2. Description of the Project (Rail)

2.1 Project Overview

Adani is proposing to develop a 60 million tonne (product) per annum (Mtpa) thermal coal mine in the north Galilee Basin approximately 160 kilometres (km) north-west of the town of Clermont, Central Queensland. All coal will be railed via a privately owned rail line connecting to the existing QR National rail infrastructure, and shipped through coal terminal facilities at the Port of Abbot Point and the Port of Hay Point (Dudgeon Point expansion). The Carmichael Coal Mine and Rail Project (the Project) will have an operating life of approximately 90 years.

The Project comprises of two major components:

- The Project (Mine): a greenfield coal mine over EPC1690 and the eastern portion of EPC1080, which includes both open cut and underground mining, on mine infrastructure and associated mine processing facilities (the Mine) and the Mine (offsite) infrastructure including:
  - A workers accommodation village and associated facilities
  - A permanent airport site
  - Water supply infrastructure
- The Project (Rail): a greenfield rail line connecting the Mine to the existing Goonyella and Newlands rail systems to provide for the export of coal via the Port of Hay Point (Dudgeon Point expansion) and the Port of Abbot Point, respectively, including:
  - Rail (west): a 120 km dual gauge portion from the Mine site running west to east to Diamond Creek
  - Rail (east): a 69 km narrow gauge portion running east from Diamond Creek connecting to the Goonyella rail system south of Moranbah

The Project has been declared a ‘significant project’ under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) and as such, an Environmental Impact Statement (EIS) is required for the Project. The Project is also a ‘controlled action’ and requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Project EIS has been developed with the objective of avoiding or mitigating all potential adverse impacts to environmental, social and economic values and enhancing positive impacts.

This section describes the Project (Rail) in detail. Volume 2, Section 2 Project Description provides a detailed description of the Project (Mine).

The objectives of the Project (Rail) are to:

- Support the Project (Mine)
- Support co-use and co-location with existing and proposed developments and third party users and in accordance with Queensland Government policy regarding the provision on rail infrastructure within the Galilee Basin
- Enable haulage of up to 100 Mtpa product from the Mine and third party users in the Rail (West) rail infrastructure corridor
- Enable haulage of up to 60 Mtpa on the Rail (East) infrastructure corridor

The Rail (east) will be a narrow gauge track with capacity assessed at 60 Mtpa. Additional capacity has been assessed on the Rail (west) as a result of discussions with the Queensland government and to assist it in advancing its policy position for the development of common user infrastructure, in particular rail infrastructure, in the Galilee Basin. For clarity and ease of reference, timeframes throughout this Volume and the EIS are based on construction activities for the Project (Rail) commencing in 2013. Various factors (such as approval timeframes, weather, etc.) may influence this timing, which would have inevitable knock-on effects on when activities, and the impacts they give rise to, are likely to occur.

In order to enable the construction and use of the Project (Rail), and potentially other third party facilities, it is envisaged that quarry and borrow pits will be needed near to the alignment of the Project (Rail). These items do not form part of the Project (Rail) assessed in Volume 3 of the EIS. However, preliminary work has been undertaken to identify investigative quarry and borrow pit areas, and these are identified in Figure 2-5. Investigation into these areas is being undertaken for potential development by the proponent, related entities or future third party entities.

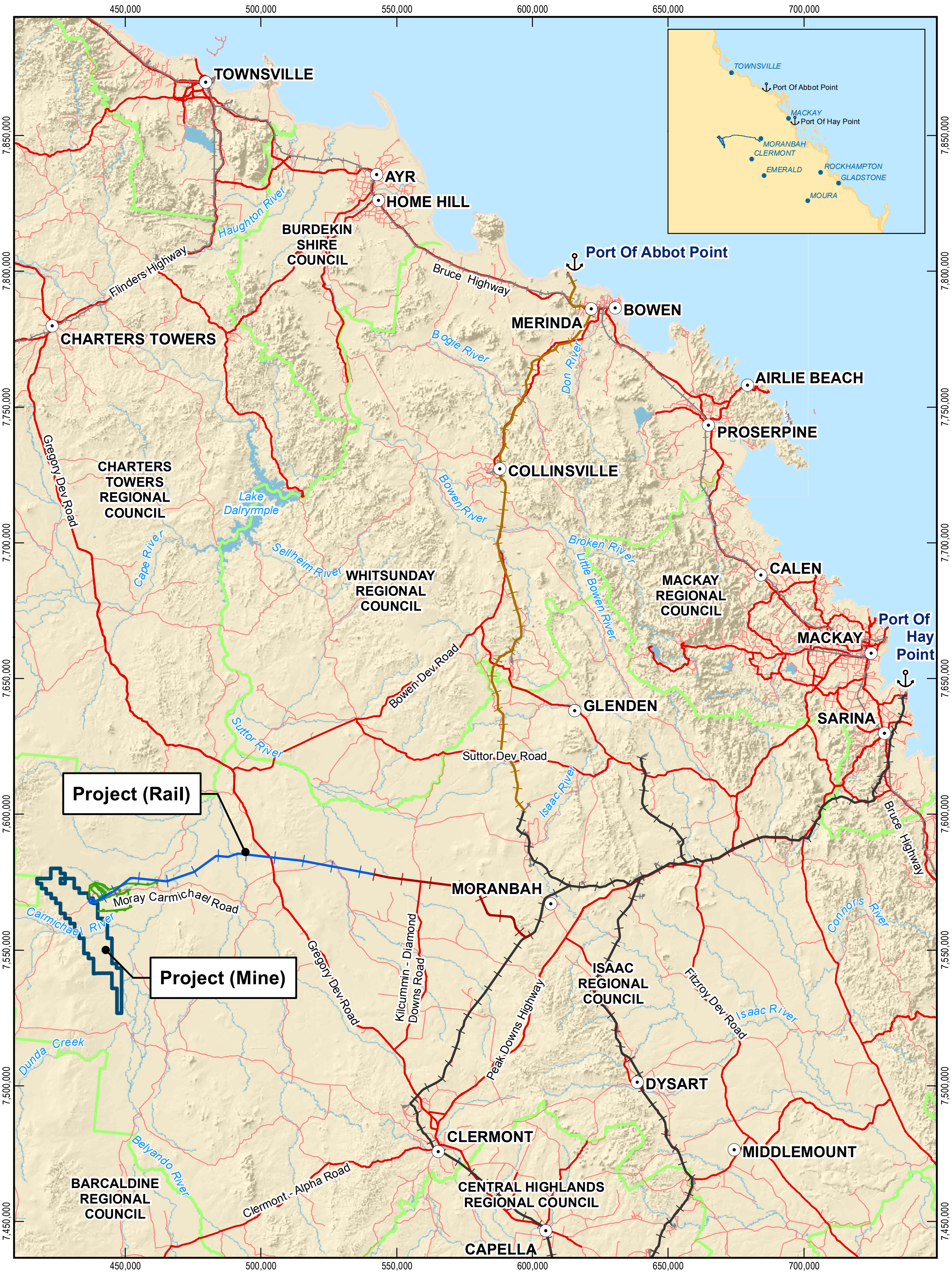
2.2 Project (Rail) Location

The Project (Rail) alignment is located within a nominal 95 metre (m) wide corridor that runs from the terminal facilities within the boundary of the Mine to connect with the Wotonga Blair Athol Branch Railway of the existing QR National Goonyella Coal Rail System south of Moranbah. The alignment is approximately 189 km long and runs west to east.

Figure 2-1 illustrates the Project (Rail) location.

The proposed Project (Rail) location is in keeping with the Queensland Government’s recent policy decision regarding development of rail corridors within the Galilee Basin (refer to Volume 4, Appendix D Project Approvals and Planning Assessment), whereby one north – south and one west – east rail corridor were determined to be preferred corridors.

The Project (Rail) traverses 11 leasehold lots and 10 freehold lots and sits wholly within the Isaac Regional Council (IRC) Local Government Area (LGA). Further details are provided in Volume 3, Section 4 Land.



LEGEND

- Town
- Major Port
- Other Rail Network
- Goonyella System
- Newlands System
- State Road
- Local Road
- Watercourse
- Local Government Area
- Project (Rail)
  - Rail (West)
  - Rail (East)
- Project (Mine)
- Mine (Offsite)

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Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

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Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Job Number	41-25215
Revision	L
Date	05-09-2012

Project (Rail) Location

Figure: 2-1

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Data Source: © Commonwealth of Australia (Geoscience Australia): Town, Railways, Watercourses (2007); DERM: LGA, (2011), Hillshade (2009); DMR: State Roads (2008); Gassman/Hyder: Mine (Offsite) (2012); DME: EPC1690 (2010), EPC1080 (2011); Adani: Alignment Opt9 Rev3 (2012). Created by: BW, JVC

2.3 Concept Design

2.3.1 Overview

All product from the Project (Mine) will be railed via a privately owned rail line connecting to the existing Goonyella and Newlands rail systems then shipped through coal terminal facilities at Port of Hay Point (Dudgeon Point expansion) and Abbot Point, respectively. The Project (Rail) includes all project components necessary for the construction and operation of the greenfield rail system between the Mine Site and the junction with the Goonyella rail system.

The Project (Rail) will be required to transport the coal product for export. It is expected that construction of the Project (Rail) will commence in the third quarter of 2013 for a period of approximately two years. The construction schedule currently indicates that construction activities in the first year are largely concerned with the undertaking of civil works (earthworks and structures), such as the establishment of watercourse crossings. Yard works are also scheduled during this period. Earthworks, are planned to commence in 2013 and continue through 2014. Track laying, followed by ballasting and tamping, will commence in 2014 and is scheduled for completion in 2015. The grade separation treatment at the Gregory Development Road is scheduled to commence in late 2013.

Adani is actively working with the Queensland Government to establish common user access to the rail proposed corridor. The proposed Project (Rail) travels west-east between the Mine and the junction with the Goonyella rail system, south of Moranbah. As identified in Section 2, the Project (Rail) is proposed to be delivered in two separable portions, namely Rail (west) and Rail (east).

The Rail (west) portion is designed to accommodate a dual gauge (i.e. narrow gauge and standard gauge) with a capacity up to 100 Mtpa. This will allow for future connections to other existing and/or proposed third party rail infrastructure via standard and/or narrow gauge lines. Existing and proposed rail systems are discussed further in Section 2.4.

The Rail (east) will be a narrow gauge track with capacity assessed at 60 Mtpa. Additional capacity has been modelled on Rail (west) as a result of discussions with the Queensland government and to assist it in advancing its policy position for the development of common user infrastructure, particularly rail infrastructure, in the Galilee Basin. This policy is directed at the construction of limited rail lines shared between numerous users. The Project (Rail) alignment as outlined in this chapter has been noted as generally in accordance with the west-east preferred common user corridors.

Common user corridor development for rail infrastructure will reduce the overall environmental and stakeholder impacts which would otherwise arise from the development of multiple corridors designed to transport coal from the Galilee Basin.

All impacts of the Rail (west) have been assessed at 100 Mtpa capacity to ensure that the EIS takes into account any impacts of the proposed use of the Rail (west) by potential third party users. The potential third party users and their projects cannot be accurately identified at this time. Of course, new projects will be the subject of separate State and where applicable Federal approval processes.

The operation of the Project (Rail) is in support of the Project (Mine) with an expected operational life of 90 years. Operational capacity of the Project (Rail) will increase from 25 Mtpa in the first year of operation, to 44 Mtpa in 2020, reaching a capacity of 60 Mtpa in 2022, in line with production from the

Project (Mine). To accommodate other existing and/or proposed third party users (whose projects will require separate assessment and approval under State and where applicable Federal approval processes), provision has been made for a maximum operational capacity of 100 Mtpa on Rail (west).

Passing loops will be constructed progressively in line with coal production and the requisite increased rail capacity required. To facilitate the Project (Mine) five passing loops will be required to be operational by 2018. A total of eight passing loops will provide sufficient operational capacity through to Project (Mine) peak production and transport of 60 Mtpa. Increasing the payload per train will achieve operational capacity of up to 100 Mtpa on Rail (West) without the need for additional passing loops.

The Project (Rail) is expected to require capital expenditure totalling $1.2 billion (excluding rolling stock). The Project (Rail) line is expected to be operational in 2016, in line with the start of the Project (Mine)'s coal production. The Mine is expected to start production at 2 Mtpa and gradually ramp up to full production of 60 Mtpa by 2022.

Adani has been granted Rail Feasibility Investigative Authority to access land and carry out investigations under the *Transport Infrastructure Act 1994* (TI Act). Adani has also progressed individual access agreements with landowners in order to facilitate field investigations which have supplemented detailed desktop assessments.

The current concept design is considered adequately robust to assess the environmental impacts of the construction and operational footprint of the Project (Rail), while allowing flexibility to review and validate the design once further data is available. A summary of the key Project (Rail) concept design characteristics are summarised in Table 2-1.

Table 2-1 Project (Rail) Concept Design Key Characteristics

Feature		
Route length (including mine loop)	189	km
Narrow gauge	69	km
Dual gauge	120	km
Total length of cut	24	Km
Total length of embankment	165	km
Maximum depth of cut (located at 5.2 km)	13.19	m
Maximum height of bank (located at 86.5 km)	10.35	m
Estimated quantity of cut		
◗ Rail (west)	0.68	million m^3
◗ Rail (east)	1.60	million m^3
◗ Balloon loop, ballast siding and flash butt welding yard	210,875	m^3
Estimated quantity of fill		
◗ Rail (west)	7.60	million m^3

Feature		
◗ Rail (east)	1.75	million m^3
◗ Balloon loop, ballast siding and flash butt welding yard	560,884	m^3
No of narrow gauge passing loops	3	
No of dual gauge passing loops	5	
Rolling Stock Maintenance Yard	1	
Track Maintenance Yard	1	
Public Road Treatments*	6	
◗ At grade crossings	2	
◗ Grade separated crossings (rail under road)	1	
◗ Grade separated crossings (rail over road)	2	
◗ Realignment	1	
Occupational crossings*	16	
At grade crossings	12	
Grade separated crossings (rail over private road)	4	
Waterway crossings	88	
Bridge structures	17	
Drainage structures	71	

* Subject to negotiations with IRC, DTMR, DNRM and landholders.

Sources: Aarvee Associates 2011; Aarvee Associates 2012

2.3.2 Concept Design Development

The first stage of the Project (Rail) concept design development involved determining a suitable route for the Project (Rail) alignment (the Rail Corridor) (refer to Volume 1, Section 1 Introduction). A 500 m wide corridor between the Mine and the connection with the Goonyella rail system was initially established to define the boundaries of the alignment. Upon confirmation of this route, more detailed design parameters and environmental analysis was undertaken and the Rail Corridor was reduced to a nominally 95 m wide corridor.

The design response to key environmental features has been developed in line with engineering constraints for a feasible Project (Rail) design. The Project (Rail) concept design is based on:

- Minimising environmental impact
- Minimising disturbance to existing infrastructure
- Limiting fragmentation of land holdings
- Meeting engineering design criteria

While all relevant environmental elements were considered and where possible negative impacts were avoided or minimised, the key environmental features that influence the engineering design are landform and hydrological conditions.

Flood plains, particularly those associated with the Belyando River, Mistake Creek and Diamond Creek, are located along the length of the Project (Rail) alignment. Maintaining the formation level so that it minimises the fill material required, while satisfying hydrological requirements, and is critical to the Project (Rail) design. Concept design flood immunity at formation level is 50 years ARI and 100 years ARI at rail level.

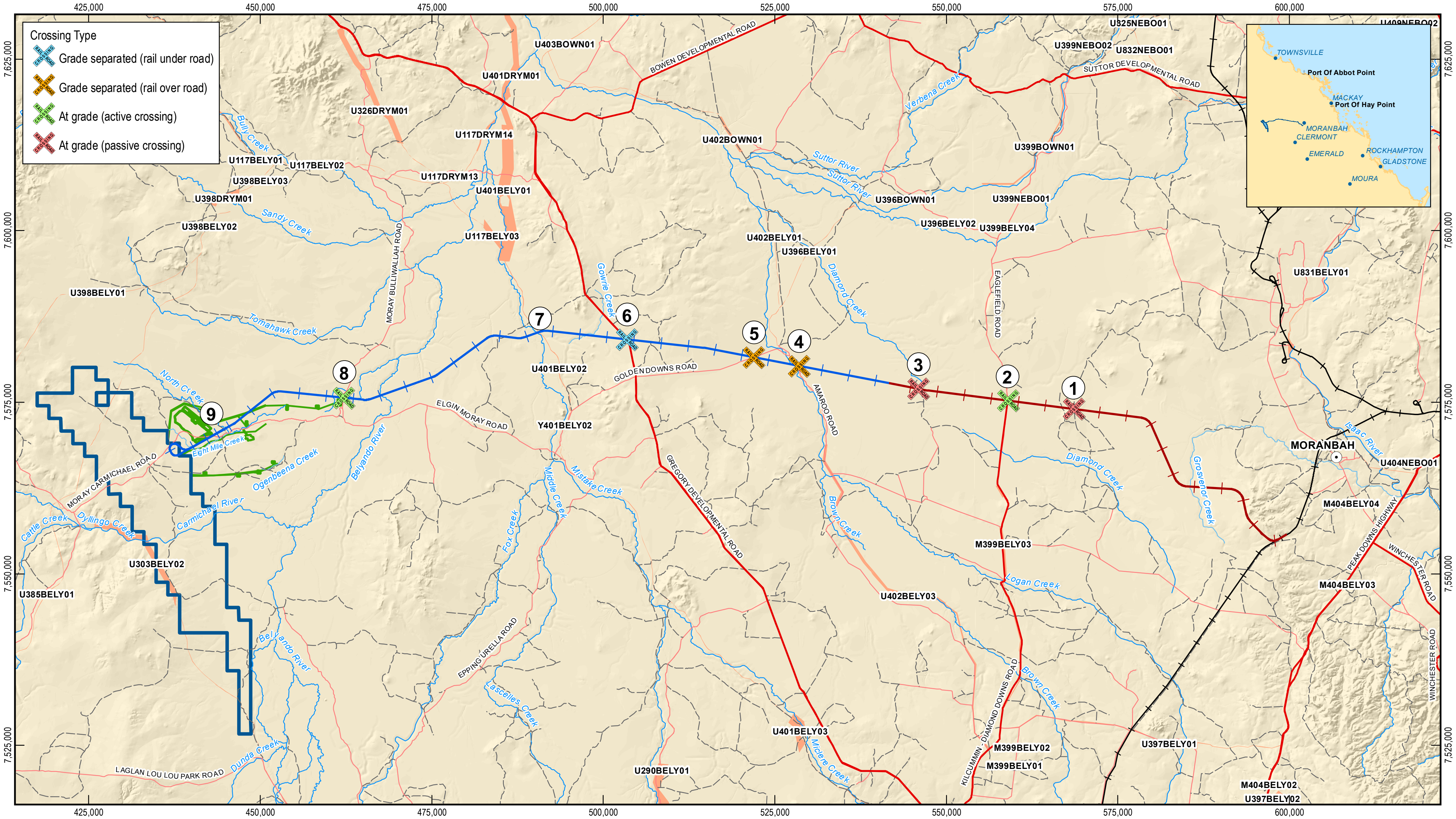
Minimising the crossing of waterways, roads and stock routes, and limiting disturbance to flora and fauna, were also incorporated in the initial route selection process. Subsequent design then determined the most appropriate location and method of avoiding or crossing these environmental features and infrastructure assets. Based on the upstream catchment areas of the water courses and the estimated structure sizing, waterway crossings were assessed and categorised (refer to Table 2-2).

Table 2-2 Waterway Crossing Types

Crossing Type	Assessment Criteria	Numbers in design
Major Water Crossings	Catchment over 100 km^2	
Major Bridge Structures	Bridge structure with catchment area over 100 km^2	9
Major Drainage Structures	Drainage structure with catchment area over 100 km^2	3
Minor Water Crossings	Catchment area less than 100 km^2	
Minor Bridge Structures	Bridge structure with catchment area less 100 km^2	8
Minor Drainage Structures	Drainage structure with catchment area less 100 km^2	68
Total		**88**

Source: Aarvee Associates, 2011

After analysis of the type, number (refer to Table 2-2) and location of waterway crossings, standard design criteria were applied. Eighty-eight waterway crossings were identified, 12 as major waterways (refer to Table 2-3) shown on Figure 2-2. A standardised bridge span was adopted, on the basis of either a 15 m or 20 m span, taking into account the bridge design loading and the consequential depth required for this loading. These will be manufactured and transported for all of the bridges. A 100 year ARI was used as the concept design criteria for design discharge on the rail bridges.



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Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

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LEGEND

- Town
- Other Rail Network
- Watercourse
- State Road
- Local Road
- Track
- Stock Route
- Project (Mine)
- Mine (Offsite)
- Rail (West)
- Rail (East)

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Location of Waterway, Road and Stock Route Crossings

Figure: 2-2

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Data source: GHD: Crossing Types (2011); DERM: DEM (2008), DCDB (2010), Physical Road Network (2011); DME: EPC1690 (2010), EPC1080 (2011); © Commonwealth of Australia (Geoscience Australia): Localities, Railways (2007); Adani: Alignment Opt9 Rev3 (SP1&2) (2012); Gassman/Hyder: Mine (Offsite) (2012). Created by: BW, jvc

Table 2-3 Major Waterways and Associated Crossing Configurations

Waterway	Chainage (km)	Catchment Area (km^2)	Bridge Configuration / Drainage Structure
Grosvenor Creek	18.497	128.4	4 x 15 m spans
Diamond Creek	62.722	1,000	Major Drainage Structure
Logan Creek	82.690	2,900	6 x 20 m Spans
Unnamed waterway	90.165	109.7	Major Drainage Structure
Gowrie Creek	113.476	210	4 x 15 m Spans and Drainage Structure
Mistake Creek	120.757	7900	5 x 20 m Spans and Drainage Structure
East Tributary of Belyando River	139.214	210	Major Drainage Structure
Belyando River	149.026	22,000	10 x 20 m Spans and Drainage Structure
Ogenbeena Creek (lower crossing)	150.630	870	4 x 15 m Spans and Drainage Structure
Ogenbeena Creek	152.991	850	4 x 15 m Spans and Drainage Structure
North Creek	170.417	300	2 x 15 m Spans and Drainage Structure
Eight Mile Creek	176.165	180	3 x 15 m Spans and Drainage Structure

** Subject to ongoing hydraulic assessment and landholder consultation.*

Source: Aarvee Associates 2011

Drainage structures will be provided where:

- Railway alignment design results in an embankment depth inappropriate to support bridge structure spans
- Topography results in a localised drainage pathway intersected by the railway
- Additional drainage area is required during flood conditions to supplement drainage areas able to be provided by bridge structures
- Drainage area is required to increase the operational resilience of the railway during flood conditions

Where multiple separate drainage pathways are intersected by the railway and located in close proximity to each other, these drainage pathways may be linked by longitudinal drainage structures located on the upstream side of the railway embankment. The flows will then be consolidated into appropriate drainage structures at a smaller number of locations.

Table 2-3 above outlines the major waterways and associated crossing configurations based on the above design criteria.

2.3.3 Road and Stock Crossings

The Project (Rail) will cross dedicated public road reserves (constructed and unconstructed) and private (farm) trails, and stock crossings. The following have been identified as being affected by the Project (Rail):

- Six public dedicated roads (constructed or unconstructed)
- Three national stock route crossings
- Four easements

The design response to these crossings is based on the following considerations:

- Preservation of existing roads and accesses
- Preservation of stock routes
- Road and rail safety
- Rail operational efficiency
- Cost to benefit risk evaluations
- Consideration to regulatory standards, guidelines and polices

In addition, operational performance targets include the need to avoid any reduction in road safety and avoid disruption of traffic.

Each crossing location has been assessed to determine whether the respective individual crossing should be retained or closed, and in the case of the retained crossings, to identify the appropriate treatment option. Three treatment options exist for the rail crossings:

- Grade separation (rail under road or rail over road)
- At grade active control
- At grade passive control

The treatment option is based on design parameters which include:

- Risk assessment
- Traffic volumes (including likely frequency of use)
- The estimated train velocities at crossing
- Sight lines

Table 2-4 provides a summary of the roads and stock routes that the Project (Rail) intersects and the type of crossing treatments proposed to be provided. The location of proposed road and stock route crossings are shown in Figure 2-2.

Table 2-4 Roads and Stock Routes that Intersect with the Project (Rail)

ID	Road/Crossing Name	Chainage	Proposed Treatment Type*	Description
1	Eaglefield Road / Kilcummin Diamond Downs Road	51.2	At grade active crossing Stock crossing separately by culvert	IRC local road State Controlled Road (south of the Project (Rail)) Stock route (M399BELY03)
2	Amaroo Road	82.1	Grade separated (rail over road) Stock route along road	IRC local road Stock route (U402BELY03)
3	Avon Road	88.7	Grade separated (rail over road)	IRC local road
4	Gregory Developmental Road	107.4	Grade separated (rail under road)	State controlled road
5	Mistake Creek Crossing	120.4	Provide sufficient clearance for stock under the waterway bridge over creek	Stock route (Y401BELY02)
6	Moray Bulliwallah Road	151.6	At grade active crossing	IRC local road
7	Moray Carmichael Road	173.1	Realigned to run parallel on the southern side of the Project (Rail). No crossing treatment required.	IRC local road

* Subject to further negotiations with IRC, DTMR, DNRM and landholders.

Gregory Developmental Road is the only State controlled road crossed by the proposed alignment. The Kilcummin Diamond Downs Road is a State controlled road which becomes an IRC local controlled road just south of the proposed rail alignment. The Project (Rail) crosses along the IRC local controlled section of the road. These roads function as inter-regional links, carrying in the order of 300 vehicles/day with a high percentage (>25-30 per cent) of commercial vehicles, including freight vehicles such as 25 m B-Doubles and longer road trains.

Moray Carmichael Road will be realigned and will not be crossed by the Project (Rail). Adani has entered into a Road Maintenance Agreement with the IRC and will be responsible for the upgrade and maintenance of Moray Carmichael Road to a standard acceptable to the IRC in accordance with the Specification and Council Road Standards. While Adani is currently maintaining the road, further studies are underway to determine what upgrades are required to support the Project's exploration phase and through construction into operation (refer Volume 2 Section 2 Project Description). Some realignment may be required.

