 3, Chpt 4, Fig 10

DETAILS OF THE ISSUE

Waratah and Powerlink have held initial discussions on the interaction between the proposed Waratah Coal rail line and the proposed Powerlink Galilee Basin transmission project.

Powerlink is seeking that the land required for the Galilee Basin transmission project is to be designated for community infrastructure under Section 201 of the *Sustainable Planning Act 2009*.

Powerlink notes that the proposed Waratah rail line Option 3 passes close to the proposed Powerlink Surbiton Hill substation and is adjacent to, or crossing over, various proposed transmission lines in the area.

Both parties have stated their intent to work together to develop a mutually acceptable outcome.

PROPONENT RESPONSE

Powerlink and Waratah Coal are in discussions to ensure that the rail and power alignments do not impact upon each other.

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Submitter No.	1840	Issue Reference:	9109
Submitter Type	Council	TOR Category	Social / Waste / **Land**
Name	**Barcaldine Regional Council**	Relevant EIS Section	1.1.4

DETAILS OF THE ISSUE

Other Project Components that will impact on the BRC are as follows:

- Power and water
- Temp and permanent accommodation
- Roads and tracks
- Upgrade airstrip
- Sewerage
- Borrow pits and quarries
- Waste facilities
- Weed and pest management, and
- Disaster management (flood/fire/drought/mine issue).

Specific discussions are required with BRC on all of these issues. A more important discussion is required as to BRC's current and future needs and resourcing requirements to administer all of these proposed projects, assessments, decisions and processes, now and in the future.

PROPONENT RESPONSE

Waratah Coal welcomes further opportunities to consult with the BRC over the above issues. Some issues, including power and water, roads and the airstrip, will be addressed under the proposed Galilee Basin CSIA Roundtable. Other issues will be addressed by Waratah Coal with Council as requested.

Submitter No.	1840	Issue Reference:	12021
Submitter Type	Council	TOR Category	Air Quality / **Land**
Name	**Barcaldine Regional Council**	Relevant EIS Section	Air Quality, Vol 2 Chapter 10

DETAILS OF THE ISSUE

Comment that '...CO_2 and methane CH_4 emitted from this project will not impact air quality as they have no adverse impact on human health and the environment' is misleading.

Note proposed improvements to energy efficiency.

The proponent noted that third party off-sets may be considered for emissions through investment. Council wish to discuss further potential for options for off-sets which may also support local community and mitigation of impacts occurring within the region.

Stockpile management, operations and decommissioning are all important factors to be considered in mitigation of impacts. The proposed method for extraction may also contribute to the impacts from mining activities with the open-cut long wall mining and underground mines and size/storage of stockpiles.

BRC note that the construction phase was not modelled for air quality impacts including cut/stripping and removal of topsoil.

PROPONENT RESPONSE

Comment that '...CO_2 and methane CH_4 emitted from this project will not impact air quality as they have no adverse impact on human health and the environment' is misleading.

This statement has been taken out of context. The original statement read (p273, Volume 2 – Mine, Chapter 10 – Air Quality and Greenhouse Gas):

> *"Greenhouse gases, carbon dioxide (CO_2) and methane (CH_4) emitted from this project will not impact air quality as they have no adverse impact on human health and the environment, except that they may lead to climate change. Even though methane is an organic component, it is very stable in the air and therefore has little impact on ozone formation or depletion. Therefore, the air quality impacts of greenhouse gases are not considered in this chapter."*

CO_2 and methane are greenhouse gases and are not relevant for air quality impact assessments.

The proponent noted that third party off-sets may be considered for emissions through investment. Council wish to discuss further potential for options for off-sets which may also support local community and mitigation of impacts occurring within the region.

Waratah Coal notes that Barcaldine Regional Council wishes to discuss the potential for options for offsets which may support local community. Waratah Coal is committed to investigating locally based projects for mitigation strategies, and welcome the opportunity to discuss this with BRC.

Stockpile management, operations and decommissioning are all important factors to be considered in mitigation of impacts. The proposed method for extraction may also contribute to the impacts from mining activities with the open-cut long wall mining and underground mines and size/storage of stockpiles.

A detailed air quality management plan will be developed once the project is approved that will include stockpile management, operations and decommissioning.

BRC note that the construction phase was not modelled for air quality impacts including cut/stripping and removal of topsoil.

One modelling scenario was considered in the air quality assessment to represent worst case air quality impacts. The air quality impact assessment considered worst case impact predicted by the proposed mine and surrounding proposed mines in the Galilee Basin.

Submitter No.	419	Issue Reference:	4001
Submitter Type	Government	TOR Category	**Land (Land Contamination)**
Name	**DERM**	Relevant EIS Section	Volume 2, Mine – Section 3.4.6.2 (p131)

DETAILS OF THE ISSUE

This section has not addressed the terms of reference 3.2.5.1 which requires identification of land that is (potentially) contaminated ... or is on the environmental management register (EMR) or contaminated land register (CLR).

The TOR requires a search of all land in the project to determine what lots are on the EMR/CLR. However it appears that for the mine site only 5 of about 40 lots were searched. Despite the Desktop Tiered Ranking Risk Assessment undertaken by the consultants, it is probable that sites listed because of notifiable activities not recorded in the sources examined by the consultants or sites known to be contaminated by former owners, occupiers or local government officers were missed.

It is unclear whether the study is intended to cover the "EPC study" area or only the "mine footprint" area. Most of the contaminated land assessment work has been conducted outside the mine footprint, e.g. on the existing railway land about 30km to the south. However, other references seem to focus on the mine footprint area. The text needs to be clarified.

It is noted that soil sampling within Lot 1 on BF72 indicated probable diesel spillage near an above ground storage tank. Although the concentrations of hydrocarbons are well above investigation levels, the affected area is apparently not large. There is insufficient information to allow DERM to decide whether the lot should be entered onto the EMR.

A search of the EMR/CLR is required for all lots within the study area. Should this search indicate that any of the lots that were not previously searched are listed on either register, further assessment will be required.

Should the applicant become aware of contamination by a hazardous contaminant at a site that is not listed on the EMR or CLR, the applicant has an obligation under s371 of the *Environmental Protection Act 1994* to notify DERM.

PROPONENT RESPONSE

A search of each property impacted by the proposed Mining Lease Application (MLA) has been completed. See *Phase 1 Environmental Site Assessment – Desktop Study* contained in *Appendices – Volume 2* of this SEIS.

Seventeen lots cover the MLA. A search of the EMR and the CLR did not identify any properties listed on either of these registers. However, during an inspection of the mine site, Lot 1 BF72, containing an Above Ground Storage Tank (AST) and cattle stockyard was observed. This lot was selected for a PSI with targeted soil sampling. The hydrocarbon impacts to soils based upon site observations of staining and the clay content of the soils present suggest a low potential for significant impacts. Based upon the extent of observed staining, distance to the nearest creeks and prior experience of spills / leakage from similar sized ASTs, the potential for impacts to penetrate more than a few centimeters below ground is considered low. It is therefore considered that the impact is unlikely to comprise serious or material environmental harm and presents a low risk.

Outside of the MLA, but within or adjacent to the study area (i.e. EPC1040 and part of EPC1079), desktop searches revealed that five lots along an existing rail line recorded a land use of "Transport Terminal" and one lot adjacent to the rail line recorded a land use as "Transformer." One of the "Transport Terminal" lots was listed on the Environmental Management Register (EMR) (possible high level of Arsenic).

The lot listed on the EMR (Lot 273 SP108314) was selected for Preliminary Site Investigation (PSI) with targeted soil sampling. This lot was representative of other rail line lots in the area. The transformer lot was not assessed further as it was not listed on the EMR. Further, due to the dangers of working in a live electrical facility and because it was located about 30 km south of the mine site, the site was considered to pose a low risk to the Project.A notification to the administering authority for a notifiable activity is required under the *Environmental Protection Act 1994* and needs to be submitted by the property owner or operator within 22 business days of becoming aware. Future identification of notifiable activities will be documented and at such a time when Waratah Coal can be considered to be the property owner or operator, a notification to the administering authority will be made.

Works to be undertaken for the contaminated land study, and the subsequent technical reports, will outline the requirements for further contaminated land works for mining activities, including preparation of Site Management Plans, notification, engagement of a third party reviewer (TPR), etc.

The commissioning of a TPR will be undertaken if considered necessary following the outcomes of the contaminated land investigations (i.e. works to follow the Phase 1 assessment works).

Submitter No.	419	Issue Reference:	4002
Submitter Type	Government	TOR Category	Land (Land Contamination)
Name	DERM	Relevant EIS Section	Volume 3, Rail – Section 3.3.1.7, Contaminated Land Assessment (p78)

DETAILS OF THE ISSUE

This section has not addressed the terms of reference 3.2.5.1 which requires identification of land that is (potentially) contaminated ... or is on the environmental management register (EMR) or contaminated land register (CLR).

The TOR requires a search of all land that is on the EMR/CLR. This section suggests that none of the 52 medium risk lots were searched. In contrast, section 3.4.6 implies that all lots were searched in the EMR/CLR, while Volume 5 Appendix 7 Section 2.1 states that only 48% of the medium risk lots were searched for the three parts of the project. Each of these references must be consistent.

Despite the Desktop Tiered Ranking Risk Assessment undertaken by the consultants, it is probable that sites listed because of notifiable activities are not recorded in the sources examined by the consultants or sites known to be contaminated by former owners, occupiers or local government officers were missed.

Material Change of Use of land that is listed on the EMR/CLR requires a Site Management Plan and it must be implemented during the construction of the new use. The Site Management Plan must be approved by DERM prior to any surface disturbance of the soil, in accordance with:

i. Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland May 1998 and the National Environmental Protection (Assessment of Site Contamination) Measure 1999.
ii. the *Environmental Protection Act 1994*.

A search of the EMR/CLR is required for all lots within the study area.

Should any additional searching indicate that any of the lots that were not previously searched are listed on either register, further assessment will be required.

It is also recommended that a Third Party Reviewer (TPR) be engaged in all instances where land is to be either removed from the EMR/CLR or requires management under a Site Management Plan. It should be noted that significant project delays may occur in the absence of a TPR.

PROPONENT RESPONSE

A search of each property impacted by the rail (based on current known alignments and information) has been completed. See *Phase 1 Environmental Site Assessment – Desktop Study* contained in *Appendices – Volume 2* of this SEIS.

The investigation found four properties listed on the EMR for notifiable activities including operating a livestock dip or spray race facility and storing petroleum products or oil. This Phase 1 investigation will form the basis for the Phase 2 investigation which will include inspection and where required, intrusive investigations will also be conducted. As part of any Phase 2 investigations, the information collected as part of the completed Phase 1 would be utilised to determine contaminants of potential concern. The identified contaminants of concern would be assessed as part of the Phase 2 investigations.

A notification to the administering authority for a notifiable activity is required under the *Environmental Protection Act 1994* and needs to be submitted by the property owner or operator within 22 business days of becoming aware. Future identification of notifiable activities will be documented and at such a time when Waratah Coal can be considered to be the property owner or operator, a notification to the administering authority will be made.

Works to be undertaken for the contaminated land study, and the subsequent technical reports, will outline the requirements for further contaminated land works for mining activities, including preparation of Site Management Plans, notification, engagement of a third party reviewer (TPR), etc.

The commissioning of a TPR will be undertaken if considered necessary following the outcomes of the contaminated land investigations (i.e. works to follow the Phase 1 assessment works).

Submitter No.	**419**	Issue Reference:	**4003**
Submitter Type	Government	TOR Category	**Land (Land Contamination)**
Name	**DERM**	Relevant EIS Section	Volume 3, Rail – Section 3.3.2.3, Contaminated Land Assessment (p79)

DETAILS OF THE ISSUE

This section of the EIS implies that arsenic was not analysed at the cattle dips. This would be the most likely contaminant in older dips. Further analyses may be required.

PROPONENT RESPONSE

Phase 2 investigations leading on from the desktop Phase 1 investigation would include inspection and where required, intrusive investigations would be conducted. As part of any Phase 2 investigations, the information collected as part of the completed Phase 1 would be utilised to determine contaminants of potential concern. The identified contaminants of concern would be assessed as part of the Phase 2 investigations.

Assessment of livestock dips or spray races would include the assessment of arsenic.

Submitter No.	**419**	Issue Reference:	**4004**
Submitter Type	Government	TOR Category	**Land (Land Contamination)**
Name	**DERM**	Relevant EIS Section	Volume 3, Rail – Section 3.4.6, Contaminated Land (p114)

DETAILS OF THE ISSUE

A helicopter inspection of the site identified several notifiable activities (cattle dips) that are not recorded on the EMR/CLR.

Should the applicant become aware of a notifiable activity occurring on a lot that is not listed on the EMR or CLR, the applicant has an obligation under section 371 of the *Environmental Protection Act 1994* to notify DERM.

PROPONENT RESPONSE

A notification to the administering authority for a notifiable activity is required under the *Environmental Protection Act 1994* and needs to be submitted by the property owner or operator within 22 business days of becoming aware. Future identification of notifiable activities will be documented and at such a time when Waratah Coal can be considered to be the property owner or operator, a notification to the administering authority will be made.

Submitter No.	**419**	Issue Reference:	**4005**
Submitter Type	Government	TOR Category	**Land (Land Contamination)**
Name	**DERM**	Relevant EIS Section	Volume 3, Rail – Section 3.6, Mitigation and Management (p120)

DETAILS OF THE ISSUE

While there is a commitment to notify DERM of any sites which are found to be contaminated, there is no similar commitment to notify DERM of notifiable activities.

Should the applicant become aware of a notifiable activity occurring on a lot that is not listed on the EMR or CLR, the applicant has an obligation under section 371 of the *Environmental Protection Act 1994* to notify DERM.

PROPONENT RESPONSE

A notification to the administering authority for a notifiable activity is required under the *Environmental Protection Act 1994* and needs to be submitted by the property owner or operator within 22 business days of becoming aware. Future identification of notifiable activities will be documented and at such a time when Waratah Coal can be considered to be the property owner or operator, a notification to the administering authority will be made.

Submitter No.	**419**	Issue Reference:	**4006**
Submitter Type	Government	TOR Category	**Land (Land Contamination)**
Name	**DERM**	Relevant EIS Section	Volume 3, Rail – Section 3.7, Conclusion (p121)

DETAILS OF THE ISSUE

The commitments in the EIS do not adequately cover notification to DERM of any notifiable activities undertaken by the railway activities or notification of any contamination that is caused by these activities.

The applicant should commit to notifying DERM of all notifiable activities or contamination of a site. Should the applicant become aware of a notifiable activity occurring on a lot that is not listed on the EMR or CLR, the applicant has an obligation under section 371 of the *Environmental Protection Act 1994* to notify DERM.

PROPONENT RESPONSE

A notification to the administering authority for a notifiable activity is required under the *Environmental Protection Act 1994* and needs to be submitted by the property owner or operator within 22 business days of becoming aware. Future identification of notifiable activities will be documented and at such a time when Waratah Coal can be considered to be the property owner or operator, a notification to the administering authority will be made.

Submitter No.	419	Issue Reference:	4007
Submitter Type	Government	TOR Category	**Land (Land Contamination)**
Name	**DERM**	Relevant EIS Section	Volume 4, Port – Section 2.2.2.5, Contaminated Land (p17)

DETAILS OF THE ISSUE

EIS investigations of the port site identified at least one notifiable activity (a cattle dip) and a potentially contaminated area that are not recorded on the EMR/CLR.

Should the applicant become aware of a notifiable activity or contamination occurring on a lot that is not listed on the EMR or CLR, the applicant has an obligation under section 371 of the *Environmental Protection Act 1994* to notify DERM.

PROPONENT RESPONSE

The port component is no longer part of the proposed project.

Waratah Coal note that notification to the administering authority for a notifiable activity is required under the *Environmental Protection Act 1994* and needs to be submitted by the property owner or operator within 22 business days of becoming aware. Future identification of notifiable activities will be documented and at such a time when Waratah Coal can be considered to be the property owner or operator, a notification to the administering authority will be made.

Submitter No.	419	Issue Reference:	4008
Submitter Type	Government	TOR Category	**Land (Land Contamination)**
Name	**DERM**	Relevant EIS Section	Volume 5, Appendix 7, Contaminated Land – Section 4.13, EMR/CLR Results (p4-1)

DETAILS OF THE ISSUE

This section implies that all 36 lots were searched, whereas sections 2.1 and 2.3.2 suggest that EMR/CLR searches were conducted for less than half the “medium risk” sites.

PROPONENT RESPONSE

Refer to Issue Reference 4001.

Submitter No.	419	Issue Reference:	4009
Submitter Type	Government	TOR Category	**Land (Land Contamination)**
Name	**DERM**	Relevant EIS Section	Volume 5, Appendix 7, Contaminated Land – Section 5.13, EMR/CLR Results (p5-1)

DETAILS OF THE ISSUE

This section implies that all 57 lots were searched, whereas sections 2.1 and 2.3.2 suggest that EMR/CLR searches were conducted for less than half the “medium risk” sites.

PROPONENT RESPONSE

A search of each property impacted by the proposed development (based on current known alignments and information) has been completed. See *Phase 1 Environmental Site Assessment – Desktop Study* contained in *Appendices – Volume 2* of this SEIS.

The investigation found four properties listed on the EMR for notifiable activities including operating a livestock dip or spray race facility and storing petroleum products or oil. This Phase 1 investigation will form the basis for the Phase 2 investigation which will include inspection and where required, intrusive investigations will also be conducted. As part of any Phase 2 investigations, the information collected as part of the completed Phase 1 would be utilised to determine contaminants of potential concern. The identified contaminants of concern would be assessed as part of the Phase 2 investigations.

A notification to the administering authority for a notifiable activity is required under the *Environmental Protection Act 1994* and needs to be submitted by the property owner or operator within 22 business days of becoming aware. Future identification of notifiable activities will be documented and at such a time when Waratah Coal can be considered to be the property owner or operator, a notification to the administering authority will be made.

Works to be undertaken for the contaminated land study, and the subsequent technical reports, will outline the requirements for further contaminated land works for mining activities, including preparation of Site Management Plans, notification, engagement of a third party reviewer (TPR), etc.

The commissioning of a TPR will be undertaken if considered necessary following the outcomes of the contaminated land investigations (i.e. works to follow the Phase 1 assessment works).

Submitter No.	**419**	Issue Reference:	**4010**
Submitter Type	Government	TOR Category	**Land (Land Contamination)**
Name	**DERM**	Relevant EIS Section	Volume 5, Appendix 7, Contaminated Land – Section 5.7, Cattle Dips – Additional Site Observations (p5-9)

DETAILS OF THE ISSUE

The occupier of land has an obligation under section 371 of the *Environmental Protection Act 1994* to notify DERM of any notifiable activities that are located such as the two cattle dips mentioned in this section.

Should the occupier of land become aware of a notifiable activity or contamination occurring on a lot that is not listed on the EMR or CLR, the applicant has an obligation under section 371 of the *Environmental Protection Act 1994* to notify DERM.

PROPONENT RESPONSE

A notification to the administering authority for a notifiable activity is required under the *Environmental Protection Act 1994* and needs to be submitted by the property owner or operator within 22 business days of becoming aware. Future identification of notifiable activities will be documented and at such a time when Waratah Coal can be considered to be the property owner or operator, a notification to the administering authority will be made.

Submitter No.	419	Issue Reference:	4011
Submitter Type	Government	TOR Category	Land (Land Contamination)
Name	DERM	Relevant EIS Section	Volume 5, Appendix 7, Contaminated Land – Section 6.1.3, EMR/CLR Results (p6-1)

DETAILS OF THE ISSUE

This section implies that all 10 lots were searched, whereas sections 2.1 and 2.3.2 suggest that EMR/CLR searches were conducted for less than half the "medium risk" sites. All sites should be searched.

PROPONENT RESPONSE

The port component is no longer part of the proposed project hence no further assessment of contaminating activities in the APSDA and Port of Abbot Point is required.

Submitter No.	419	Issue Reference:	4012 / 17012
Submitter Type	Government	TOR Category	Land (Land Contamination)
Name	DERM	Relevant EIS Section	Volume 5, Appendix 7, Contaminated Land – Appendix A to Appendix E

DETAILS OF THE ISSUE

Volume 5, Appendix 7, Appendices A to E of the EIS have not been provided for review and assessment.

PROPONENT RESPONSE

Waratah Coal have provided *Volume 5, Appendix 7, including Appendices A to E* (of the existing Galilee Coal Project EIS) in the *Appendices – Volume 2* of this SEIS.

Submitter No.	664	Issue Reference:	4092
Submitter Type	Council	TOR Category	Land
Name	Whitsunday Regional Council	Relevant EIS Section	

DETAILS OF THE ISSUE

Geology, geomorphology and soil

A complex of soil units across the proposed mine area include Kandosols and Rudosols, some prone to erosion and dispersion. The majority of the soils are also unsuitable as topsoils. Target Geology is the coal seams within the Bandanna Formation and Colinlea Sandstone. Surface geology is dominated by Cainozoic unconsolidated sediments including sands, silts and clays, laterised in part. Sediment depth varies up to 90m. There are 36 lots that cover the mine footprint, 6 with a potential High risk for contamination one of which is listed on the EMR for possible high levels of arsenic. The other 30 lots were classes as rural land use and ranked as Medium risk.

PROPONENT RESPONSE

Soils prone to erosion and dispersion have been discussed in Section 2 of the *Soils and Land Suitability SEIS Report* (contained in *Appendices – Volume 2* of this SEIS), with commitments for further work discussed in Section 6. Appendix B of the *Soils and Land Suitability SEIS Report* provides a list of the susceptibility of different soils to water and wind erosion. This information is mapped in Figures 2.4 and 2.5.

Refer to Issue Reference 4001 in Part C – 02 – Land for further information related to contaminated land matters.

Submitter No.	**1840**	Issue Reference:	**4093**
Submitter Type	Council	TOR Category	**Land**
Name	**Barcaldine Regional Council**	Relevant EIS Section	1.2.2.1 – Open-cut

DETAILS OF THE ISSUE

Out of pit spoil, dumps have a maximum height of 40m above ground level. Please advice on how impacts and final land form will be addressed with dump piles.

PROPONENT RESPONSE

Refer to Issue Reference 4040 in Part C – 19 – Decommissioning and Rehabilitation.

Submitter No.	**1840**	Issue Reference:	**4094**
Submitter Type	Council	TOR Category	**Land**
Name	**Barcaldine Regional Council**	Relevant EIS Section	3.1.5.2

DETAILS OF THE ISSUE

No description has been provided as to the mitigation measures to manage post-mining topography and landscape.

PROPONENT RESPONSE

Rehabilitation planning will ensure the total area of disturbance at any one time is minimised to reduce the potential for wind-blown dust, visual impacts and increased sediment-laden run-off.

Rehabilitation will be designed to achieve a safe and stable final landform compatible where practicable and possible with the surrounding environment. This will involve the reshaping of the majority of overburden emplacement slopes to <10°. Where slopes are >10°, additional drainage and revegetation works will be carried out to achieve the necessary erosion / sediment control and groundcover establishment.

The use of natural re-contouring will be incorporated in rehabilitation design and construction and treed vegetation will be retained where possible along the toe of rehabilitation areas. Where ever possible vegetation will be retained unless an unacceptable safety or erosion risk remains.

Waterways and diversions on the project site will be rehabilitated to a pre-determined post-mining standard. This will include the use of endemic native trees, shrubs and grasses where suitable.