The Stock Route Network is the network of stock routes and reserves for travelling stock in Queensland. The Project (Rail) alignment crosses three national stock routes. The stock routes and associated proposed crossing treatments (as agreed in principle with the State and IRC) are as follows:

- Kilcummin Diamond Downs Road is a stock crossing (Stock route (M399BELY03) and it is proposed that the crossing treatment will comprise a large culvert
- Amaroo Road (stock route U402BELY03) is proposed to be grade separated with stock passing under the proposed rail bridge structure (i.e. rail over road) (to be confirmed through detailed design)
- Mistake Creek is also a stock crossing (stock route (U401BELY02). Mistake Creek crossing is proposed to be grade separated with stock passing under the proposed rail bridge structure necessary for crossing the watercourse

2.3.4 Easements

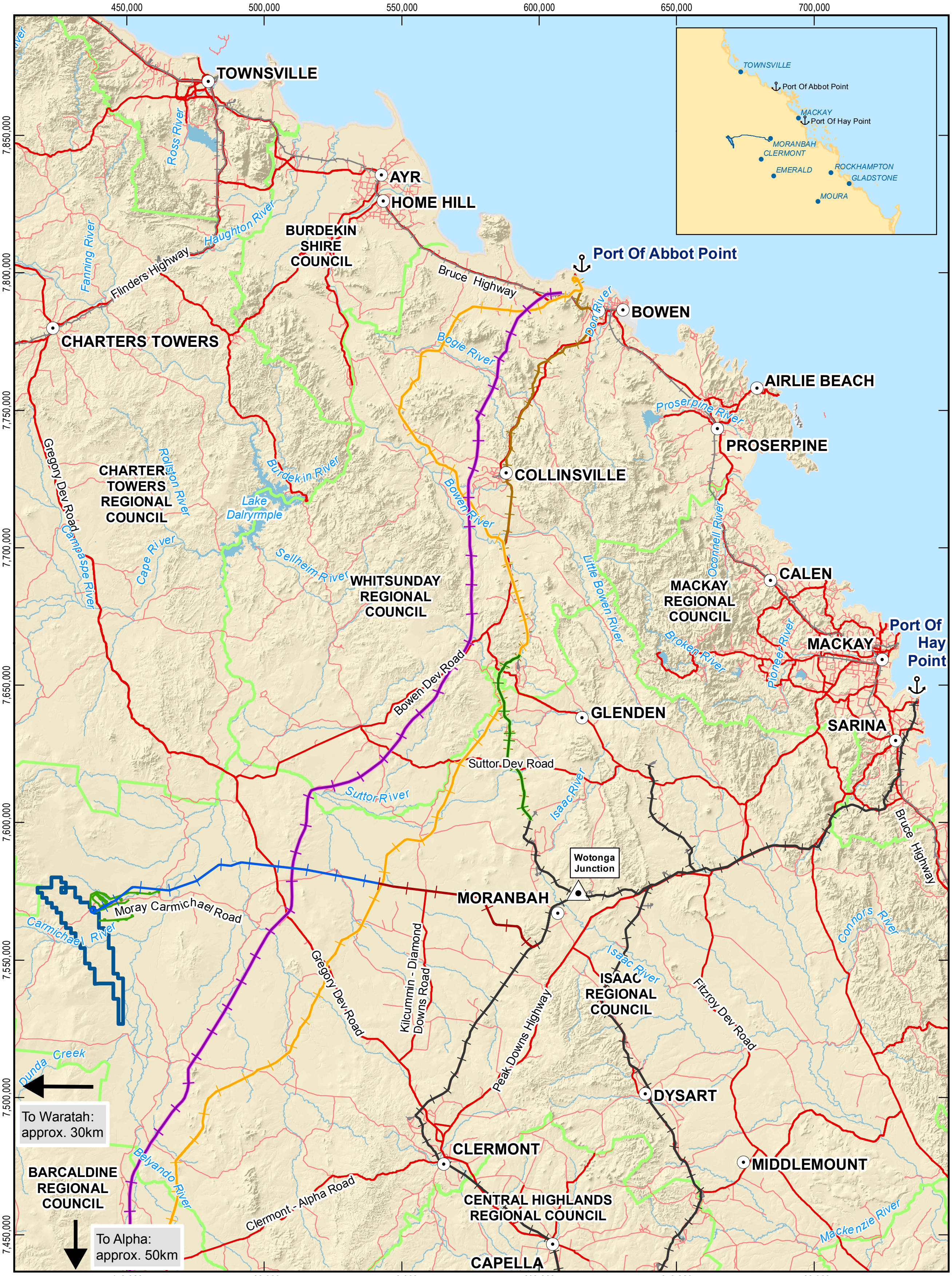
Sixteen easements have been identified within the vicinity of the Project (Rail) corridor. Of the 16 easements identified, only four cross the Project (Rail) where the rail line connects with the existing Goonyella rail system.

2.4 Rail System Interface

2.4.1 Overview

The Project (Rail) concept design is sufficiently robust to allow for interfaces with existing and proposed rail systems. The Project (Rail) provides a greenfield west-east link between the Mine Site and existing or proposed rail systems to port facilities at Port of Hay Point (Dudgeon Point expansion) and Port of Abbot Point.

The existing rail systems comprise the QR National owned and operated Goonyella rail system, the Newlands rail system and Goonyella to Abbot Point Expansion (GAPE) project. The proposed rail systems may include the Galilee Coal Project and the Alpha Coal Project. Figure 2-3 illustrates the rail system interface between the Project (Rail) and these systems.



LEGEND

- Town
- Major Port
- Other Rail Network
- Goonyella System
- Newlands System
- GAPE
- Proposed Waratah Alignment
- Proposed Hancock Alpha Alignment
- State Road
- Local Road
- Watercourse
- Project (Mine)
- Mine (Offsite)
- Rail (West)
- Rail (East)
- Local Government Area

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Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

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Carmichael Coal Mine and Rail Project

Job Number 41-25215
Revision C
Date 11-09-2012

Rail System Interface

Figure: 2-3

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Data Source: DERM: LGA (2011); DMR: State Roads (2008); DME: EPC1690 (2010), EPC1080 (2011); Adani: Alignment Opt9 Rev3 (2012); GHD:Proposed Alignments (2011); Gassman/Hyder: Mine (Offsite) (2012). Created by: BW,JVC

2.4.2 Existing Rail Systems

The Goonyella rail system comprises 925 km narrow gauge rail line. The Goonyella rail system is electrified, with the overhead line equipment operating at 25,000 volts, 50 Hertz alternating current supply. The Goonyella rail system is currently contracted to export 129 Mtpa product. It currently services 30 coal mines in the Bowen Basin. QR National has a current program of capacity upgrades which will initially increase capacity to 140 Mtpa for export via the Port of Hay Point (Dudgeon Point expansion).

The Newlands rail system comprises approximately 190 km of narrow gauge single track rail line. The Newlands rail system is capable of operating with diesel hauled trains which predominantly consist of three locomotives hauling 82 wagons. The Newlands rail system is currently contracted to export 32 Mtpa product. It currently services three coal mines in the northern Bowen Basin. QR National is developing master plans for the expansion of the Newlands Rail Line to accommodate 120 Mtpa of product.

The GAPE project, completed in December 2011, provides a link from the existing Goonyella rail system to the Newlands rail system, enabling export of coal from the northern Bowen Basin through the Port of Abbot Point. The completion of the GAPE project sees the capacity of Abbot Point Coal Terminal 1 and the Newlands Railway increase to 50 Mtpa.

The Project (Rail (West)) comprises dual gauge (narrow and standard) rail line. This allows connection to the Goonyella rail system (narrow gauge) at a point south west of Moranbah. Connection to the Port of Hay Point is via the Goonyella rail system. Connection to the Port of Abbot Point is via the Newlands rail system which branches from the Goonyella rail system north of Moranbah at Wotonga.

2.4.3 Proposed Rail Systems

A number of third party rail systems are proposed to link coal resources in the Galilee Basin with export terminals at the Port of Abbot Point as follows:

- The approved Alpha Coal Project by Hancock Prospecting Pty Ltd, includes approximately 495 km of standard gauge, single track, and non-electrified railway line. The rail line has the capacity for 60 Mtpa product. The entire railway line is a greenfield development. It is proposed to run from Alpha Mine, located approximately 30 km north-west of the Alpha Township, to the Point of Abbot Point (Hancock Prospecting Pty Ltd, 2010). This proposed line intersects the Project (Rail) approximately 120 km east of the Mine Site.
- The Galilee Coal Project (Northern Export Facility) (also known as the China First Project) proposed by Waratah Coal Pty Ltd includes approximately 468 km of standard gauge, non-electrified railway line. It is proposed to ultimately export 400 Mtpa product. The entire railway line is a greenfield development. It is proposed to run from a new coal mine approximately 30 km north of the Alpha Township, to the Port of Abbot Point (Waratah Coal, 2011).
- The Goonyella to Abbot Point Rail Project proposed by BHP Billiton MetCoal Holdings Pty Ltd (a member of the BHP Billiton Group) includes a greenfield dual and/or standard gauge rail line. It is expected to enable the transport of approximately 60 Mtpa of product. It is proposed to run from the Goonyella Riverside Mine Complex, located approximately 24 km north-west of Moranbah, to the Port of Abbot Point (BHP Billiton, 2011).

- The Co-ordinator General declared the Central Queensland Integrated Rail Project (CQIRP) as a significant project on the 27 January 2012. The proposed Central Queensland Integrated Rail Project will service the growing needs of the Central and South Galilee Basin providing the Basin's mines with access to the ports of Central Queensland (Abbot Point, Dalrymple Bay, Hay Point and Gladstone). The project will also provide enhanced access to Abbot Point for the expanding and new mines of the Bowen Basin (QR National, 2011).

Volume 1 Section 1 Introduction provides detail regarding the specific relationship between the Project (Rail) and the abovementioned rail systems. The Project (Rail) offers significant opportunity for the co-location and co-use of infrastructure, assisting with the sustainable development of the Galilee Basin by accommodating additional capacity for third party users on Rail (west). The Project (Rail) closely follows the west-east corridor options determined to be preferred by the State government, with the approved Alpha project rail component following the other.

2.5 Project Components

2.5.1 Overview

The Project (Rail) components comprise of the following rail infrastructure:

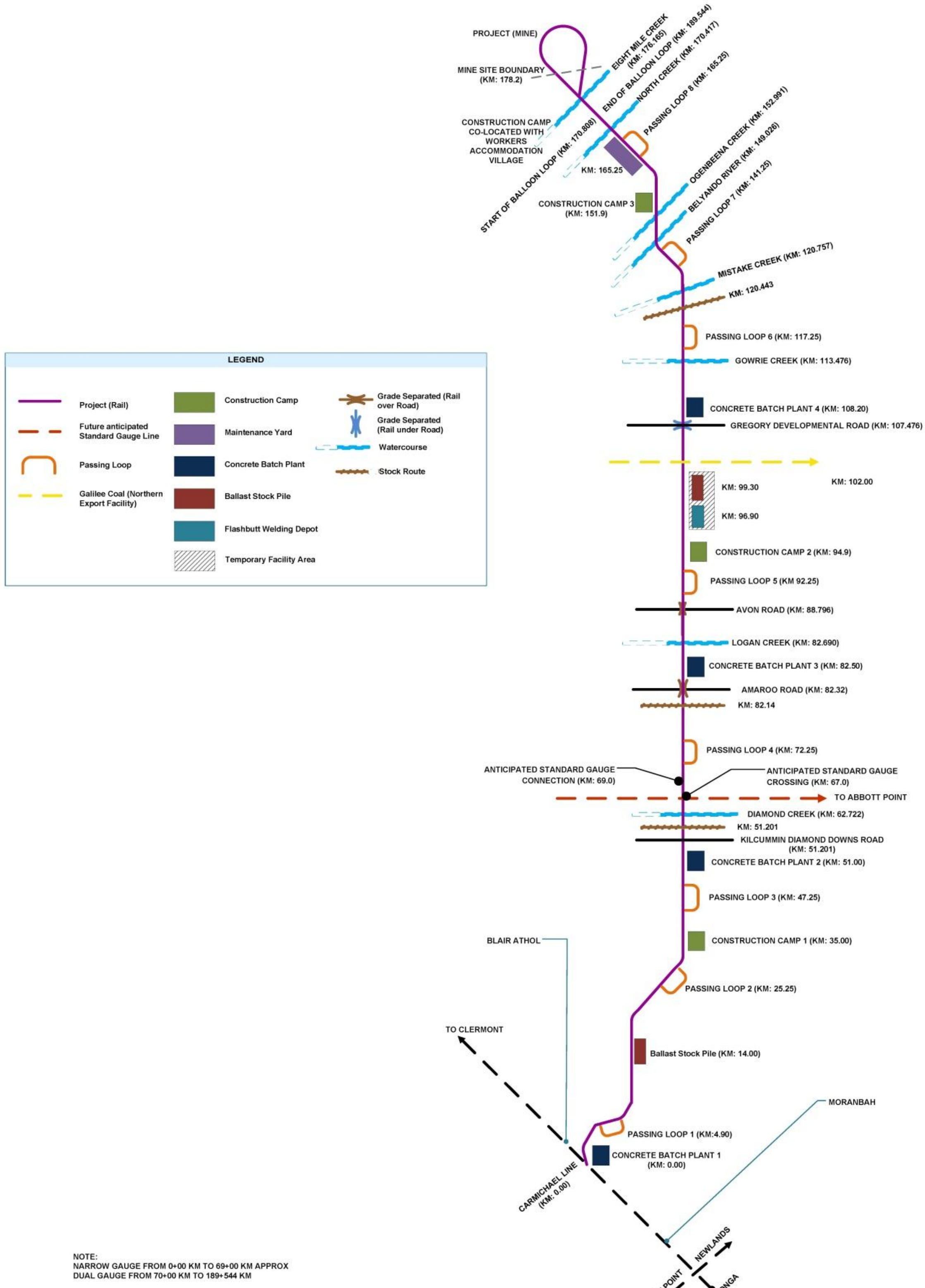
- Terminus facilities
- Track (including earthworks, structures and track)
- Passing loops
- Maintenance facilities (rolling stock and track)

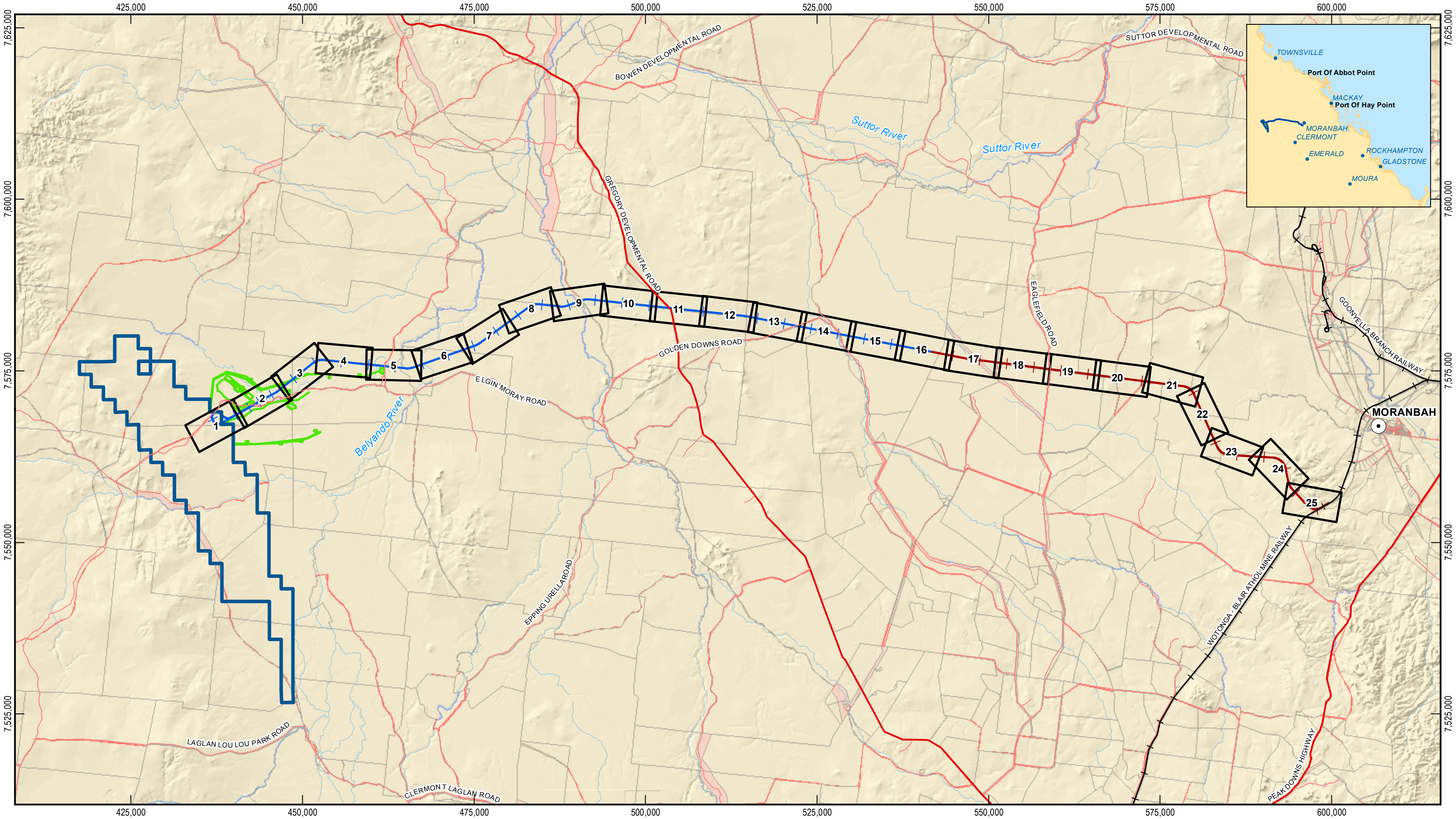
The Project (Rail) above rail project components includes:

- Rolling stock
- Signalling and communications

Figure 2-4 is a schematic and Figure 2-5 illustrates the Project (Rail) components that are required for successful operation.

Figure 2-4 Project (Rail) Components





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Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
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LEGEND

- Town
- Other Railway
- Watercourse
- State Road
- Local Road
- Cadastral Parcel
- Road Reserve
- Watercourse Reserve
- Mine (Onsite)
- Mine (Offsite)
- Mine (Offsite)
- Project (Rail)
  - Rail (West)
  - Rail (East)

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Project (Rail) Description
Index Map

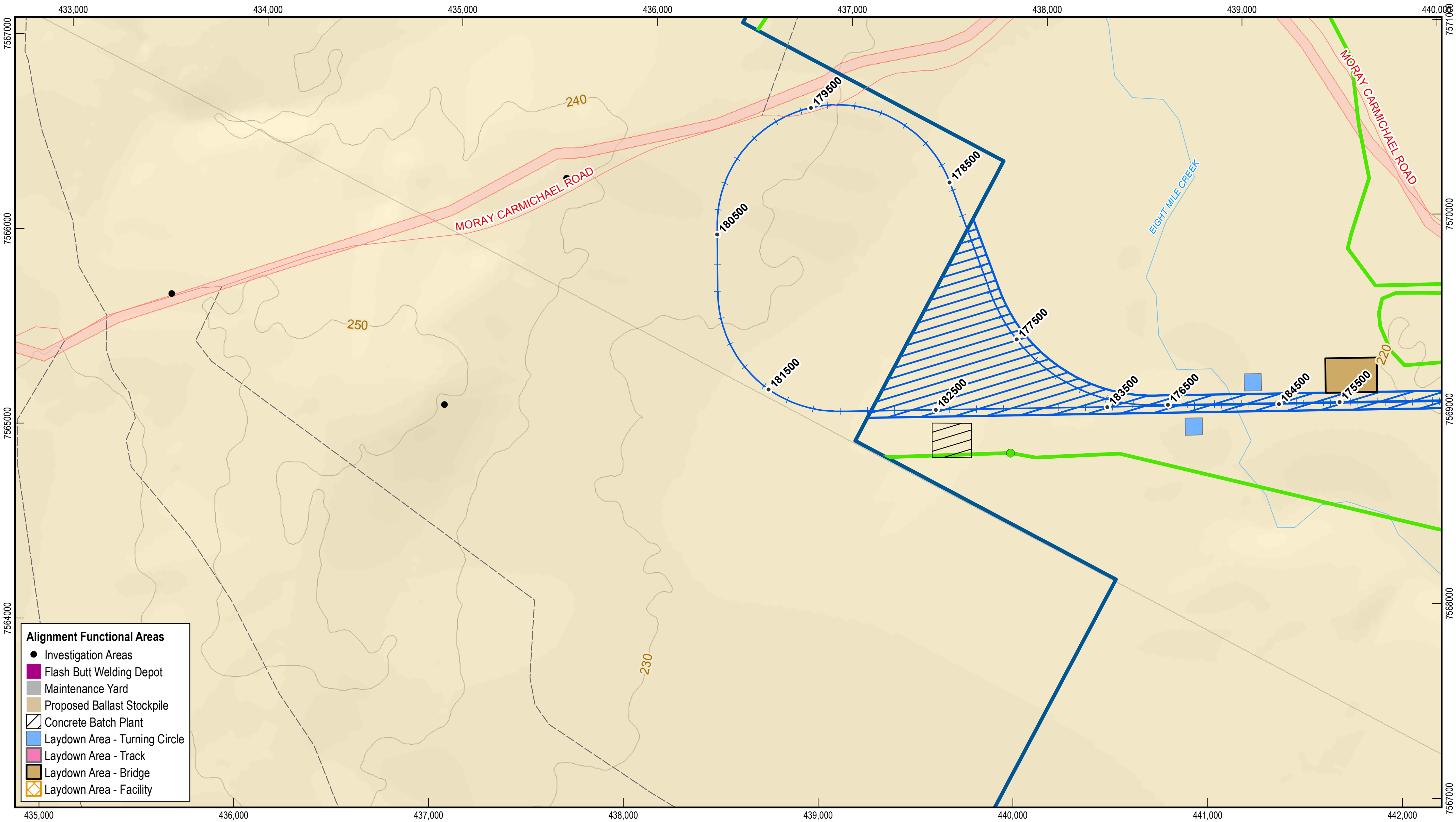
Job Number	41-25215
Revision	C
Date	11-09-2012

Figure 2-5
Series Index

G:\41\25215\GIS\Maps\MXD\100_Planning\41-25215_189_rev_c.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: DEM (2008), DCDB (2010); DME: EPC1690 (2010), EPC1080 (2011); © Commonwealth of Australia (Geoscience Australia): Localities, Railways, Roads, Watercourses (2007); Adani: Project Rail Alignment (2012); Gassman/Hyder: Mine (Offsite) (2012), Created by: B.W.



1:30,000 (at A4)

0 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

Construction Camp
Rail Line
Other Railway
Watercourse
State Road
Local Road
Track
Contour - 10m
Cadastral Parcel
Road Reserve
Watercourse Reserve
Mine (Onsite)
Mine (Offsite)
Mine (Offsite)
Project (Rail)
Rail (West)
Rail (East)
Rail (West)
Rail (East)

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Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Project (Rail) Description

Job Number 41-25215
Revision D
Date 14-09-2012

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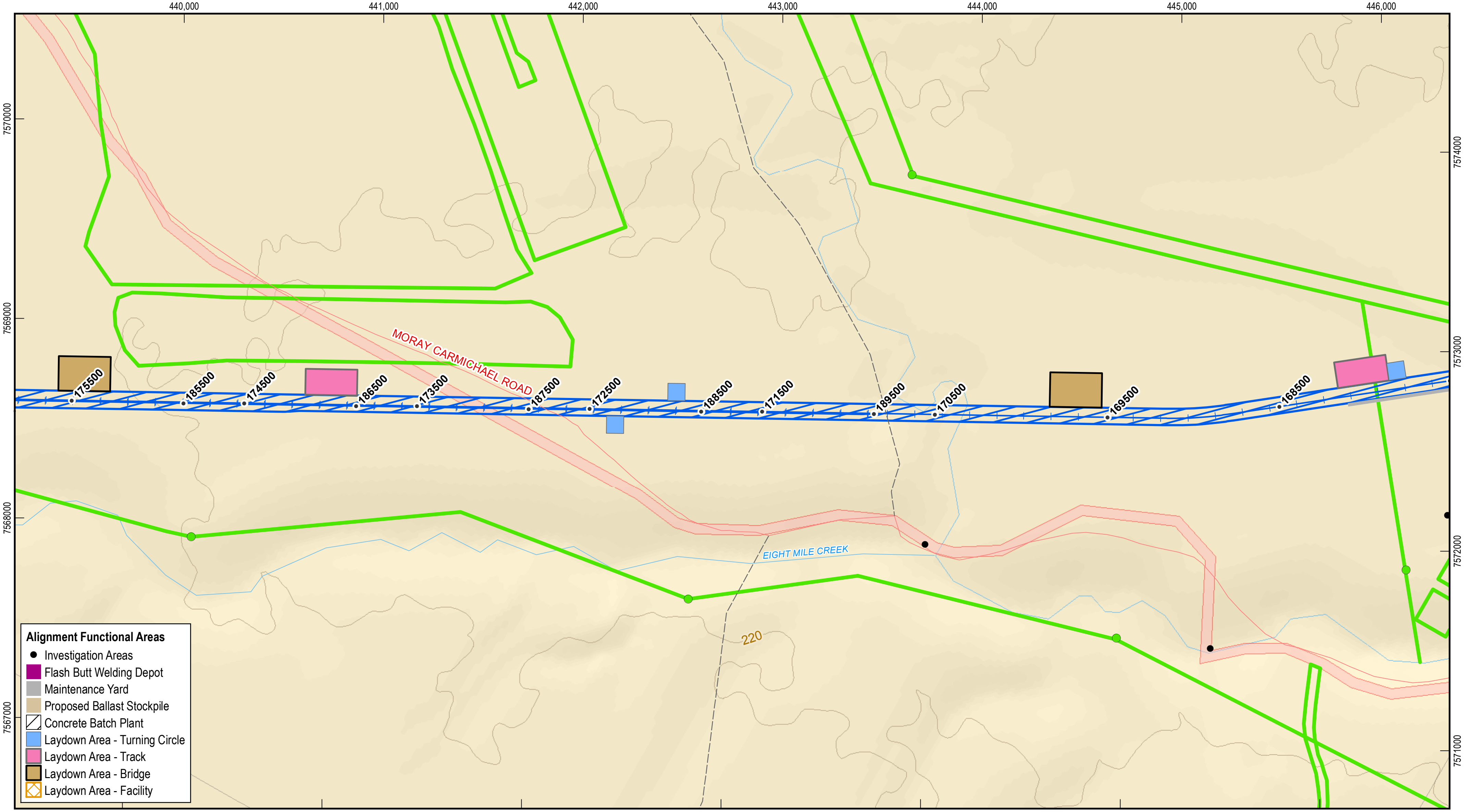
Level 4, 201 Charlotte St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: DEM (2008), DCDB (2010); © Commonwealth of Australia (Geoscience Australia): Localities, Railways, Roads, Watercourse (2007); Adani: Project Rail Alignment, Camp Sites, Alignment Functional Areas, Investigation Areas (2012); Gassman/Hyder: Mine (Offsite); DME: EPC1690 (2010) / EPC1080 (2011); GHD: Project Rail Corridor Opt 9 Rev 3 (2012). Created by: B.W



1:30,000 (at A4)

0 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Construction Camp
- Rail Line
- Other Railway
- Watercourse
- State Road
- Local Road
- Track
- Contour - 10m
- Cadastral Parcel
- Road Reserve
- Watercourse Reserve
- Mine (Onsite)
- Mine (Offsite)
- Mine (Offsite)
- Project (Rail)
  - Rail (West)
  - Rail (East)
  - Rail (West)
  - Rail (East)

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Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Project (Rail) Description

Job Number	41-25215
Revision	D
Date	14-09-2012

Figure 2-5
Sheet 2 of 25

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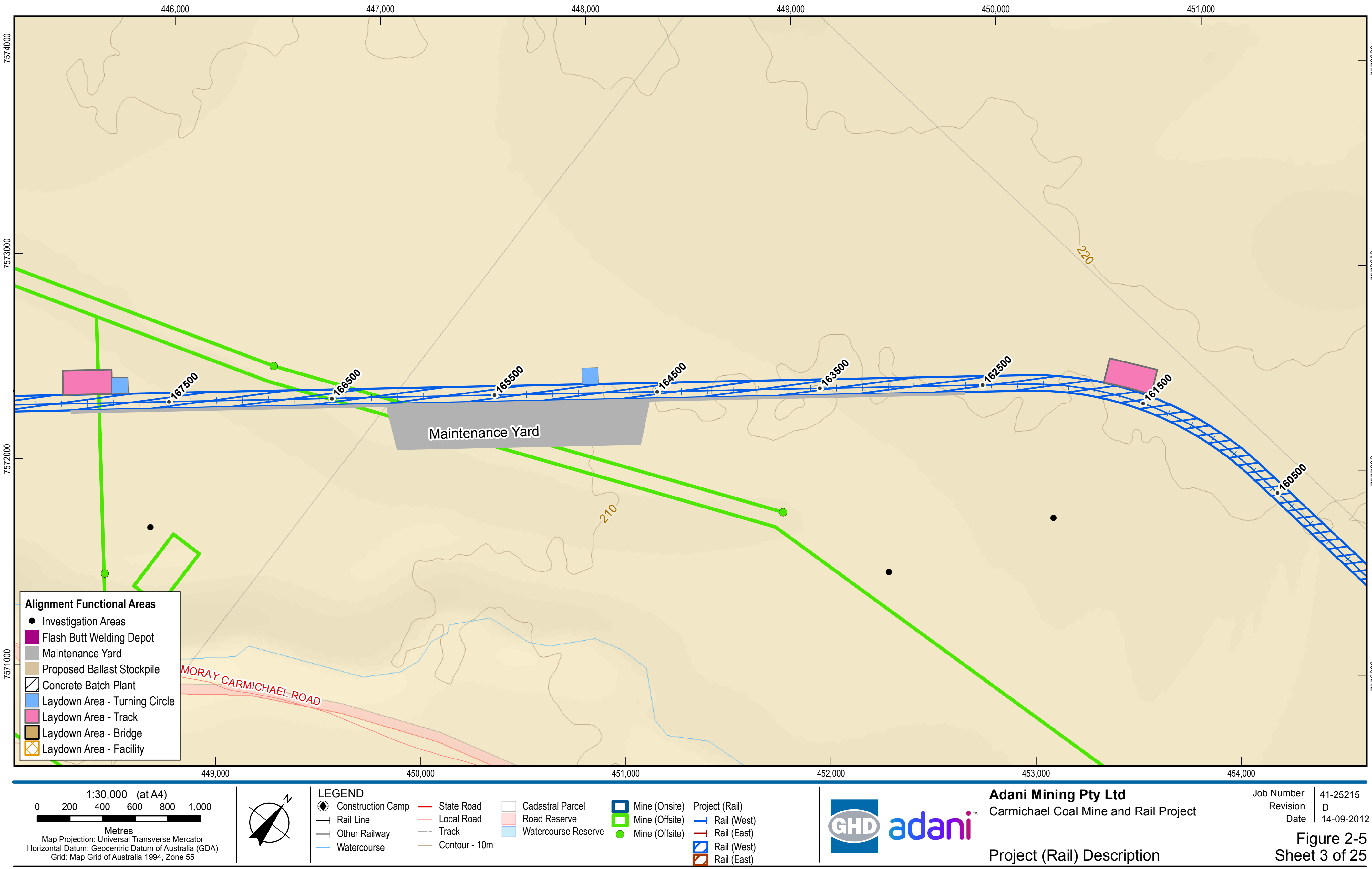

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Project (Rail) Description

Job Number 41-25215
Revision D
Date 14-09-2012

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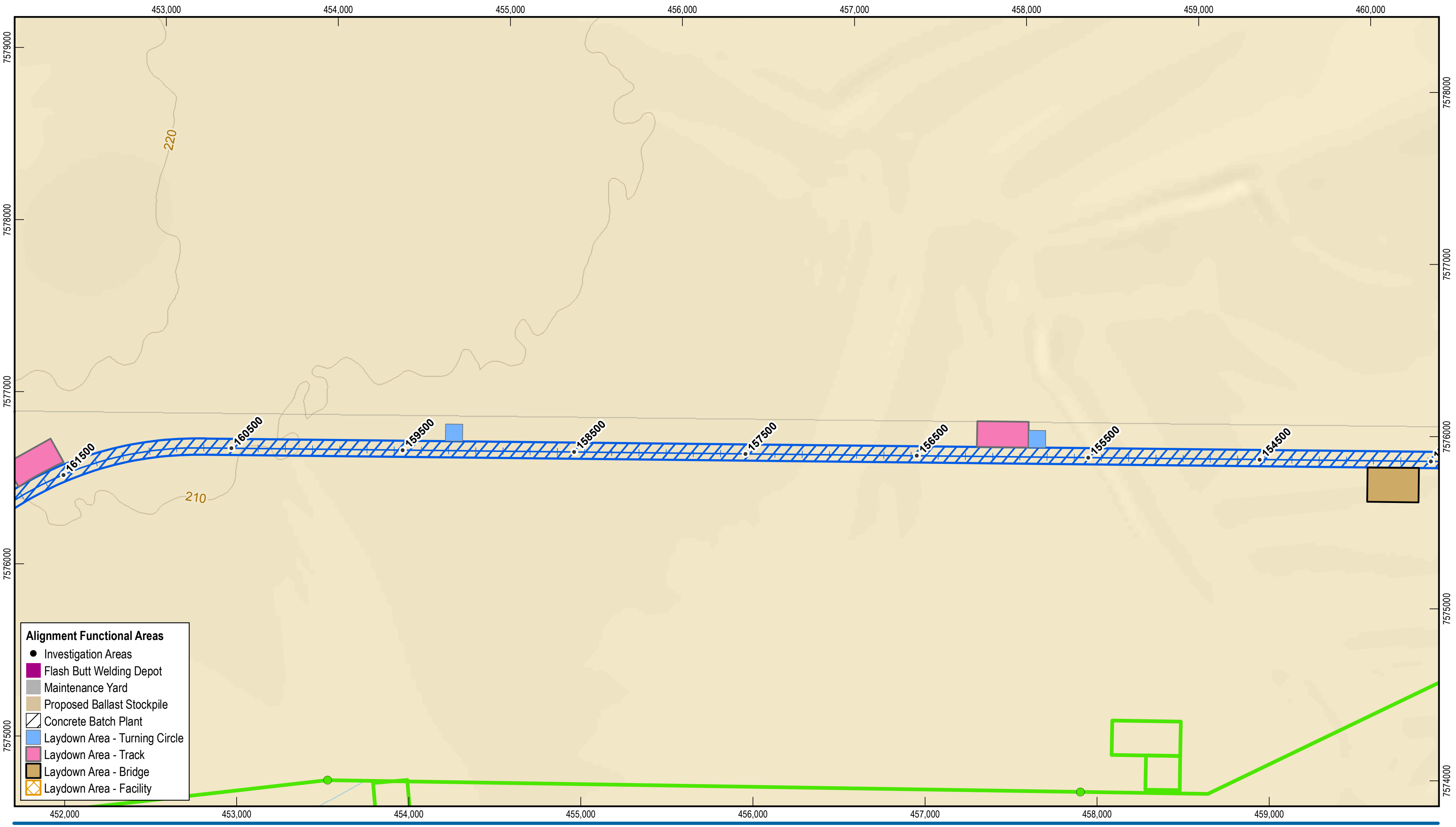

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0 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

Construction Camp	State Road	Cadastral Parcel	Mine (Onsite)	Project (Rail)
Rail Line	Local Road	Road Reserve	Mine (Offsite)	Rail (West)
Other Railway	Track	Watercourse Reserve	Mine (Offsite)	Rail (East)
Watercourse	Contour - 10m			Rail (West)
				Rail (East)

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Project (Rail) Description

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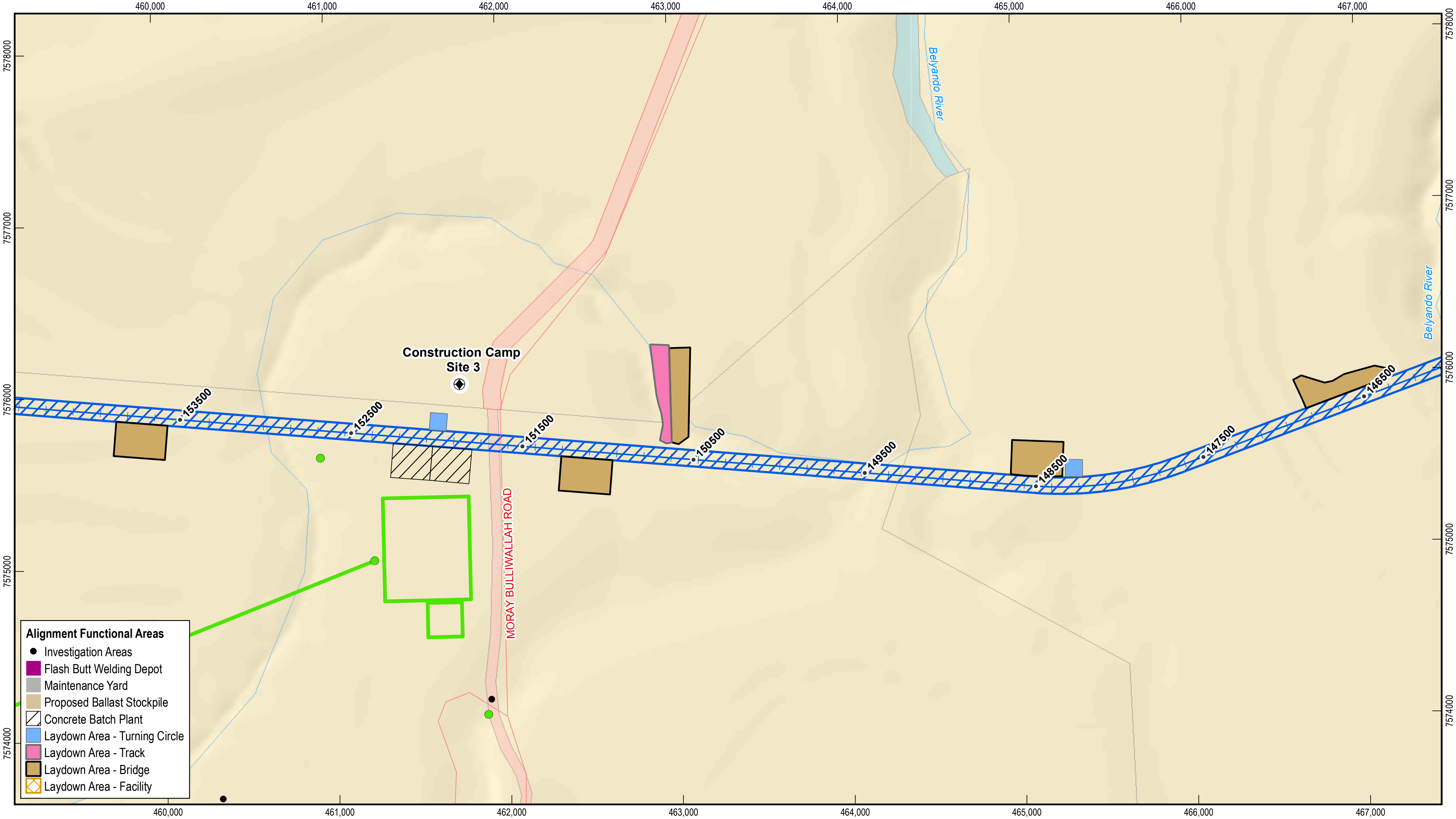

1:30,000 (at A4)

0 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Construction Camp
- Rail Line
- Other Railway
- Watercourse
- State Road
- Local Road
- Track
- Contour - 10m
- Cadastral Parcel
- Road Reserve
- Watercourse Reserve
- Mine (Onsite)
- Mine (Offsite)
- Mine (Offsite)
- Project (Rail)
  - Rail (West)
  - Rail (East)
  - Rail (West)
  - Rail (East)

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Project (Rail) Description

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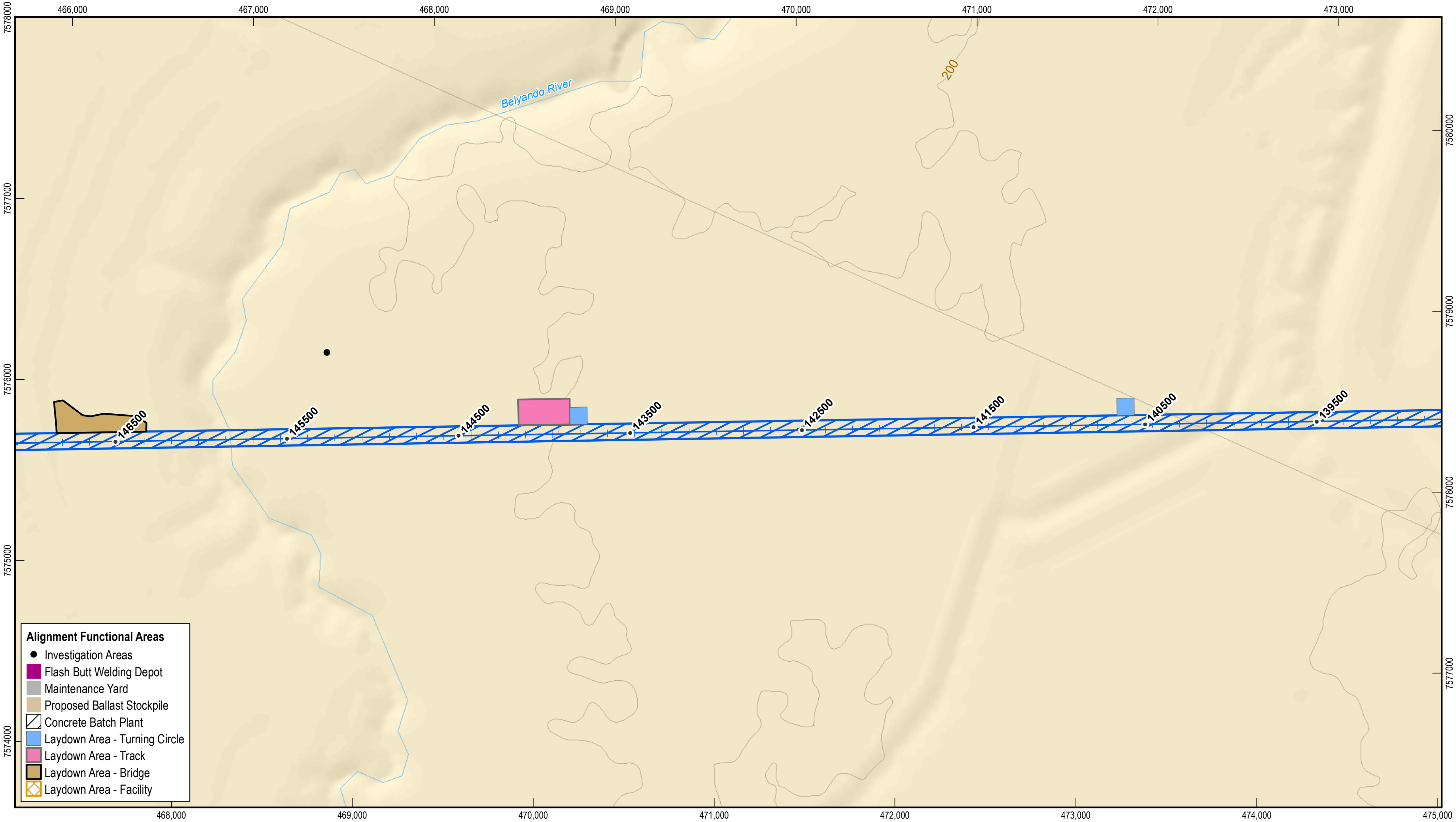

1:30,000 (at A4)

0 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Construction Camp
- Rail Line
- Other Railway
- Watercourse
- State Road
- Local Road
- Track
- Contour - 10m
- Cadastral Parcel
- Road Reserve
- Watercourse Reserve
- Mine (Onsite)
- Mine (Offsite)
- Mine (Offsite)
- Project (Rail)
- Rail (West)
- Rail (East)
- Rail (West)
- Rail (East)

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Adani Mining Pty Ltd

Carmichael Coal Mine and Rail Project

Project (Rail) Description

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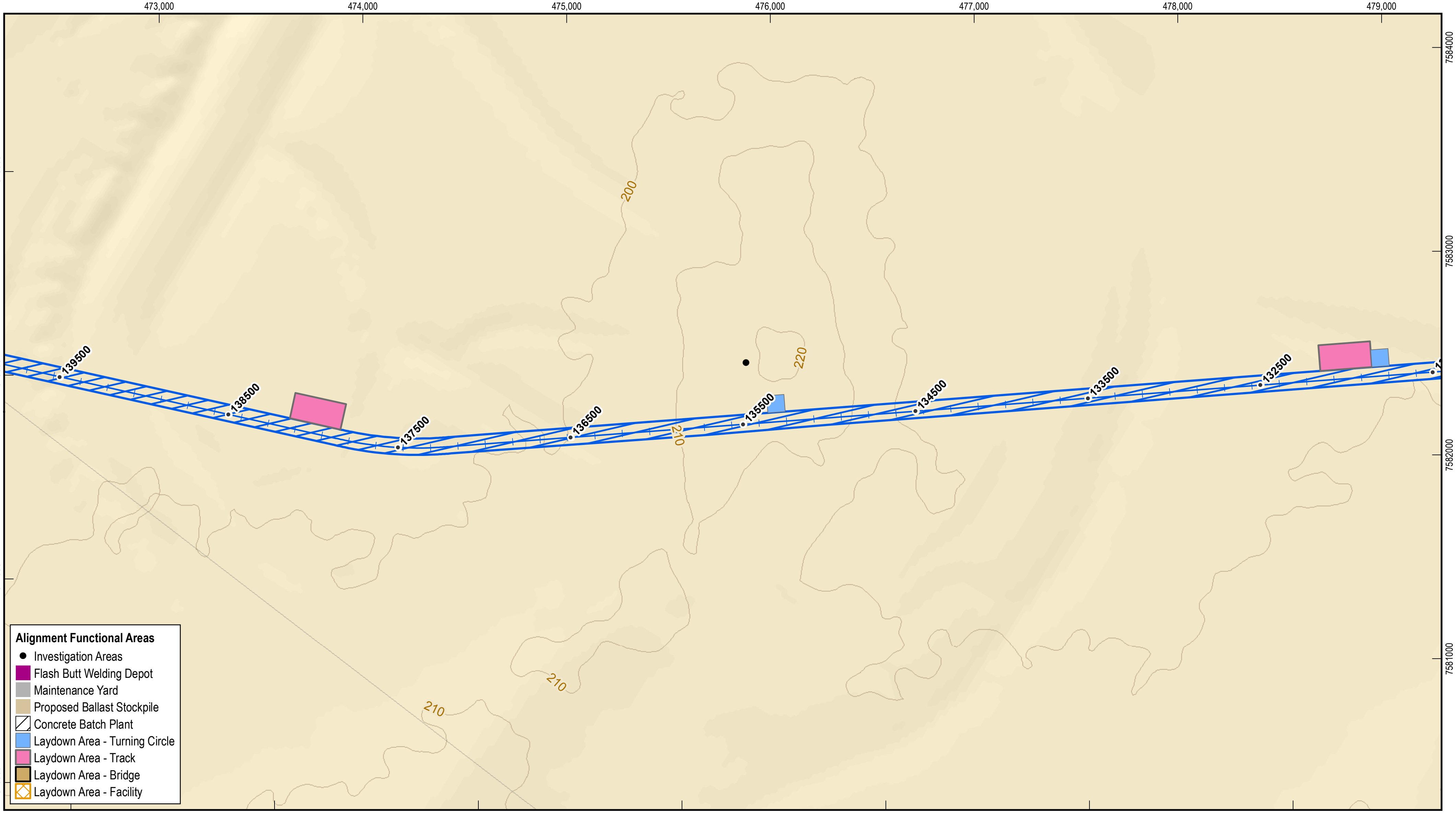

1:30,000 (at A4)

0 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Construction Camp
- Rail Line
- Other Railway
- Watercourse
- State Road
- Local Road
- Track
- Contour - 10m
- Cadastral Parcel
- Road Reserve
- Watercourse Reserve
- Mine (Onsite)
- Mine (Offsite)
- Mine (Offsite)

Project (Rail)
- Rail (West)
- Rail (East)
- Rail (West)
- Rail (East)

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Carmichael Coal Mine and Rail Project

Job Number	41-25215
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Project (Rail) Description

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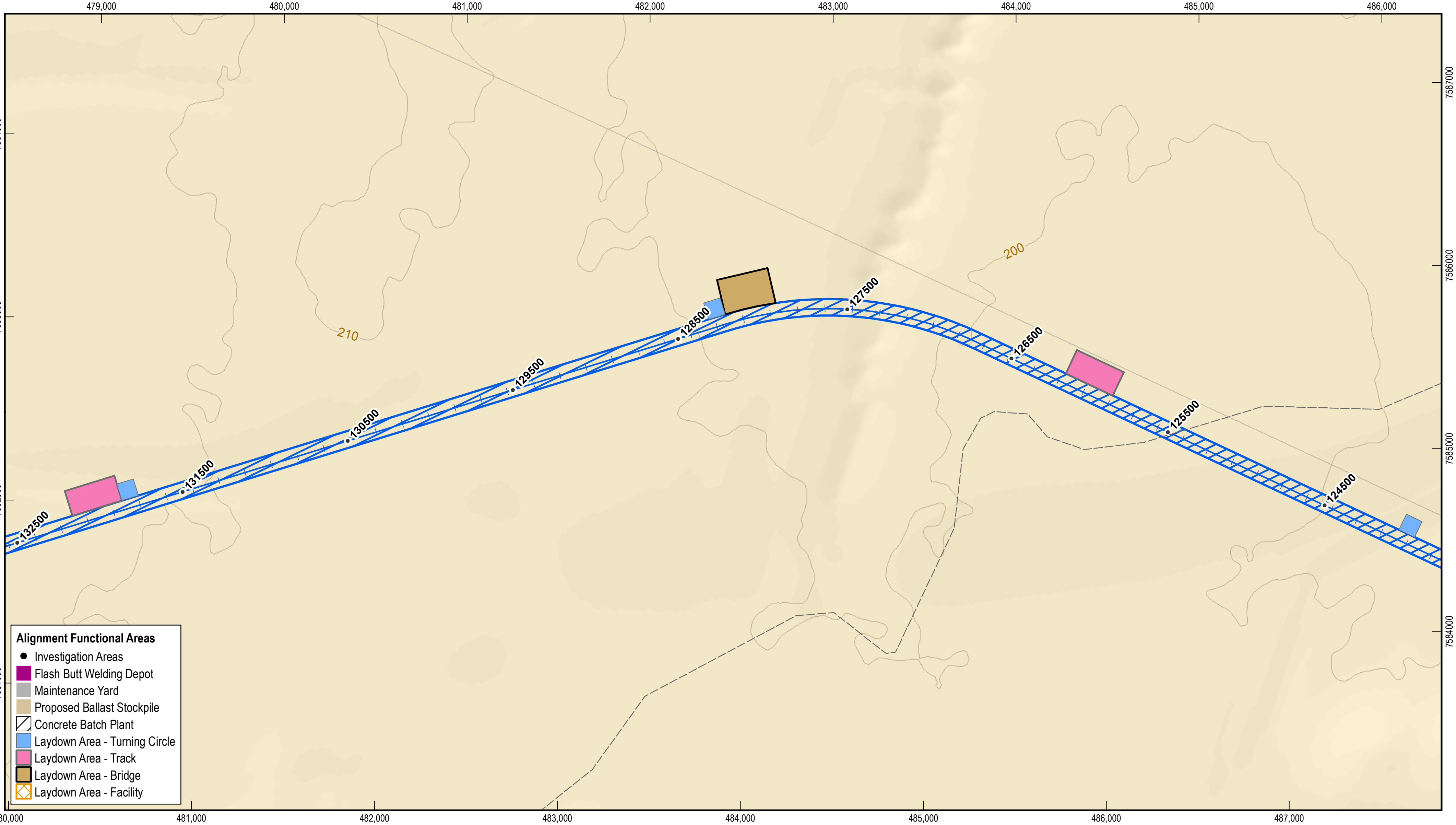

1:30,000 (at A4)

0 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Construction Camp
- Rail Line
- Other Railway
- Watercourse
- State Road
- Local Road
- Track
- Contour - 10m
- Cadastral Parcel
- Road Reserve
- Watercourse Reserve
- Mine (Onsite)
- Mine (Offsite)
- Mine (Offsite)

Project (Rail)

- Rail (West)
- Rail (East)
- Rail (West)
- Rail (East)