The conceptual final landform for the entire site will be determined through consultation with relevant Government agencies and the local community. Once a conceptual design is finalised, a detailed Landscape Rehabilitation Plan, based on the desired post-mining landform will be developed and submitted to Government for consideration.

Refer to the *Rehabilitation and Decommissioning* section of the *Draft Mine EM Plan* contained in *Appendices – Volume 2* of this SEIS.

Submitter No.	419	Issue Reference:	4096
Submitter Type	Government	TOR Category	**Land**
Name	**DERM**	Relevant EIS Section	Volume 2, Mine – Section 3.8, Commitments (p138)

DETAILS OF THE ISSUE

The EIS commitments do not adequately cover notification to DERM of any notifiable activities undertaken by the mining company or notification of any contamination that is caused by mining activities during the operation of the mine.

The commitment to make any site with identified contamination suitable for its proposed post-mining use needs to include sites that are listed as notifiable activities because of the mining activities even when contamination is not identified. This must be based on an appropriate site investigation or validation report that results in the site being released from the EMR/CLR or the issuing of an appropriate suitability statement.

The applicant should commit to notify DERM of all notifiable activities or contamination on a site.

The applicant should commit to remediate any land listed in the EMR/CLR because of the mining activities.

After mining has ceased in an area that is listed on the EMR/CLR, the lease holder must commission a suitably qualified person to conduct a site investigation in accordance with the *Environmental Protection Act 1994*, the Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland May 1998 and the National Environmental Protection (Assessment of Site Contamination) Measure 1999. This investigation is required to validate that the remediation will allow the land to be removed from the EMR/CLR or to remain on the EMR with a site management plan and a suitability statement that indicates that the land is suitable for (at least) the proposed post mining land use.

It is recommended a Third Party Reviewer (TPR) be engaged in all instances where land is to be either removed from the EMR/CLR or requires management under a Site Management Plan. It should be noted that significant project delays may occur in the absence of a TPR.

PROPONENT RESPONSE

Refer to Issue Reference 4001.

Submitter No.	1840	Issue Reference:	4097
Submitter Type	Council	TOR Category	**Land**
Name	**Barcaldine Regional Council**	Relevant EIS Section	1.1.9

DETAILS OF THE ISSUE

The total waste thickness ranges 'from 20-120m'. Limited information on re-use of rock options within project or alternative use and further information from the proponent is needed.

PROPONENT RESPONSE

Rehabilitation plans for the project will be developed taking into account results from geochemical and geological investigations. The options for the re-use of rock will be dependent upon the findings of these studies and the composition and quantities of rock.

A geochemical assessment program has been initiated, and is described in more detail in Issue Reference 4098.

Submitter No.	1840	Issue Reference:	4098
Submitter Type	Council	TOR Category	Land
Name	Barcaldine Regional Council	Relevant EIS Section	3.1.13.1.2

DETAILS OF THE ISSUE

Physical and chemical properties (quality) of overburden are required to be used in assessments.

PROPONENT RESPONSE

To assess the physical and chemical characteristics of the mineral waste a scoping assessment of the project was undertaken by Environmental Geochemistry International. This included a site visit in May 2012 to view the project area and examine drill core through the mine stratigraphic sequence. Findings indicated that pyrite appears to occur in generally low abundances in overburden and interburden, apart from some isolated zones, and that the acid generation potential from pyrite in overburden and interburden is likely to be mostly offset by reactive acid neutralising calcitic carbonate.

These initial findings are being followed up with a geochemical assessment program with the following objectives:

- assess the acid rock drainage (ARD), salinity, sodicity/dispersion and elemental solubility (including neutral mine drainage, NMD) potential of the proposed mine materials
- identify any geochemical issues, and
- provide recommendations for materials management and any follow up test work required.

This program will provide sufficient information on the geochemical characteristics of mineral waste to identify the presence of pyritic materials and the overall relative distribution of geochemical rock types, help assist in planning follow up work to better define the continuity and variation of geochemical rock types, and define the main implications for mine materials management. The proposed sodicity/dispersion testing will provide preliminary information on these issues for mine materials and help direct any further investigations.

The report entitled *Preliminary Report on the First Stage Geochemical Assessment of the Galilee Coal Project* (included in *Appendices – Volume 2* of this SEIS) provides more details on the geochemical assessment program.

Submitter No.	1840	Issue Reference:	4099 / 19117
Submitter Type	Council	TOR Category	Land (Soils)
Name	Barcaldine Regional Council	Relevant EIS Section	3.1.3; 3.1.3.1

DETAILS OF THE ISSUE

Volume 2, Chapter 3 states: "…prone to erosion and dispersion…". Can the EIS identify the extent of dispersive soils?

- Please provide details on erosion and dispersion, and
- Please provide information as to the suitable landforms for the identified soil types.

PROPONENT RESPONSE

Soils prone to erosion and dispersion have been discussed in Section 2 of the *Soils and Land Suitability SEIS Report*, (contained in *Appendices – Volume 2* of this SEIS) with commitments for further work discussed in Section 6.

Appendix B of the *Soils and Land Suitability SEIS Report* provides a list of the susceptibility of different soils to water and wind erosion. This information is mapped in Figures 2.4, 2.5 and 2.8, Plans 1-8.

Submitter No.	364	Issue Reference:	4100 / 17048
Submitter Type	Government	TOR Category	Land (Soils)
Name	DEEDI (Agriculture & Food)	Relevant EIS Section	Volume 2 – 3.5.7

DETAILS OF THE ISSUE

The EIS does not adequately address the impacts on agricultural land use and good quality agricultural land. It makes broad statements such as:

- "During the operation of the mine, existing land uses, such as grazing may be able to continue within area not directly impacted by the open-cut mines and supporting infrastructure", and
- "The land is not considered to have high value for agriculture and as such, the mine would not be expected to have a significant impact on agriculture in the region".

DEEDI (Agriculture and Food) understands that there are numerous grazing properties, both uncleared and cleared, with improved pastures adjoining the lease areas. It is recommended that further information be provided on the specific impacts of the project on adjoining landowners and associated agricultural activities. This should also include clearly articulated measures to mitigate adverse impacts resulting from the development.

A number of research programs assessing grazing productivity/activity in the Desert Uplands have been undertaken, including research on properties in the vicinity of the proposed mine site. It is recommended that the proponents provide additional information on the likely impact of the project on agricultural research programs in the area, particularly the impact of the project on long term data sets/monitoring relevant to grazing research.

PROPONENT RESPONSE

Potential impacts to grazing properties adjoining the lease area are discussed in Section 3.4.1 of the *Soils and Land Suitability SEIS Report* (contained in *Appendices – Volume 2* of this SEIS), with commitments for further work discussed in Section 6.

Waratah Coal acknowledge that the project will result in the discontinuation of various currently occuring projects. Whilst acknowledging that this will produce spatial variability in the datasets, Waratah Coal would welcome the opportunity to discuss with DEEDI (Agriculture & Food) and other stakeholder agencies and NGO's, the potential to transfer these projects to other suitable locations in the region.

Submitter No.	364	Issue Reference:	4101
Submitter Type	Government	TOR Category	**Land (Soils)**
Name	**DEEDI (Agriculture & Food / Animal Science)**	Relevant EIS Section	General comments

DETAILS OF THE ISSUE

The impact of the rail line/s from the Alpha mines to the coast has the potential to destroy the value and productivity of good quality grazing and farming lands. The proposed rail corridor has the potential to destroy more 'good' quality agricultural land than the mine site.

The EIS does not adequately address the impact of the rail line/s on productive grazing and farming lands.

PROPONENT RESPONSE

The class and location of good quality agricultural land has been discussed in Sections 3.4.1 and 3.5 of the *Soils and Land Suitability SEIS Report* (contained in *Appendices – Volume 2* of this SEIS), with commitments for further work discussed in Section 6.

Appendix B of the *Soils and Land Suitability SEIS Report* provides a list of preliminary soil types and agricultural class. This information is mapped in Figure 2.8, Plans 1-8.

Submitter No.	364	Issue Reference:	4102
Submitter Type	Government	TOR Category	**Land (Soils)**
Name	**DEEDI (Agriculture & Food / Animal Science)**	Relevant EIS Section	General comments

DETAILS OF THE ISSUE

Rehabilitation methods for agricultural land need to be well defined, planned from the start, and implemented at all phases of the mining process to have any chance of success.

If land is to return, or maintain, some value for agriculture, a rehabilitation program must be developed, process and milestones clearly identified and the program followed/enforced explicitly.

The project proponents are advised to consult with local farmers and graziers in order to understand and deliver the best long term outcomes for agriculture in the region – including maximising rehabilitation success.

PROPONENT RESPONSE

Refer to the *Rehabilitation and Decommissioning* section of the *Draft Mine EM Plan* (contained in *Appendices – Volume 2* of this SEIS) for details of the proposed mine rehabilitation plans.

Submitter No.	**364**	**Issue Reference:**	**4103**
Submitter Type	Government	**TOR Category**	**Land (Soils)**
Name	**DEEDI (Agriculture & Food)**	**Relevant EIS Section**	Volume 3 – 3.5.8

DETAILS OF THE ISSUE

The EIS acknowledges the sterilisation of agricultural land, including potential class A land between KP25-85 and KP322-355.

PROPONENT RESPONSE

The class and location of good quality agricultural land has been discussed in Section 3.5 of the *Soils and Land Suitability SEIS Report* (contained in *Appendices – Volume 2* of this SEIS), with commitments for further work discussed in Section 6.

Appendix B of the *Soils and Land Suitability SEIS Report* provides a list of preliminary soil types and agricultural class. This information is mapped in Figure 2.8, Plans 1-8 of that report.

Submitter No.	**419**	**Issue Reference:**	**4104**
Submitter Type	Government	**TOR Category**	**Land (Soils)**
Name	**DERM**	**Relevant EIS Section**	Volume 2 Mine – 03 Land

DETAILS OF THE ISSUE

The EIS does not adequately address soils and land suitability assessment requirements. Soils and land suitability assessments have been discussed too broadly and have not been investigated to an acceptable level of detail.

The Land Suitability Assessment Techniques within the Technical Guidelines for the Environment Management of Exploration and Mining in Queensland state that soil mapping should be divided into two separate areas:

- Those parts of the lease which will not be disturbed by the mining activity
- Those parts of the lease which will be disturbed by mining.

Mapping of proposed disturbance areas of large mines should be conducted at a scale of 1:5000.

Mapping of proposed non-disturbance areas for a mine lease of 105 550 ha in size should be conducted at a scale of 1:250 000.

DERM would accept a soil investigation conducted at a 1:100 000 scale across the entire mining lease area. One quarter of the sites should be described in detail following the Australian Soil and Land Survey procedures. The remainder of the sites may be described in lesser detail, but sufficient to define the boundaries between different soils.

PROPONENT RESPONSE

The scope of work for a soils investigation of the mine site, meeting DERM/DEHP's requirements is provided in Appendix A of the *Soils and Land Suitability SEIS Report* (contained in *Appendices – Volume 2* of this SEIS). Appendix B of the *Soils and Land Suitability SEIS Report* provides a list of preliminary soil and land suitability classifications. This information is mapped in Figures 2.3, 2.4, 2.5, 2.6 and 2.7 of that report.

A Supplementary Soil Survey for the Proposed Open Cut Area report that gives details and the results of a preliminary soils survey within the open cut mining area is contained in the *Appendices – Volume 2* of this SEIS.

Commitments for further work are discussed in Section 6 of the *Soils and Land Suitability SEIS Report*.

Submitter No.	**419**	Issue Reference:	**4105**
Submitter Type	Government	TOR Category	**Land (Soils)**
Name	**DERM**	Relevant EIS Section	Volume 3 Rail, 03 Land

DETAILS OF THE ISSUE

The soil and land suitability assessment is inadequate. The soil and land suitability assessment has not been conducted to an acceptable level of detail.

An investigation of Acid Sulfate Soils for relevant areas of the proposal has not been provided in the EIS.

The EIS should include a soil and land suitability assessment of the rail corridor in accordance with DERM's draft working document Soil Survey Methodology along Linear Features. This document supplements Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining (DME, 1995)[1].

That the EIS should provide an Acid Sulfate Soil investigation and site specific Acid Sulfate Soil Management Plan, as required by the Terms of Reference.

PROPONENT RESPONSE

Desktop studies will be undertaken involving geological and soils mapping and acid sulfate soils (ASS) risk mapping. Where there is a possibility that ASS may be disturbed by the proposed works or there is a requirement under State Planning Policy 2/02[2] (SPP2/02), then a detailed field investigation and laboratory testing regime will be undertaken more or less in compliance with SPP2/02 and its attendant guidelines.

If investigations indicate the presence of ASS and if the proposed works may disturb the ASS, then management strategies will be developed base on the hierarchy of preferred strategies as set out in the Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines Version 3.8[3] issued by the Queensland Government. The hierarchy includes ASS avoidance and minimisation as well as treatment and handling strategies. The management strategies will be designed to mitigate any likely ASS impacts and will be set out in an ASS management plan to be approved by the Queensland Government.

The scope of work for a soils investigation of the mine site, meeting DERM/DEHP's requirements is provided in Appendix A of the *Soils and Land Suitability SEIS Report*. Appendix B of the *Soils and Land Suitability SEIS Report* (contained in *Appendices – Volume 2* of this SEIS) provides a list of preliminary soil and land suitability classifications. This information is mapped in Figures 2.3, 2.4, 2.5, 2.6 and 2.7. Commitments for further work are discussed in Section 6 of the report.

1 Department of Minerals and Energy. 1995. *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland*. Queensland Government.

2 State Planning Policy 2/02 *Guideline: Planning and Managing Development involving Acid Sulphate Soils. 2.0*. Queensland Government.

3 Dear, S.E., Moore, N.G., Dobos, S.K., Watling, K.M., Ahern, C.R. (2002). *Soil Management Guidelines, Queensland Acid Sulfate Soil Technical Manual*. Version 3.8, November 2002.

Submitter No.	419	Issue Reference:	19097
Submitter Type	Government	TOR Category	**Land (Land Use & Tenure)**
Name	**DERM**	Relevant EIS Section	Volume 2, Chapter 4, Land Use and Tenure (p146) and Volume 3, Chapter 4, Land Use and Tenure (p206)

DETAILS OF THE ISSUE

The proposed rail line from the mine to Abbot Point intersects the Stock Route Network at thirteen points.

The EIS identifies all stock routes which intersect the proposed rail corridor and in Chapter 13 Rail and Transport (p467) proposes to mitigate the impacts to stock routes.

On 17th October 2011 DERM attended a presentation on this EIS, where the proponent's representative advised that stock would not be crossing the rail line/s. This will mean that the Stock Route Network would be severed at thirteen locations, which would not be acceptable.

This advice contradicts the commitment made in the EIS to mitigate the impacts on stock routes.

The EIS should detail how travelling stock can be moved from one side of the rail corridor to the other and thereby maintain the utility and connectivity of the stock route network.

PROPONENT RESPONSE

Stock routes have been allowed within the rail design, and will be specified in detail during the detailed design stage. It is not intended to severe any stock routes.

Submitter No.	425	Issue Reference:	19098
Submitter Type	Individual	TOR Category	**Land (Land Use & Tenure)** / Nature Conservation
Name	**Name withheld**	Relevant EIS Section	

DETAILS OF THE ISSUE

Noxious weeds.

PROPONENT RESPONSE

The *Draft Mine EM Plan* and *Draft Rail EMP* contain weed management measures including control strategies for environmental weeds such as Parthenium and Buffel Grass (see *Appendices – Volume 2* of this SEIS). Section 2 of the *Initial Biosecurity Management Strategy* provides measures to deal with weed species (see *Initial Biosecurity Management Strategy* in *Appendices – Volume 2* of this SEIS).

Submitter No.	534	Issue Reference:	19099
Submitter Type	Individual	TOR Category	**Land (Land Use & Tenure)** / Social
Name	**Name withheld**	Relevant EIS Section	

DETAILS OF THE ISSUE

Coal dust covering the grass that cattle eat.

PROPONENT RESPONSE

The revised Mine EM Plan and Rail EMP will contain management measures for control of dust emissions generated from mine and rail activities.

Note also that Waratah Coal commits to the following control measures that will significantly reduce coal dust from the rail and unloading operations:

- Use of tippler wagons (gondola) rather than the more traditional bottom dump wagons. This will eliminate or reduce to negligible any coal hang up, which is frequently associated with bottom dump wagons, particularly in wet weather, and
- Use of covers for wagons. The covers proposed for use are approved for, and have been proven in, the service of contaminated material in the USA.

Submitter No.	419	Issue Reference:	17038 / 8016
Submitter Type	Government	TOR Category	**Land (Geology)**
Name	**DERM**	Relevant EIS Section	Vol 2 Mine, Chapter 1 Project Description, Section 1.1.7 Stratigraphy of the Galilee Basin (p13)

DETAILS OF THE ISSUE

In this section and in the EIS generally, there is insufficient data to determine where the mine sits geologically and geographically, especially in relation to the Rewan formation and the overlying GAB aquifers.

Surface geology presented through the EIS indicates that potentially some GAB formations may exist on the western edge of the mine. In this section a description is given which indicates that only the Rewan (base of the GAB) is intermittently present.

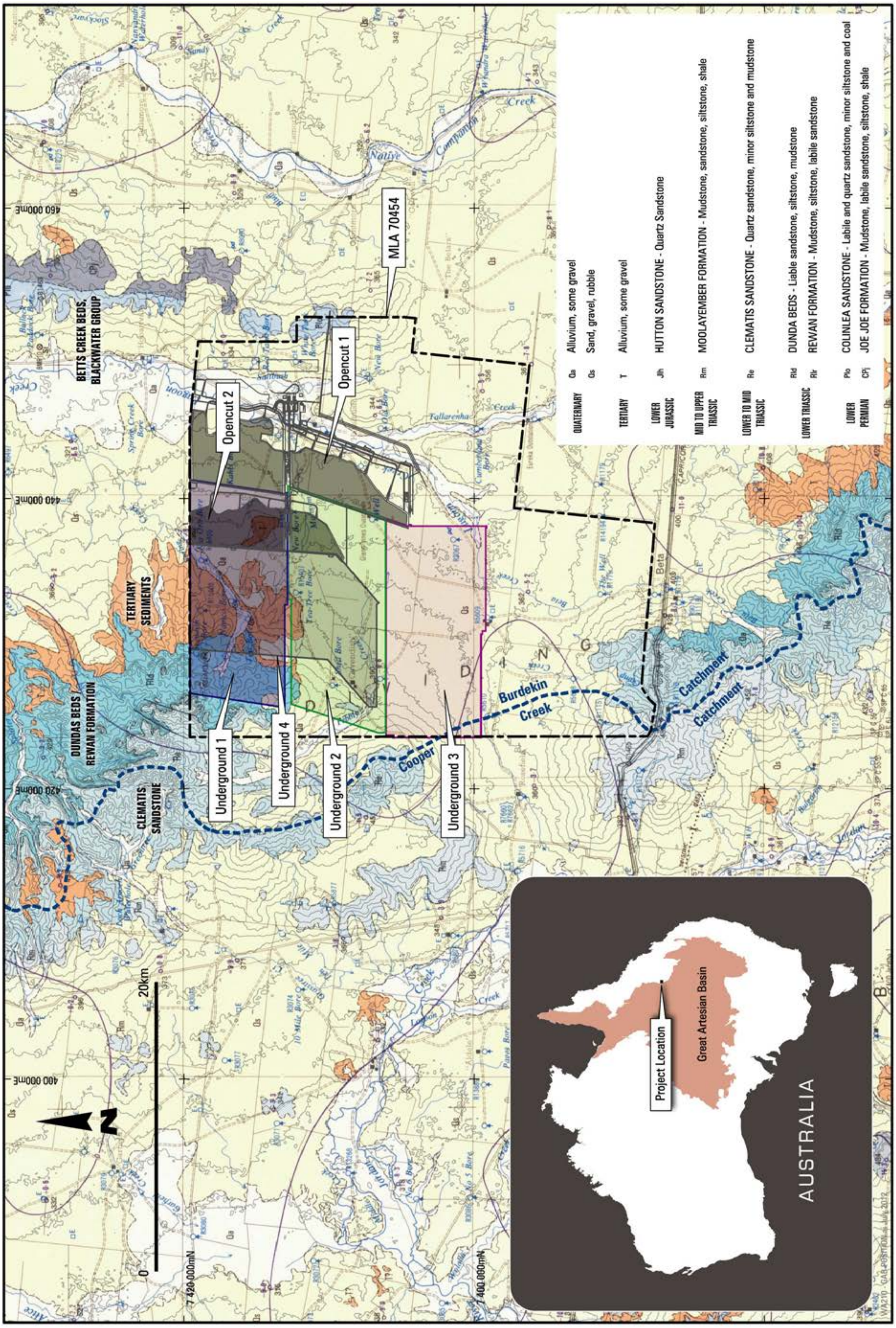
All cross sections that are provided throughout the EIS provide little indication of where the mine starts and stops in relation to the cross sections and no plans are supplied with the cross sections again to demonstrate where the sections run.

The EIS should provide a west to east cross section(s) that clearly identifies the extent of the proposed mining area (the mine footprint) along with the geological formations (including the Rewan) to the west and east of the mine site.

PROPONENT RESPONSE

Waratah Coal have now completed more detailed investigations into the geographical location of the mine area in relation to the mapped or recorded underlying geological lithologies and specifically in reference to the Great Artesian Basin. See Figure 1.

Figure 1. Mine Location Map



Mine Location Map, Showing Mine foot print, (both open-pit and underground), the Great Dividing Range as a barrier between Coopers Creek and Burdekin Catchments. Mapped Geology is from the Jericho 1:250K government series SF 55 – 14.

The stratigraphic bottom of the of the GAB was previously erroneously reported in the EIS as the base of the Clematis Sandstone, this has now been rectified and the stratigraphic base of the GAB is now being reported as the base of the Lower Triassic, Dunda Beds and Rewan Formation, a (thick 100m to 175m) aquitard that lies beneath the Clematis Sandstone. The Clematis Sandstone is thus the most easterly outcropping aquifer of the GAB in the vicinity of the mine. As shown in Figure 2, the Clematis Sandstone outcrops on the very far west of the proposed underground mine foot print (note however that the Clematis Sandstone will not be affected by the underground mining operations as it is vertically separated from the workings (which lie far enough beneath it to not affect it) – see *Longwall Mining Subsidence* report in *Appendices – Volume 2* of this SEIS for more information regarding this).

The location of the base of Dunda Beds/Rewan Formation sub crop line over all of the mine area is obscured by the Tertiary and Quaternary cover sequences. The Dunda Beds/ Rewan Formation rocks only outcrop in the northern-western corner of the underground mine area with the eastern most actual subcrop of these rocks covered by a tertiary cover.