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

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Project (Rail) Description

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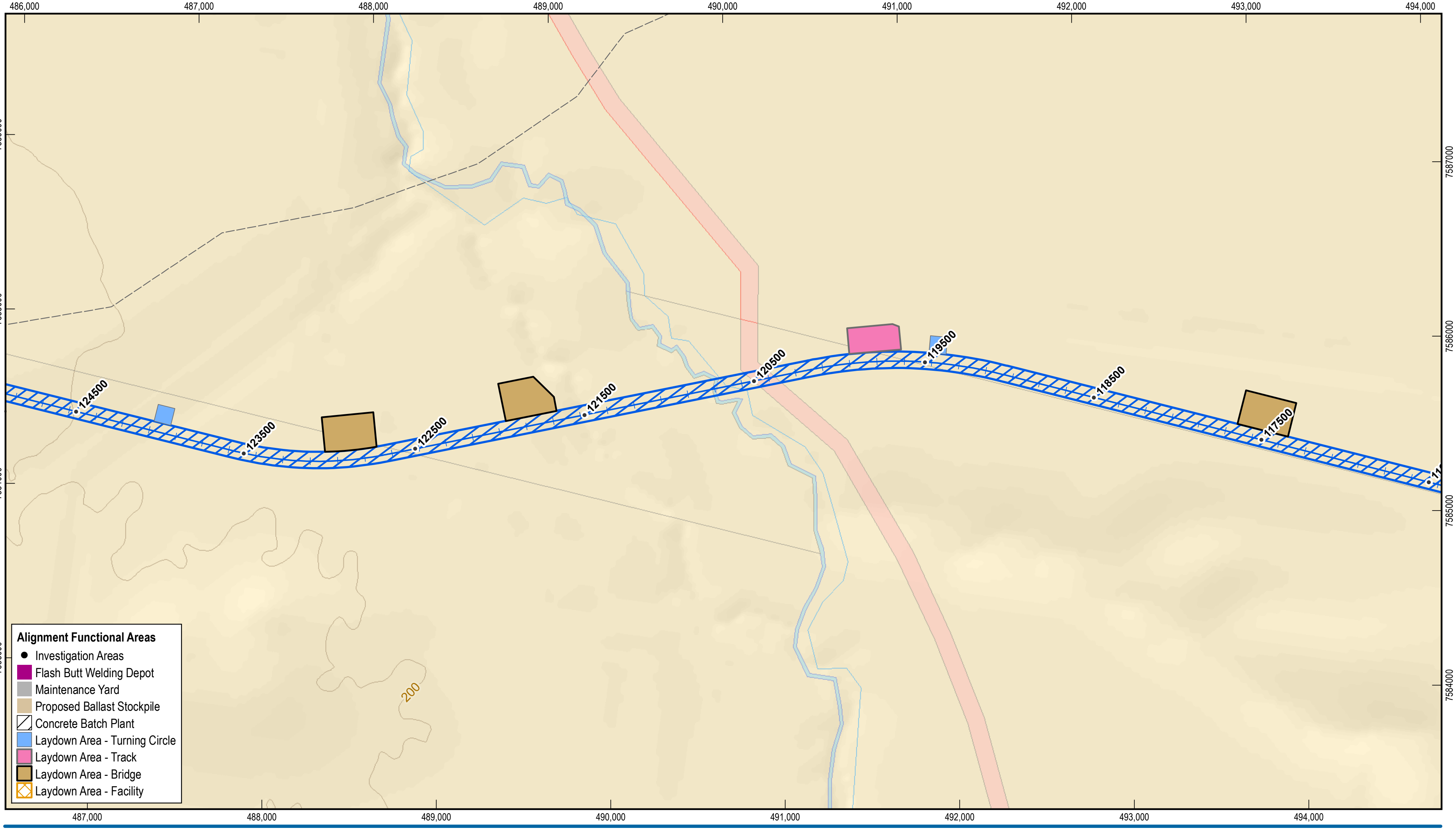
Level 4, 201 Charlotte St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: DEM (2008), DCDB (2010); © Commonwealth of Australia (Geoscience Australia): Localities, Railways, Roads, Watercourse (2007); Adani: Project Rail Alignment, Camp Sites, Alignment Functional Areas, Investigation Areas (2012); Gassman/Hyder: Mine (Offsite); DME: EPC1690 (2010) / EPC1080 (2011); GHD: Project Rail Corridor Opt 9 Rev 3 (2012). Created by: B.W



1:30,000 (at A4)

0 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

LEGEND

Construction Camp
Rail Line
Other Railway
Watercourse
State Road
Local Road
Track
Contour - 10m
Cadastral Parcel
Road Reserve
Watercourse Reserve
Mine (Onsite)
Mine (Offsite)
Mine (Offsite)
Project (Rail)
Rail (West)
Rail (East)
Rail (West)
Rail (East)

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Job Number 41-25215
Revision D
Date 14-09-2012

Project (Rail) Description

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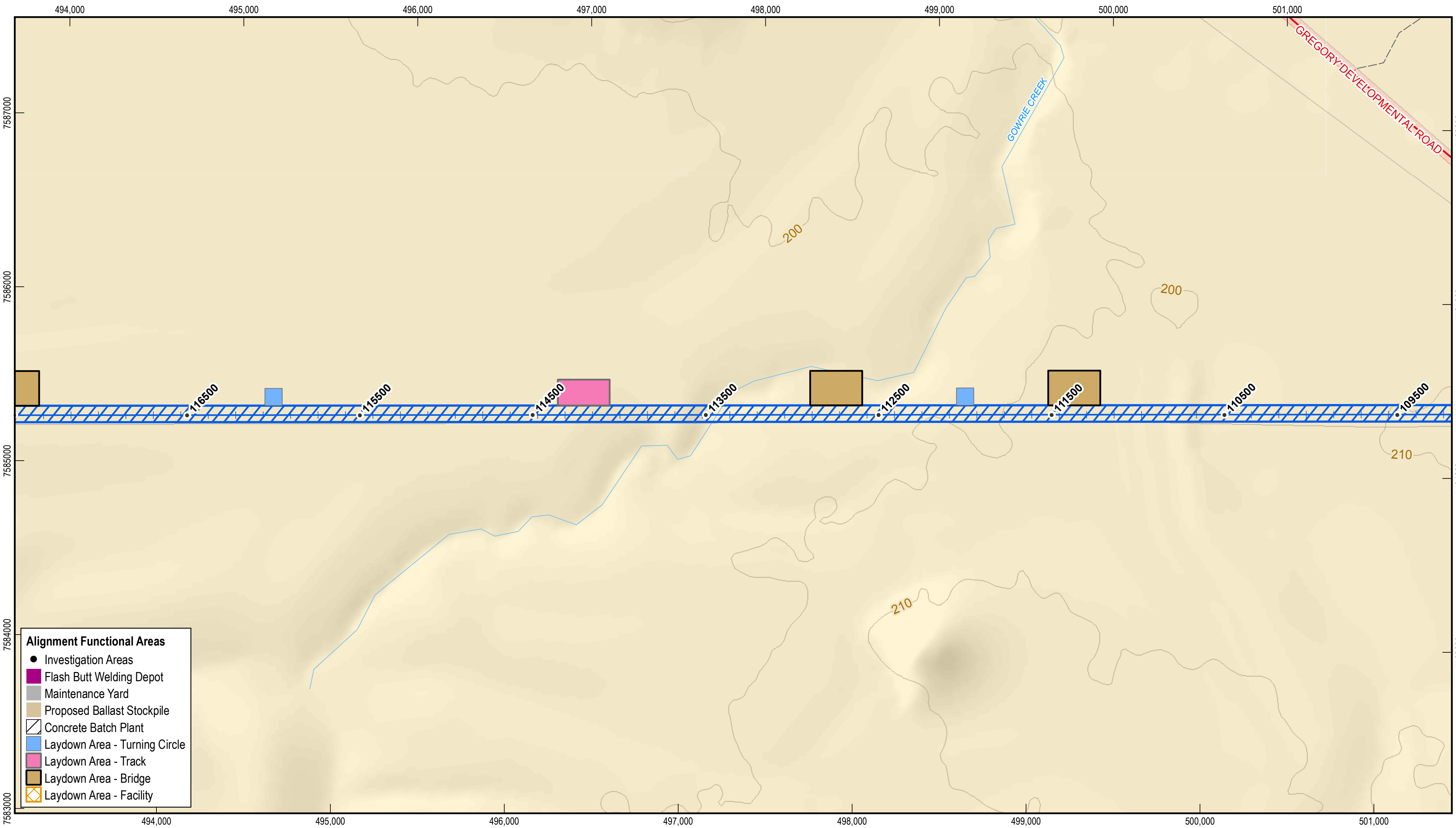
Level 4, 201 Charlotte St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: DEM (2008), DCDB (2010); © Commonwealth of Australia (Geoscience Australia): Localities, Railways, Roads, Watercourse (2007); Adani: Project Rail Alignment, Camp Sites, Alignment Functional Areas, Investigation Areas (2012); Gassman/Hyder: Mine (Offsite); DME: EPC1690 (2010) / EPC1080 (2011); GHD: Project Rail Corridor Opt 9 Rev 3 (2012). Created by: B.W



1:30,000 (at A4)

0 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Construction Camp
- Rail Line
- Other Railway
- Watercourse
- State Road
- Local Road
- Track
- Contour - 10m
- Cadastral Parcel
- Road Reserve
- Watercourse Reserve
- Mine (Onsite)
- Mine (Offsite)
- Mine (Offsite)
- Project (Rail)
  - Rail (West)
  - Rail (East)
  - Rail (West)
  - Rail (East)

Adani Mining Pty Ltd

Carmichael Coal Mine and Rail Project

Project (Rail) Description

Job Number	41-25215
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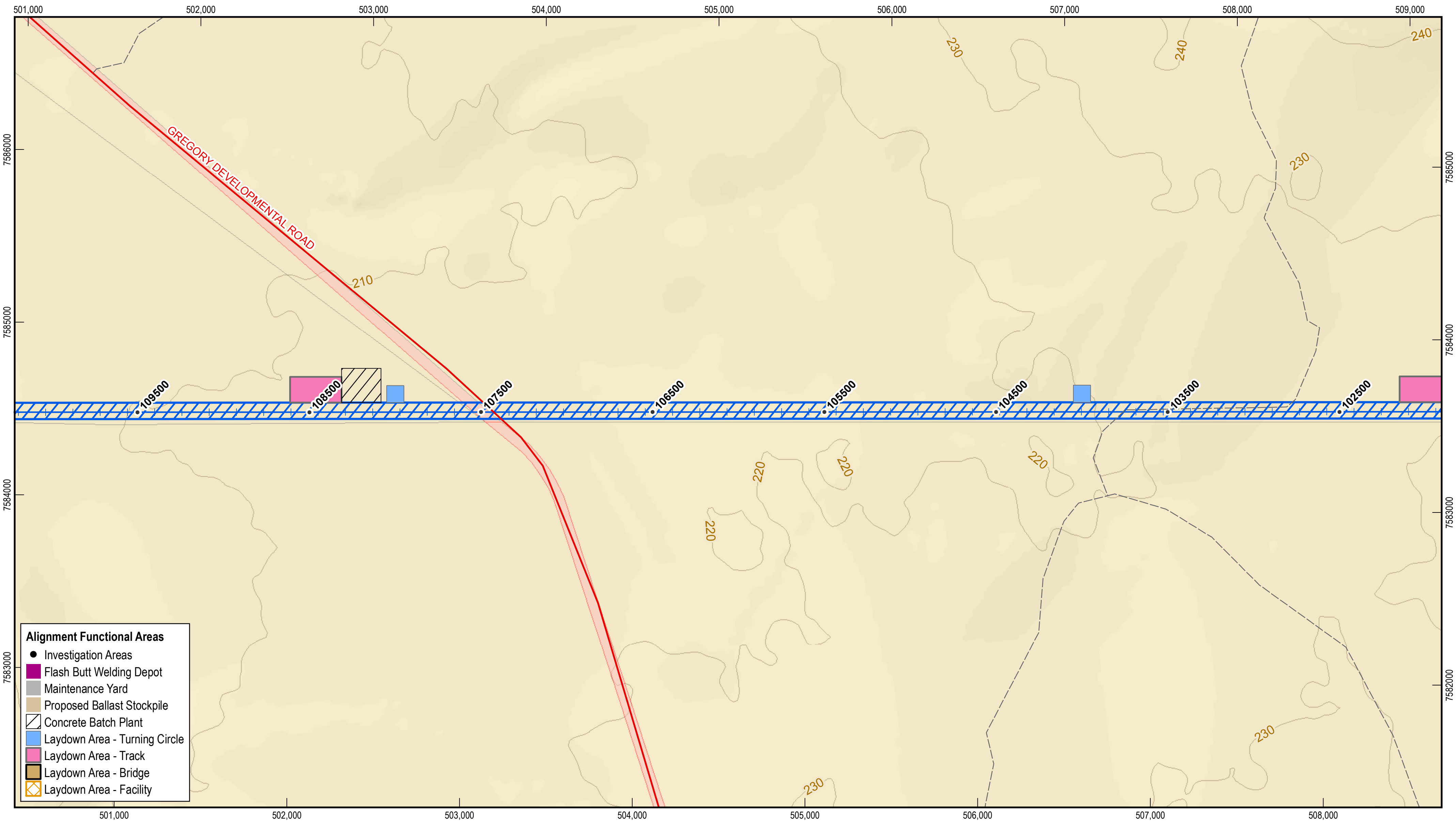

1:30,000 (at A4)

0 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

Construction Camp | Rail Line | Other Railway | Watercourse | State Road | Local Road | Track | Contour - 10m | Cadastral Parcel | Road Reserve | Watercourse Reserve | Mine (Onsite) | Mine (Offsite) | Mine (Offsite)

Project (Rail): Rail (West) | Rail (East) | Rail (West) | Rail (East)

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Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Project (Rail) Description

Job Number 41-25215
Revision D
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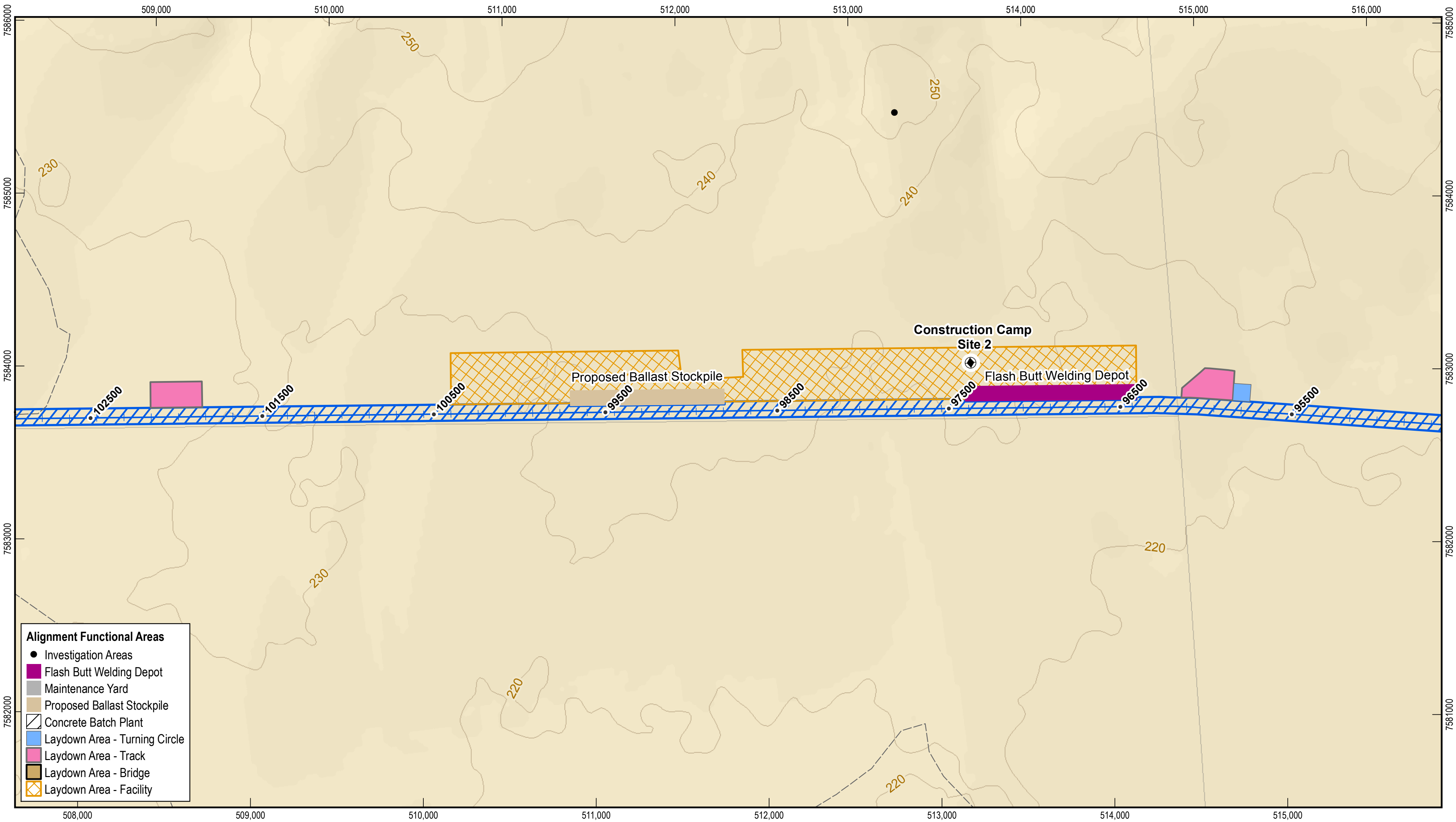
Data source: DERM: DEM (2008), DCDB (2010); © Commonwealth of Australia (Geoscience Australia): Localities, Railways, Roads, Watercourse (2007); Adani: Project Rail Alignment, Camp Sites, Alignment Functional Areas, Investigation Areas (2012); Gassman/Hyder: Mine (Offsite); DME: EPC1690 (2010) / EPC1080 (2011); GHD: Project Rail Corridor Opt 9 Rev 3 (2012). Created by: B.W



1:30,000 (at A4)

0 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

Construction Camp
Rail Line
Other Railway
Watercourse
State Road
Local Road
Track
Contour - 10m
Cadastral Parcel
Road Reserve
Watercourse Reserve
Mine (Onsite)
Mine (Offsite)
Mine (Offsite)
Project (Rail)
Rail (West)
Rail (East)
Rail (West)
Rail (East)

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Project (Rail) Description

Job Number	41-25215
Revision	D
Date	14-09-2012

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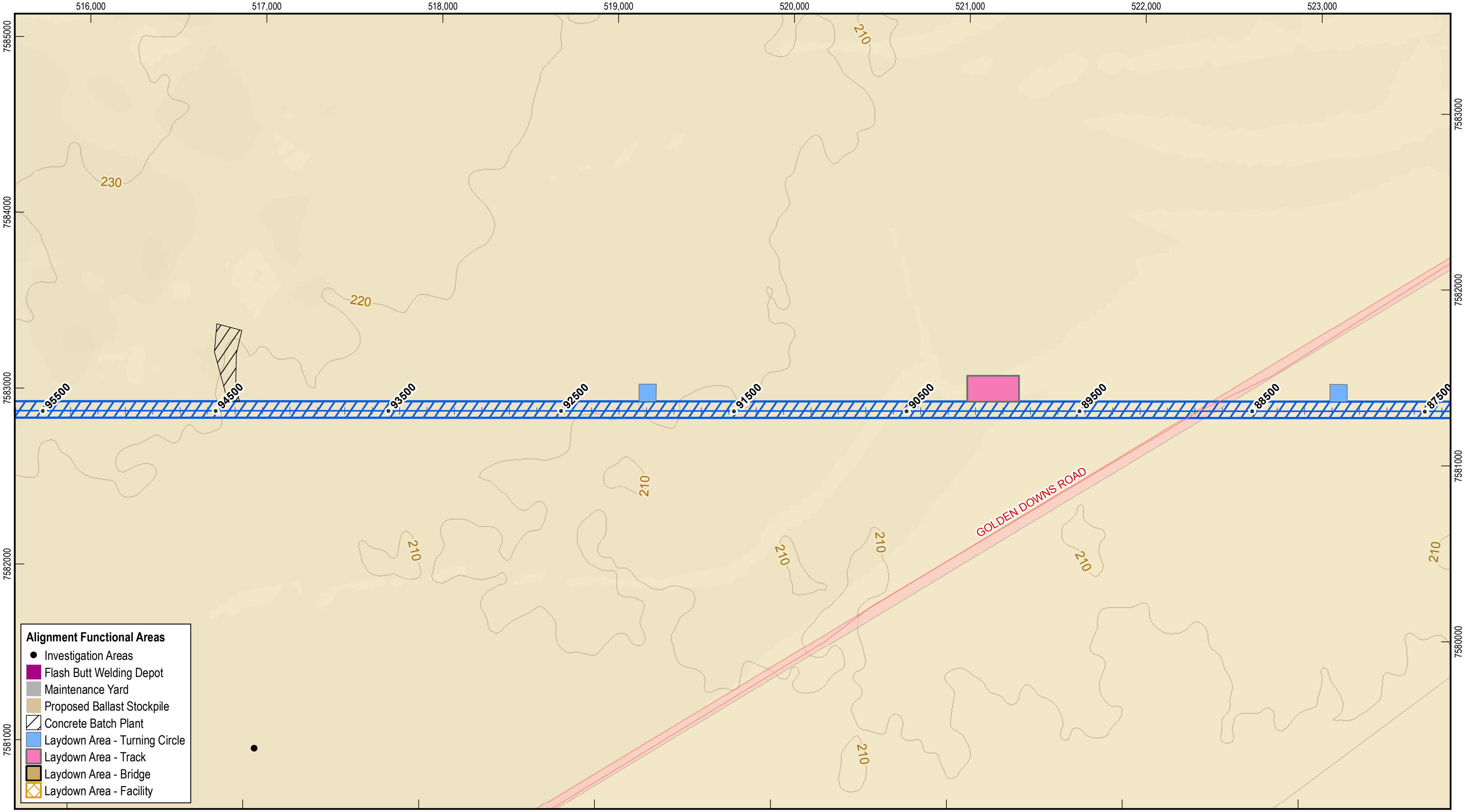

1:30,000 (at A4)

0 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

Construction Camp, Rail Line, Other Railway, Watercourse, State Road, Local Road, Track, Contour - 10m, Cadastral Parcel, Road Reserve, Watercourse Reserve, Mine (Onsite), Mine (Offsite), Mine (Offsite)

Project (Rail): Rail (West), Rail (East), Rail (West), Rail (East)

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Job Number 41-25215
Revision D
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Project (Rail) Description

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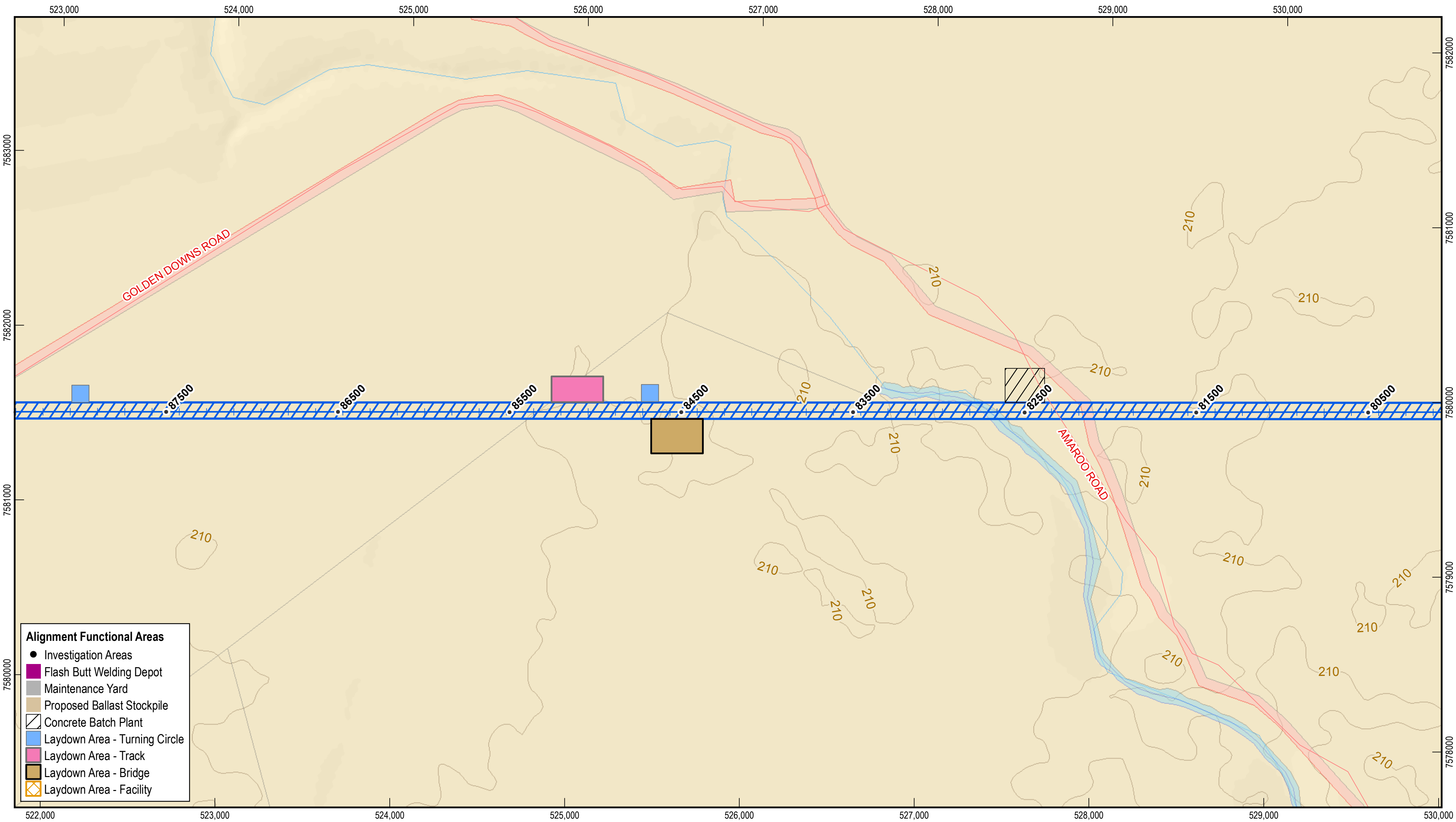

1:30,000 (at A4)

0 200 400 600 800 1,000

Metres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Construction Camp
- Rail Line
- Other Railway
- Watercourse
- State Road
- Local Road
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- Cadastral Parcel
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- Mine (Onsite)
- Mine (Offsite)
- Mine (Offsite)
- Project (Rail)
- Rail (West)
- Rail (East)
- Rail (West)
- Rail (East)

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Adani Mining Pty Ltd

Carmichael Coal Mine and Rail Project

Project (Rail) Description

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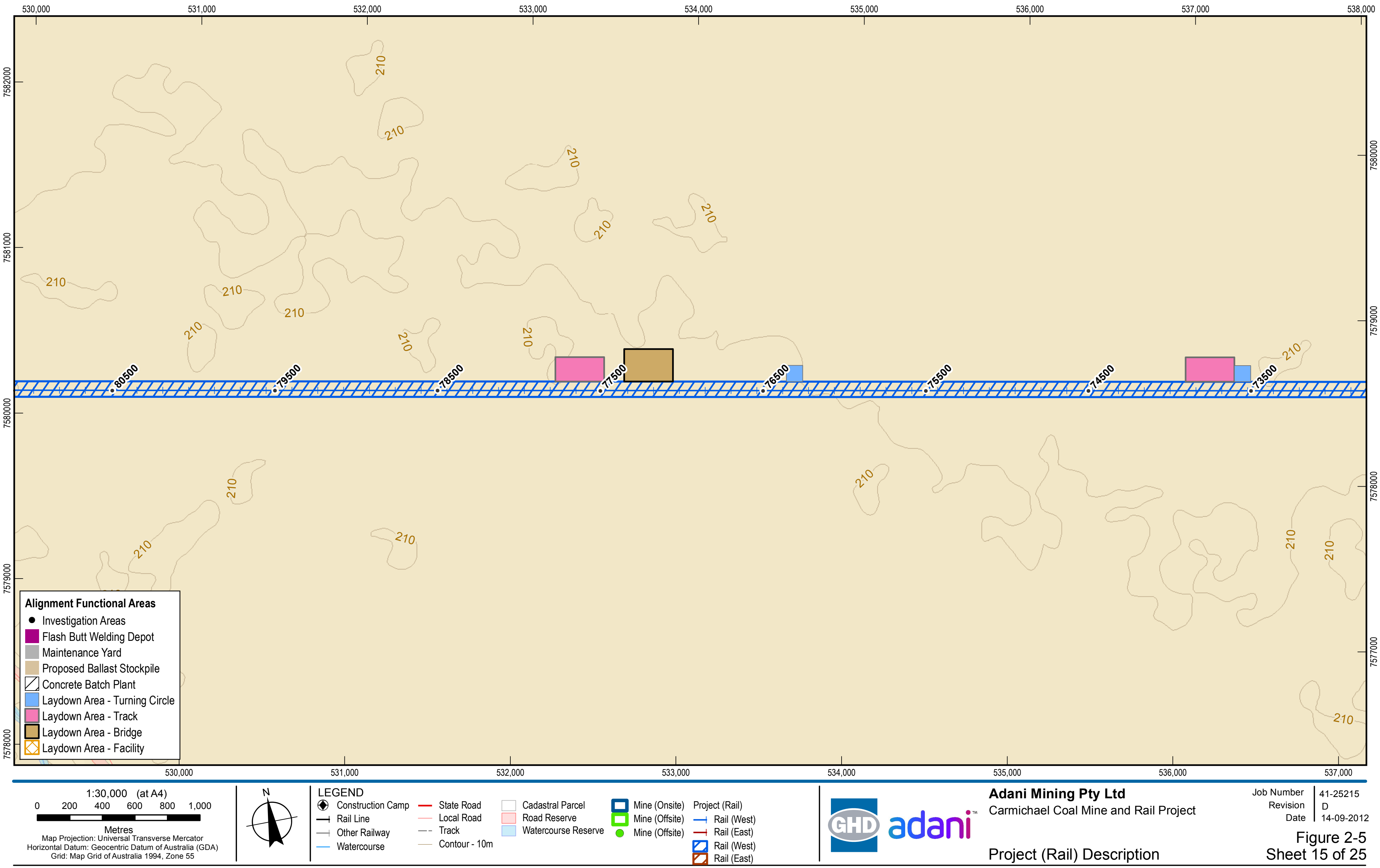