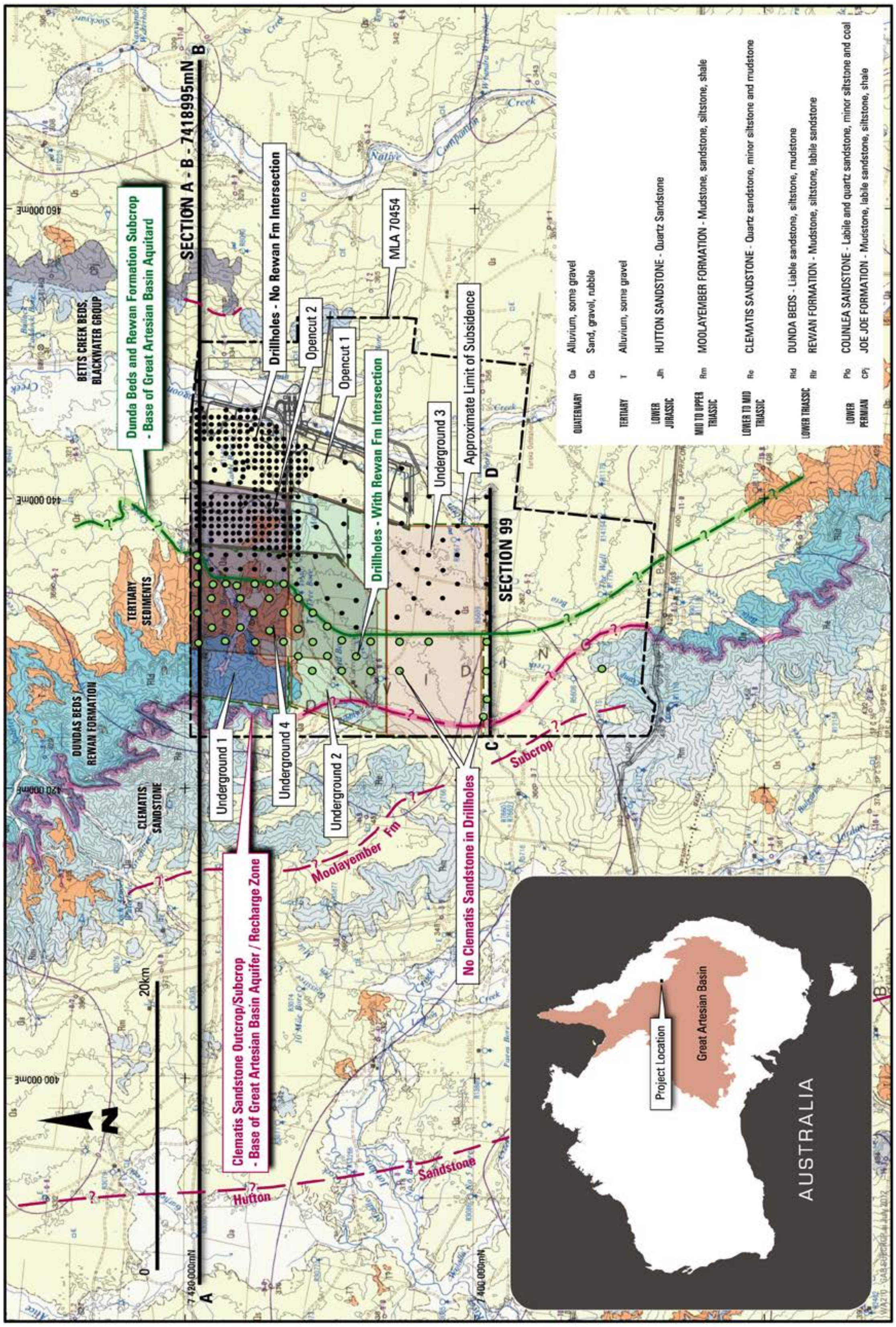
The "subcrop" line in this area was projected from a re-interpretation of the Waratah Coal boreholes drilled in this area, and the position was confirmed by the Hancock interpretation of the same, to the north.

In the south of the mining lease area, where there are poor rock outcrop and much less drilling completed to date, the projection of the base of the GAB is less factual, however, Waratah Coal's interpretation is in line with stratigraphic level in mapped lithologies to the south of the Alpha – Jericho highway.

The initial problem with delineating the base of the Rewan has been corrected by the re-interpretation of Waratah Coal borehole geological and geophysical logs. This in conjunction with correctly relating this to the base of the Lower Triassic Dundas Beds and Rewan Formation, a thick (100m) aquitard that lies beneath the Clematis Sand stone, the most easterly outcropping aquifer in the GAB. This is shown in the following cross sections, Figures 3 and 4.

See also the Groundwater Assessment report contained in *Appendices – Volume 2* of this SEIS.

Figure 2. Relationship with GAB



Green dots show Waratah holes that intersect the rocks of the Dundas Beds/Rewan Formation. Black dots Waratah show holes with no Rewan intersection. Green Line is thus the most easterly aquitard for the GAB, and as such, most east ward projected position of the GAB, as interpreted from sub surface borehole data (sub-crop).

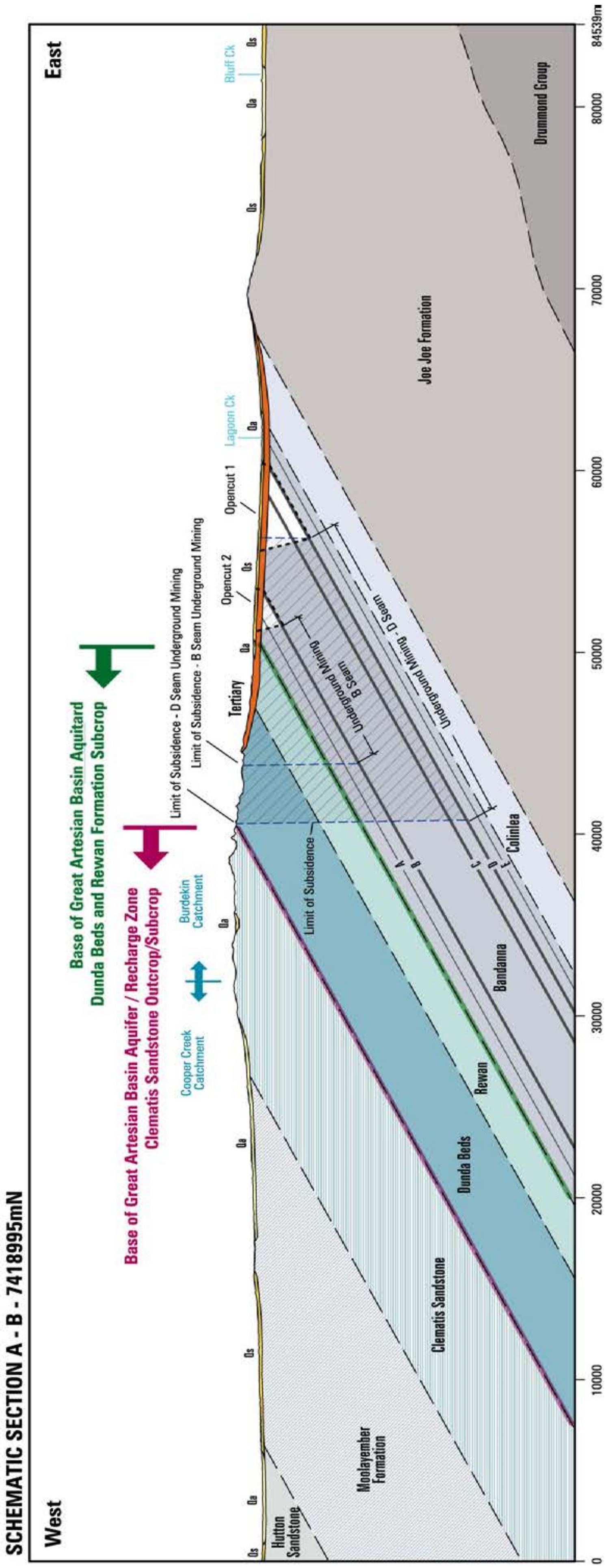
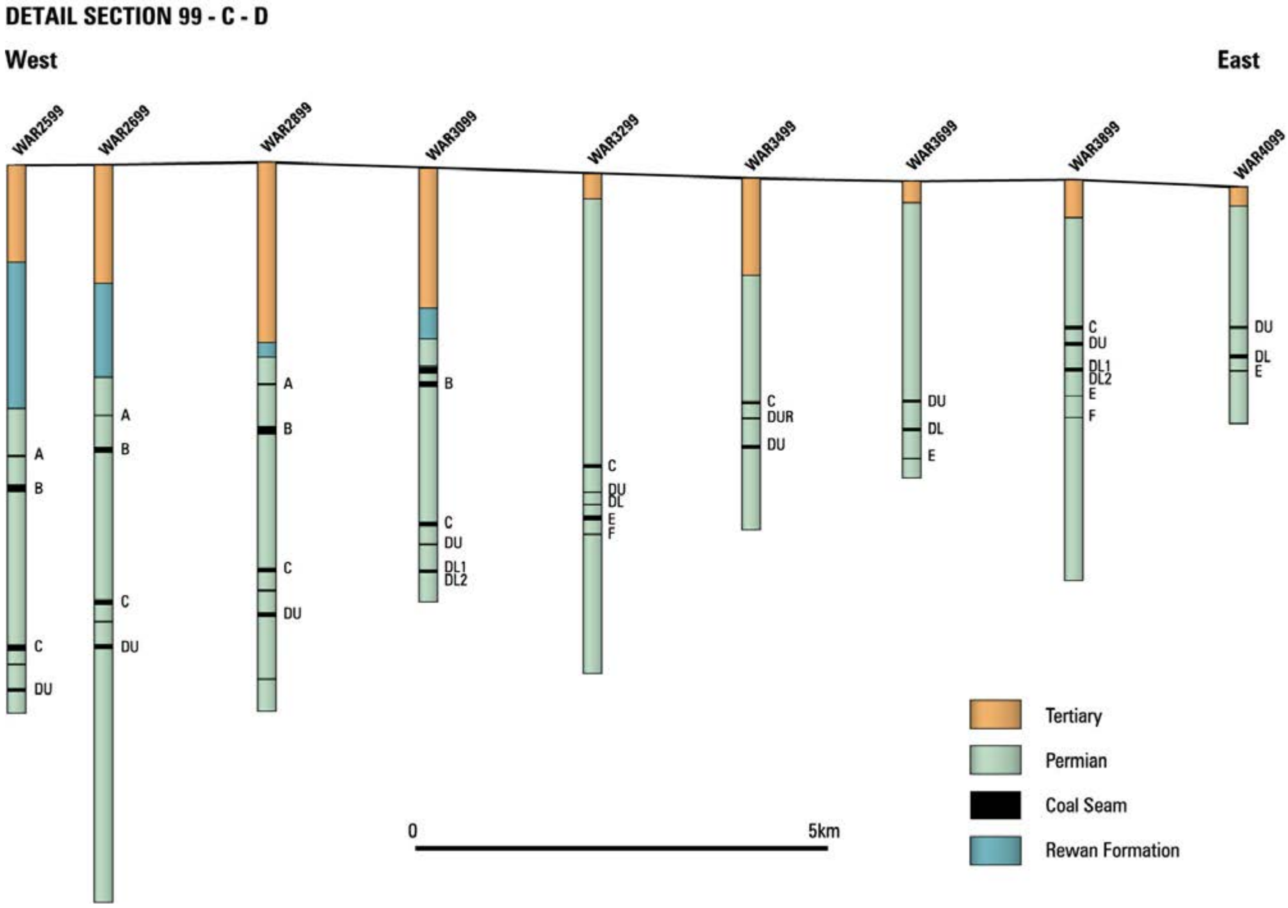


Figure 3. Schematic Cross-Section

Figure 4. Detail Section



SUBMITTER NO.	1840	ISSUE REFERENCE:	10010 / 8018
SUBMITTER TYPE	Council	TOR CATEGORY	**Land** / Water Resources (Groundwater)
NAME	**Barcaldine Regional Council**	RELEVANT EIS SECTION	1.3.6

DETAILS OF THE ISSUE

Surface subsidence and suitability for grazing land post mining.

Noted "groundwater... predicted level of subsidence, cracking of overlying geology is likely to occur" with "rapid infiltration of rainfall into the aquifers... flow into goafs potentially leading to increased dewatering." Please provide further details.

PROPONENT RESPONSE

The soil profile will remain intact, with surface tension cracks only occurring in areas where depth of cover to mining horizon is less than about 180m. In these cases remedial works may include ripping, re-compacting and seeding of all tension cracks and reshaping any internally draining areas to be externally draining by the construction of contour drains and top soiling and seeding any disturbed areas. These works will extend to blanketing and compacting of some water courses post-subsidence, preventing inflow of runoff into underground mining areas and maintain environmental surface flows. Materials which have been investigated for use in compacted blankets include silty alluvium and clay. Some minor earthworks will be necessary, but the work done so far allows these activities to be well planned prior to subsidence in any particular area. The natural fall of the mining area drains freely to the north and is sufficient to minimise the events of subsidence troughs. In the flatter areas, reshaping of any internally draining areas to be externally draining will be done by the construction of contour drains and appropriate rehabilitation measures.

The new groundwater model includes the fractured zone as a matter of course and sensitivity analysis on a range of permeability profiles that bracket likely and worst case scenarios. Higher infiltration rates will be short-lived as the cracks will infill with sediment after one or more rainfall events or will be managed as described above.

The subsidence impact assessment has recently been completed and revised flood modelling has been undertaken using the post-mine ground surface to assess changes to the flooding and stream flow regimes as a result of subsidence (refer *Longwall Mining Subsidence* report and *Surface Water Impact Assessment of Longwall Mining Subsidence* report contained in *Appendices – Volume 2* of this SEIS).

Submitter No.	**419**	Issue Reference:	**10006 / 6037 / 2013 / 8017**
Submitter Type	Government	TOR Category	**Land (Land Disturbance)**
Name	**DERM**	Relevant EIS Section	Chapter 3 Land, Section 3.5 Potential Impacts, Section 3.5.2 Subsidence (p134)

DETAILS OF THE ISSUE

This section of the EIS is inadequate. This section should discuss the potential impacts of subsidence. This section of the EIS does not adequately address ponding of water within the subsided panels, the impacts and risks associated with the construction of drainage works to link this ponded area to the existing drainage paths or impacts on watercourses, such as loss of surface flows, reduction in contributing catchment, instability of the physical integrity of the watercourse. Furthermore no mitigation measures or management options are proposed to address these impacts.

Impacts may include:

- lowering of bed and banks
- creation of in-stream waterholes
- changes to local drainage patterns
- incision processes
- stream widening
- erosion
- increased overbank flows due to lowering of the high banks
- tension cracking through both shallow and deeper underlying strata, (including aquifers)
- root shear and loss of riparian vegetation and groundwater.

The proponent should refer to the DERM draft guideline (version 7.0) '*Watercourse Subsidence – Central Queensland Mining Industry*'.

PROPONENT RESPONSE

Subsidence

Longwall mining has minimal impact on surface topography compared to that of open-cut mining operations. Surface changes due to longwall mining are dependent on the amount of surface subsidence, determined by factors such as overlying strata geology, the longwall block width, the seam height extracted, and the depth of cover. Post-subsidence landforms will be modelled and surveyed to better predict future subsidence quantities. Subsidence impacts on the surface include the formation of tension cracks and in flat areas internal drain way subsidence troughs can form.

The effects of subsidence through four underground longwall operations will be spread over 34,000ha for life of mine period of 25 years. The majority of land being affected through these operations is classified as Agricultural (Class C1, C2 Good Quality Agricultural Land Classification). Commercial grazing activities will take place in conjunction with subsidence activities. Active subsidence areas will be temporarily quarantined allowing remedial works to complete a completed rehabilitation landform. The grazier and landowner will use temporary electric fencing to exclude cattle from the active subsidence areas for a period of a few months depending upon the season.

Subsidence monitoring will also aid in calibrating predictive computational modelling and allow a refinement of predictions of subsidence during operations to help plan grazing and mining activities. The foundation for this will be laid during the early construction period.

Soil erosion monitoring is being undertaken on both grazing and agricultural catchments and "before-subsidence" catchments to quantify the level of soil erosion which may take place during the subsidence process.

Types of remedial works may include ripping, re-compacting and seeding of all tension cracks and reshaping any internally draining areas to be externally draining by the construction of contour drains and topsoiling and seeding any disturbed areas. These works will extend to blanketing and compacting of some water courses post-subsidence, preventing inflow of runoff into underground mining areas and maintain environmental surface flows. Materials which have been investigated for use in compacted blankets include silty alluvium and clay. Some re-alignment of water courses and minor earthworks will be necessary, but the work done so far allows these activities to be well planned prior to subsidence in any particular area. The natural fall of the mining area drains freely to the north and is sufficient to minimise the events of subsidence troughs. In the flatter areas, reshaping of any internally draining areas to be externally draining will be done by the construction of contour drains and appropriate rehabilitation measures.

On the cessation of subsidence in any one area and completion of remedial works, it is planned that the land will be returned to grazing and original land activities. Yield trials will verify the maintenance of original land productions.

Longwall mining at shallow depths at German Creek and Oaky Creek has shown that tree roots remain unaffected by subsidence and vegetation continues to persist. The project area surface stratigraphy contains cohesive Quaternary alluvial and Tertiary sands, clays and laterites which are self-healing to tensile surface fracturing. Surface tension cracks which form in cohesionless creek bed alluvium and Recent Colluvium are self-healing and readily infill. Open tension cracks in surface clays need to be ripped and compacted.

Impacts on drainage

Revised flood modelling has been undertaken using a post-mine ground surface (refer to the *Surface Water Impact Assessment of Longwall Mining Subsidence* report contained in *Appendices – Volume 2* of this SEIS). This modelling identifies locations of changes to the surface flow regime and assesses possible mitigation measures where necessary in accordance with *Watercourse Subsidence – Central Queensland Mining Industry Guideline*.

Additional aquatic ecosystem assessments have been undertaken, including an assessment of the potential impacts of the mining activities on aquatic ecosystems. Potential impacts on water quality and aquatic ecosystems relating to activities associated with the project are defined and discussed in the *Mine Aquatic Ecology* report and the *Water Quality Monitoring Program* contained in the *Appendices – Volume 2* of this SEIS.

For further information regarding subsidence and impacts refer to *Longwall Mining Subsidence* report in the *Appendices – Volume 2* of this SEIS.

Submitter No.	**1840**	Issue Reference:	**6088**
Submitter Type	Council	TOR Category	Water Resources / **Land**
Name	**Barcaldine Regional Council**	Relevant EIS Section	Mine Flood Modelling

DETAILS OF THE ISSUE

- App 17 the model has not been calibrated, does not incorporate post-design flood impacts and notes flow rates of $600m^3$/sec on Lagoon Creek. What are the impacts on Tallarenha Creek, the subject of dam installation and other?
- Flood impacts are confined to 1:100 year max. in reporting.
- Flood modelling does not note any information relating to subsidence (as suggested in 1.3.6.1 'flood modelling on the site has indicated that the subsidence will have minimal impact on the upstream and downstream processes")

Impacts of mining, proposed dam, diversion channels, underground/above ground, storage dams and spoil piles should be considered in the flooding impacts assessment and that scaled topographical data be obtained from proponent at scale (<25m).

A simulated post mining flood model for final topographical land form is also required to enable proponent to design and assess potential impacts and appropriate mitigation.

Flood modelling probabilities should be extended based on recent flooding impacts 2010/11 to include min 1:500/ 1:1,000 ARI.

PROPONENT RESPONSE

Revised flood modelling has been completed based on the proposed creek diversions and flood protection levees within the mine lease area (see the *Mine Site Creek Diversion and Flooding* report in *Appendices – Volume 2* of this SEIS). The modelling has been undertaken for average recurrence intervals ranging from the 1 in 2 year to the 1 in 1000 year flood events. The design flow rate for these events has been revised through validation against flood frequency analysis of the flow gauging station on Native Companion Creek. This flood frequency analysis has been extended to include the 2010/2011 wet season which has resulted in larger flow rates than originally reported.

The 1 in 1000 year flood modelling is consistent with the DERM requirements for the protection of mine infrastructure, people and on site containment dams. The dam located on Tallarenha Creek is no longer proposed and therefore does not impact the flood behaviour within the area. Results of the post mine flood modelling indicate the proposed creek diversions and flood protection levees do modify the flood behaviour due to redirection of flow and reduction in floodplain storage. However, these impacts are localised and are wholly contained within the mine lease area. The flood modelling study undertaken for the creek diversions and waterways in the vicinity of the open cut coal mines and mine industrial area is detailed in the *Mine Site Creek Diversion and Flooding* report (contained in *Appendices – Volume 2* of this SEIS).

The potential maximum impacts of underground longwall mining associated with the proposed Galilee Coal Project on flood and stream flow characteristics within the underground mining area have been identified and are described in the *Surface Water Impact Assessment of Longwall Mining Subsidence* report (contained in *Appendices – Volume 2* of this SEIS).

Flood modelling has been undertaken to identify subsidence ponding areas and changes to flood inundation depths, extents and velocities as a result of mine subsidence. Water balance modelling has been performed to assess the potential reduction in stream flow volumes as a result of underground mine subsidence and capture of runoff in open cut pits and dams. Modelling has been undertaken in accordance with *Watercourse Subsidence – Central Queensland Mining Industry Guideline*.

Management strategies to reduce the impacts of subsidence on waterways are identified in the *Surface Water Impact Assessment of Longwall Mining Subsidence* report (contained in *Appendices – Volume 2* of this SEIS).

Submitter No.	**1840**	**Issue Reference:**	**17032 / 4095**
Submitter Type	Council	**TOR Category**	**Land**
Name	**Barcaldine Regional Council**	**Relevant EIS Section**	1.2.2.1 – Open-cut

DETAILS OF THE ISSUE

"The mining blocks have been designed with a 20m bench in the advancing high wall at the base…. for any soft material slumping."

Please address the method and slumping and clarify management and geological conditions- during operation and post LOM.

Query the batter angle stability in the Tertiary horizon of 45 degrees.

PROPONENT RESPONSE

The batter angles for all excavations will be determined as part of the mine planning and monitoring during mine development and operations. All decisions will be made on the best practice at the time and what is otherwise standard practice.

The batter angle of 45° in the Tertiary horizon is a nominal value and may be varied during operations. The width of the advance bench has been selected as a safety precaution against any failure of the 45° slopes. 'The overall stability of the Tertiary Clay on the highwall advance bench is largely dependent on the width of the highwall bench at the Permian strata level. If the advance bench is wide enough, any local failure of Tertiary Clay would not have an interactive effect on the highwall immediately above the mining horizon.' (Refer to EIS Vol 2, Section 1.2.2.1, 6th dot point.)

The recommended batter angle for the Permian rock is 0.5 (horizontal) to 1.0 (vertical).

Submitter No.	1840	Issue Reference:	17036
Submitter Type	Council	TOR Category	Land
Name	Barcaldine Regional Council	Relevant EIS Section	1.2.2.7 Underground

DETAILS OF THE ISSUE

Longwall mining blocks ..width 480m and lengths to 7,000m

A long term plan for the final land form and rehabilitation is required prior to impacts occurring. Further works and understanding is required to enable reinstatement of grazing industry following LOM as it has been noted that major subsidence is predicted and final voids will be of up to 120m in depth.

PROPONENT RESPONSE

Waratah Coal aims to minimise the potential impact of subsidence that may result from longwall mining undertaken by its operation and proactively manage subsidence impacts that may result from its underground operations. This includes the prevention and management of impacts as well as monitoring to provide early identification of impacts.

More specifically, the objectives of the Subsidence Management Strategy are to:

- Outline the monitoring and measurement protocols
- Establish responsibilities for the management of subsidence related issues during and immediately following underground mining
- Satisfy the applicable regulatory requirements for subsidence management across the Waratah Coal Project
- Justify the relevance, suitability and adequacy of the proposed mine layout and mine sequence with respect to subsidence related issues
- Establish management priorities and detail the proposed mitigation/remediation and management measures. This includes presenting contingency plans / procedures, and
- Detail the review and reporting protocols.

Subsidence Management Process, Structure and Organisation

Waratah Coal's overall approach to subsidence management includes the following:

- Design to reduce surface impacts – Mine design is such to reduce the potential impact to public safety, the natural environment and built features
- Identify and manage environmental risks – specialist studies (including subsidence) are prepared to identify potential impacts to public safety, the natural environment and built features
- Measure baseline information – Background data is established for the surface above the proposed mining area, this will include the establishment of subsidence monitoring points
- Monitor the effects of mining – Continued monitoring of data for the surface above the proposed mining area, including subsidence monitoring points
- Regularly assess and interpret monitoring – Monitoring data is analysed to identify any variances
- Re-assess impacts – Where variances are identified that are greater than predictions, additional assessment of impacts is undertaken
- Identify and implement remedial actions – If additional assessment indicates greater impacts, then remedial action may be required. Stakeholder consultation will be undertaken in determining and implementing remedial actions, as required

- Implement remedial actions – In the event that any surface impacts due to subsidence are noted, appropriate remediation and/or mitigation measures will be implemented in consultation with appropriate stakeholders, and
- Provide regular progress reports – Progress reports will be provided to relevant parties in accordance with reporting conditions outlined in approval documentation.

Final land-form and rehabilitation specifics will be set out in the Environmental Authority, the EM Plan and the Rehabilitation and Decommissioning Plan. The general rehabilitation goals, objectives and strategies for the project are set out in section 1.3.3 of Vol 2, Chapter 1 of the EIS.

Submitter No.	364	Issue Reference:	17037
Submitter Type	Government	TOR Category	Land (Geology)
Name	DEEDI (Mining and Petroleum Operations)	Relevant EIS Section	Vol 2 1.1.5

DETAILS OF THE ISSUE

Resource sterilisation – Resource description should fully describe all coal seams on the subject tenures and clearly state the efficiency of coal recovery. Potential resources that may be sterilised from future mining should be stated and shown in maps and diagrams of appropriate scale, including the level of resource knowledge in JORC terms.

PROPONENT RESPONSE

Resource sterilisation

Resource description should fully describe all coal seams on the subject tenures

The target coal seams in the project area (EPC 1040 and part of 1079) are found in the Late Permian age Bandanna Formation and the Colinlea Sandstone.

The coal is found in four major seams – B, C, DU, and DL.

The total resources for the Galilee Coal Project as of 24th February 2010 are estimated to be 3.684 Billion tonnes (Bt) of JORC compliant coal resources. The resources are quantified and categorized as 1.975 Bt of measured resources, 569 Million tonnes (Mt) of indicated and 1.140 Bt of inferred resources. The estimate has found there is approximately 0.6 Bt in the concept open-cut and the remaining 3.1 Bt in the concept underground.

Australia wide the majority of coal projects JORC compliant coal resources are rarely fully recoverable, due to geological conditions, geotechnical conditions, hydrogeological conditions, mining technique, coal quality, geographical location, infrastructure, and marketing conditions to name a few.

The Galilee Coal Project open-cut mining areas will mine seams B, C, DU, and DL. These seams will be mined to an economic depth of cover extent, which include 579 Mt of coal. Beyond this economic cut off limit, underground operations will commence.

The quantity of coal being extracted by the from open-cut operations are the respective seams is shown in Table 1.

Table 1. Resource Estimate Summary by Conceptual Mining Type

Resource Category	Value	SEAM B	SEAM C	SEAM DU	SEAM DL	Total Tonnes
		Feb-10	Feb-10	Feb-10	Feb-10	Feb-10
Measured	Volume (Mm³)	572	159	264	294	
	Area (Ha)	9,685	11,400	13,651	12,276	
	Thickness (m)	5.10	1.40	1.94	2.40	
	Insitu Density (t/m³)	1.62	1.38	1.38	1.40	
	Sub total Tonnes (Mt)	**974**	**220**	**367**	**414**	**1,975**
Indicated	Volume (Mm³)	121	47	47	155	
	Area (Ha)	2,031	3,410	2,443	6,213	
	Thickness (m)	4.90	1.37	1.91	2.49	
	Insitu Density (t/m³)	1.74	1.36	1.38	1.43	
	Sub total Tonnes (Mt)	**219**	**64**	**65**	**221**	**569**
Sub total Measured + Indicated		**1,193**	**284**	**432**	**635**	**2,544**
Inferred	Volume (Mm³)	197	165	114	261	
	Area (Ha)	3,343	10,939	6,331	11,463	
	Thickness (m)	4.69	1.51	1.80	2.26	
	Insitu Density (t/m³)	1.87	1.36	1.34	1.42	
	Sub total Tonnes (Mt)	**391**	**225**	**152**	**371**	**1,140**
Grand Total Tonnes		**1,584**	**509**	**584**	**1,006**	**3,684**

The China First Project underground mining areas will selectively mine seams which can be mined safely and efficiently, without endangering the lives of workers. The seam selection criteria are based on geological conditions, geotechnical conditions, hydrogeological conditions, longwall mining technique, coal quality, and geographical location. There are four longwall mining areas which will selectively mine various seams.

Underground longwall mine 1 will extract DU seam, based on the superior coal quality and coal thickness within the northern section of mining tenure. The estimate of coal to be extracted within underground 1 operation is 300 Mt. Seams C and DL within the foot print of underground 1 mining area will be left due to interburden thickness rendering extraction unsafe. The estimated amount of coal left is the thickness of the C and D seams, being 1.5m and 2m thick respectively.

Underground longwall mine 2 will extract DL seam, utilising longwall mining operations. The DL seam is selected due to superior coal quality, working section height and geotechnical conditions. An estimate of coal to be extracted through this system is 340 Mt. Within the footprint mining area of longwall two seams C and DU are left due to insufficient interburden thicknesses rendering extraction unsafe. The estimated amount of coal left is the thickness of the C and D seams, being 1.5m and 2m thick respectively.

Underground longwall mine 3 will extract DL seam, utilising longwall mining operations. Similar to underground two DL seam is selected due to superior coal quality, working section height and geotechnical conditions. An estimate of coal to be extracted through this system is 340 Mt. Within the footprint mining area of longwall two seams C and DU are left due to insufficient interburden thicknesses rendering extraction unsafe. The estimated amount of coal left is the thickness of the C and D seams, being 1.5m and 2m thick respectively.

Underground longwall mine 4 will extract B8 seam, utilising longwall mining operations. The B8 seam is selected due to superior coal quality, working section height and geotechnical conditions. An estimate of coal to be extracted through this system is 320 Mt.

The total estimate of underground coal to be extracted from undergrounds 1, 2, 3 and 4 will be 1,300 Mt of coal. The quantity of underground coal being estimated as JORC resources is shown in Table 1. Approximately 42% will be recoverable underground resources.

Plans showing resources extend and open-cut and underground mining areas are shown in Figures 5 through to 12. Figure 5 through to Figure 9 display the B seam. Figures 10, 11 and 12 show seams C, DU and DL respectively.