Adani Mining Pty Ltd

Carmichael Coal Mine and Rail Project

Project (Rail) Description

Job Number	41-25215
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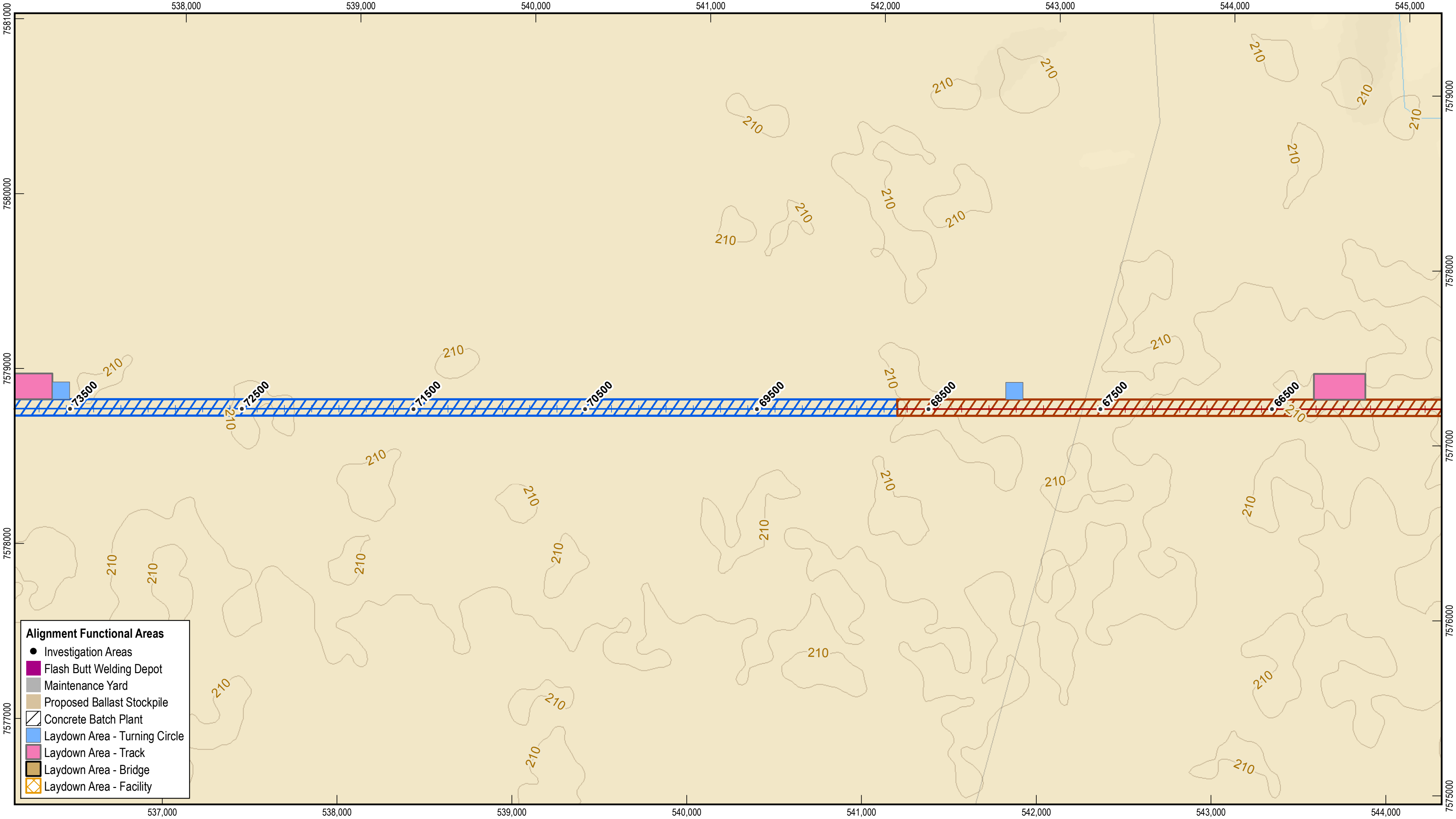

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Metres

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Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Construction Camp
- Rail Line
- Other Railway
- Watercourse
- State Road
- Local Road
- Track
- Contour - 10m
- Cadastral Parcel
- Road Reserve
- Watercourse Reserve
- Mine (Onsite)
- Mine (Offsite)
- Mine (Offsite)
- Project (Rail)
  - Rail (West)
  - Rail (East)
  - Rail (West)
  - Rail (East)

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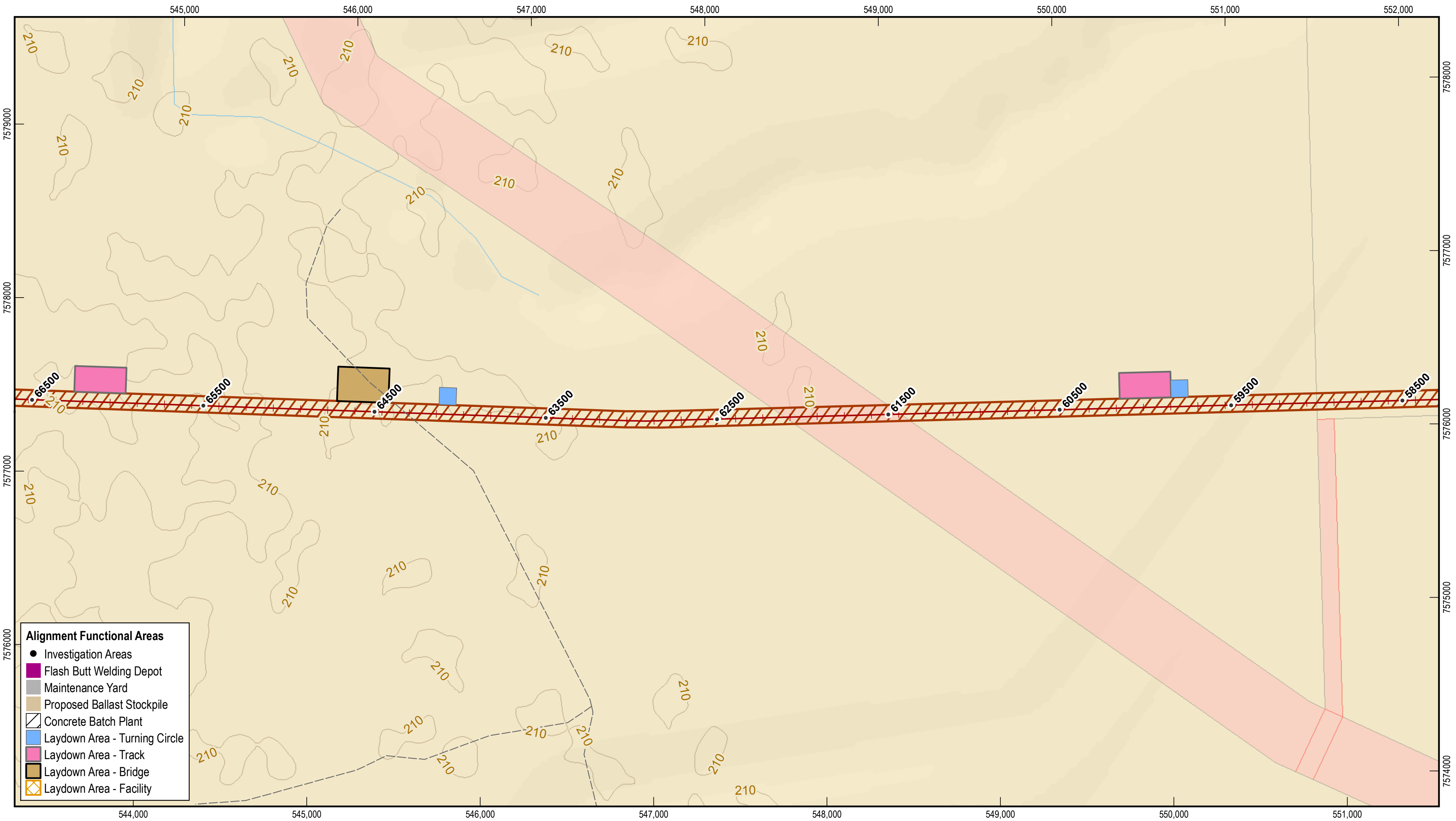

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Rail (West)
Rail (East)

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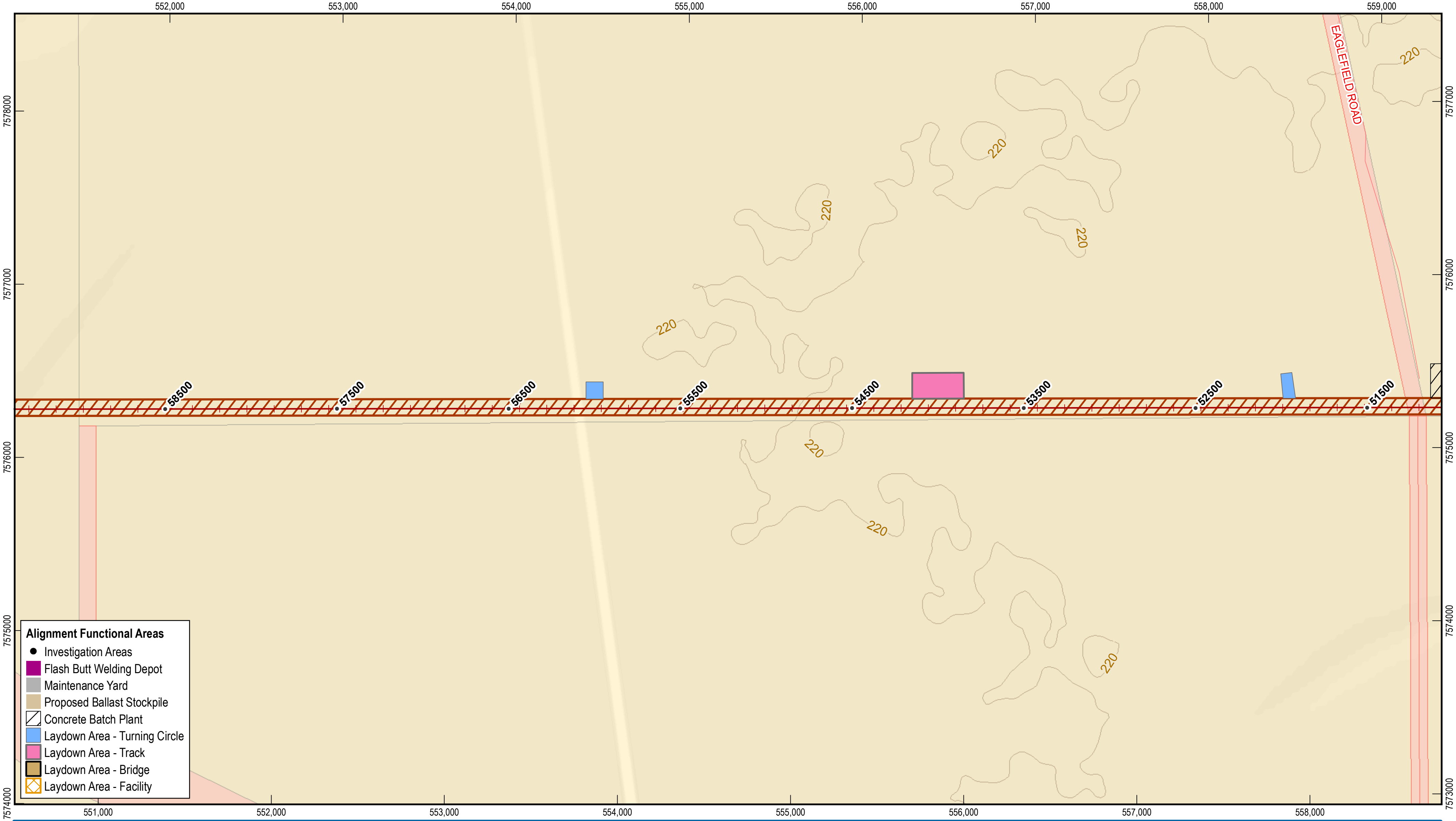

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Rail (East)

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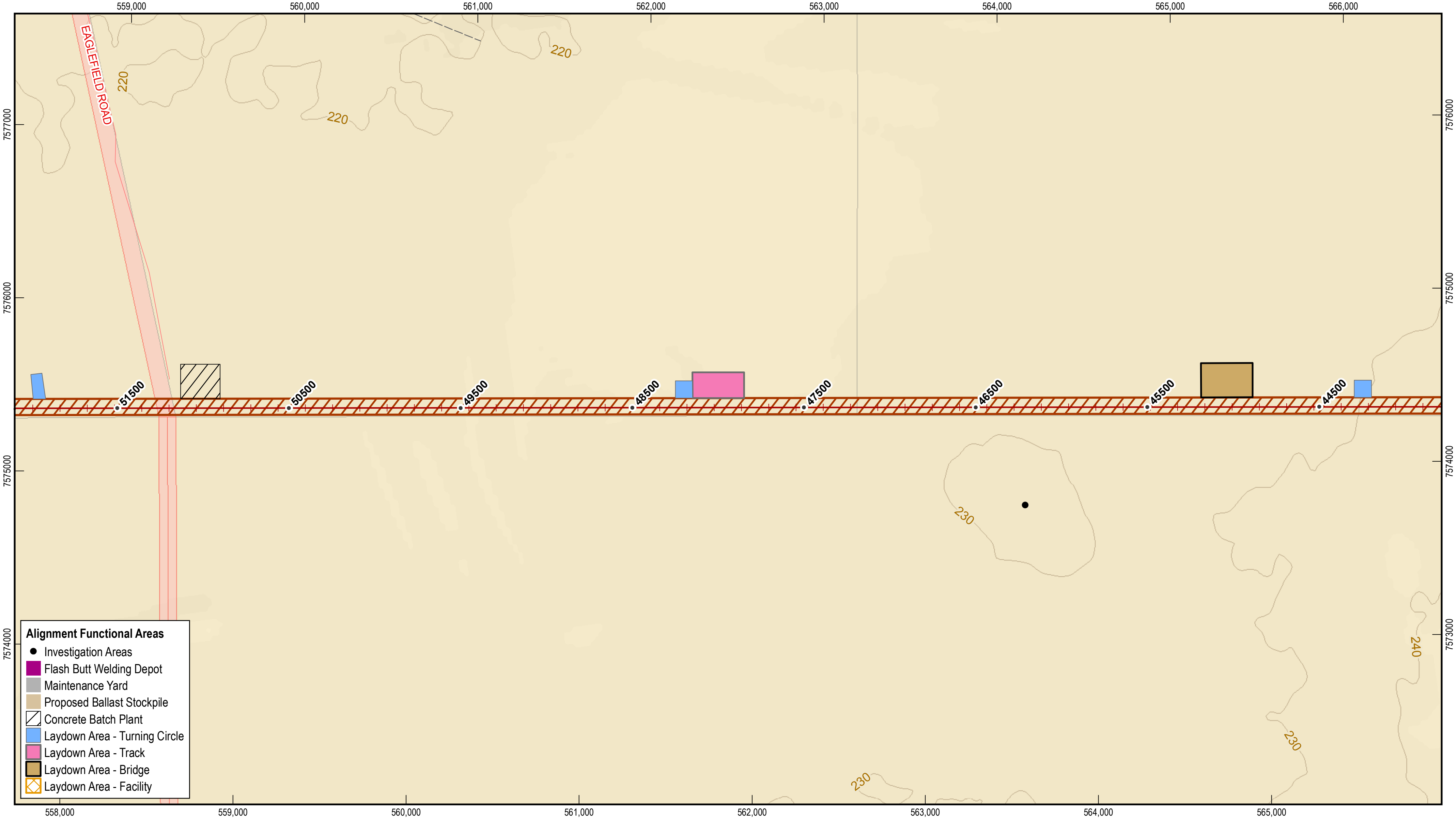

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LEGEND

Construction Camp	State Road	Cadastral Parcel	Mine (Onsite)	Project (Rail)
Rail Line	Local Road	Road Reserve	Mine (Offsite)	Rail (West)
Other Railway	Track	Watercourse Reserve	Mine (Offsite)	Rail (East)
Watercourse	Contour - 10m			Rail (West)
				Rail (East)

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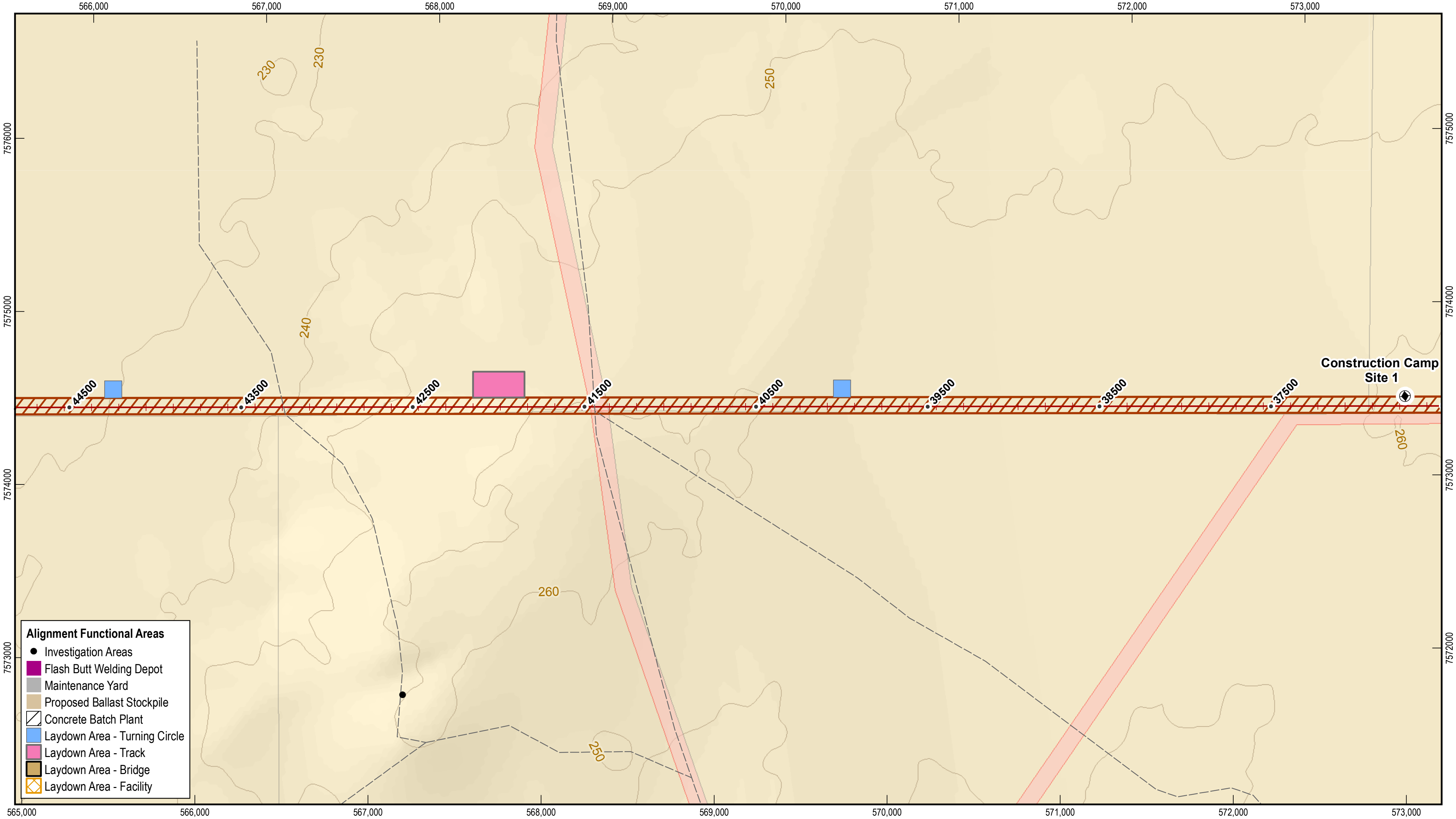

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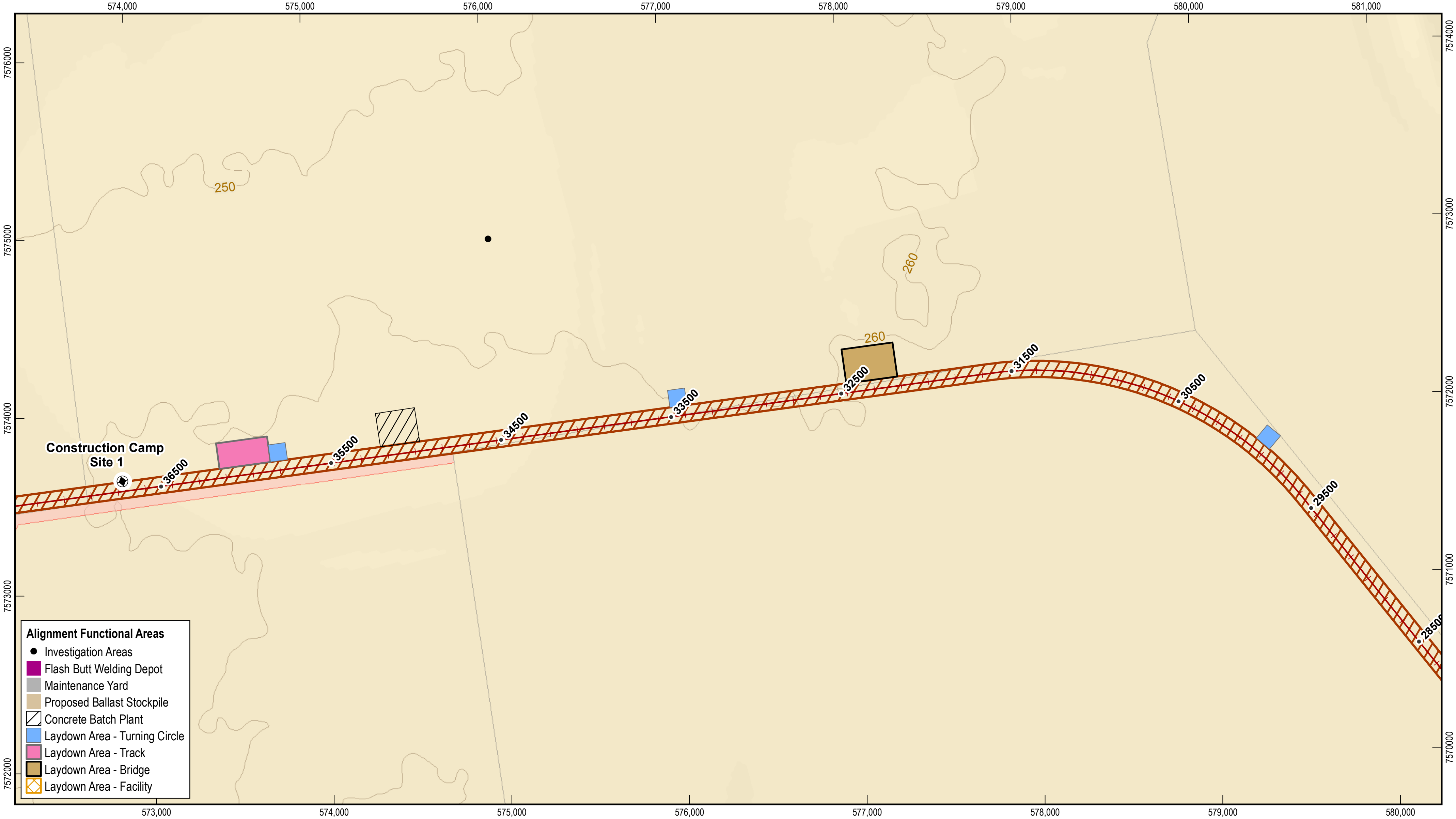

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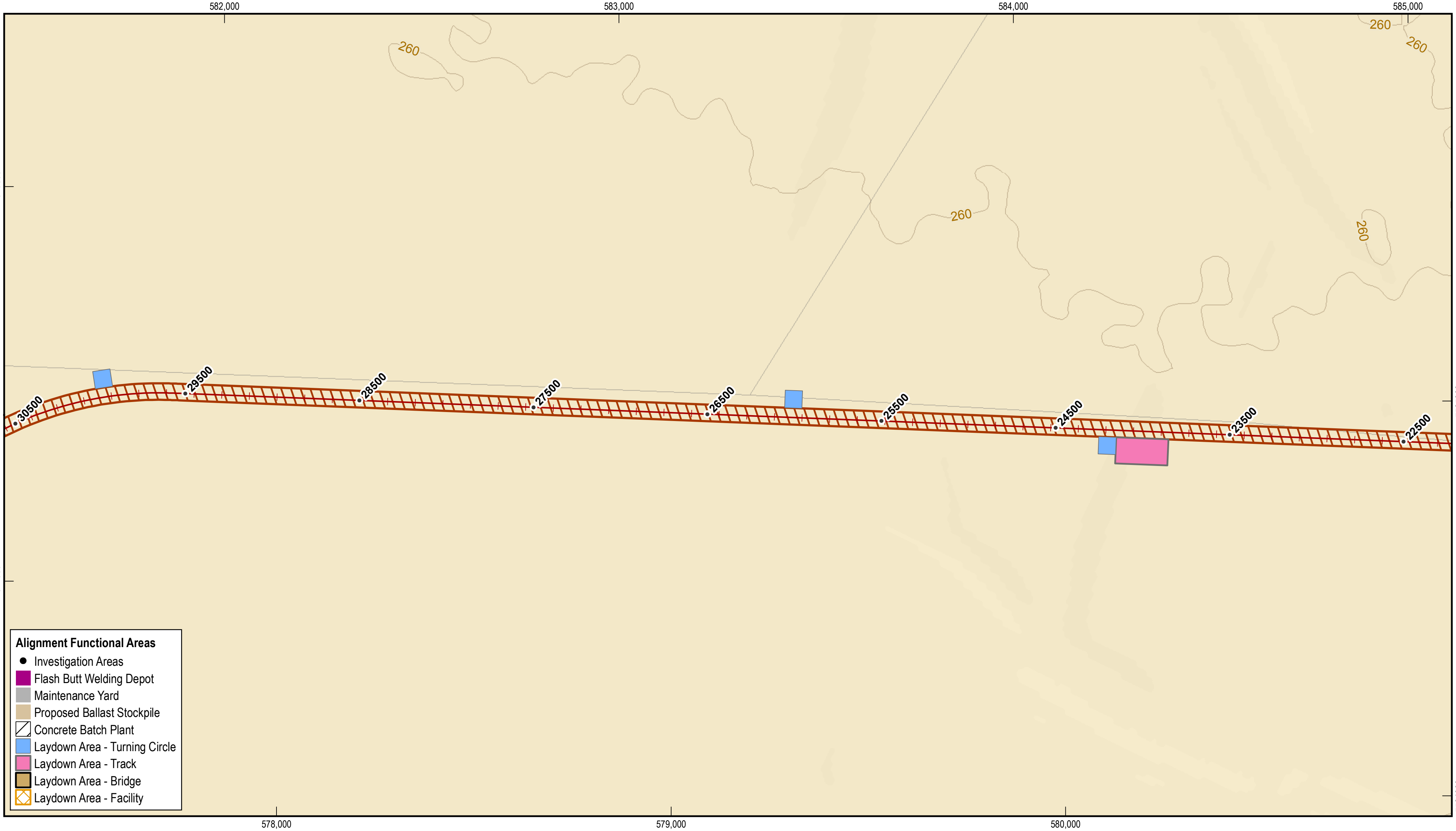

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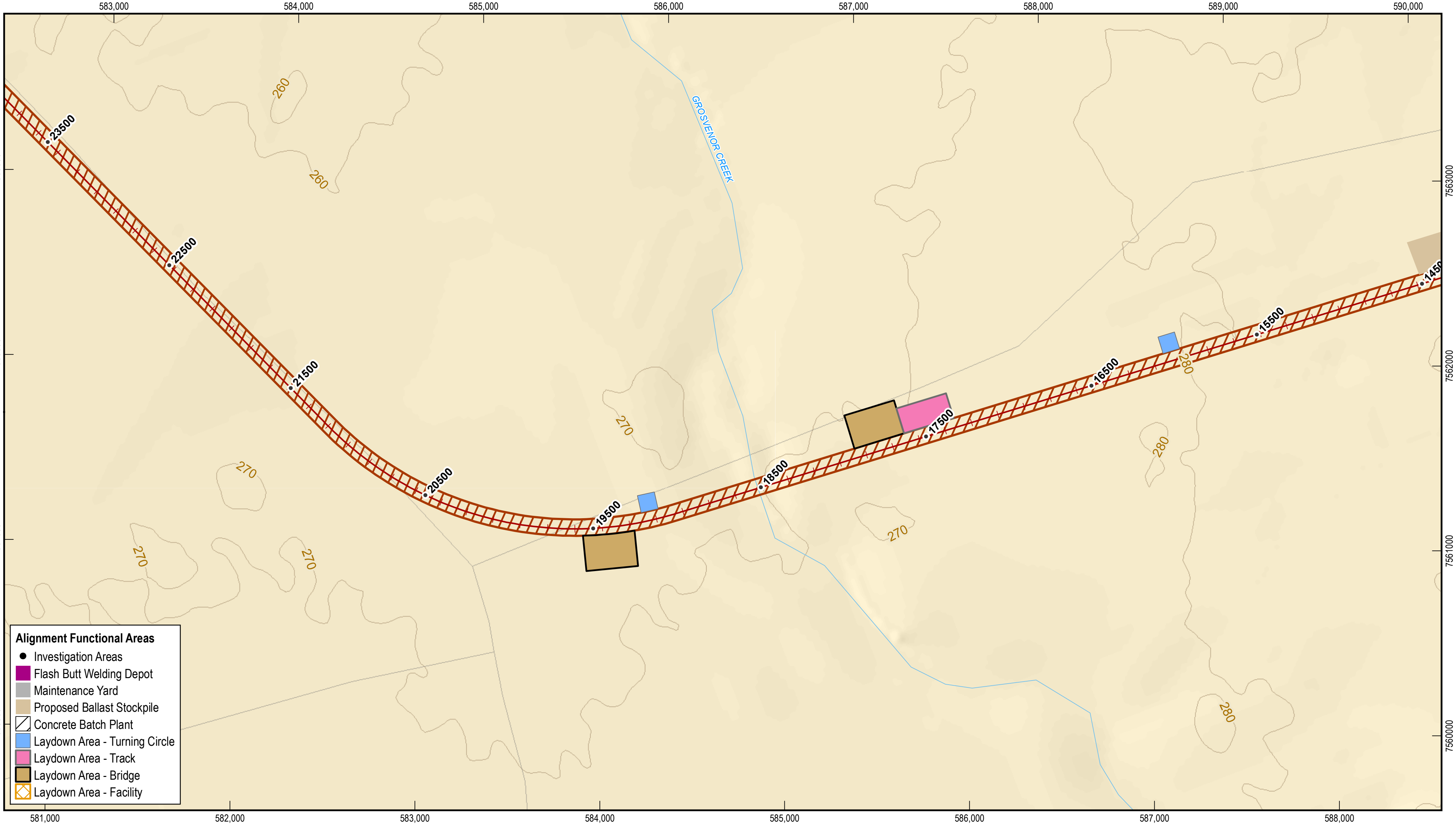

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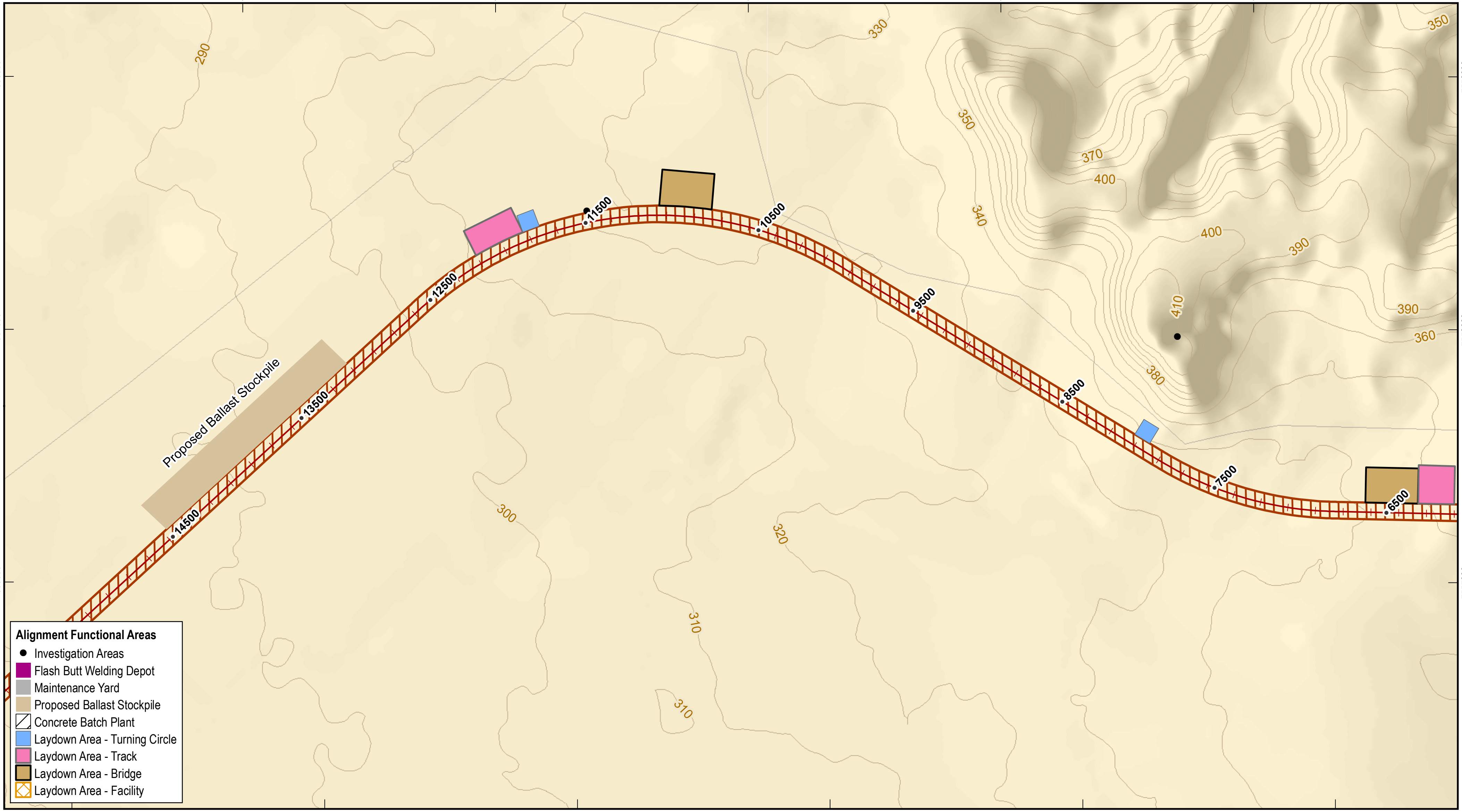

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Rail (East)

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Project (Rail) Description

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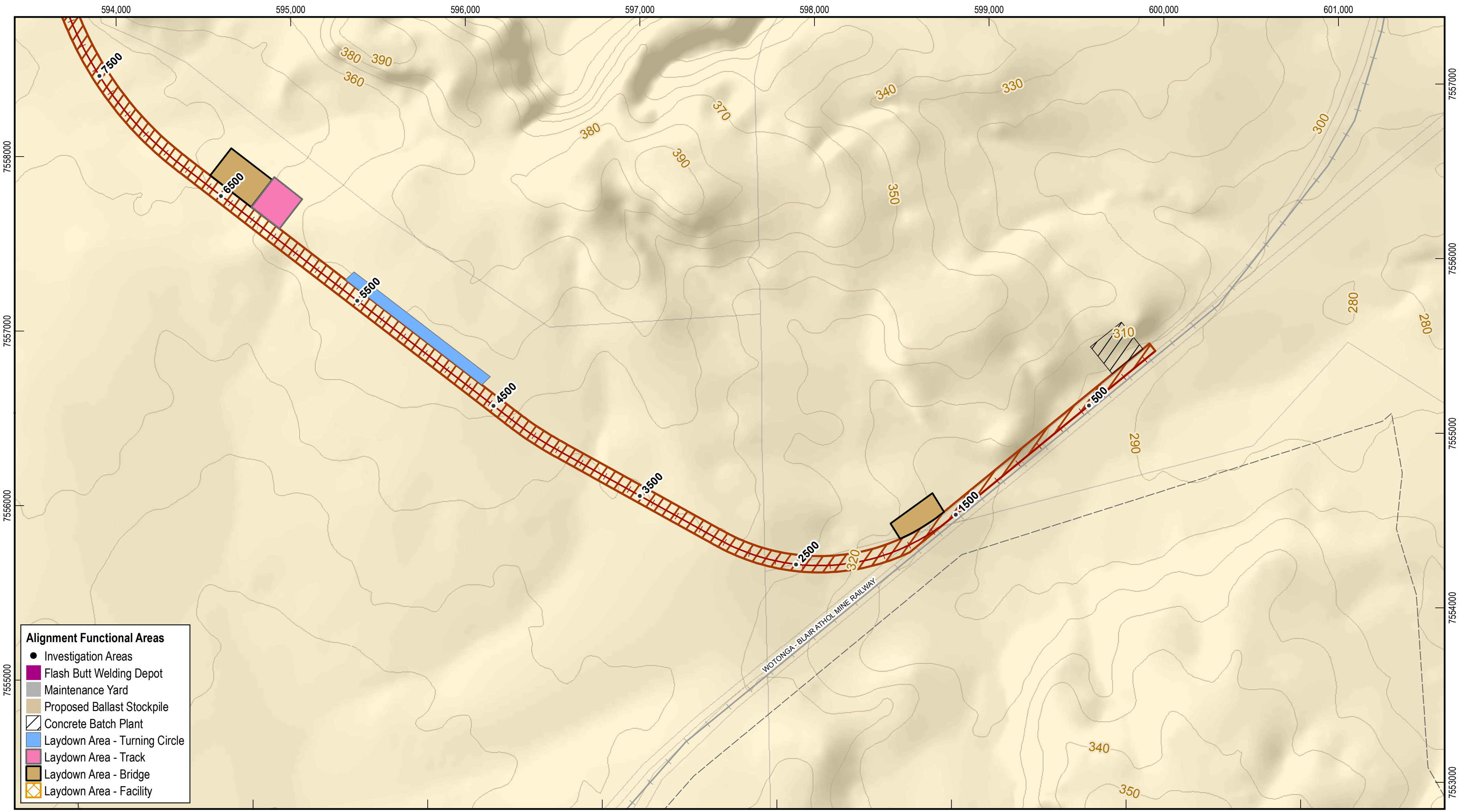

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2.5.2 Terminus Facility

Coal product is loaded on to the trains at the terminus facility, located immediately north of the Mine Infrastructure Area (MIA). The terminus consists of:

- A dual gauge reception line of 4.5 km length
- Balloon loop loading line (18.7 km)
- Weighbridge/overloaded removal device
- Dual gauge 4.5 km length departure line
- Bad order siding

When coal production reaches in the order of 29 Mtpa and more than nine trains per day require loading, a second balloon loop will be required.

The balloon loop accommodates a simultaneous operation of one train loading, one train held awaiting loading and one loaded train awaiting clearance prior to departure.

The terminus facility will also accommodate:

- A control room for the train loading operator
- Dragging equipment detector
- Overload detector instrument
- Derailment detector
- Telecommunication system

2.5.3 Track

Project (Rail) track generally consists of:

- Ballast: 250 mm to 300 mm minimum depths under sleepers
- Sleepers: pre-stressed concrete sleepers are proposed
- Rail fixings and jewellery
- Rail: AS 60 kg/m standard carbon and AS 60 kg/m head hardened at turnouts, insulated joints and the balloon loop

There is approximately 247 km of track comprising both narrow and standard gauge along the length of the Project (Rail). This includes the mainline, passing loops, bad order sidings, loading balloon, etc. (excluding the maintenance yard).

2.5.4 Passing Loops

Passing loops allow for trains using the same rail network to meet and pass each other, in either the opposite or the same direction. Five dual gauge passing loops, each 4.5 km in length, are proposed along Rail (west). Three narrow gauge passing loops, each 2.5 km in length are proposed along Rail (east).

Bad order sidings are required to allow maintenance activities to take place with minimal disruption to the rest of the line. Bad order sidings will be constructed at every second or third passing loop subject to further operational assessment.

The development of the network to include all passing loops will be staged, depending on the final synchronisation of rail operations to the timing of mine production expansion and demand from third party users. This includes consideration to the consist requirements and train running paths required to meet production and exportation requirements. The footprint within which the passing loops will be located is defined within the current nominal 95 m rail corridor width.

2.5.5 Maintenance Facility – Rolling Stock

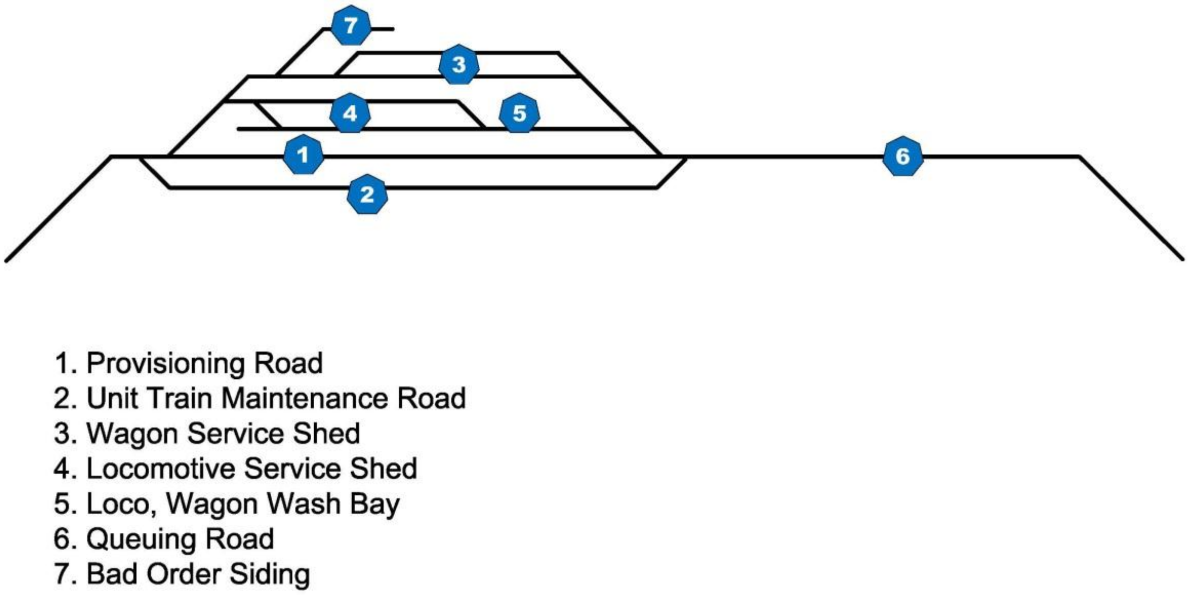
The maintenance facility is located near the Mine site, has an approximate footprint area of 280 ha, and comprises:

- Traffic and workshop tracks
- Locomotive provisioning
- Locomotive and wagon maintenance
- Administration and train crew depot.

The approximate capacity will account for 100 employees and 18 consist.

Figure 2-6 provides an illustration of the proposed maintenance facility.

Figure 2-6 Maintenance Facility Schematic



Source: Adapted from Aarvee Associates, 2011

Typical facilities for locomotive maintenance include:

- Two locomotive provisioning facilities with the capability for fuelling, lubricating oil top up, engine coolant top up and sanding
- Locomotive maintenance and repair building comprising two roads with pits and platforms for access to underbody, equipment room and roof with a footprint of approximately 2,200 m^2
- One locomotive jacking system for bogie, wheel and traction motor replacement
- Two bridge cranes (10 t and 30 t) for major component replacement
- Underfloor wheel lathe for re-profiling locomotive wheels

Typical facilities for wagon maintenance include:

- One full train length road for operational maintenance and repair
- Wagon maintenance and repair building comprising two workshop roads each equipped with wagon jacking systems for tandem coal wagons and vehicle progression systems, inbound and outbound storage roads with a footprint of approximately 1,680 m^2.
- Bogie repair building comprising workstations and two bridge cranes with a footprint of approximately 560 m^2

Typical warehouse and storage areas include:

- Component storage with a footprint of approximately 300 m^2
- Wheel and bogie storage with a footprint of approximately 1,500 m^2

Diesel storage capacity is 1,050,000 litres comprising of 10 diesel storage tanks each with a capacity of 105,000 litres. Hazardous and dangerous chemicals such as oil and other lubricants will be held in appropriately ventilated segregated areas of the warehouse. Train washing facilities include a combined locomotive and wagon wash facility (470 m^2) which is provided to wash vehicle bodies and components. It is estimated that a total of 90,000 litres of potable water will be required per month and a further 63,000 litres per month required for rollingstock wash facilities. Power will be supplied from the same power source for the Mine Site.

A maintenance access track will run adjacent to the rail line wherever possible.

Holding yards within the maintenance facility provide a location for consists to be kept while not in operation. Track maintenance requirements aim to shadow the total network shutdowns of the Goonyella and Newlands systems. This requires consideration of non-mainline locations for the stowage of train sets during these track maintenance closures. In the event that QR National will not allow the Project (Rail) to stow on the Goonyella system, Adani will be required to find stowage for 18 consists when maximum tonnage rate is achieved.

Based on conceptual track design when the target capacity is reached, it is anticipated that train stowage will be required as follows:

- Eight consist stowed on the Project (Rail) mainline
- Three consist stowed at the Project (Rail) load-out balloon
- Two stowed at the Project (Rail) maintenance facility
- Five stowed at either, or between, Dudgeon Point and the Port of Abbot Point

Bad order sidings along the corridor would also be required for track machines and faulty rolling stock.

Operationally, interactions with the Goonyella system may see train arrival patterns on to and off the Project (Rail) generate unwanted queuing at the interface with the Goonyella system. The first loop on the Project (Rail) prior to the Goonyella system is the logical location for inclusion of additional holding roads. This would then serve to absorb some of the variations imposed by the Goonyella system supply chain. It would also relieve the stowage requirements on the network during the maintenance closure days.

2.5.6 Rollingstock

The number of trains operating within the rail system reflecting the production of coal from the Project (Mine) and potential third party users comprises:

- Ten trains per day each way to transport up to 30 Mtpa product, consisting of three locomotives and 120 narrow gauge wagons
- Twelve trains per day each way to transport up to 60 Mtpa product, consisting of four locomotives and 164 narrow gauge wagons
- Eighteen trains per day each way, including standard gauge wagons, to transport up to 100 Mtpa product

Trains are expected to run 24 hours per day, 320 days a year.

Table 2-5 provides rolling stock specifications.

Table 2-5 Rollingstock Specifications

Rollingstock Item	Specification
Type of locomotive/s	Narrow gauge: PH37 / GT46AC* Standard gauge: ES44AC / SD70
Mass of locomotive/s (t)	Narrow gauge: 132 / 138 Standard gauge: 196
Number of locomotive/s per train	3 - 4
Type of wagons	Bottom dump coal hopper, ECP brakes, KDD mechanism, coupled in packs of two
Number of wagons	Narrow gauge: 120 / 164 Standard gauge: 240
Nominal gross mass per wagon (t)	120
Average proposed load (of product) per wagon	Narrow gauge: 84 t increasing to 98 t Standard gauge: 106 t
Designed gross tonnage of wagon (t)	109 t (narrow gauge) increasing to 130 t (standard gauge)

Rollingstock Item	Specification
Tare mass per wagon (t)	22
Maximum axle loading	32.5 t
Gross tonnes per train service – forward (unloaded) (maximum) (t)	Narrow gauge: 4,160 Standard gauge: 6,004
Gross tonnes per train service – return (loaded) (maximum) (t)	Narrow gauge: 20,232 Standard gauge: 29,580
Maximum operation speed of empty train service (km/h)	100
Maximum operation speed of loaded train service (km/h)	80
Total length of train (approximate, including locomotives) (m)	Narrow gauge: 2,760 Standard gauge: 3,984

* Under development.

2.5.7 Signalling and Communications

The signalling requirements for the Project (Rail) consist of a remote control signalling (RCS) system utilising signalling methodology currently in use on Queensland mainline railways. It is proposed that train control will be located within the existing QR National train control centre as the Project (Rail) is integrating with the QR National Goonyella rail system. In addition, a satellite control centre will be considered in Brisbane for controlling Project (Rail) operations.

A user requirement specification will define the specific requirements of the signalling and control systems and be used as a basis for the initial scheme design. Once the scheme design has been approved for construction a detailed design will be produced. For the interface area with QR National, the design will be issued to QR National to be checked and approve prior to formal submission. Signalling plans and ‘as built’ drawings received from QR National are being used to inform interface design.

2.6 Project (Rail) Construction

2.6.1 Construction Overview

The construction program for the Project (Rail) defines a number of stages and activities. These comprise:

- Site preparation including site clearance, construction camp establishment, installation of temporary and permanent fencing, installation of drainage and water management controls and construction of site access
- Civil works including bulk earthworks, black soil treatment, construction of cuts and embankments, installation of permanent drainage controls, construction of temporary haul roads,

establishment of concrete batching plants, bridge and water course crossing construction and development of quarries and borrow areas

- Track works including installation of the rail, signalling infrastructure and maintenance infrastructure

Construction methodology considers engineering, environmental, cultural and social attributes particular to the Project (Rail). Specific consideration has been given to:

- Minimising disruption to landowners
- Minimising disruption to public infrastructure
- Minimising the impact on the environment

This will be achieved through:

- Suitable access to construction sites
- Timing of construction
- Development of appropriate management plans

2.6.2 Site Preparation

The site clearing includes removal of vegetation and debris. Site preparation also includes modification, diversion or realignment of any services and infrastructure. Site clearing will occur prior to the main earthworks construction teams arriving. In addition, in order to avoid large areas of the construction corridor being unnecessarily exposed to the erosive effects of wind and rain, areas will be opened immediately in advance of construction fronts. There are no major structures along the proposed corridor requiring removal.

Four construction camps (one combined with the mine workers accommodation village) will be required. This is to facilitate a number of simultaneous work fronts along the alignment, namely three on Rail (west) and one on Rail (east), noting however that final construction planning will be established by the successful works contractor. The water demand and sourcing is being finalised and is described further in Section 2.6.13.

Access roads will be required along the alignment to allow drainage and bridge structure crews to access work locations. The primary access roads to the alignment will be designed and constructed/upgraded with due consideration to minimising disruption to landholders and public infrastructure.

A direct construction access is proposed to be provided adjacent to all rail works along the Project (Rail) corridor, and will be sized to allow free flow and unhindered access for all construction and support traffic vehicles. These access points will also be utilised for the transport of water, personnel, fuel and materials for maintenance purposes. Construction access will be provided adjacent to the rail works and typically be located on the northern side of the Project (Rail) corridor. The intersections of the construction access road with the primary access roads will need to be designed and constructed during the site preparation/mobilisation period.

The access roads will also cater for the movement of:

- Construction equipment and vehicles

- Personnel transport for staff and labour to access the works
- Maintenance vehicles
- Water deliveries
- Deliveries of materials including, but is not limited to, fill material, sub-base and capping material, equipment, fuels and lubricants
- Servicing temporary construction facilities along the route

Transport corridors have been identified for the purposes of assessing the impact of construction traffic on the surrounding highway network. These corridors comprise of both state and local controlled roads and will be used as the primary routes during the construction phase for transporting of equipment and materials. Further detail is outlined in Volume 3 Section 11 Transport.

All turf, topsoil and other organic and unsuitable material shall be stripped from the site. Wherever possible and appropriate, such material will be stockpiled and recycled within the Project (Rail) area.

Both temporary and permanent fencing is required due to the high concentrations of livestock on the properties adjacent to the proposed works site. Fencing standards will be confirmed upon consultation with relevant landowners and in accordance with requirements to facilitate fauna movement (refer Volume 3, Section 5 Nature Conservation).