Figure 5. B2 Seam Resource Areas

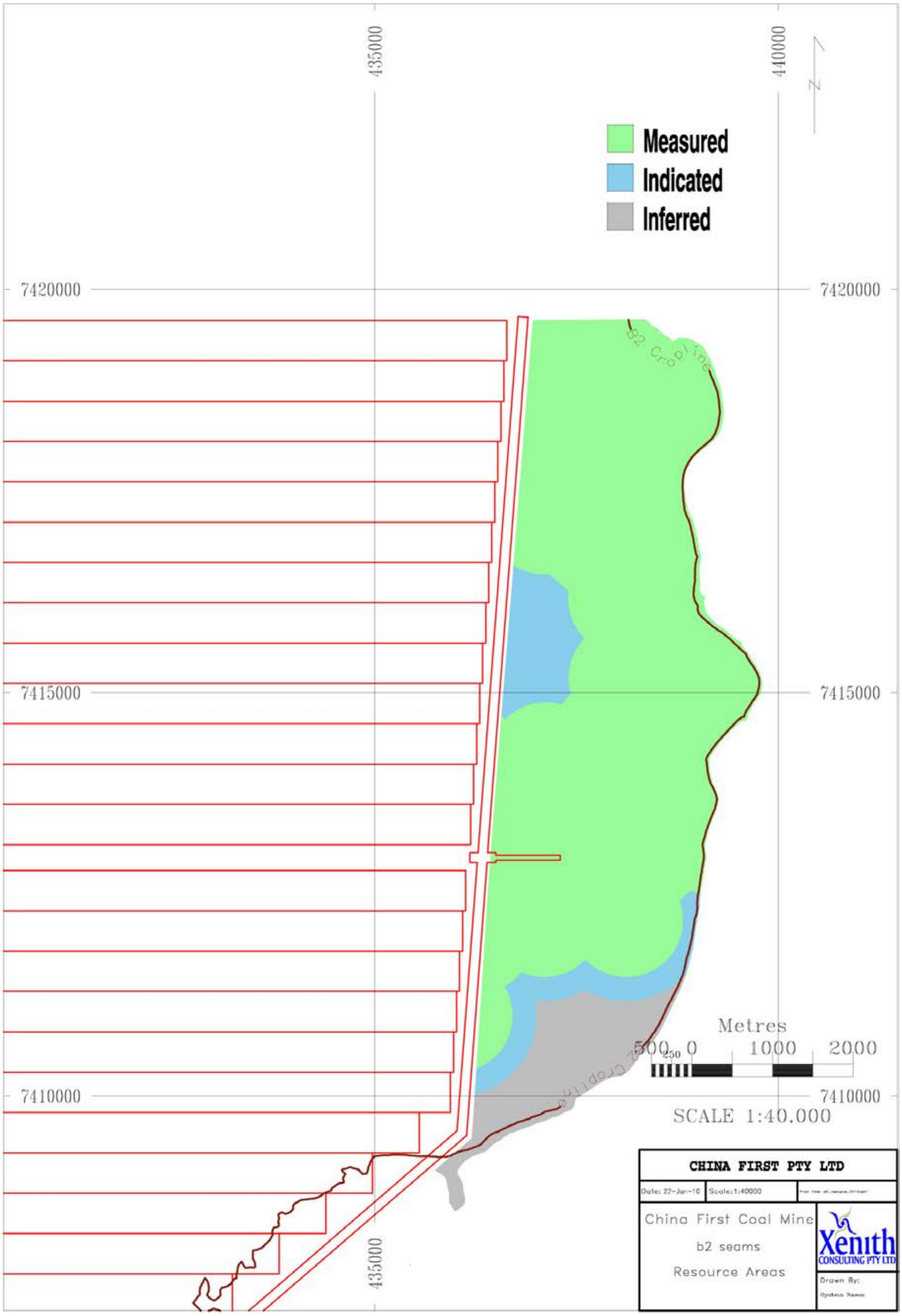


Figure 6. B4 Seam Resource Areas

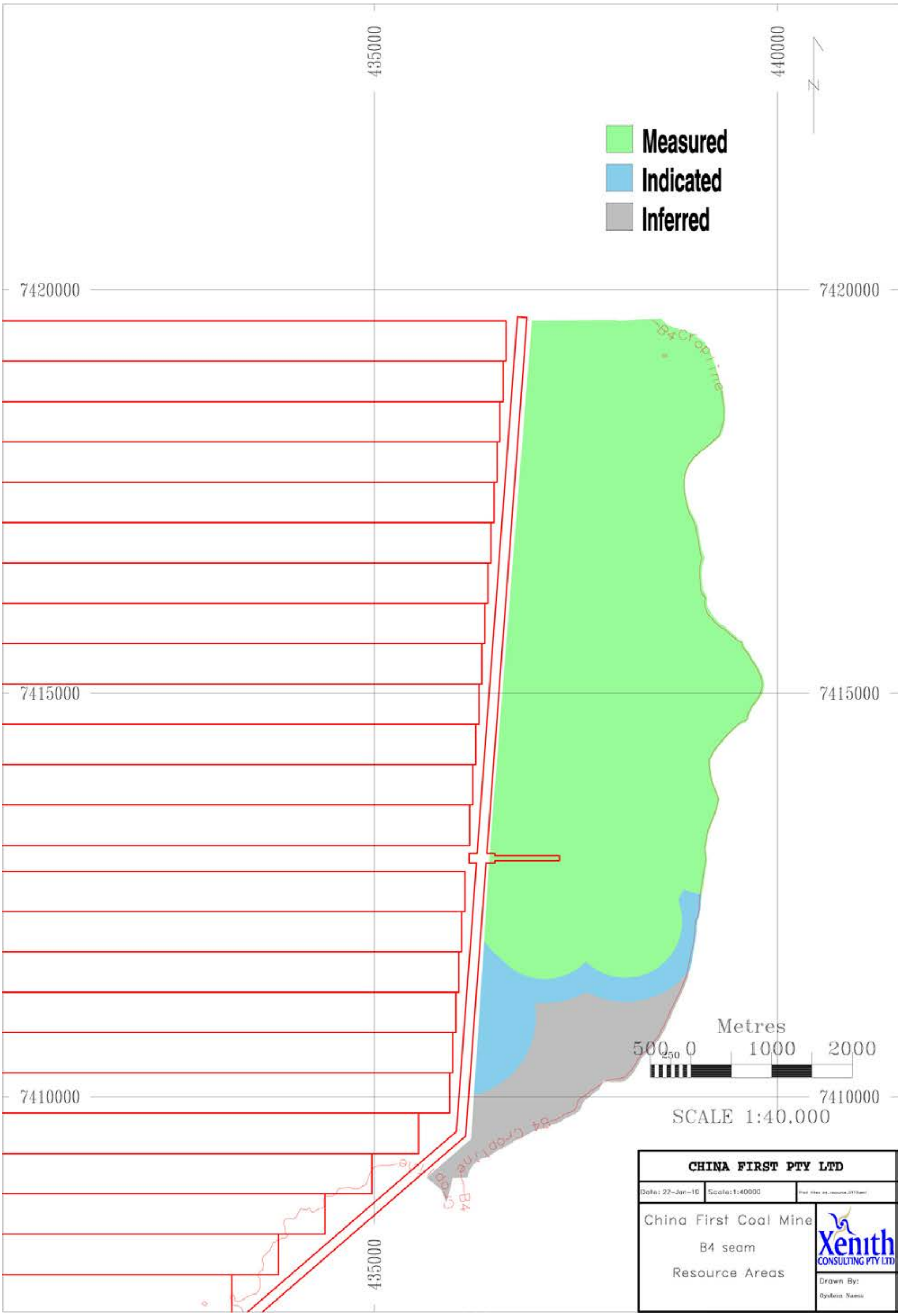


Figure 7. B6 Seam Resource Areas

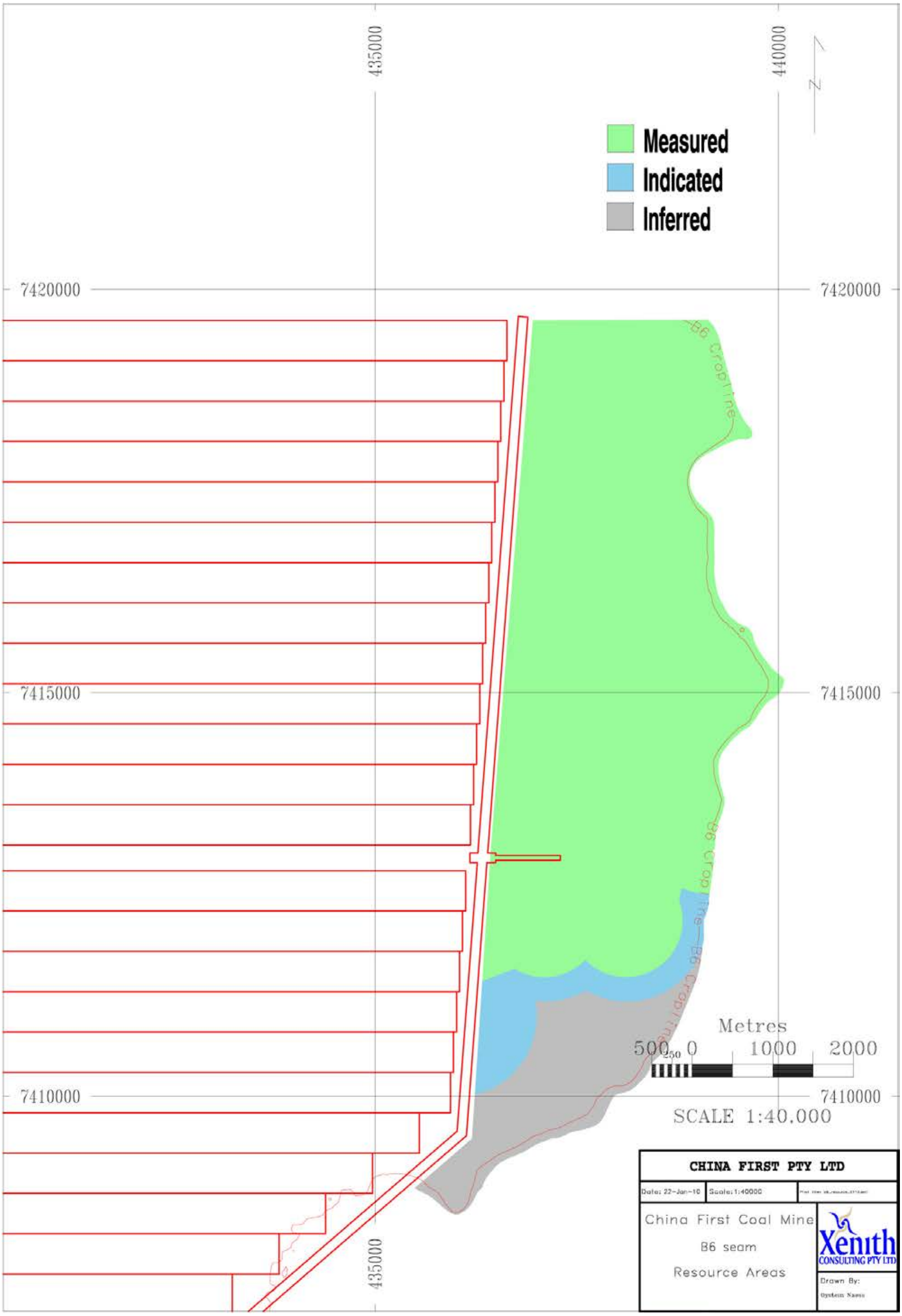


Figure 8. B8 Seam Resource Areas

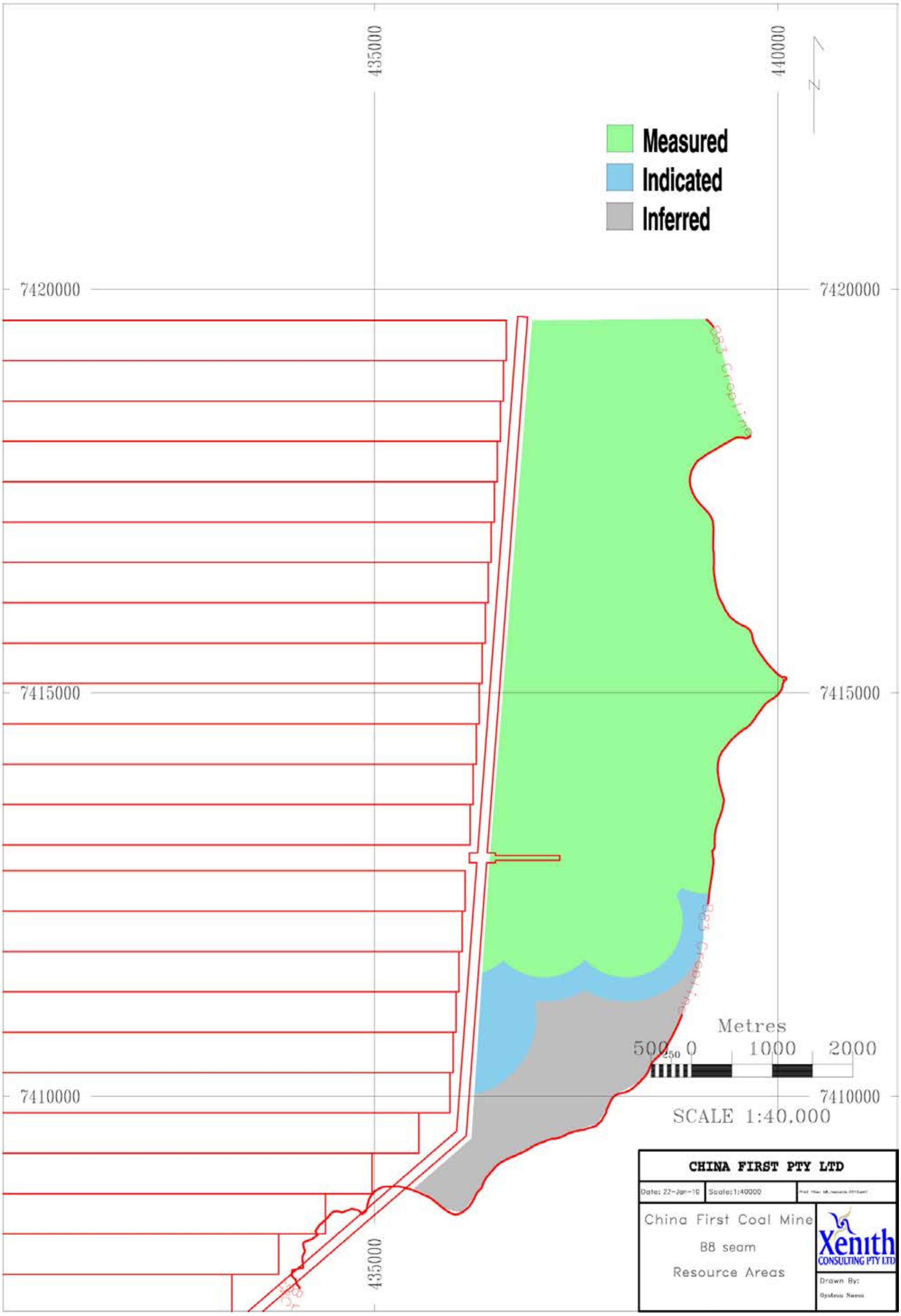


Figure 9. Full B Seam Resource Areas

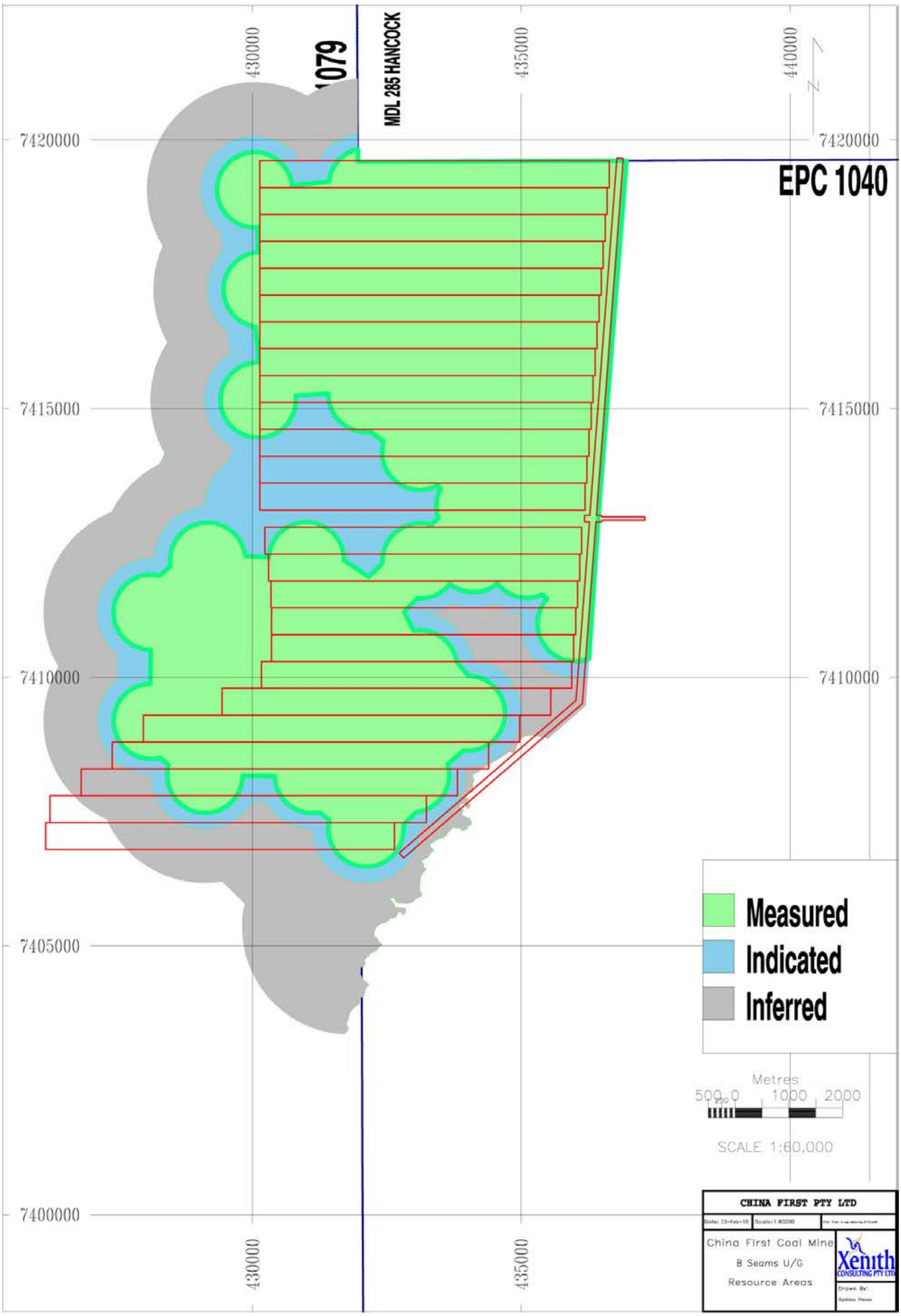


Figure 10. C Seam Resource Areas

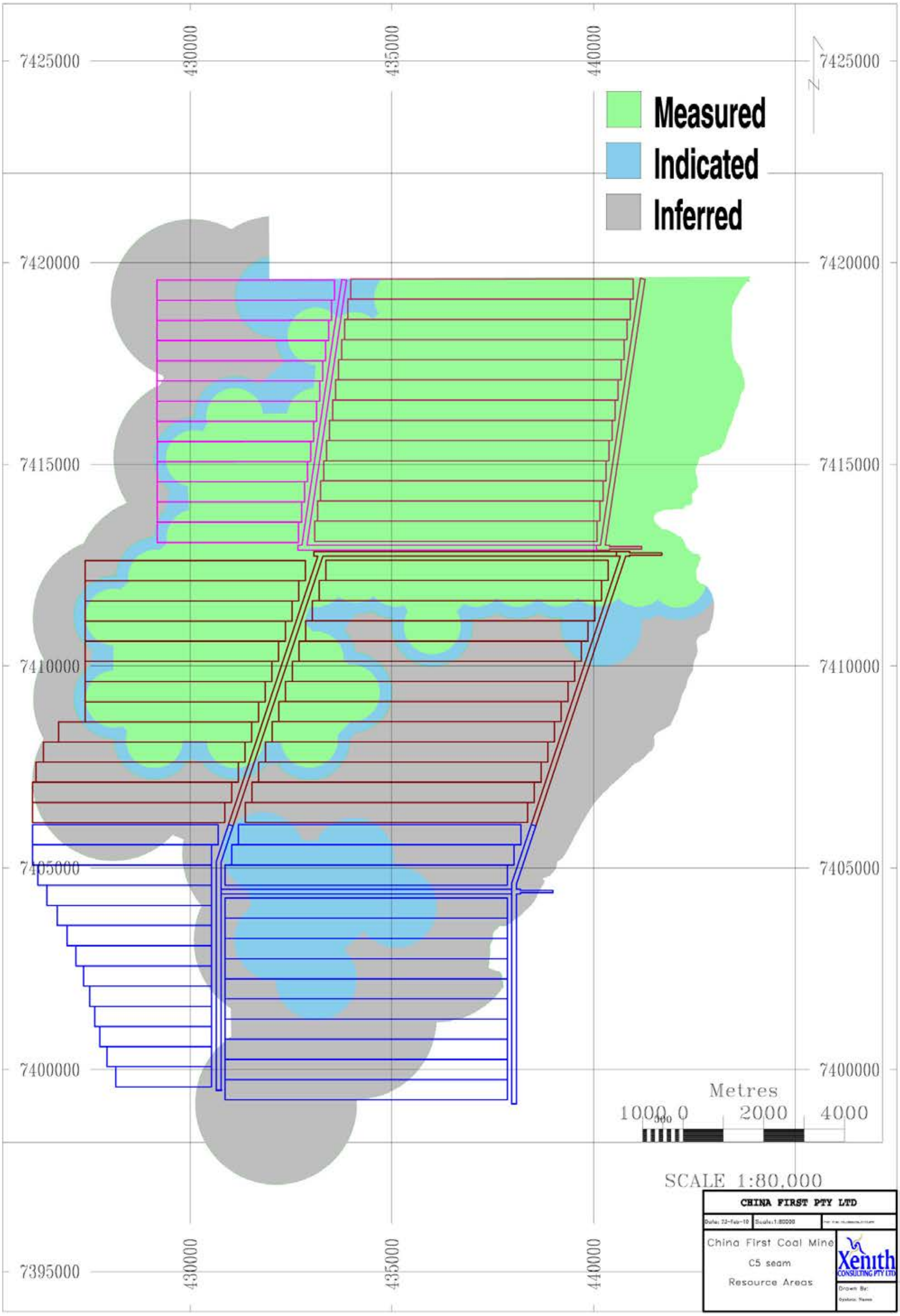


Figure 11. DU Seam Resource Areas

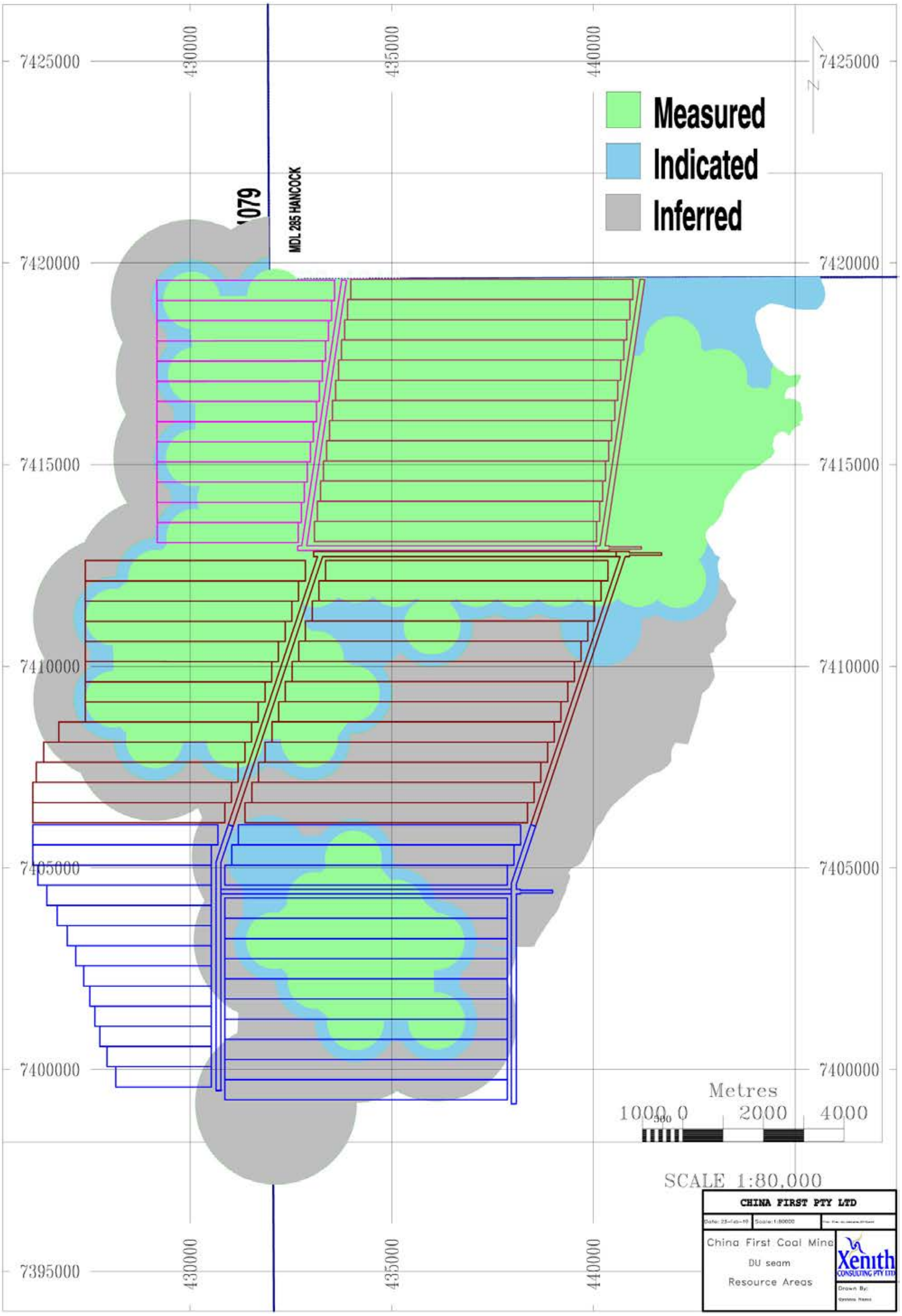
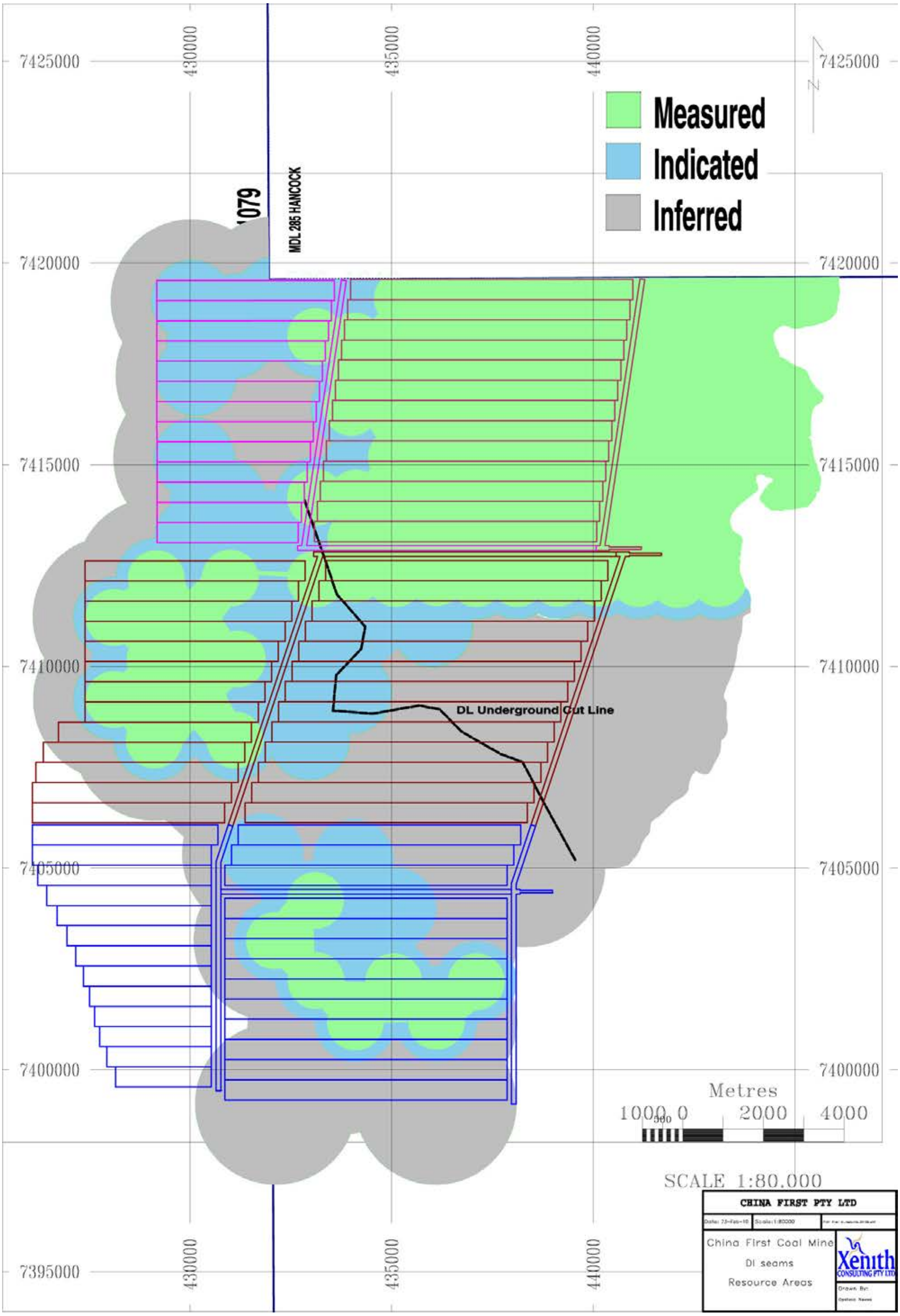


Figure 12. DL Seam Resource Areas



The Underground Reserves have been independently verified by Coffey Mining. The total underground Probable Reserve is estimated at 708.4Mt. The contents and accuracy of the report have been independently verified by an Independent Principal Mining Engineer.

The Open-cut Reserves have been verified by Xenith Consulting in its March 2011 report. A total Probable Reserve is estimated at 396.5Mt.

Submitter No.	344 , 440	Issue Reference:	17039, 17040
Submitter Type	NGO'S	TOR Category	Land (Land Use & Tenure)
Name	Pelican Creek Coal Pty Ltd, Rosella Creek Pty Ltd	Relevant EIS Section	3.2.3.2, 4.2.4.3, 4.2.5.1

DETAILS OF THE ISSUE

- Sterilisation of areas containing high quality commercially viable coal measures. The Waratah rail corridor traverses through Pelican Creek's EPC 639.
- Pelican Creek have not been able to fully explore the areas of its EPC that are impacted by the rail corridor.
- Greater level of commitment required so that coal measures are not sterilised and if so that tenure holders are adequately compensated for their losses.

PROPONENT RESPONSE

Waratah will work co-operatively with all tenure holders to enable them to undertake activities under their relevant permits.

There are no physical reasons why exploration of the EPC land impacted by the Waratah Coal alignment cannot proceed as required under the permit. Waratah Coal has some flexiblility with its alignment through the portion of EPC 639 where it traverses. Where identified coal resources are impacted, Waratah Coal will refrain from constructing over those coal resources and if diversions are not possible appropriate compensation will be paid by Waratah Coal.

Submitter No.	425	Issue Reference:	17041, 17042
Submitter Type	Individuals	TOR Category	Land (Land Use & Tenure) / Social (Community Engagement) / Transport
Name	Names withheld	Relevant EIS Section	Vol 2 16.5.4

DETAILS OF THE ISSUE

- Disturbance of cattle
- Access roads.

PROPONENT RESPONSE

Operational issues such as disturbance of cattle will be negotiated with the affected landowners as part of ongoing consultation.

It should be noted that Waratah Coal abides by a Code of Conduct which sets out requirements for appropriate behavior on landowners' properties. Waratah Coal also use experienced contractors who understand that speed should be limited to reduce disturbance to cattle and generation of dust, that gates should be left as they were found etc. Waratah Coal's contractors are also bound by Waratah Coal's Code of Conduct.

Submitter No.	425	Issue Reference:	17043
Submitter Type	Individuals	TOR Category	**Land (Land Use & Tenure)** / Water Resources
Name	**Names withheld**	Relevant EIS Section	Vol 2 16.5.3

DETAILS OF THE ISSUE

Water

PROPONENT RESPONSE

Operational issues such as water use and protection of water supply from potentially contaminating activities will be negotiated with the affected landowners as part of ongoing consultation. Waratah Coal fully understands that water is a priority issue in this section of central west Queensland.

It should be noted that Waratah Coal abides by a Code of Conduct which sets out requirements for appropriate behavior on landowners properties. Waratah Coal's contractors are also bound by Waratah Coal's Code of Conduct.

Submitter No.	417	Issue Reference:	14001
Submitter Type	Council	TOR Category	**Land**
Name	**Isaac Regional Council**	Relevant EIS Section	

DETAILS OF THE ISSUE

Mine operation needs to sustainably address the ingress of invasive weed species within the lease area and implement long term management strategies to prevent further expansions of existing infestations into the surrounding rural landscape especially those along the haul route, access to the site and those interface areas with water courses that can rapidly spread invasive week species to down stream properties and the wider catchment.

PROPONENT RESPONSE

Mine

Waratah Coal will have a statutory responsibility to ensure it manages and eradicates (where practical) all declared plant pest species. To this end Waratah Coal's EM Plan and associated Monitoring Programs will provide a range of land management practices to remove and control all pest plant species.

There are a range of environmental weeds which are currently within, or may be introduced into, the mine lease area during the life of the mine. Waratah Coal's EM Plan and Pest Management Plan will provide for an integrated monitoring program to regularly sample various habitat types to locate and manage any pest plan and/or environmental weed incursion over and above performance criteria established by Waratah Coal and approved by the Commonwealth and/or State and/or Local Government authorities.

Waratah Coal also acknowledges its responsibility to existing and adjacent land holders and the EM Plan and associated Monitoring Programs will also seek to integrate into existing property based programs undertaken by those land holders.

See the *Draft Mine EM Plan* contained in *Appendices – Volume 2* of this SEIS.

Rail

With regards to the rail corridor, the vegetation management program will seek to ensure regular monitoring and management of existing and new occurrences of declared pest plants and environmental weeds is undertaken along the entire length of the rail corridor. Particular focus may be on sensitive vegetation communities or habitat for conservation significant flora and fauna species as well as waterway and wetland areas along and abutting the rail corridor.

See the *Draft Rail EMP* contained in *Appendices – Volume 2* of this SEIS.

Submitter No.	566	Issue Reference:	10003
Submitter Type	Individual	TOR Category	Land
Name	Names withheld	Relevant EIS Section	

DETAILS OF THE ISSUE

Subsidence and impacts on soil profile and hydrology – no details given.

PROPONENT RESPONSE

Waratah Coal aims to minimise the potential impact of subsidence that may result from longwall mining undertaken by its operation and proactively manage subsidence impacts that may result from its underground operations. This includes the prevention and management of impacts as well as monitoring to provide early identification of impacts.

More specifically, the objectives of this Management Strategy are to:

- Outline the monitoring and measurement protocols
- Establish responsibilities for the management of subsidence related issues during and immediately following under-mining
- Satisfy the applicable regulatory requirements for subsidence management across the Waratah Coal Project
- Justify the relevance, suitability and adequacy of the proposed mine layout and mine sequence with respect to subsidence related issues
- Establish management priorities and detail the proposed mitigation/remediation and management measures. This includes presenting contingency plans / procedures, and
- Detail the review and reporting protocols.

Subsidence Management Process, Structure and Organisation

Waratah Coal's overall approach to subsidence management includes the following:

- Design to reduce surface impacts – Mine design is such to reduce the potential impact to public safety, the natural environment and built features
- Identify and manage environmental risks – specialist studies (including subsidence) are prepared to identify potential impacts to public safety, the natural environment and built features
- Measure baseline information – Background data is established for the surface above the proposed mining area, this will include the establishment of subsidence monitoring points
- Monitor the effects of mining – Continued monitoring of data for the surface above the proposed mining area, including subsidence monitoring points

- Regularly assess and interpret monitoring – Monitoring data is analysed to identify any variances
- Re-assess impacts – Where variances are identified that are greater than predictions, additional assessment of impacts is undertaken
- Identify and implement remedial actions – If additional assessment indicates greater impacts, then remedial action may be required. Stakeholder consultation will be undertaken in determining and implementing remedial actions, as required
- Implement remedial actions – In the event that any surface impacts due to subsidence are noted, appropriate remediation and/or mitigation measures will be implemented in consultation with appropriate stakeholders, and
- Provide regular progress reports – Progress reports will be provided to relevant parties in accordance with reporting conditions outlined in approval documentation.

Subsidence and impacts on soil profile

The soil profile will remain intact, with surface tension cracks only occurring in areas where depth of cover to mining horizon is less than 180m. Surface crack apertures of 2.5mm to 20mm are estimated due to the alluvial nature of soils above the underground mines. In these cases remedial works may include ripping, re-compacting and seeding of all tension cracks and reshaping any internally draining areas to be externally draining by the construction of contour drains and top soiling and seeding any disturbed areas. These works will extend to blanketing and compacting of some water courses post-subsidence, preventing inflow of runoff into underground mining areas and maintain environmental surface flows. Materials which have been investigated for use in compacted blankets include silty alluvium and clay. Some minor earthworks will be necessary, but the work done so far allows these activities to be well planned prior to subsidence in any particular area. The natural fall of the mining area drains freely to the north and is sufficient to minimise the events of subsidence troughs. In the flatter areas, reshaping of any internally draining areas to be externally draining will be done by the construction of contour drains and appropriate rehabilitation measures.

Longwall mining at shallow depths at German Creek and Oaky Creek has shown that tree roots remain unaffected by subsidence and vegetation continues to persist with soil profiles remaining intact. The project area surface stratigraphy contains cohesive Quaternary alluvial and Tertiary sands, clays and laterites which are self-healing to tensile surface fracturing. Surface tension cracks which form in cohesionless creek bed alluvium and Recent Colluvium are self-healing and readily infill. Open tension cracks in surface clays need to be ripped and compacted.

On the cessation of subsidence in any one area and completion of remedial works, it is planned that the land will be returned to grazing and original land activities. Yield trials will verify the maintenance of original land productions.

Subsidence and impacts on hydrology

When underground mining is undertaken, a fractured zone is developed above the mined panels which manifests as subsidence of the land surface. Above the underground mined seams it is likely that the fractured zone will extend to the land surface where depth of cover is less than 180m. This is expected to promote enhanced rainfall infiltration for a time, but it is probable that the higher infiltration rates will be short-lived as the cracks will infill with sediment after one or more rainfall events. Apart from intercepting more rainfall, there will be a freshening effect on groundwaters in or above the fractured zone due to the introduction of low-salinity rain water.

The formation of the fractured zone will extend to the surface in areas where depth of cover between the surface and the underground workings is less than 180m. This will be accompanied by increases in the permeability and porosity of overburden materials. This will promote higher mine inflows and lower groundwater heads.

The recovery of groundwater levels after cessation of mining has been investigated by running a simulation for 200 years without any mining stresses. There will be a permanent lowering of the water table over the mine footprint, with a typical elevation of 340m AHD through the centre of the mining area. Mild groundwater sinks are maintained at each final void.For the deep hydrographs, the modelling shows rapid recovery over 50 years, with slower incomplete recovery out to 200 years. The shallowest hydrograph behaves differently, and is indicative of what will happen at shallow depths. The water level declines for about 60 years, then stabilises, then starts to climb in concert with the deeper water levels. The early-time response is due to vertical drainage of water through the fractured zone over the mine voids, replenishing the deeper water-bearing formations.

A cumulative impact assessment (CIA) was undertaken for the South Galilee Coal Project, this project and the Alpha Coal Project. The CIA revealed a broad elongated cone of depression that is about 30km wide and over 100km in length along a north-south axis. The eastern limit of drawdown is well defined, as it is controlled by outcropping geology and the erosion of coal measures. There is some expansion of the drawdown limit to the west, including a small tongue crossing the GAB geological boundary in the area where the GAB rocks are hidden by Quaternary cover. The expansion to the west is not substantial and considered unlikely to impact on the GAB aquifer or the GAB springs.

For further information regarding subsidence and impacts on soil profile and hydrology refer to the *Longwall Mining Subsidence* report in *Appendices – Volume 2* of this SEIS.

Submitter No.	**779**	Issue Reference:	**10004**
Submitter Type	Individuals	TOR Category	**Land** / Nature Conservation (Terrestrial Ecology)
Name	**Names withheld**	Relevant EIS Section	V2, ch 6, 6.4.1.2; V 1, ch 1, 1.3.6; exec summary 3.1.8.2, App 10. 9.1; 4.5;

DETAILS OF THE ISSUE

The EIS has not presented some of the potential impacts on ecology from subsidence. Paucity of information and discrepancy in information with reference to subsidence.

PROPONENT RESPONSE

The underground mining activities will result in surface subsidence that will develop progressively within each longwall mining block and present on the surface as a series of trough like depressions. The maximum subsidence (i.e. in the centre of the longwall panels) will range from 1.6m in standalone mines to 3.2m in areas of cumulative subsidence where underground mine 4 lies above underground mine 1. See Figure 13.

Longitudinal tension cracks of 2.5mm to 20mm are predicted to occur at the edge of the longwall mining panel, parallel to the chain pillar areas, where the depth of cover between the surface and the underground mines is less than 180m. See Figure 14.

Depressions in the surface from subsidence can lead to ponding if unmanaged, however the longwall mining panels are aligned longitudinally with the natural fall of the land within the MLA, which drains freely to the east and is sufficient to minimise subsidence troughs. In flatter area, reshaping of any internally draining areas will be done by the construction of contour drains and appropriate rehabilitation measures.

As no underground coal mines currently exist in the Galilee Basin, there is no precedence to use as a guide to the expected impacts on ecological values from subsidence. There are relatively few published studies of the impacts of subsidence on native vegetation, and those that are available, have typically described local and specific issues (Frazier et al., 2010[4]), mostly from the NSW coalfield areas. The potential consequences of subsidence on vegetation

4 Frazier P, Jenkins R, Trotter T. 2010. *Monitoring the Effect of Longwall Mine Subsidence on Native Vegetation and Agricultural Environments*. (ACARP C15013). Report prepared for ACARP January 10 by Ecological Australia.

are likely to be indirect and heterogeneous (Frazier et al., 2010). Possible changes to near-surface regolith and soil that could affect vegetation include:

- Soil fractures causing changes to the hydrological properties of soils, which could promote local dessication
- Soil fractures could act as macropores that increase hydraulic connectivity
- High flow in fractures could lead to increased erosion
- The availability of groundwater for vegetation may be markedly changed in areas where shallow groundwater systems are within two metres of the surface.

In addition root-ball disturbance could arise from the soil rupture and shaking associated with subsidence.

As mentioned above, fracturing will only occur longitudinally parallel to the chain pillar areas where depth of cover between the surface and the mine is less than 180m. Furthermore, given the alluvial nature of the surface material in the MLA area, the cracking is not expected to exceed 20mm. Remedial works for longitudinal surface fractures from subsidence may include ripping, recompacting, seeding of the cracks and reshaping.

Waratah Coal will develop a subsidence management plan to mitigate and manage the effects of subsidence on hydrology and native vegetation as much as possible (see *Longwall Mining Subsidence Report* in the *Appendices – Volume 2* of this SEIS). For residual impacts, Waratah Coal will provide offsets in accordance with the State and Commonwealth offsets policies. Given that the potential impacts of subsidence on vegetation in the Galilee are unknown, but that it is likely that not all vegetation overlying subsidence areas will be impacted, Waratah Coal have adopted a staged approach to offset delivery for residual impacts. This approach will still involve upfront delivery of offsets for the project's rail component, open cut pits, coal preparation plants and underground mining activities proposed to occur in years 0 to 5. However, to allow for information gained from monitoring of the impacts of subsidence between years 0 and 5 to inform the offset requirements for impacts arising from underground mining activities that may occur between years 5 and 30, offsets for underground mining activities will be delivered in five yearly stages that correspond with the underground mining development sequence. Waratah Coal consider it likely that offsets provided for the first five years of mining will be in excess of that required.

Figure 13. Predicted Subsidence Contours

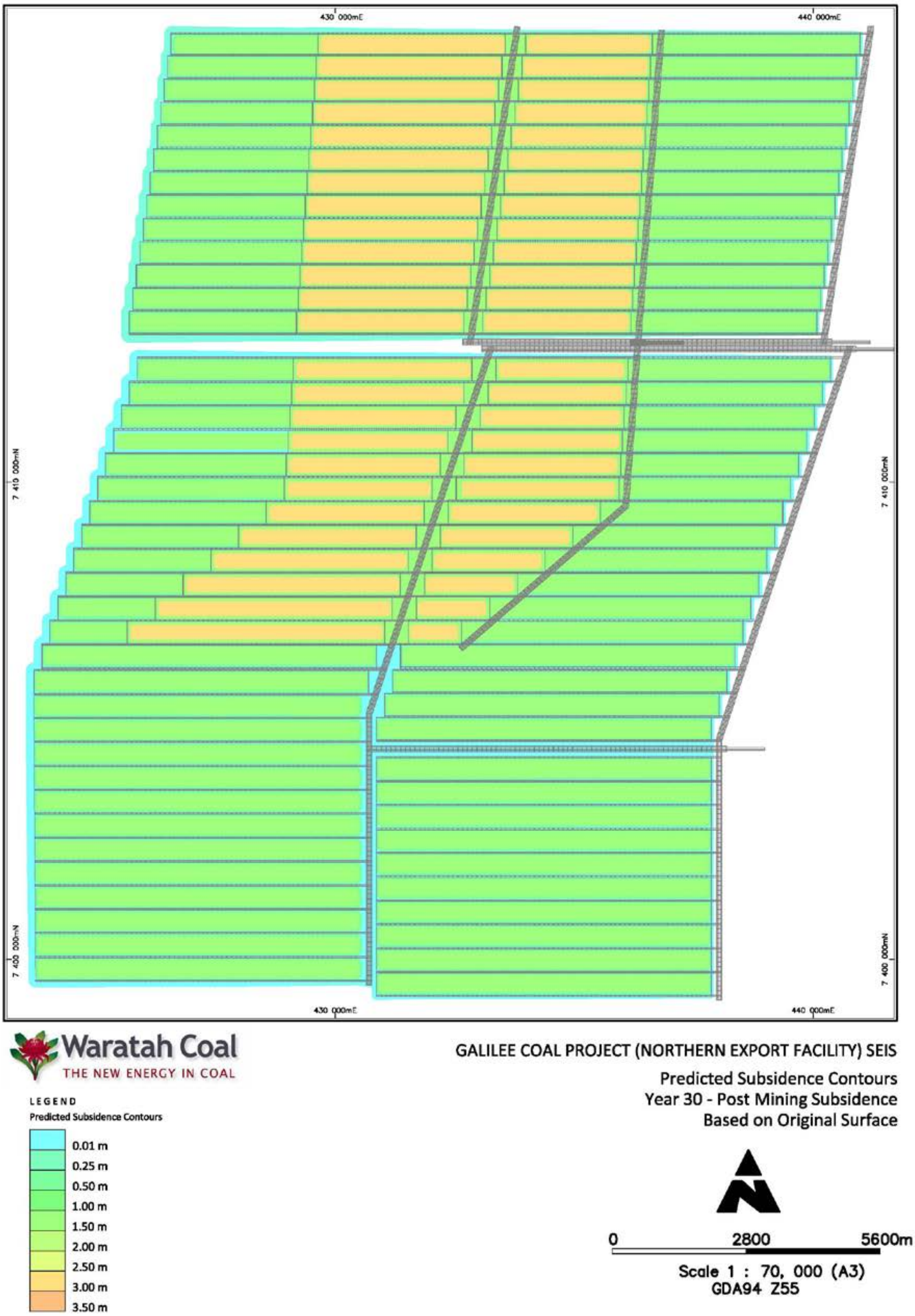
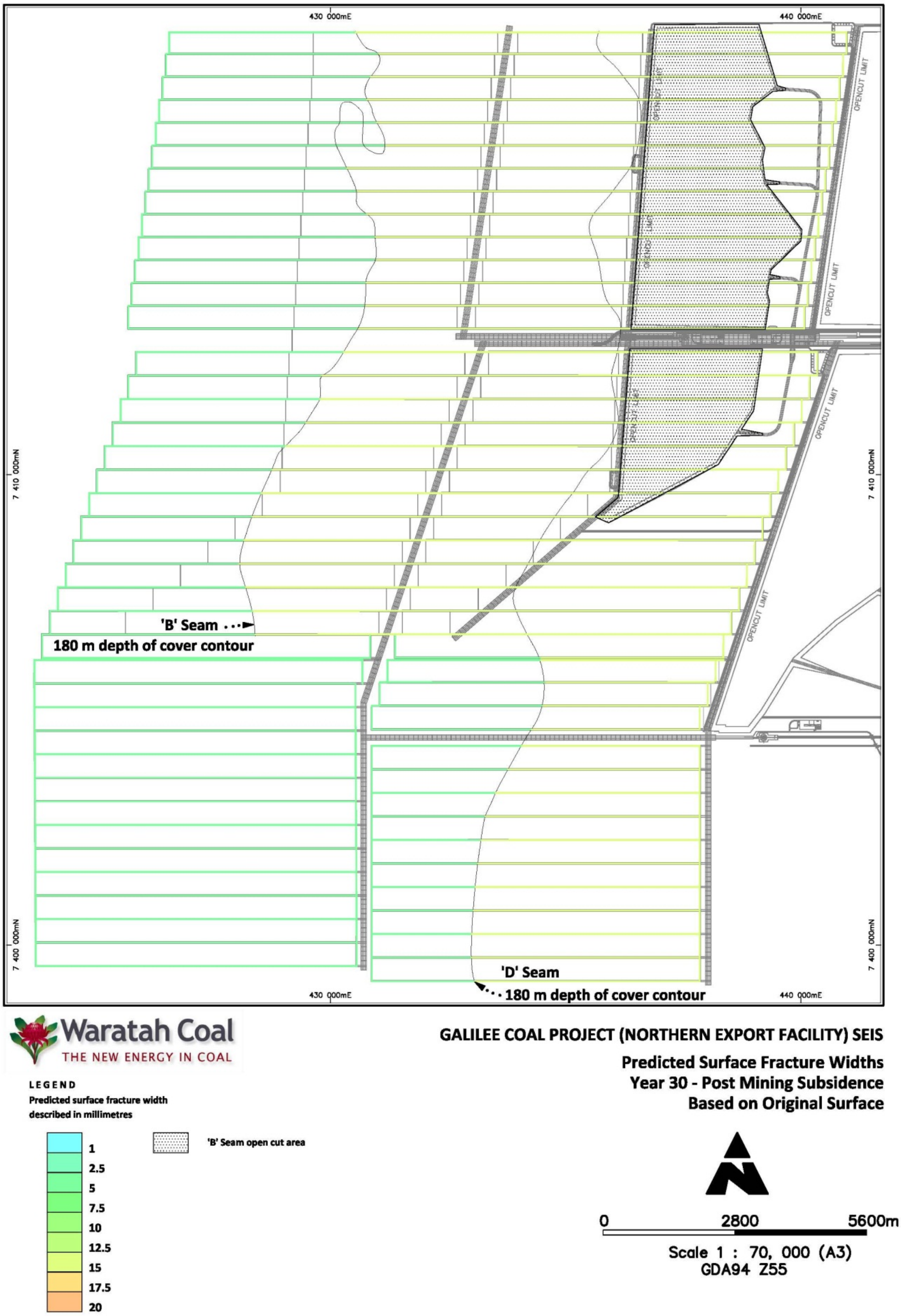


Figure 14. Predicted Surface Fracturing



Submitter No.	1840	Issue Reference:	10005
Submitter Type	Council	TOR Category	Land
Name	Barcaldine Regional Council	Relevant EIS Section	1.2.2.3

DETAILS OF THE ISSUE

"It is anticipated that final voids with depths of up to 120m will remain in each of the four open-cut pits at the completion of mining"

The proponent has noted their commitment to the final land form and reinstatement of grazing industry, and noted that this would be in close collaboration with BRC, and others. The final voids and depths.

"The total extracted width is 480m ..the length of longwall blocks will be up to 7,000m."

A long term plan for the final land form and rehabilitation is required prior to impacts occurring. Further works and understanding is required to enable reinstatement of grazing industry following LOM as it has been noted that major subsidence is predicted and final voids will be of up to 120m in depth.

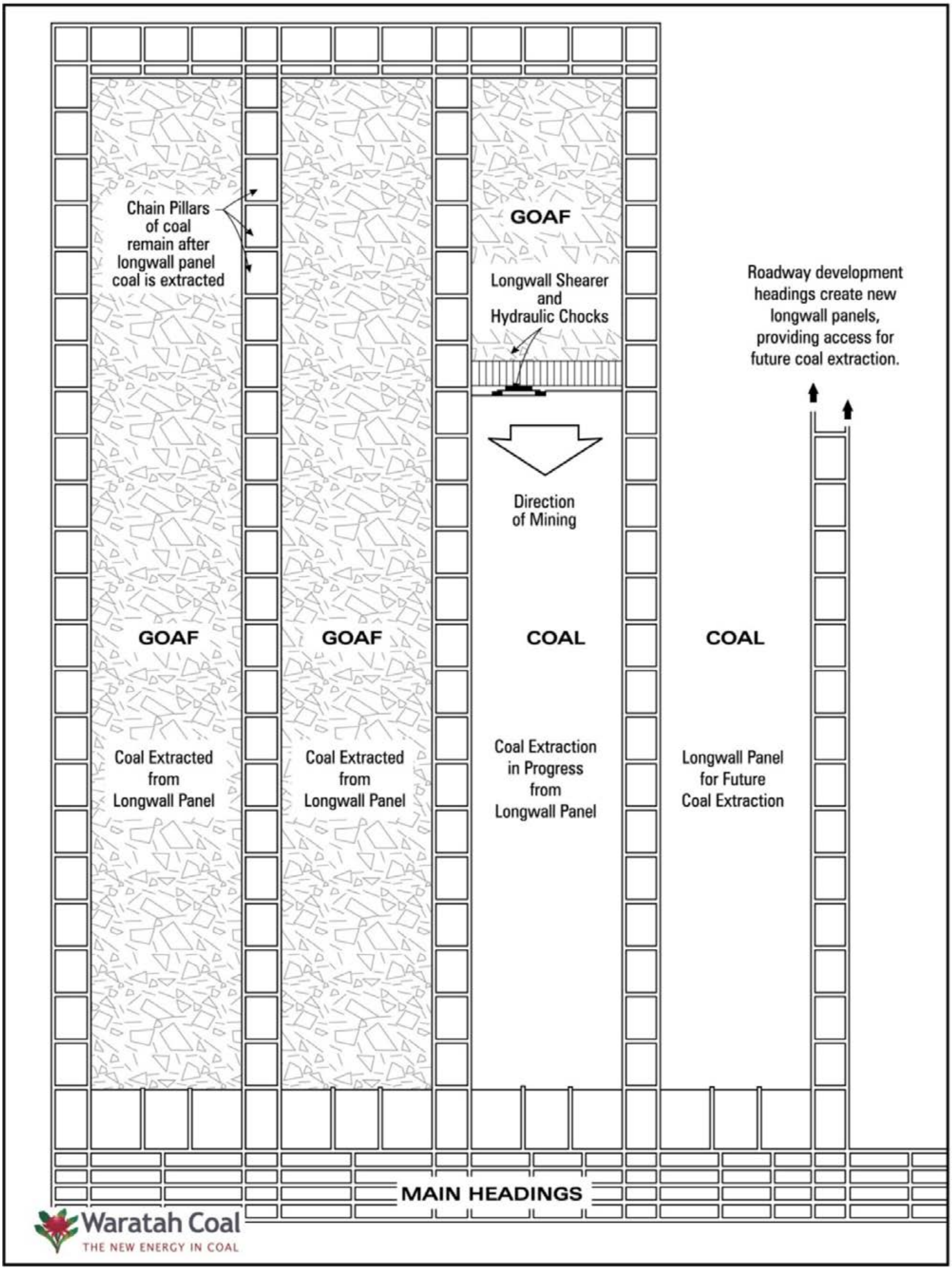
PROPONENT RESPONSE

The proposed longwall blocks have a mining width of 470m, rib-to-rib and a chain pillar width of 20m to 50m (solid), pillar width increase with depth of cover. The lengths of the longwall blocks will be up to 7,000m. Between each longwall extraction block, a coal chain pillar will be left with a total width of 20m to 50m rib-to-rib and a length between cut-through of 95m rib-to-rib. An illustrated schematic of the proposed development is shown in Figure 15.

For further information regarding subsidence and impacts refer to the *Longwall Mining Subsidence* report in *Appendices – Volume 2* of this SEIS.

With regards to management of the voids from the open-cut mining operations refer to the *Rehabilitation and Decommissioning* section of the *Draft Mine EM Plan* in *Appendices – Volume 2* of this SEIS.

Figure 15. Illustrated schematic of the proposed development



Submitter No.	1840	Issue Reference:	10007 / 7011
Submitter Type	Council	TOR Category	Land (Land Disturbance)
Name	Barcaldine Regional Council	Relevant EIS Section	3.1.9.2

DETAILS OF THE ISSUE

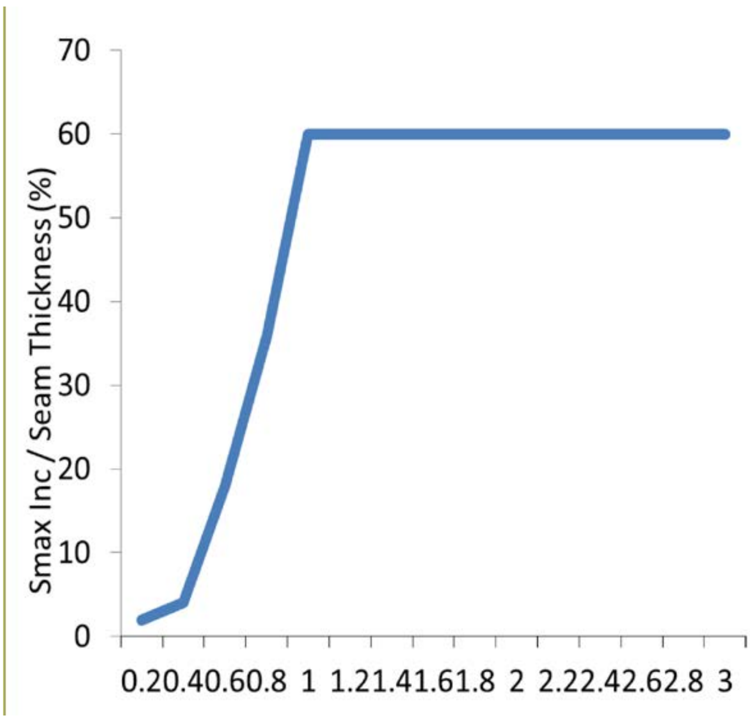
- What is the current level of understanding of the impacts on the expect subsidence?
- Predicted 3.6m maximum and 1.3 to 1.61. Where will these drainage pattern impacts occur?
- The post mining industry reinstatement for industry such as cattle requires further planning.
- Please provide information on expected costs to manage the subsidence drainage issues.
- Please provide information on impacts to cropping.

PROPONENT RESPONSE

The subsidence profiles used for the 3D extrapolation are based on subsidence parameters of angle of draw, maximum subsidence and pillar subsidence. Subsidence ranges from supercritical to subcritical below a depth of 481m. A caving angle of 26.5˚ has been used in this report.

Total subsidence comprises sag subsidence between pillars and the abutment subsidence above the pillars. The maximum sag subsidence is determined using the maximum subsidence/seam thickness and panel width to depth ratio profile as outlined in Figure 16, and is based on the prediction curves in MSEC (2007)[5]. The maximum sag subsidence for supercritical subsidence has a ratio of 0.6 times the seam thickness. For subcritical subsidence, the maximum sag subsidence is reduced as per the trend in Figure 16. Tables 2 and 3 give the summary of the calculations.

Figure 16. Prediction curve for maximum incremental subsidence with the estimated linear relationship, MSEC Trend, adopted for Galilee Basin



5 Mine Subsidence Engineering Consultants. 2007. *General Discussion of Mine Subsidence Ground Movements*. August 2007.

Table 2. Summary of mine subsidence calculations

ITEM								
Mine	1		2		3		4	
Seam	DU		DL2		DL1, DLX ply, DL2		B8	
Average Seam Thickness (m)	2.50		2.00		2.00		2.66	
Depth of Cover, Minimum, Maximum (m)	100	380	120	390	100	390	90	250
Maximum Subsidence (m)	1.50	1.40	1.20	1.10	1.20	1.10	1.60	1.55
Pillar Subsidence (m)*	0.04	0.15	0.05	0.15	0.04	0.15	0.04	0.10

* 40m chain pillar, rib-to-rib

Table 3. Summary of subsidence calculations for multiple seams mining

ITEM								
Mining Sequence	Mine 4 above Mine 1				Mine 4 above Mine 2			
Seam	B8		DU		B8		DL2	
Average Seam Thickness (m)	2.66		2.50		2.66		2.00	
Depth of Cover, Minimum, Maximum (m)	90	250	195	355	90	250	195	355
Maximum Subsidence (m)	1.60	1.55	1.60	1.50	1.60	1.60	1.20	1.10
Pillar Subsidence (m)*	0.04	0.10	0.08	0.14	0.04	0.10	0.08	0.14
Cumulative Maximum Subsidence (m), Minimum Depth of Cover (m)	3.20				2.80			
Cumulative Maximum Subsidence (m), Maximum Depth of Cover (m)	3.05				2.70			
Cumulative Pillar Subsidence (m), Minimum Depth of Cover (m)	0.12				0.12			
Cumulative Pillar Subsidence (m), Maximum Depth of Cover (m)	0.24				0.24			

* 40m chain pillar, rib-to-rib

Where will these drainage pattern impacts occur?

Subsidence impacts on the surface include the formation of tension cracks of between 2.5 and 20mm along the chain and pillar areas where depth of cover is less than 180m and in flat areas internal drain way subsidence troughs can form.