Temporary site drainage and water management controls will be installed in order to minimise any runoff and sedimentation from the Project (Rail) activities to existing waterways, and disturbance to the water quality of existing waterways.

2.6.3 Site Civil Works

Site civil works includes bridge and water course crossing construction, bulk earthworks and construction of cuts and embankments, black soil treatment, installation of permanent drainage controls, construction of temporary haul roads, and establishment of concrete batching plants.

Civil works will be undertaken in the following general order:

- Bulk earthworks including cuttings and embankments
- Embankment materials will be sourced with preference from local borrow pits and cuttings, while capping material and ballast will be sourced from either quarries developed along the route or from established quarries. An estimated 9.9 million m^3 of fill is required for Project (Rail), including provision for the flash butt welding yard, the permanent ballast siding and balloon loadout loop. An estimated 2.67 million m^3 of cut will be generated.
- The capping layers, on the embankments and pavements to access roads, will be constructed by dedicated crews comprising graders, compaction equipment and water trucks
- Dedicated drainage crews will install drainage pipe work or culverts and concrete headwall structures
- Dedicated bridge crews will construct the bridges and associated retaining walls
- Rail systems conduit installation will commence prior to formation capping activities
- Rail track works will be commenced as soon as the capping layer is completed on embankments and cut zones. This rail work will be concurrent with other earthwork stages of the Project (Rail)

The earthworks for the railway will require balancing cut to fill along the rail corridor where practicable, to minimise the creation of spoil and the need to import fill. Construction material such as sub-base (general fill, formation), select fill, capping material, scour protection and ballast will need to be sourced.

Total fill requirements are approximately 9.9 million m^3, with cut material potentially providing up to 2.5 million m^3, noting that not all cut material will be suitable for use as engineering fill. Hard rock will be required for the purposes of ballasting and scour protection. It is expected that the majority of this construction material will be sourced from local and regional quarries and borrow areas. One option is for quarries and borrow areas to be developed along the rail corridor (in suitable areas having regard to environmental, social, cultural or heritage values).

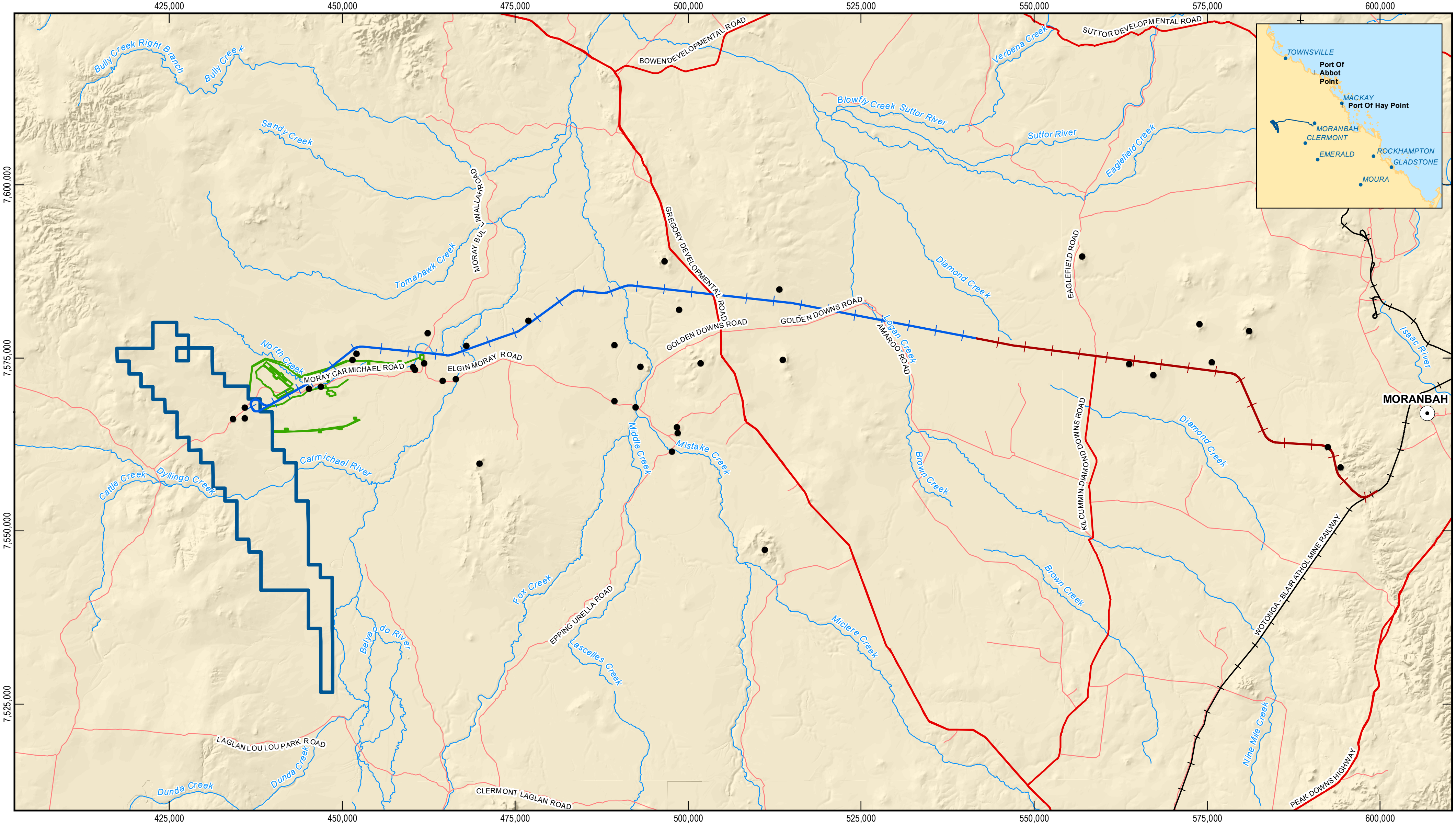
Rock will need to be quarried, crushed and screened by the ultimate supplier to produce material of the required specification, which will be transported by road or access track to the rail corridor.

The ballast quarries will either be new operations, or private licensed operations. Quarrying contracts for externally sourced ballast material will include provision of surplus ballast for rail maintenance. However, depending on the quantities of viable hard rock remaining on completion of construction within the Project (Rail) footprint, one or more of the ballast quarries may be retained to meet ongoing maintenance ballast requirements.

A number of quarry and borrow locations have been identified for investigation as shown in Figure 2-7. Geotechnical investigations are underway to better determine the nature of the potential resource and the quantity of resource available.

These components do not form part of the Project (Rail) to be assessed as part of this EIS. Reference to investigate quarry and borrow areas highlight in places the potential for cumulative impacts arising from the development of the Project (Rail) as well as the potential development of quarries and borrow pits to service the Project (Rail) and other infrastructure

Preliminary desktop estimates of the type, size and expected resource from investigative quarries and borrow areas are outlined in Table 2-6. Before any quarries or borrow pits will be developed, appropriate lawful approvals process will be followed to ensure proper assessment of that development is carried out.



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0 5 10 15 20 25

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Investigation Areas
- Town
- Watercourse
- Other Rail Network
- State Road
- Local Road
- Rail (West)
- Rail (East)
- Mine (Onsite)
- Mine (Offsite)

GHD adani

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Job Number	41-25215
Revision	B
Date	14-09-2012

Potential Quarry and Borrow Locations for Project (Rail)

Figure 2-7

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Data source: DERM: DEM (2008), Nature Refuge (2011); DME: EPC1690 (2010), EPC1080 (2011): © Commonwealth of Australia (Geoscience Australia): Localities, Railways, Roads (2007); Adani: Alignment Opt9 Rev3, Investigation Areas (2012); Gassman/Hyder: Mine (Offsite) (2012). Created by: NR, CA

Table 2-6 Investigative Quarry and Borrow Area Locations and Attributes

Location	Type	Quantity of resource (m^3)	Investigation Footprint (ha)	Depth (m)	Expected materials
Loop	Borrow	1,5000	100	1	Select fill
Twin Hills	Quarry	5,000,000	800	15	Ballast, capping, sub-base, select fill,
Disney	Quarry	5,000,000	75	15	Ballast, capping, sub-base, select fill,
Borrow 1	Borrow	50,000	15	1	Select fill
Borrow 2	Borrow	50,000	9	1	Select fill
Borrow 3	Borrow	50,000	12	1	Select fill
Borrow 4	Borrow	30,000	50	1	Select fill
Borrow 5	Borrow	30,000	15	1	Select fill
Borrow 6	Borrow	500,000	200	1	Select fill
Borrow 7	Borrow	200,000	500	1	Select fill
Borrow 8	Borrow	500,000	500	1	Select fill
Borrow 9	Quarry	5,000,000	100	3	Sub-base, select fill
Borrow 10	Borrow	50,000	15	1	Select fill
Borrow 11	Borrow	100,000	50	1	Select fill
Borrow 12	Borrow	200,000	15	1	Select fill
Borrow 13	Borrow	100,000	50	1	Select fill
Borrow 14	Borrow	300,000	150	1	Select fill
Borrow 15	Borrow	50,000	12	1	Select fill
Borrow 16	Borrow	300,000	200	1	Select fill
Borrow 17	Borrow	250,000	100	1	Select fill
Borrow 18	Borrow	500,000	25	5	Select fill
Borrow 19	Borrow	1,000,000	600	2	Select fill
Borrow 20	Borrow	1,000,000	1,500	1	Select fill
Back creek (pit)	Quarry	5,000,000	50	15	Ballast, capping, sub-base, select fill,

Location	Type	Quantity of resource (m^3)	Investigation Footprint (ha)	Depth (m)	Expected materials
Walton Road / Mistake creek (pit)	Quarry	500,000	50	10	Sub-base, select fill
Elgin Pit (pit)	Quarry	500,000	50	10	Sub-base, select fill
Plains creek road (pit)	Quarry	500,000	50	10	Sub-base, select fill
Moray Downs existing (pit)	Quarry	500,000	50	10	Sub-base, select fill
Moray Downs (proposed)	Quarry	500,000	50	10	Sub-base, select fill
Labona (pit)	Quarry	500,000	50	10	Sub-base, select fill
North creek (crossing)	Quarry	500,000	50	10	Sub-base, select fill
16 Mile Creek (crossing)	Quarry	500,000	50	10	Sub-base, select fill
Labona Airstrip	Quarry	500,000	50	10	Sub-base, select fill
Moray Anabranch	Quarry	500,000	50	10	Sub-base, select fill
Belyando River	Quarry	500,000	50	10	Sub-base, select fill
Belyando River Anabranch	Quarry	500,000	50	10	Sub-base, select fill
Mistake Creek	Quarry	500,000	50	10	Sub-base, select fill
Back Creek	Quarry	500,000	50	10	Sub-base, select fill
Mt Gregory	Quarry	5,000,000	800	15	Ballast, capping, sub-base, select fill,

Cutting construction will progress over the width at the top of the batters. Catch drains will be installed to separate water from the construction corridor. Excavation will then progress depending on the insitu material types.

'Black soil' (reactive clays) exists along the rail alignment. There are a number of treatments that may be utilised, either in isolation or together, to try and remove the impact of 'black soil' on the permanent works. These are typically aimed at reducing water ingress into the in-situ subgrade material and thereby reducing the swell of the highly expansive clays.

The need for blasting will be determined with further geotechnical investigations but is not considered likely at this stage along the Project (Rail).

Additional drains and access roads will be completed as the construction proceeds. Protection measures for exposed slope and batters, such as grass mats or shotcrete, may be required if the in-situ materials are unsuitable. The drainage structures will require several full time installation crews throughout the construction period. This construction will be a mix of installation prior to and post bulk earthworks. Drainage structures are likely to be precast concrete products dependent upon site-specific loading, hydraulics, and alignments.

It will also be necessary to capture overland flow and transfer it to the cross drainage structures. The sizing of the longitudinal drainage will be dependent upon the hydrology and it is important that these drains are capable of efficiently moving overland flow to dedicated drainage lines to reduce the likelihood of water ingress to the permanent works.

The diversion of water courses for the purpose of construction would be confirmed during detailed design and avoided where practicable. Construction works within these areas that are subject to the effects of wet weather are planned to be undertaken in dry conditions.

The final design of the haul roads will be dependent upon the local geotechnical profile. Maximum use will be made of the rail corridor for haul roads within the site. Continual maintenance of the temporary haul roads will be undertaken. Temporary turning circle areas will be required to facilitate delivery of materials and movement of vehicles, equipment and personal at locations along Project (Rail). Temporary facilities will as far as practicable be located in previously cleared and/or disturbed areas (i.e. non-remnant vegetation areas), away from watercourses and floodplains or within areas intended for use as part of permanent operations..

It is likely that four concrete batch plants will be required for the Project (Rail) construction. Nominal locations are currently proposed (refer Figure 2-5). The most appropriate locations for these plants are dictated by:

- Cartage time for delivery of concrete to site
- Concentration of structure works
- Environmental considerations (in particular remnant vegetation and floodplains)
- The proximity of any source of materials (identified quarries) within the site
- Logistical access routes
- Proximity to major structures along the alignment

Bridge substructures include the construction of:

- Foundation piles and pile caps

- Columns and headstocks
- Abutments

Piles may be constructed as cast in-situ with the use of temporary reusable steel casings and driven steel piles with cathodic protection for submerged locations or as driven octagonal concrete piles. Due to seasonal rainfall the installations of bridge structures will be programmed during the dry season to reduce the number of submerged locations. Pile caps may be constructed as cast in-situ formed by either steel or precast concrete panels.

Columns and headstocks may be constructed as either cast in-situ, precast or a combination of both. Cast in-situ method will require steel formwork with temporary supports and working platforms. For precast method, all units will be fabricated in the precast yard and delivered to site. Temporary laydown areas will be required to store precast material at locations along Project (Rail). Temporary facilities will as far as practicable be located in previously cleared and/or disturbed areas (i.e. non-remnant vegetation areas), away from watercourses and floodplains or within areas intended for use as part of permanent operations. Small localised temporary laydown areas may be utilised at bridge crossings for temporary storage of girders.

Abutments consist of abutment pile caps, abutment walls, bearing pads, wing walls, approach slabs and reinforced earth walls constructed as cast in-situ.

Bridge substructures for multi-span structures will most likely have to be constructed in creek beds on temporary working platforms and crossings. These crossings will also provide construction access across creeks in locations where the bridge structure is not yet completed. The superstructure may be constructed by composite steel girders or precast/prestressed concrete T-girders. Placement of girders will mainly be undertaken by appropriately sized cranes. The typical span of these girders will be 15 m or 20 m. Larger structures may require special design and construction to account for local conditions and loadings.

2.6.4 Track Works

A completely mechanised tracklaying methodology will be used, based on the continuous operation of a specialist tracklaying machine and encompasses daily supply of track construction materials. This approach is more efficient and enables greater daily production than other track construction approaches. It also eliminates significant numbers of heavy truck movements over the road network, thereby improving both worker and public safety. Mechanised track construction is a linear project, in which the construction progress happens in one direction. An alternative method of track laying using conventional equipment may be used for the laying of passing loops and construction of the maintenance facility.

The logistics of material supply is critical for the success of the track construction, particularly to supply the construction material to the work front at the correct rate to meet the tracklaying speed. Temporary track laydown areas will be required to store material, equipment and machinery at locations along Project (Rail). Temporary facilities will as far as practicable be located in previously cleared and/or disturbed areas (i.e. non-remnant vegetation areas), away from watercourses and floodplains or within areas intended for use as part of permanent operations.

The track construction will progress from the temporary construction facility area located near the intersection of the Project (Rail) with the Gregory Developmental Road (Ch 96.8 km). The track materials will be delivered to this location by road.

The construction of the permanent infrastructure maintenance depot will also commence at the start of the Project (Rail), so that it is completed before the track construction crews arrive and ease pressure on temporary camp sites in later stages of construction.

It is proposed that the rail procurement and delivery schedule be developed jointly.

2.6.5 Flash Butt Welding Yard

A dedicated flash butt welding yard will be developed within the temporary construction facility area near the junction with the Gregory Developmental Road. The setup will be capable of welding short rails of 25 m lengths into 300 m to 400 m long welded rail strings that may be transported by road or rail.

The flash butt welding yard will have:

- Dedicated gantries for unloading the short rail
- Automatic short rail feeder
- Power roller line for deeding the short rails to the flash butt welder and to grinding
- Inspection stations
- The long welded rail stockpile

All movements of the rail will be done by gantries and roller line. A summary of the flash butt welding yard details are outlined in Table 2-7. The location of the flash butt welding yard is demonstrated in Figure 2-5.

Table 2-7 Flash Butt Welding Yard Key Features

Item	Description
Short rail stockpile capacity	Maximum short rail stockpile tonnage = 12,775 metric t Based on nine stockpiles of 835 rails
Stockpile arrangement	Adjacent to the roller line close to feeder table
Short rail handling system	Short rail delivered to site on long flatbed trailers
	Dedicated gantry crane handling system for unloading, stockpiling and feeding the flash butt welder
	Spreader beam with four rail camlock clamps
Short rail profile and length	60 kg / m 25 m long
Short rail end preparation method	A shot blasting station for preparing the rail ends for welding
Roller line height from the natural ground level and spacing	1 m high to the top of the roller of the roller frame, from the natural ground level. Roller frames are spaced 3 m apart each other, centre to centre

Item	Description
Power and control cabling system	Cable trays are laid adequately above the ground level to avoid the potential drainage problems
Flash butt welding machines required in the system	1 no permanent flash butt welding station installed next to the feeding table system
Post grinding method	Hand profile grinding method using portable grinders
Number of work stations required up to the long welded rail portal frame system	End and bed grinding at the feeding table system Shot blasting station Fixed flash butt welding station Grinding station – 1, 2 and 3
Length of the long welded rail	300 m long welded rail strings
Long welded rail strings stockpile capacity	835 strings stacked (calculated capacity limited to 804 strings)
Long welded rail strings handling system	19 m span, 16 portal frames spaced at 19 m each
Portal frame operation and control system	Single operator controlled synchronised control
Long welded rail strings loading to wagon type	19 portals single operator synchronised control

Source: Aarvee Associates, 2011

In addition, the temporary construction facility will be used for stacking ballast and storing various free issue materials. A smaller construction depot is planned at the Moranbah end of the Project (Rail) to cater for the construction of Rail (east).

2.6.6 Ballast Supply

The current assumption for the ballast profile is a nominal 250 mm of bottom ballast and 300 mm shoulders for narrow gauge and 300 mm of bottom of ballast and 300 mm shoulders for dual gauge. The ballast required for the track works, given the assumed ballast profiles, will be approximately 820,000 t. The ballast will be loaded into stockpiles in advance of track construction works, to keep up with the demand and facilitate the provision of consistent supply during track construction. To maintain a progress rate of 1.8 km per day of new track construction, 4500 metric t of ballast will be required. The location of additional construction ballast stockpiles may be able to be maintained at the ultimate location of any quarry and/or borrow pits that can supply suitable ballast material. A ballast siding is proposed within the temporary construction facility area near the Gregory developmental Road. Additional ballast sidings are proposed at the eastern extent of the Project (Rail) near the connection with the Goonyella rail system.

2.6.7 Construction Train Control

During construction, the rail line will be designated as:

- Construction zone track
- Open railway track

A block point will be established behind the current track laying location. All tracks between the block point and the rail head will be classified as construction zone track and will be subject to the control of the track construction team. Track between the block point and the depot will be classified as commissioned railway and will fall under the control of the train controller.

The speed limit on the construction track will range from 10 km/h on skeleton track in increments to 30 km/h, and 60 km/h. Only after the track has been completed, inspected and passed, can a section of track be reclassified from construction zone track to commissioned railway and the block point moved forward.

2.6.8 Railway Safeworking

Railway safeworking systems will be implemented during the works to manage to the construction zone track. The safeworking of construction trains and work sites within the construction zone will be designed on the ‘block separation’ method. The construction team will assist in the development of suitable construction safeworking as necessary.

2.6.9 New Track Construction and Track Laying

The new track construction machine draws sleepers and rail from the work train to lay skeleton track in a continuous process, allowing for progressive advancement of the new track construction and wagons together without any damage to formation or sleepers.

The train loaded with long welded rail strings and sleepers on arrival at site will be hooked up with the new track construction and the locomotive will be disengaged. The long welded rail strings will be pulled forward on to the formation by a track excavator assisted by roller assembly that runs along the entire length of the train. The 300 m long strings will be pulled on the formation on under-foot rollers laid on the formation. At any given time there will be a minimum two adjacent strings of 300 m on the formation to facilitate the track layer.

It is proposed to fasten (clip up) the rail to the sleepers behind the new track construction machine when the temperature is within the appropriate stress-free temperatures ranges. The heavy weight of the sleepers and rail, mild track curve radii, and good quality fastenings will ensure the track remains stress free when the rail is clipped up within the stress-free temperature.

Loading of ballast trains will occur at ballast sidings using two front-end loaders. Ballast train unloading will be undertaken using automated remote controlled ballast hoppers, which will allow a complete ballast train to be unloaded in an hour. The track will be lifted in four lifts with a tamper. The ballast tamping requirement in different passes is up to 10 km per day. This is calculated based on 1.8 km progress and four to five tamping passes within that distance. The Project (Rail) will utilise three ballast tampers, collectively having a capacity of tamping over 10 km of finished track per day.

Tamped track sections will require destressing if the rails have not been clipped at the stress free temperature. To speed up the destressing operation, rollers will be used to destress 800 metre blocks (two 400 metre lengths). The rollers will ensure one destressing team achieve more than 2 km of destressing in a shift. One destressing team working behind the final tamping will ensure non-compliant areas are destressed. The standard gauge rail (or third rail) will be installed and stressed by the destressing crews after the narrow gauge leg is completed and will require a final tamping pass using a tamper capable of tamping dual gauge track.

2.6.10 Passing Loops and Yards

It is proposed to pre-build the passing loop turnouts (likely to be 1 in 16 or 1 in 20 swing nose turnouts) on the formation before the arrival of the new track construction machine. The new track construction machine will be used to lay the track for the main passing loops by using the pre-laid turnouts. The 300 m long rail will be delivered by the rail train to site and threaded on the already laid sleepers. The ballast trains will drop ballast as outlined in Section 2.4.6.

2.6.11 Indicative Construction Equipment and Resources

Table 2-8 outlines the plant and resources required for construction activities.

Table 2-8 Construction Plant and Resources

Construction Activity	Plant and Resources
Earthworks	D10 dozers D11 dozers 651 open bowl scrapers 631 open bowl scrapers 623 elevating scrapers 825 compactors 16 G Graders (may have machine control) 30,000 litre water carts 85 Tonne excavator 740 rear dump trucks Labourers
Drainage and Headwalls	30 tonne excavators 60 Tonne rough terrain hydraulic cranes 20 tonne rough terrain Franna type cranes Front end loaders/backhoes 20,000 litre water carts 10 tonne self-propelled pad-foot rollers Miscellaneous small hand held compaction equipment Form-setters

Construction Activity	Plant and Resources
	Pipe layers
	Labourers
Capping Layers and Pavements	140 G Graders (will have machine control)
	825 compactors
	15 tonne vibrating smooth drum rollers
	20,000 litre water carts
	Labourers
Structures Crew – Bridge	160/220 Tonne hydraulic cranes
	20 tonne rough terrain crane
	Rough terrain Tele-hoist with forklift attachments
	30 tonne excavator (part time)
	950 front end loader
	10 tonne self-propelled pad-foot roller
	Front end loader/backhoe
	20,000 litre water carts
	Form-setters
	Steel fixers
	Concrete labourers
	Labourers
Haul Road and Access Track Maintenance	140G grader
	30,000 litre water carts
	30 Tonne excavator (part time)

Source: Aarvee Associates, 2011

Table 2-9 outlines the critical plant and equipment applicable to new track construction.

Table 2-9 Indicative Equipment and Plant for Track Construction

Plant Description	Numbers
Flash butt welder	1
Mobile flash butt welder	1
Tracklaying machine	1
Main Line Tamper	1
Track Lifter	1
Main Line Tamper	1
Switch Tamper	1

Plant Description	Numbers
Regulator	3
Sleeper Gantry (on wagons)	2
Rolling stock	4 locos+51 ballast wagons+ 27 sleeper/rail wagons
Flash butt welding yard portal cranes and rollers	1 lot
Loaders for ballast, track excavator, loaders	2
16T Track excavator	2
120F Loaders	8

Source: Aarvee Associates, 2011

Plant providers usually provide their own workshop and repair facilities on site and onsite service vehicles and temporary workshops for their own equipment if required. Bulk fuel will be supplied to on site self-bunded storage facilities. Fuel will be distributed by fuel trucks to onsite service equipment.

2.6.12 Total Construction Truck Movement

Table 2-10 provides the estimated truck movements associated with the construction of the proposed rail line. The traffic movements provided in Table 2-10 are trips to and from site (two-way trips) and are estimated on the basis of an inbound and outbound (two) movements per delivery. The estimated trip numbers are external trips, which would occur on the surrounding road network (refer Volume 4 Appendix AI Rail Transport Report).

Table 2-10 Summary of Estimated Rail Line Construction Vehicle Movements by Category

Category	Estimate of Rail Line Construction Truck Movements (two-way)*
Track-laying Activities	48,424
Maintenance Yard	2,144
Construction Camps	3,222
Earthworks and Civil Activities	540,892
Total	594,682 vehicle movements

*Note that these figures include both trips to and from site and therefore, unless otherwise stated, are estimated on the basis of two vehicle movements per delivery.

2.6.13 Temporary Construction Utilities

In the order of 10,300 kL of water per day would be required (as a maximum), for multipurpose use (raw and potable) during the construction of Project (Rail).

A number of options are being investigated for construction water supply such as:

- Creeks and rivers that are located at various points along the alignment
- Construction of bores
- Existing storages such as dams that can be deepened to increase capacity and rainfall harvesting
- The construction of new dams along the corridor
- Recycled, potable and/or raw water may be available from proximate townships and would be tankered to site
- Recycled water from construction camps and/or the workers accommodation village at the Mine

Each option is subject to specific regulatory requirements and is being investigated further to determine suitability of supply (refer Volume 3, Section 6 Water Resources). The provision of power for construction related activities will be through the use of portable generator sets.

2.6.14 Transportation of Hazardous Materials

Large quantities of fuel will be required to maintain the large earthmoving fleet during the construction period. Storage points will be planned as part of the detailed construction planning and require approval, in particular as environmentally relevant activities from relevant agencies. It is not envisaged that large volumes of other hazardous materials will be routinely stored on site for this type of construction.

For further detail on Project (Rail) associated approvals, refer to Volume 4 Appendix D Approvals. Volume 3 Section 12 Hazard and Risk provides further detail on transportation and storage of hazardous materials.

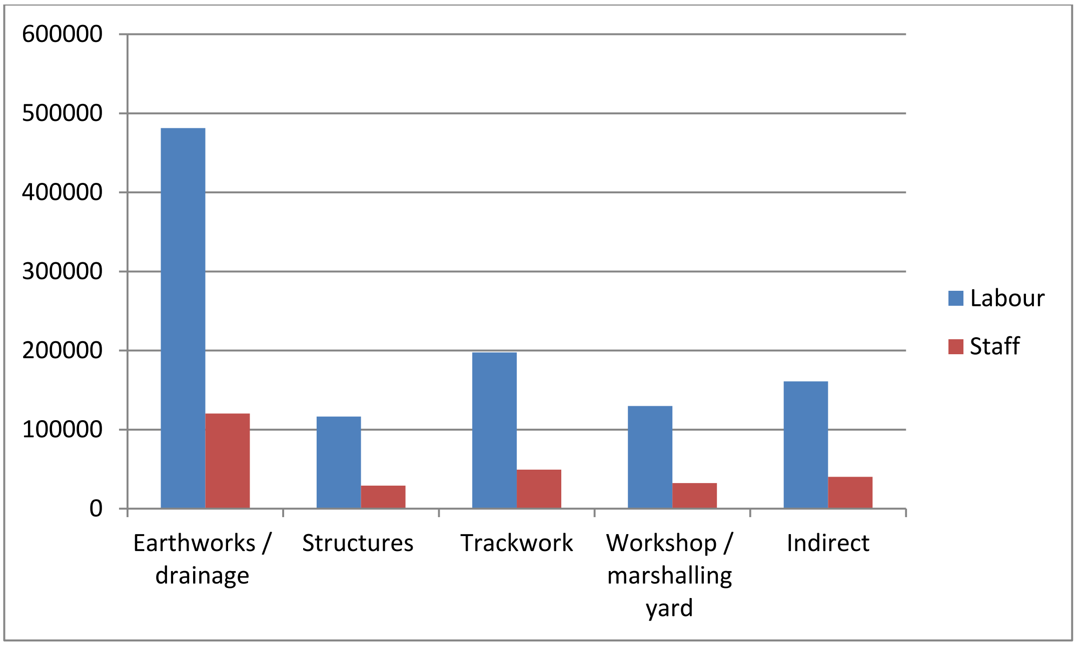
2.6.15 Construction Workforce

The likely level of construction workforce required is based on the following assumptions:

- The labour and staff hours presented for the structures; track works; earthworks and drainage; and workshop/marshalling yards have been benchmarked to similar works on greenfield rail alignments within Australia.
- The calculated labour and staff hours have been spread over an assumed program. The Implementation Program will be further developed and refined, based on detailed design.

Figure 2-8 and Figure 2-9 illustrate the total and monthly indicative civil construction workforce requirements respectively (Refer to Volume 4, Appendix F Social Impact Assessment).

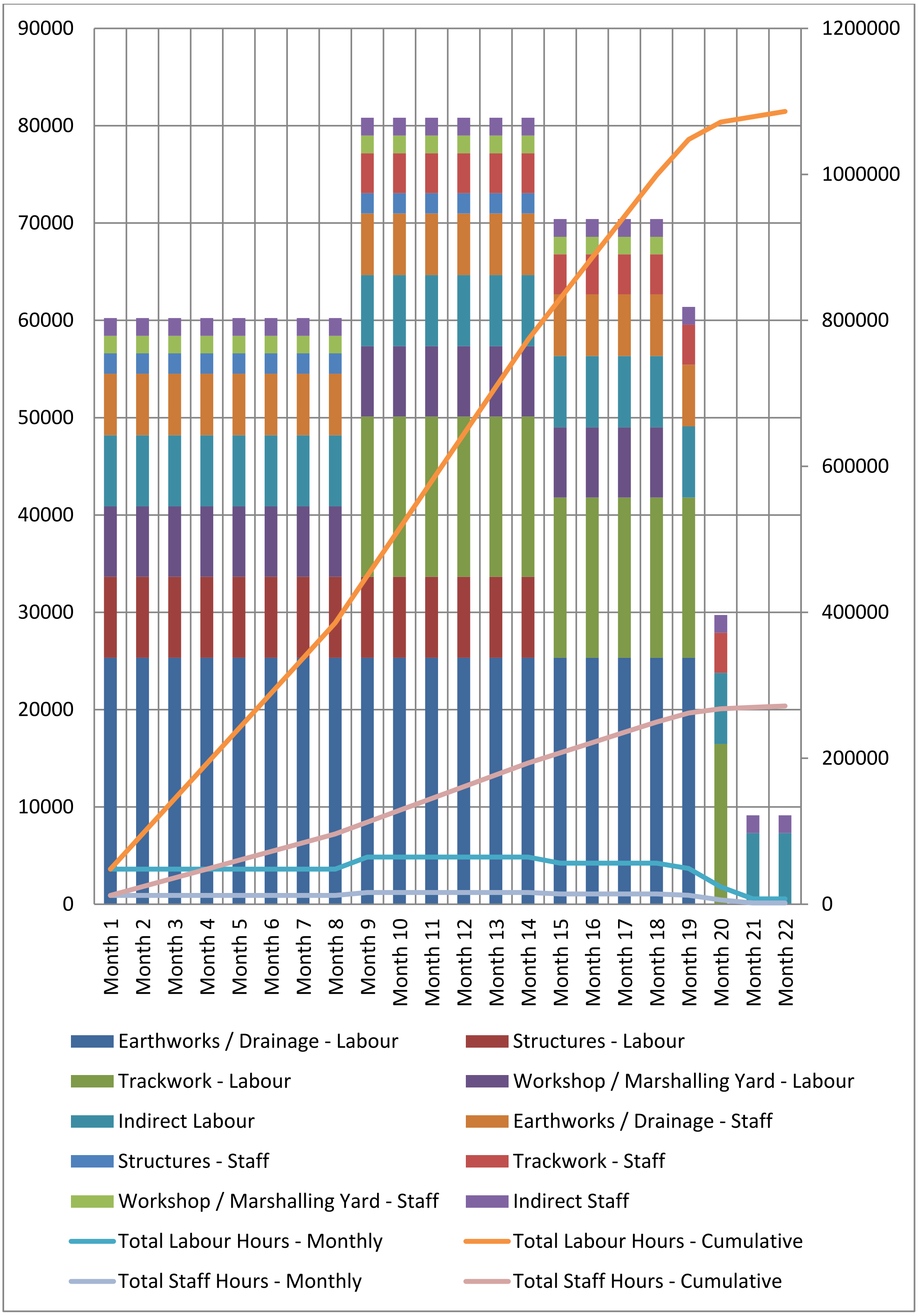
Figure 2-8 Total Indicative Civil Construction Workforce Requirements (hours)



Source: Aarvee Associates 2011.

Note: Workforce requirements quoted in hours. Blue bars define labour requirements. Red bars define staff requirements.

Figure 2-9 Monthly Indicative Civil Construction Workforce Requirements (hours)



Note: Left axis defines individual hours and right axis monthly and cumulative hours *(Source: Aarvee and Associates 2011)*

2.6.16 Origins of Workforce and Means of Travel to Site

The following travel and accommodation arrangements are anticipated:

- Fly-in-fly-out could be from anywhere on the East Coast of Australia to Moranbah and the Mine Site and then personnel would be transferred to the construction camp sites via buses
- Employees would be transported from construction camps to the work sites by 4WD’s or communal buses
- Construction staff will most likely have to be provided with return airfares or transport to the place of engagement for every roster cycle

The following human resource availability is anticipated:

- Specialist rail trades may be sourced from within Queensland and interstate, if necessary, to complete the rail works
- Skilled labour may be sourced locally (i.e. from Mackay, Rockhampton and surrounding areas)

The most appropriate work roster will be determined closer to the time of implementation such that good productivity and a lifestyle balance that appeals to prospective employees is achieved (Refer to Volume 4, Appendix F Social Impact Assessment).

2.6.17 Temporary Construction Camps

Camp Locations

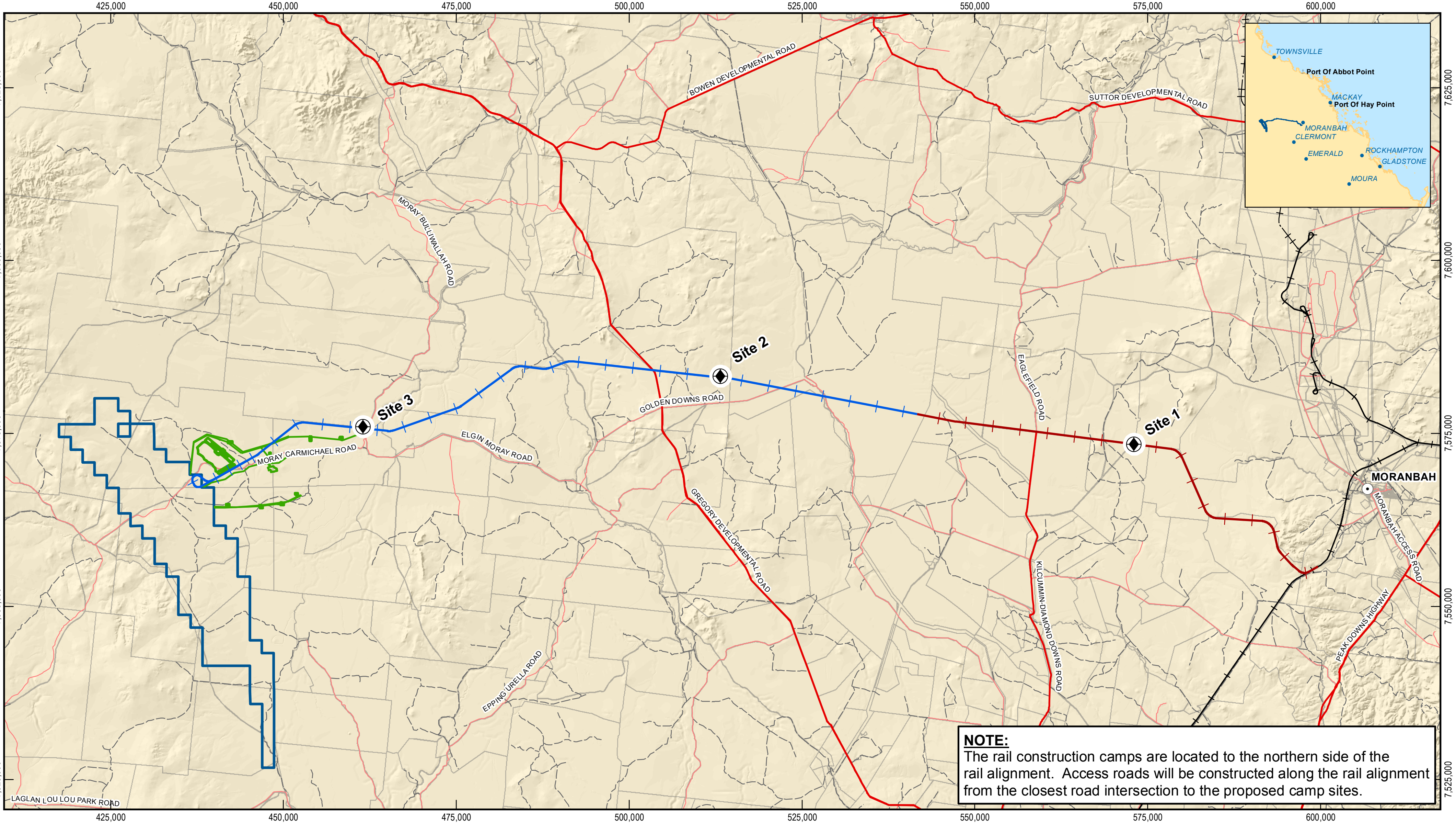
Four temporary construction camps will be developed[1] (three dedicated to Project (Rail) and one integrated at the mine), evenly spaced at less than 60 km apart as illustrated in Figure 2-10. Construction teams will travel a maximum of 30 km to the furthest work point from the camp. The final location of these camps will be agreed with the appropriate landowners and regulatory authorities, and located where possible in areas of non-remnant vegetation or previously cleared and degraded locations, away from river banks and outside of floodplains.

The maximum travel time to the furthest work front is anticipated to be approximately 35 minutes. As the work fronts approach the construction camps the travelling times will decrease and result in the average travel time over the duration reducing.

The construction work force is expected to peak at approximately 2,000. The workforce will be distributed relatively evenly across the four camps, with the capacity for 400 beds per camp. This calculation takes into account the construction works, support services required and logistical support for the permanent works.

Other logistics that have not been specifically accounted for in the camp sizing and personnel calculations are: fuel deliveries; offsite manufacture of precast elements; delivery of precast elements; offsite fabrication of bridge superstructures; delivery of bridge elements; delivery of reinforcing steel; potable water deliveries; and solid waste and wastewater collections from camps.

[1] Final location subject to landowner negotiations and considerations.



NOTE:
The rail construction camps are located to the northern side of the rail alignment. Access roads will be constructed along the rail alignment from the closest road intersection to the proposed camp sites.

1:750,000 (at A4)

0 5 10 15 20 25

Kilometres

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 55

N

LEGEND

- Town
- Construction Camp
- Existing Railway
- State Road
- Local Road
- Track
- Rail (West)
- Rail (East)
- Mine (Onsite)
- Mine (Offsite)
- Cadastral Parcel

GHD adani

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project

Project (Rail)
Location of Construction Camps

Job Number 41-25215
Revision D
Date 11-09-2012

Figure 2-10

G:\41\25215\GIS\Maps\MXD\100_Planning\41-25215_161_rev_d.mxd

Level 4, 201 Charlotte St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com

Data source: DERM: DEM (2008), DCDB (2010), Physical Road Network (2011); DME: EPC1690 (2010), EPC1080 (2011); © Commonwealth of Australia (Geoscience Australia): Localities, Railways (2007);
Adani: Alignment Opt9 Rev3 (SP1&2) (2012), Construction Camps (2011); Gassman/Hyder: Mine (Offsite) (2012). Created by: BW, jvc

Water

All camps will require potable water. The volume estimated per person per day has been taken from the Queensland Water Commission as 210 litres per day (L/day). Onsite potable water will be stored in poly tanks or large panel tanks. Laundry and washing facilities will be provided.

Sewage

Waste water will be treated in portable treatment plants comprising modular units with numbers dependent on the final size of the camps. Treated effluent can be reticulated to designated areas (irrigation, dust suppression), leached underground or pumped to evaporation ponds. Discharge limits and thresholds will be dependent on the site location, ground conditions, proximity to watercourses and groundwater sources, and the nature of vegetated areas.

Temporary sewerage treatment works will be required which require approval as an environmentally relevant activity. For further detail on the approvals required refer Volume 4 Appendix D Approvals and Planning Assessment.

Power

It is probable that each camp will require 2 x 300 kVA generator sets for operation. Assuming one generator set operates 24 hours a day and the other 12 hours a day, both with an efficiency factor of 80 % and load factor of 50 %, then approximately 1,600,000 KWH of power will be required per camp per year of operation.

Communications

Site communications during construction will be generally via UHF/VHF radio. Duplex capacity may be required ensuring full length communications are available for train control during construction with separate channels of train operations and general construction activities. In general, mobile telecommunications will be required on site for the operation of site administration facilities. It is likely that this would be a mix of Next G, satellite and existing hard asset communications systems.

Waste

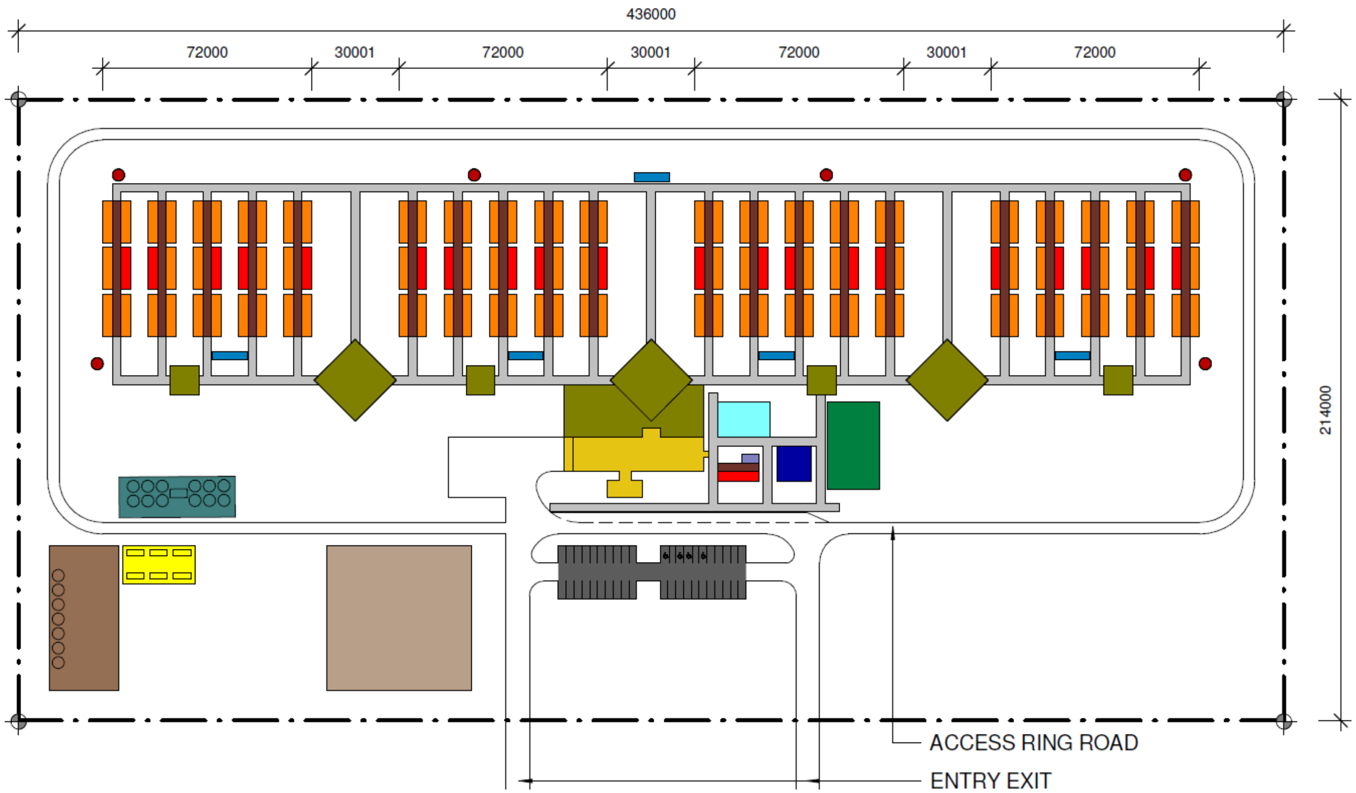
All solid waste produced during the construction activities and during the operation of the camps will be collected and placed into segregated bins for wood, steel, glass, other recyclables and general waste. These bins will be regularly collected and disposed of in the nearest registered landfill or transported to recycling facilities, where possible.

An indicative layout of a typical construction camp is shown in Figure 2-11.

Figure 2-11 Indicative Project (Rail) Construction Camp Layout

BUILDING LEGEND

- ABLUTION BUILDING
- ACCOMMODATION
- BBQ AREA/ RECREATION AREA
- CAR PARK
- COVERED WALK WAY
- DINING/ KITCHEN
- FIRST AID BUILDING
- GENERATOR
- GYM
- LAUNDRY/ LINEN STORE
- LAYDOWN YARD
- OFFICE/ TRAINING ROOM
- SEWERAGE TREATMENT PLANT
- TIMBER DECKING
- WATER TREATMENT PLANT
- WET MESS/ RECREATION ROOM/ IT & TELEPHONE ROOM.
- 34,000L FIRE WATER TANK



SITE OPTION B

SITE AREA 9.3304 ha

SITE LAYOUT OPTION B

2.7 Operation of Project (Rail)

2.7.1 Operation Overview

The operation of the Project (Rail) specific to project components is generally outlined in Section 2.5. In addition to the ongoing operation of the described project components, track maintenance and the operational workforce are described below.

2.7.2 Track Maintenance

Generally maintenance requirements can be split into three distinct categories:

- Routine Maintenance
- Major Periodic Maintenance
- Emergency Response

Maintenance teams will require facilities that are suitable to make routine maintenance cost effective, and are also able to support the major periodic maintenance or any emergency response requirements should they arise.

For the Project (Rail), construction processes employed will significantly influence the following on-going track maintenance activities:

- Extended cutting and clearing width at the location of the flash butt welding depot for rail construction works
- Extended clearing and hardstand areas at the construction siding to be used for ballast distribution
- Building and ablution facilities at the Mine Site and rollingstock maintenance facilities
- General allowance for bad order sidings which can also accommodate stabling roads for track maintenance machines at each of the passing loops
- Construction of haul roads that will ultimately become maintenance access roads

Each of these areas will become significant for the on-going track maintenance activities as described below.

For the flash butt welding siding, ballast siding and bad order sidings:

- Flash butt welding equipment is removed after construction, but track work remains for stabling of track maintenance and large maintenance equipment storage
- Ballast siding is reduced and maintained for future materials deliver and storage
- Bad order sidings to also provide stabling facilities for track maintenance machines

For haul roads, Mine Site and rolling stock maintenance amenities:

- The haul roads will provide a ready-made maintenance access and corridor which will allow for some holding of track maintenance materials
- Passing loop locations will be wide clear spaces and allow room for easy replacement of turnout components by prefabricating panel or the complete system on site

- Building facilities can also house administrative requirements of a track maintenance team.

The primary on-going track maintenance requirements arise from routine maintenance activities. These activities typically include, but are not limited to:

- Track inspections and repairs
- Signal compliance and operations checks
- Structures inspections and repairs (both bridge and drainage)
- Turnout maintenance
- Minor faults and defect repair works
- First contact emergency response

Efficiencies are gained when the routine maintenance teams also define major periodic maintenance programs. Such works typically include but are not limited to:

- Structures cleaning and repairs
- Drainage works
- Rerailing
- Turnout Replacement
- Rail Grinding
- Resurfacing
- Rail Stress Management
- Reballasting

2.7.3 Operational Workforce – Train Crew

The number of train drivers required will vary depending on the cycle time, which is inherently driven by the design specification for the Project (Rail).

It is anticipated that the majority of the mainline train crew will be based out of Mackay and Bowen and would work shifts while staying at the at the Mine workers accommodation village, then return to the Port of Hay Point (Dudgeon expansion) and the Port of Abbot Point. A smaller number of yard drivers will be based at the provisioning and maintenance facility.

Inbound mainline crew would work up to a 12 hour shift which post unload at the port, would be relieved by the outbound crew. The outbound crew would work the empty train to the provisioning/train maintenance facility where they would go to the mine workers accommodation village. The yard crew would perform provisioning and light maintenance as well as the load cycle at the mine balloon loop. The yard crew would hand over to the inbound mainline crew for the cycle to start over again.

On average six train crew are required for any 24 hour cycle – 3 x two driver crews.

2.7.4 Train Crew Requirements

Table 2-11 provides the train crew numbers required, which is based on train consist numbers, cycle times and annual tonnage profile.

Table 2-11 Train Crew Requirements

FY Year	Consists/Day	Train Crew	Yard Drivers	Total Train Crew
2016/17	9	103	7	110
2020	12	138	7	145
2025	18	208	12	220

Crewing assumptions, based on the target of ten crew members/consist, are as follows:

- Yard drivers were calculated one per shift of eight hours per train per loading balloon
- From 2018, two sets of drivers in each shift per loading balloon
- Leave/training is taken at +15 per cent of the crew required

2.8 Decommissioning and Rehabilitation

2.8.1 Decommissioning and Rehabilitation Plan

The transport of coal product will be required until the closure of the Mine Site, which is estimated to have an operational lifetime of 90 years. Decommissioning of the Project (Rail) will most likely occur after that event, unless in use by third parties.

As per the TI Act, decommissioning is the responsibility of the Railway Manager, in this case, Adani.

Decommissioning will generally consist of:

- The removal of above ground and in ground structures
- The reinstatement of a natural landform and the stabilisation of soils on the site via plantings or other erosion and sediment controls

A Decommissioning and Rehabilitation Plan will be required to be developed with the overall aim of minimising the amount of land disturbed at any one time during the life of the Project (Rail). It will be required to be developed in accordance with the current Queensland legislative requirements (refer Volume 4 Appendix D), particularly DERM's Guideline 18 – Rehabilitation Requirements for Mining Projects, which provides information on progressive and final rehabilitation for mining projects in Queensland.

The Project (Rail) Decommissioning and Rehabilitation Plan (Rail) will include the following:

- Relevant permits and approvals that may be required for the removal of facilities
- Timing and methodology for the decommissioning
- The intended use of the sites after decommissioning
- Details of any structures or facilities that remain in place after decommissioning
- Erosion and sediment controls during and after decommissioning

- Rehabilitation details
- Reuse, recycling or disposal options for removed facilities, structures and materials, including community legacy opportunities

Additional legislative requirements are also outlined in the TI Act and the *Environmental Protection Act 1994*. Refer Volume 4 Appendix D Project Approvals and Planning Assessment.

Due to the present conceptual design stage of the Project, infrastructure which is not intended to be decommissioned at the end of the Project cannot yet be definitively determined, as future requirements in this regard cannot be assumed based on a contemporary scenario. Following the same rationale, ownership of any remaining infrastructure at the end of the operational phase Project (Rail) is also difficult to determine. It should be noted that land tenure agreements and requirements will also assist in determining the disposal of land improvements and assets after the Project cycle has ended.

Temporary infrastructure and use areas (such as laydowns, construction camp), including quarry and borrow areas will require rehabilitation. Affected areas will be rehabilitated to an extent appropriate to the expected future use in each location. Rehabilitation would include, as a minimum, the redistribution of stockpiled topsoil and revegetation consistent with the surrounding land use (refer Volume 3, Section 13 Draft Environmental Management Plan).

2.9 Project (Rail) Approvals

Adani is seeking environmental approval and conditions for the rail project under the SDPWO Act and EPBC Act. At the completion of the assessment of the Project the Coordinator-General will issue a report containing imposed and recommended conditions for the Project. It is proposed these conditions cover as many environmental approvals under other Queensland Government legislation as possible using the SDPWO Act part 4, divisions 4, 5, 6 and 8. The following legislation may be used in this process:

- the integrated development assessment process for development approvals under the *Sustainable Planning Act 2009* (division 4)
- conditioning the mining lease under the *Mineral Resources Act 1989* (division 5)
- the approval processes under the *Environmental Protection Act 1994*, including environmental authorities (division 6)
- any other environmental approvals under other legislation, including:
  - resource entitlements under the Water Act 2000, the Vegetation Management Act 1999 and Forestry Act 1959
  - conditioning environmental approvals under any other legislation such as the Fisheries Act 1994, Nature Conservation Act 1992 and the TI Act 1994

The proponent seeks to use these provisions to streamline the process as much as possible and seeks conditioning and approvals activities such as:

- temporary rail accommodation
- rail corridor development activities such as clearing, earthworks and rail construction
- development and operation of maintenance facilities

- construction of temporary yards
- other miscellaneous activities associated with the construction of the rail and supporting activities

Volume 4, Appendix D (Project Approvals and Planning).outlines the environmental approvals sought through this EIS and supporting application information.

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