Types of remedial works for these impacts may include ripping, re-compacting and seeding of all tension cracks and reshaping any internally draining areas to be externally draining by the construction of contour drains and topsoiling and seeding any disturbed areas. These works will extend to blanketing and compacting of some water courses post-subsidence, preventing inflow of runoff into underground mining areas and maintain environmental surface flows. Materials which have been investigated for use in compacted blankets include silty alluvium and clay. Some re-alignment of water courses and minor earthworks will be necessary, but the work done so far allows these activities to be well planned prior to subsidence in any particular area. The natural fall of the mining area drains freely to the north and is sufficient to minimise the events of subsidence troughs. In the flatter areas, reshaping of any internally draining areas to be externally draining will be done by the construction of contour drains and appropriate rehabilitation measures.

The costs to carry out rehabilitations works will be approximately $7.50 per cubic metre.

On the cessation of subsidence in any one area and completion of remedial works, it is planned that the land will be returned to grazing and original land activities. Yield trials will verify the maintenance of original land productions.

The project area surface stratigraphy contains cohesive Quaternary alluvial and Tertiary sands, clays and laterites which are self-healing to tensile surface fracturing. Surface tension cracks which form in cohesionless creek bed alluvium and Recent Colluvium are self-healing and readily infill. Open tension cracks in surface clays need to be ripped and compacted.

For further information regarding subsidence and impacts refer to the *Longwall Mining Subsidence* report in *Appendices – Volume 2* of this SEIS.

With regards to management of the voids from the open-cut mining operations refer to the *Rehabilitation and Decommissioning* section of the *Draft Mine EM Plan* in *Appendices – Volume 2* of this SEIS.

Submitter No.	**565**	Issue Reference:	**10008**
Submitter Type	Individual	TOR Category	**Land (Land Disturbance)**
Name	**Name withheld**	Relevant EIS Section	

DETAILS OF THE ISSUE

Subsidence and impacts on soil profile and hydrology.

PROPONENT RESPONSE

See response to Issue Reference 10003.

Submitter No.	**88**	Issue Reference:	**10009**
Submitter Type	Individual	TOR Category	**Land (Land Disturbance)** / Water Resources
Name	**Name withheld**	Relevant EIS Section	

DETAILS OF THE ISSUE

Long wall mining will cause subsidence and subsequently interfere with natural hydrology

PROPONENT RESPONSE

Waratah Coal aims to minimise the potential impact of subsidence that may result from longwall mining undertaken by its operation and proactively manage subsidence impacts that may result from its underground operations. This includes the prevention and management of impacts as well as monitoring to provide early identification of impacts.

More specifically, the objectives of this Management Strategy are to:

- Outline the monitoring and measurement protocols
- Establish responsibilities for the management of subsidence related issues during and immediately following under-mining
- Satisfy the applicable regulatory requirements for subsidence management across the Waratah Coal Project
- Justify the relevance, suitability and adequacy of the proposed mine layout and mine sequence with respect to subsidence related issues

- Establish management priorities and detail the proposed mitigation/remediation and management measures. This includes presenting contingency plans / procedures, and
- Detail the review and reporting protocols.

Subsidence Management Process, Structure and Organisation

Waratah Coal's overall approach to subsidence management includes the following:

- Design to reduce surface impacts – Mine design is such to reduce the potential impact to public safety, the natural environment and built features
- Identify and manage environmental risks – specialist studies (including subsidence) are prepared to identify potential impacts to public safety, the natural environment and built features
- Measure baseline information – Background data is established for the surface above the proposed mining area, this will include the establishment of subsidence monitoring points
- Monitor the effects of mining – Continued monitoring of data for the surface above the proposed mining area, including subsidence monitoring points
- Regularly assess and interpret monitoring – Monitoring data is analysed to identify any variances
- Re-assess impacts – Where variances are identified that are greater than predictions, additional assessment of impacts is undertaken
- Identify and implement remedial actions – If additional assessment indicates greater impacts, then remedial action may be required. Stakeholder consultation will be undertaken in determining and implementing remedial actions, as required
- Implement remedial actions – In the event that any surface impacts due to subsidence are noted, appropriate remediation and/or mitigation measures will be implemented in consultation with appropriate stakeholders, and
- Provide regular progress reports – Progress reports will be provided to relevant parties in accordance with reporting conditions outlined in approval documentation.

Surface subsidence caused by longwall mining will be managed through Subsidence and Rehabilitation Management Plans.

Interference with natural hydrology will be rehabilitated by remedial works which may include ripping, re-compacting and seeding of all tension cracks and reshaping any internally draining areas to be externally draining by the construction of contour drains and topsoiling and seeding any disturbed areas. These works will extend to blanketing and compacting of some water courses post-subsidence, preventing inflow of runoff into underground mining areas and maintain environmental surface flows. Materials which have been investigated for use in compacted blankets include silty alluvium and clay. Some re-alignment of water courses and minor earthworks will be necessary, but the work done so far allows these activities to be well planned prior to subsidence in any particular area. The natural fall of the mining area drains freely to the north and is sufficient to minimise the events of subsidence troughs. In the flatter areas, reshaping of any internally draining areas to be externally draining will be done by the construction of contour drains and appropriate rehabilitation measures.

On the cessation of subsidence in any one area and completion of remedial works, it is planned that the land will be returned to grazing and original land activities with natural hydrology passages. Yield trials will verify the maintenance

The project area surface stratigraphy contains cohesive Quaternary alluvial and Tertiary sands, clays and laterites which are self-healing to tensile surface fracturing. Surface tension cracks which form in cohesionless creek bed alluvium and Recent Colluvium are self-healing and readily infill. Open tension cracks in surface clays need to be ripped and compacted.

For further information regarding subsidence and impacts refer to *Longwall Mining Subsidence* report in *Appendices – Volume 2* of this SEIS. The potential maximum impacts of underground longwall mining associated with the proposed Galilee Coal Project on flood and stream flow characteristics within the underground mining area have been identified and are described in the *Surface Water Impact Assessment of Longwall Mining Subsidence* report (contained in *Appendices – Volume 2* of this SEIS).

Submitter No.	**419**	Issue Reference:	**10014 / 6086**
Submitter Type	Government	TOR Category	Water Resources (Surface Water) / **Land (Land Disturbance)**
Name	**DERM**	Relevant EIS Section	Chapter 6 – Commitments – Section 6.5.9 Surface Water Resources (p96)

DETAILS OF THE ISSUE

There are no commitments in the EIS in relation to the potential impacts of subsidence on identified environmental values, including watercourses and vegetation, nor does it propose appropriate management or mitigation measures that would be required due to the potential impacts of underground mining operations.

The EIS should develop a subsidence management plan in accordance with the draft Departmental guideline Watercourse Subsidence – Central Queensland Mining Industry.

PROPONENT RESPONSE

Waratah Coal aims to minimise the potential impact of subsidence that may result from longwall mining undertaken by its operation and proactively manage subsidence impacts that may result from its underground operations. This includes the prevention and management of impacts as well as monitoring to provide early identification of impacts.

More specifically, the objectives of the Subsidence Management Strategy are to:

- Outline the monitoring and measurement protocols
- Establish responsibilities for the management of subsidence related issues during and immediately following underground mining
- Satisfy the applicable regulatory requirements for subsidence management across the Waratah Coal Project
- Justify the relevance, suitability and adequacy of the proposed mine layout and mine sequence with respect to subsidence related issues
- Establish management priorities and detail the proposed mitigation/remediation and management measures. This includes presenting contingency plans / procedures, and
- Detail the review and reporting protocols.

Subsidence Management Process, Structure and Organisation

Waratah Coal's overall approach to subsidence management includes the following:

- Design to reduce surface impacts – Mine design is such to reduce the potential impact to public safety, the natural environment and built features
- Identify and manage environmental risks – specialist studies (including subsidence) are prepared to identify potential impacts to public safety, the natural environment and built features
- Measure baseline information – Background data is established for the surface above the proposed mining area, this will include the establishment of subsidence monitoring points

- Monitor the effects of mining – Continued monitoring of data for the surface above the proposed mining area, including subsidence monitoring points
- Regularly assess and interpret monitoring – Monitoring data is analysed to identify any variances
- Re-assess impacts – Where variances are identified that are greater than predictions, additional assessment of impacts is undertaken
- Identify and implement remedial actions – If additional assessment indicates greater impacts, then remedial action may be required. Stakeholder consultation will be undertaken in determining and implementing remedial actions, as required
- Implement remedial actions – In the event that any surface impacts due to subsidence are noted, appropriate remediation and/or mitigation measures will be implemented in consultation with appropriate stakeholders, and
- Provide regular progress reports – Progress reports will be provided to relevant parties in accordance with reporting conditions outlined in approval documentation.

Surface subsidence caused by longwall mining will be managed through Subsidence and Rehabilitation Management Plans – see *Longwall Mining Subsidence* report and *Rehabilitation and Decommissioing* report in *Appendices – Volume 2* of this SEIS.

The potential maximum impacts of underground longwall mining associated with the proposed Galilee Coal Project on flood and stream flow characteristics within the mine lease area have been identified and are described in the *Surface Water Impact Assessment of Longwall Mining Subsidence* report (contained in *Appendices – Volume 2* of this SEIS).

Flood modelling has been undertaken to identify subsidence ponding areas and changes to flood inundation depths, extents and velocities as a result of mine subsidence. Water balance modelling has been performed to assess the potential reduction in stream flow volumes as a result of underground mine subsidence and capture of runoff in open cut pits and dams.

Management strategies to reduce the impacts of subsidence on waterways are identified in the *Surface Water Impact Assessment of Longwall Mining Subsidence* report (contained in *Appendices – Volume 2* of this SEIS).

Submitter No.	364	Issue Reference:	7012
Submitter Type	Government	TOR Category	Land (Land Use & Tenure)
Name	DEEDI (Mining and Petroleum Operations)	Relevant EIS Section	Vol 2 Chap 4

DETAILS OF THE ISSUE

Tenures – Mining Lease: The diagrams and text in the EIS should reflect the current mining lease status – as the ML has been applied for the MLA number is now available.

PROPONENT RESPONSE

See revised Figure showing the most current mining tenure information within and surrounding the project. The mining lease application number is 70454 and it covers an area of 76,123.98ha. See Figure 17.

Submitter No.	364	Issue Reference:	7013
Submitter Type	Government	TOR Category	Land (Land Use & Tenure)
Name	DEEDI (Mining and Petroleum Operations)	Relevant EIS Section	Vol 2 Chap 4 4.3

DETAILS OF THE ISSUE

State lands – Stock routes: Stock routes have historically played an important part in the movement of stock across this landscape. Stock Routes should be shown on site maps and the significance of these tenures to stakeholders should be investigated and reported.

PROPONENT RESPONSE

Mine: here are no stock routes within the Mining Lease Application areas or the Proposed Mineral Development License Areas. See Figure 17.

Rail: Waratah Coal recognises the importance of this infrastructure and intends to maintain the stock route access to at least the same level of standard after construction to that as it exists today.

The stock routes within the project region have been identifed and are shown Figure 18. Where the Waratah Coal rail line traverses across an existing stock route, an undertrack crossing for the stock will be provided that limits the amount of 'tunnel effect' to a similar standard to those recently constructed for new rail projects within central Queensland and provides a safe and effective path for the stock and stockmen.

Where the rail alignment cuts across the same stock route in several places within a relatively short distance, there may be an opportunity to realign the stock route along one side of the rail only, to provide a shorter and more effective stock route.

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Figure 17. Mining Lease Application Area

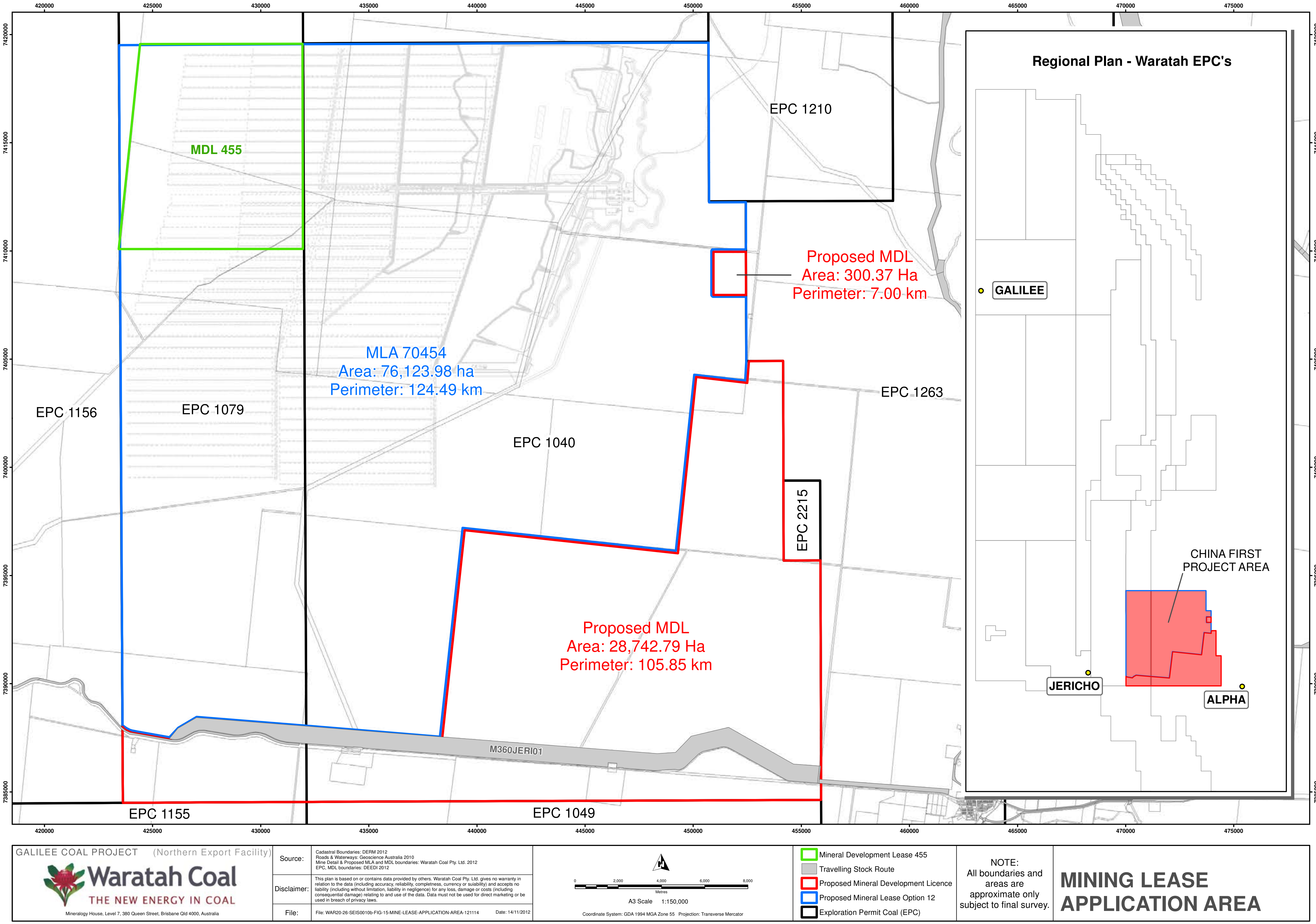
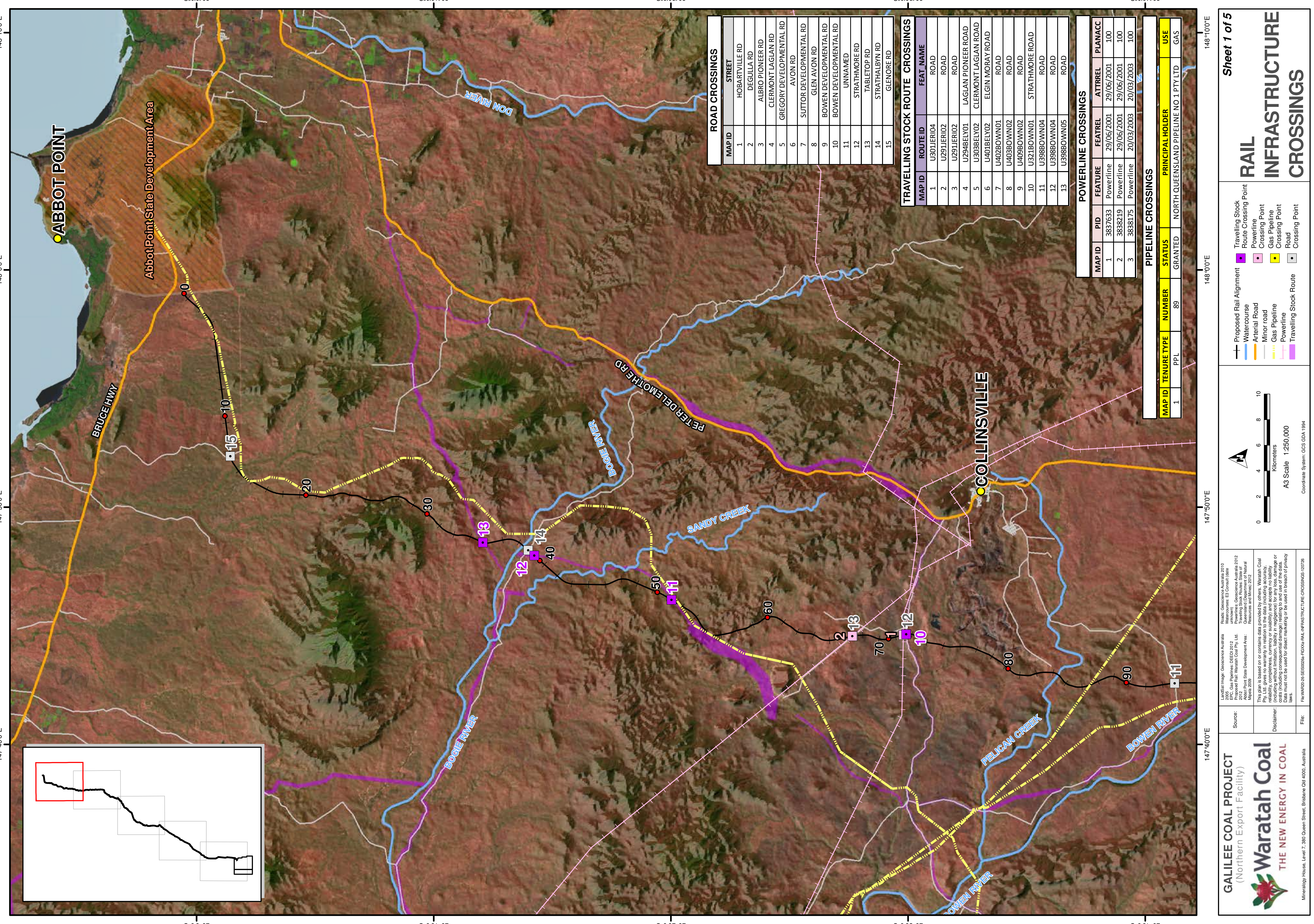


Figure 18. Rail Infrastructure Crossing (Sheet 1 of 5)



ROAD CROSSINGS

MAP ID	STREET
1	HOBARTVILLE RD
2	DEGULLA RD
3	ALBRO PIONEER RD
4	CLERMONT LAGLAN RD
5	GREGORY DEVELOPMENTAL RD
6	AVON RD
7	SUTTOR DEVELOPMENTAL RD
8	GLEN AVON RD
9	BOWEN DEVELOPMENTAL RD
10	BOWEN DEVELOPMENTAL RD
11	UNNAMED
12	STRATHMORE RD
13	TABLETOP RD
14	STRATHALBYN RD
15	GLENORE RD

TRAVELLING STOCK ROUTE CROSSINGS

MAP ID	ROUTE ID	FEAT_NAME
1	U301JERI04	ROAD
2	U291JERI02	ROAD
3	U291JERI02	ROAD
4	U294BELY01	LAGLAN PIONEER ROAD
5	U303BELY02	CLERMONT LAGLAN ROAD
6	U401BELY02	ELGIN MORAY ROAD
7	U402BOWN01	ROAD
8	U403BOWN02	ROAD
9	U409BOWN02	ROAD
10	U321BOWN01	STRATHMORE ROAD
11	U398BOWN04	ROAD
12	U398BOWN04	ROAD
13	U398BOWN05	ROAD

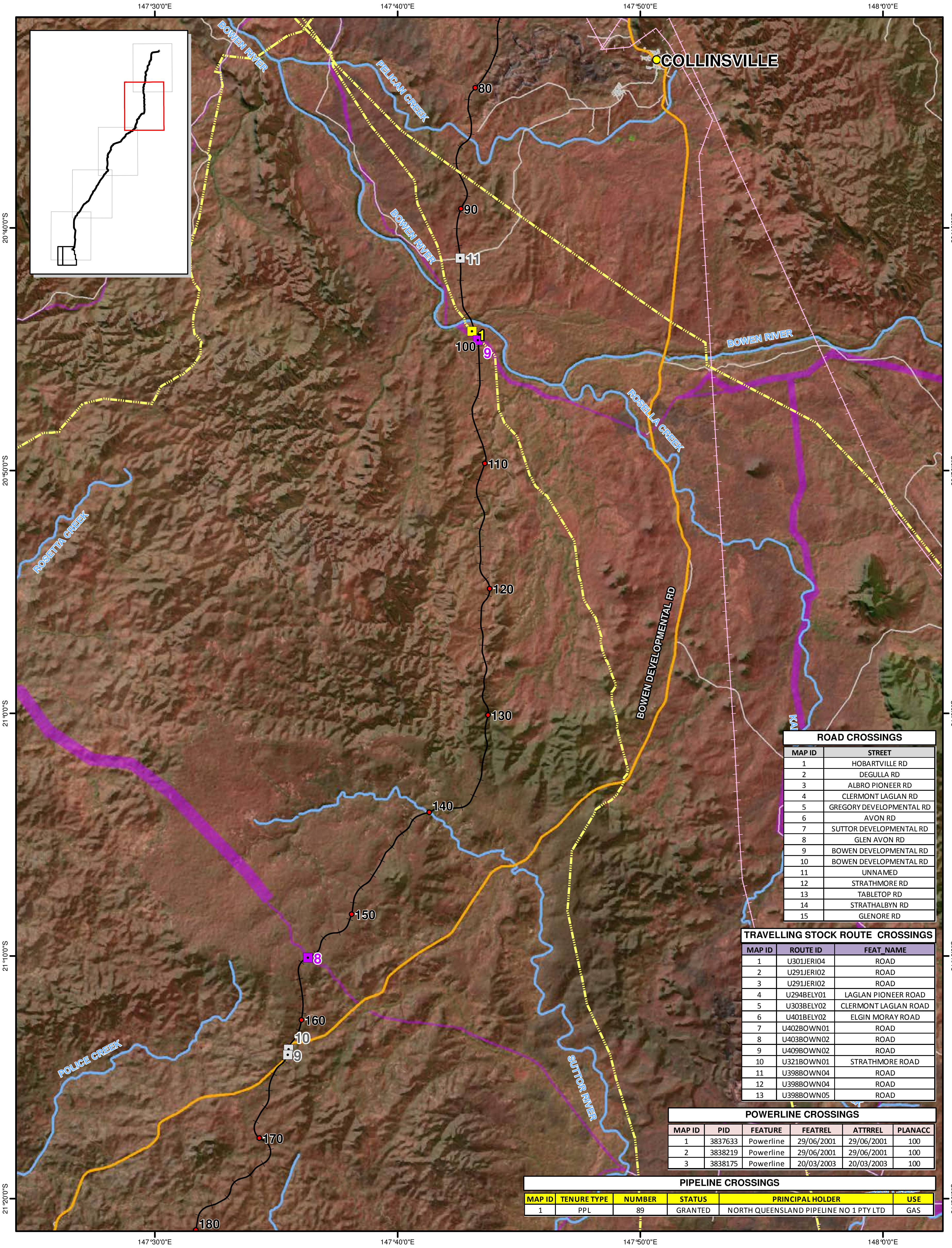
POWERLINE CROSSINGS

MAP ID	PID	FEATURE	FEATREL	ATTRREL	PLANACC
1	3837633	Powerline	29/06/2001	29/06/2001	100
2	3838219	Powerline	29/06/2001	29/06/2001	100
3	3838175	Powerline	20/03/2003	20/03/2003	100

PIPELINE CROSSINGS

MAP ID	TENURE TYPE	NUMBER	STATUS	PRINCIPAL HOLDER	USE
1	PPL	89	GRANTED	NORTH QUEENSLAND PIPELINE NO 1 PTY LTD	GAS

Figure 18. Rail Infrastructure Crossing (Sheet 2 of 5)



ROAD CROSSINGS

MAP ID	STREET
1	HOBARTVILLE RD
2	DEGULLA RD
3	ALBRO PIONEER RD
4	CLERMONT LAGLAN RD
5	GREGORY DEVELOPMENTAL RD
6	AVON RD
7	SUTTOR DEVELOPMENTAL RD
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TRAVELLING STOCK ROUTE CROSSINGS

MAP ID	ROUTE ID	FEAT_NAME
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3	U291JERI02	ROAD
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5	U303BELY02	CLERMONT LAGLAN ROAD
6	U401BELY02	ELGIN MORAY ROAD
7	U402BOWN01	ROAD
8	U403BOWN02	ROAD
9	U409BOWN02	ROAD
10	U321BOWN01	STRATHMORE ROAD
11	U398BOWN04	ROAD
12	U398BOWN04	ROAD
13	U398BOWN05	ROAD

POWERLINE CROSSINGS

MAP ID	PID	FEATURE	FEATREL	ATTRREL	PLANACC
1	3837633	Powerline	29/06/2001	29/06/2001	100
2	3838219	Powerline	29/06/2001	29/06/2001	100
3	3838175	Powerline	20/03/2003	20/03/2003	100

PIPELINE CROSSINGS

MAP ID	TENURE TYPE	NUMBER	STATUS	PRINCIPAL HOLDER	USE
1	PPL	89	GRANTED	NORTH QUEENSLAND PIPELINE NO 1 PTY LTD	GAS

GALILEE COAL PROJECT
(Northern Export Facility)

Waratah Coal
THE NEW ENERGY IN COAL

Mineralogy House, Level 7, 380 Queen Street, Brisbane Qld 4000, Australia

Source: LandSat Image: Geoscience Australia 2005; EPC, Gas Pipelines: DEEDI 2012; Proposed Rail: Waratah Coal Pty. Ltd. 2012; Abbot Point State Development Area: Mipela 2009; Roads: Geoscience Australia 2010; Watercourses: E3 Consult (date unknown); Powerlines: Geoscience Australia 2012; Travelling Stock Routes: State of Queensland (Department of Natural Resources and Mines) 2012

Disclaimer: This plan is based on or contains data provided by others. Waratah Coal Pty. Ltd. gives no warranty in relation to the data (including accuracy, reliability, completness, currency or suiability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to and use of the data. Data must not be used for disect marketing or be used in breach of privacy laws.

File: File:WAR20-26-SEIS0026a-FIGXXa-RAIL-INFRASTRUCTURE-CROSSINGS-120726

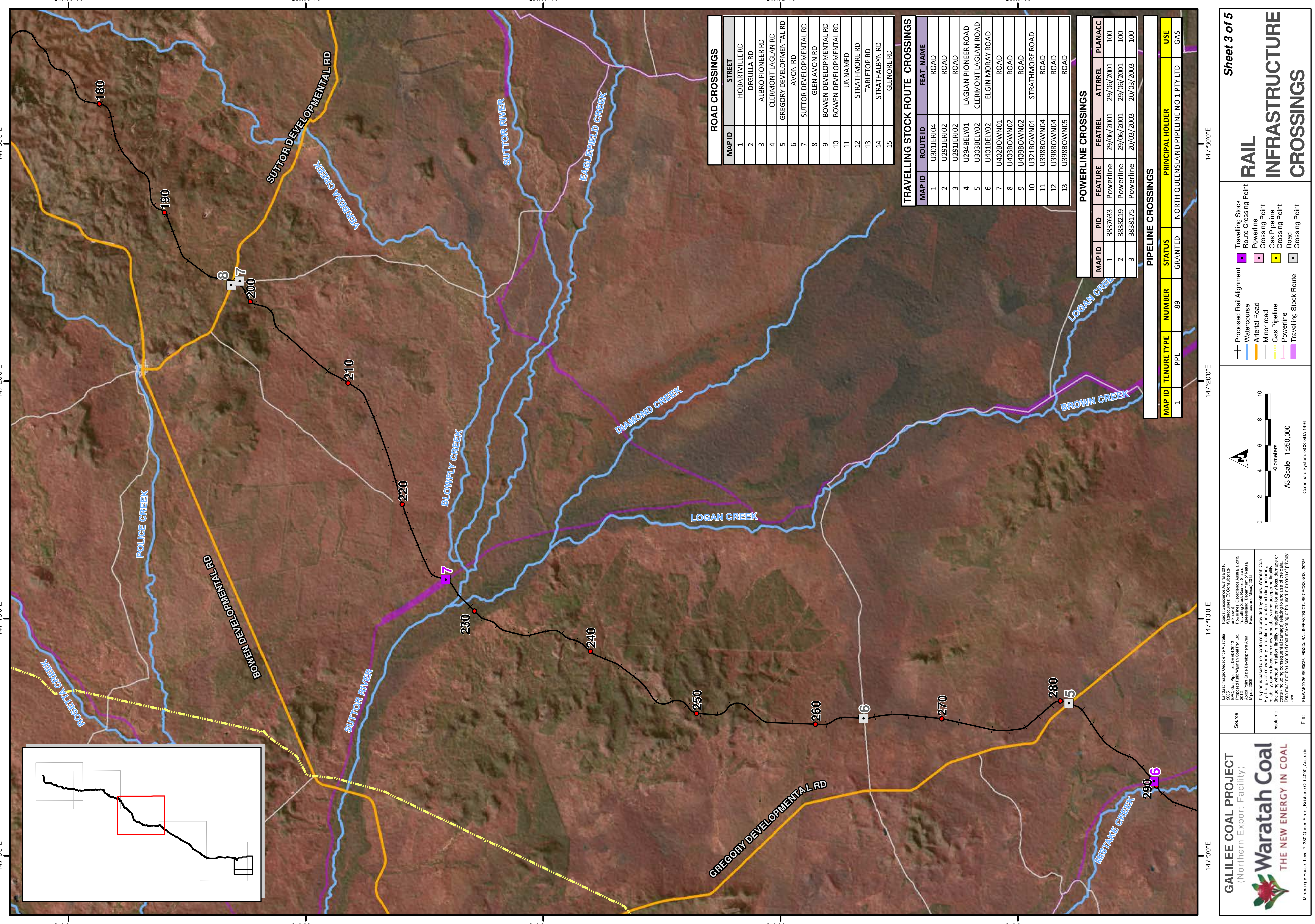
0 2 4 6 8 10 Kilometers
A3 Scale 1:250,000
Coordinate System: GCS GDA 1994

Legend:
- Proposed Rail Alignment
- Watercourse
- Arterial Road
- Minor road
- Gas Pipeline
- Powerline
- Travelling Stock Route
- Travelling Stock Route Crossing Point
- Powerline Crossing Point
- Gas Pipeline Crossing Point
- Road Crossing Point

Sheet 2 of 5

RAIL INFRASTRUCTURE CROSSINGS

Figure 18. Rail Infrastructure Crossing (Sheet 3 of 5)



ROAD CROSSINGS

MAP ID	STREET
1	HOBARTVILLE RD
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7	U402BOWN01	ROAD
8	U403BOWN02	ROAD
9	U409BOWN02	ROAD
10	U321BOWN01	STRATHMORE ROAD
11	U398BOWN04	ROAD
12	U398BOWN04	ROAD
13	U398BOWN05	ROAD

POWERLINE CROSSINGS

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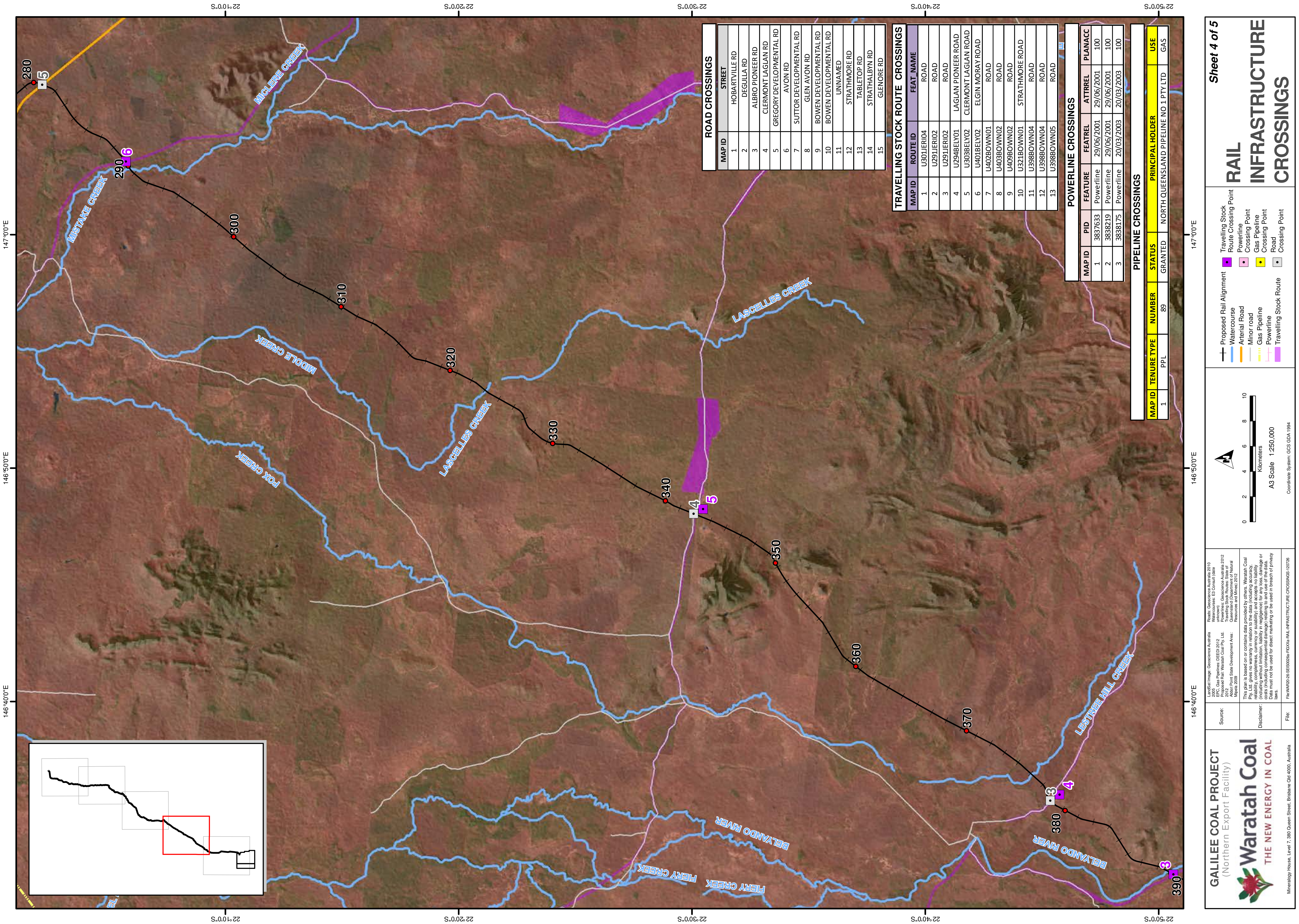
2	3838219	Powerline	29/06/2001	29/06/2001	100
3	3838175	Powerline	20/03/2003	20/03/2003	100

PIPELINE CROSSINGS

MAP ID	TENURE TYPE	NUMBER	STATUS	PRINCIPAL HOLDER	USE
1	PPL	89	GRANTED	NORTH QUEENSLAND PIPELINE NO 1 PTY LTD	GAS

Figure 18. Rail Infrastructure Crossing (Sheet 4 of 5)



ROAD CROSSINGS

MAP ID	STREET
1	HOBARTVILLE RD
2	DEGULLA RD
3	ALBRO PIONEER RD
4	CLERMONT LAGLAN RD
5	GREGORY DEVELOPMENTAL RD
6	AVON RD
7	SUTTOR DEVELOPMENTAL RD
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10	BOWEN DEVELOPMENTAL RD
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12	STRATHMORE RD
13	TABLETOP RD
14	STRATHALBYN RD
15	GLENORE RD

TRAVELLING STOCK ROUTE CROSSINGS

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3	U291JERI02	ROAD
4	U294BELY01	LAGLAN PIONEER ROAD
5	U303BELY02	CLERMONT LAGLAN ROAD
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7	U402BOWN01	ROAD
8	U403BOWN02	ROAD
9	U409BOWN02	ROAD
10	U321BOWN01	STRATHMORE ROAD
11	U398BOWN04	ROAD
12	U398BOWN04	ROAD
13	U398BOWN05	ROAD

POWERLINE CROSSINGS

MAP ID	PID	FEATURE	ATTRREL	PLANACC
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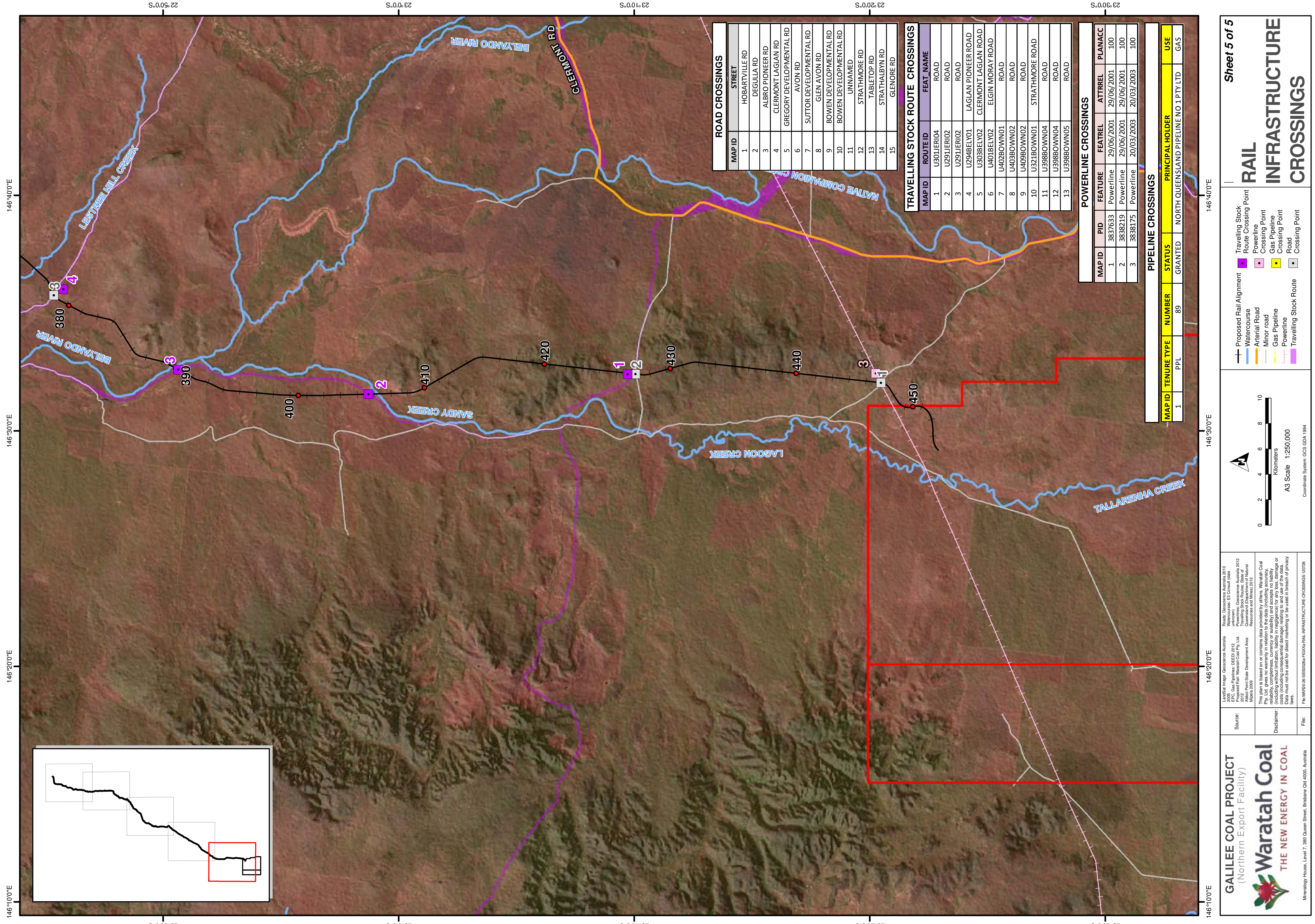
2	3838219	Powerline	29/06/2001	100
3	3838175	Powerline	20/03/2003	100

PIPELINE CROSSINGS

MAP ID	TENURE TYPE	NUMBER	STATUS	PRINCIPAL HOLDER	USE
1	PPL	89	GRANTED	NORTH QUEENSLAND PIPELINE NO 1 PTY LTD	GAS

Figure 18. Rail Infrastructure Crossing (Sheet 5 of 5)



Submitter No.	**1840**	Issue Reference:	**17033**
Submitter Type	Council	TOR Category	**Land**
Name	**Barcaldine Regional Council**	Relevant EIS Section	

DETAILS OF THE ISSUE

Soils and landform and post mining land use – More information is required.

PROPONENT RESPONSE

Soils and mine site landform impacts rehabilitation and management are further discussed in Sections 5.1 and 5.2 of the *Soils and Land Suitability SEIS Report* (contained in *Appendices – Volume 2* of this SEIS), with commitments for further work discussed in Section 6 of that report. The *Rehabilitation and Decommissioning* section of the *Draft Mine EM Plan* (contained in *Appendices – Volume 2* of this SEIS) provides further information on the rehabilitation objectives.

Submitter No.	**664**	Issue Reference:	**17046**
Submitter Type	Council	TOR Category	**Land (Soils)**
Name	**Whitsunday Regional Council**	Relevant EIS Section	

DETAILS OF THE ISSUE

Geology, Geomorphology and soils

The rail corridor traverses low coastal plains to gently undulating plains and transects through granitic hills associated with the Clarke Range where the highest elevation is 200m. Soil units identified include areas of sodosols and vertosols in the east and sodosols in the west. Many of these units are prone to erosion and dispersion, may be sodic and dispersive.

The proposed railway corridor will result in permanent steriliation of discrete areas of Class A and Class B GQAL suitable for cropping. The rail corridor intersects 72 separate rural allotments, approximately 50% of these are leasehold, 30% freehold and 20% as easements. The rail corridor is likely to impact the agricultural use of the land by fragmenting parts of properties and affecting infrastructure such as fences, gates, dams and irrigation systems.

The application also outlines that numerous construction access roads and lay down areas will be developed, there will be temporary hard rock quarries, gravel quarries, sand and water extraction points required for the construction of the rail line. Further information is required to exact number and locations of these facilities and the impact they may have on the natural environment and surrounding land use.

The geology along the rail corridor includes gentle sloping volcanic and clay plains in the south to moderate to steep undulating sandstone ridges with deep gullies through the north. Through the northern part the route traverses the Leichardt and Clarke Ranges, crossing stony low hills, rocky outcrops, gravelly ridges and exposed cliffs of sandstone, siltstone and basalt. Soil compositions includes coarse sandy slopes, yellow-grey duplex soils, red clay soils and cracking clays. Where the railway crosses the alluvial floodplains of major drainage lines, there will be areas of volatile cracking clays that are prone to shrinkage and swelling. Further information regarding the specific soil types needs to be included in the detailed design stage. This must be and factored into the erosion and sediment control plans for construction works (in particular for culverts and bridges), temporary camp and laydown facilities.

The EIS does not describe any of the major anticlines, synclines and fault lines that intersect or are close to the project as mapped by GSQ (2007), nor does it describe other features that may pose significant impacts on the construction, operation and rehabilitation of the project footprint.

It is also not known what quantity of material will be able to be source from within the project footprint, whether material will need to be brought to the area or excess spoil will require disposal.

PROPONENT RESPONSE

The EIS has been prepared to obtain the major approvals required to facilitate the project. The locations and approvals required for hard rock quarries, and sand extraction are not currently within the scope of the EIS. Waratah Coal will either acquire material from commercial quarries or obtain approvals for extraction of materials utilising pathways within the *Sustainable Planning Act 2009*. Roads that may be impacted as a result of the project are outlined within the transport section of the EIS (Volumes 2 and 3, Chapter 13). Further information on road and traffic requirements is presented in the *Traffic Engineering* report in *Appendices – Volume 2* of this SEIS.

The *Soils and Land Suitability SEIS Report* (contained in *Appendices – Volume 2* of this SEIS), provides information on the soils within the rail footprints and outlines the future work required to finalise the soils assessment.

Submitter No.	**572**	Issue Reference:	**17245**
Submitter Type	Individual	TOR Category	**Land**
Name	**Name withheld**	Relevant EIS Section	

DETAILS OF THE ISSUE

Degrade surface by subsidence.

PROPONENT RESPONSE

Surface changes due to longwall mining are dependent on the amount of surface subsidence, determined by factors such as overlying strata geology, the longwall block width, the seam height extracted, and the depth of cover. Subsidence impacts on the surface include the formation of tension cracks and in flat areas internal drain way subsidence troughs can form.

Types of remedial works for these impacts may include ripping, re-compacting and seeding of all tension cracks and reshaping any internally draining areas to be externally draining by the construction of contour drains and topsoiling and seeding any disturbed areas. These works will extend to blanketing and compacting of some water courses post-subsidence, preventing inflow of runoff into underground mining areas and maintain environmental surface flows. Materials which have been investigated for use in compacted blankets include silty alluvium and clay. Some re-alignment of water courses and minor earthworks will be necessary, but the work done so far allows these activities to be well planned prior to subsidence in any particular area. The natural fall of the mining area drains freely to the north and is sufficient to minimise the events of subsidence troughs. In the flatter areas, reshaping of any internally draining areas to be externally draining will be done by the construction of contour drains and appropriate rehabilitation measures.

On the cessation of subsidence in any one area and completion of remedial works, it is planned that the land will be returned to grazing and original land activities. Yield trials will verify the maintenance of original land productions. The project area surface stratigraphy contains cohesive Quaternary alluvial and Tertiary sands, clays and laterites which are self-healing to tensile surface fracturing. Surface tension cracks which form in cohesionless creek bed alluvium and Recent Colluvium are self-healing and readily infill. Open tension cracks in surface clays need to be ripped and compacted.