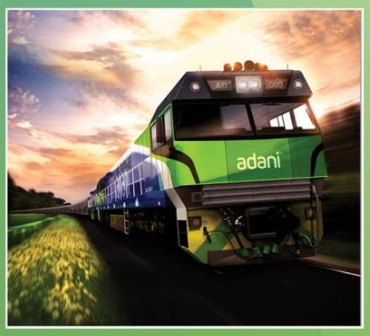



Adani Mining Pty Ltd

# NORTH GALILEE BASIN RAIL PROJECT

## Environmental Impact Statement

## Appendix C Land use and tenure

November 2013

*This North Galilee Basin Rail Project land use and tenure report ("the Report") has been prepared by GHD Pty Ltd ("GHD") on behalf of and for Adani Mining Pty Ltd ("Adani") in accordance with an agreement between GHD and Adani.*

*The Report may only be used and relied on by Adani for the purpose of informing environmental assessments and planning approvals for the proposed North Galilee Basin Rail Project ("the Purpose") and may not be used by, or relied on by any person other than Adani.*

*The services undertaken by GHD in connection with preparing the Report were limited to those specifically detailed in section 1.2 of the Report.*

*The Report is based on conditions encountered and information reviewed, including assumptions made by GHD, at the time of preparing the Report. Assumptions made by GHD are contained through the Report, including (but not limited to) concept design and operations information provided by Adani.*

*To the maximum extent permitted by law GHD expressly disclaims responsibility for or liability arising from:*

- *any error in, or omission in connection with assumptions, or*
- *reliance on the Report by a third party, or use of the Report other than for the Purpose.*

# Executive summary

The land use and tenure report describes the existing land use and tenure values and infrastructure relevant to the North Galilee Basin Rail Project (NGBR Project), including the following values:

- State interests in land
- Freehold and leasehold property tenures
- Mining tenure
- Agricultural land uses
- Existing and proposed infrastructure
- Stock routes.

The study area for this land use and tenure report is defined at two levels:

- The regional study area which is defined by the boundaries of the Isaac Regional Council (IRC), the Whitsunday Regional Council (WRC) and the Abbot Point State Development Area (APSDA) in which the preliminary investigation corridor lies.
- The local study area is defined by the NGBR Project final rail corridor (i.e. a nominally 100 m wide corridor) and immediately adjacent parcels of land, infrastructure, communities and land use.

A desktop assessment was undertaken to describe the existing environment in terms of existing land use and tenure values and infrastructure relevant to the regional and local study areas.

Approximately 40 km of the preliminary investigation corridor (a nominally 1,000 m wide corridor) will be located in the IRC local government area (LGA), approximately 240 km will be located within the WRC LGA and 20 km located within the APSDA. The key communities that will potentially be influenced by the NGBR project are considered to be Bowen, Collinsville and Moranbah.

The NGBR Project traverses a total of 64 properties comprising of:

- 27 leasehold lots
- 36 freehold lots
- One lot deemed to be ‘Unallocated State Land’.

The NGBR Project traverses a number of mining tenements comprising exploration permits for coal (EPCs), exploration permits for minerals (EPMs), an exploration permit for petroleum (EPP) and a petroleum pipeline licence (PPL). However, the NGBR Project is not expected to cross any mining lease or mineral development licence areas.

The extent of the land through which the NGBR Project traverses is classified as production from relatively natural environments. Land use in the study area is predominantly for the purposes of cattle breeding and fattening, with limited areas defined as being for the purposes of cattle fattening only and grains and cattle fattening.

The NGBR Project area is sparsely populated with the actual rail corridor avoiding close contact with potential sensitive receptor locations. A total of 32 sensitive receptor locations were identified within 10 km of the NGBR Project, of which 23 are homesteads. Nine of the

homesteads are located within three kilometres of the final rail corridor. The closest sensitive receptor is located approximately one km of the NGBR Project.

A total of 20 public roads and road reserves are likely to be intersected by the NGBR Project, of which four are considered major roads (State-controlled roads), 11 are minor roads (Council owned roads), one is a private road owned by North Queensland Bulk Ports (crossed at three locations), and four are road reserves. Seven stock routes are crossed, three of which are shared public road crossings. The alignment also crosses the Bicentennial National Trail - a long distance, multi-use recreational trekking route.

The NGBR Project traverses a number of existing utilities including one gas pipeline and one water pipeline, three telecommunications cables and 13 power lines (including two high voltage transmission lines).

The NGBR Project is located within the external boundaries of the Jangga People (QUD6230/98, QC98/10), Birri People (QUD6244/1998, QC98/12), Juru People (QUD554/2010, QC10/5) and Juru People No.2 (QUD07/2012, QC12/1) registered native title claims.

# Table of contents

Executive summary ..... i

1. Introduction ..... 7
   - 1.1 Project overview ..... 7
   - 1.2 Scope of report ..... 7
2. Methodology ..... 10
   - 2.1 Study area ..... 10
     - 2.1.1 Regional study area ..... 10
     - 2.1.2 Local study area ..... 10
   - 2.2 Data sources ..... 10
   - 2.3 Legislation and guidelines ..... 11
   - 2.4 Desktop assessment ..... 12
   - 2.5 Limitations ..... 12
3. Existing environment ..... 13
   - 3.1 Regional context ..... 13
     - 3.1.1 Isaac Regional Council ..... 13
     - 3.1.2 Whitsunday Regional Council ..... 13
     - 3.1.3 Abbot Point State Development Area ..... 13
   - 3.2 Local context ..... 15
     - 3.2.1 Local communities ..... 15
   - 3.3 Tenure ..... 17
     - 3.3.1 Freehold and leasehold tenure ..... 17
     - 3.3.2 Mining and petroleum tenure ..... 19
     - 3.3.3 Strategic port land ..... 23
   - 3.4 Land use ..... 27
     - 3.4.1 Rural uses ..... 27
     - 3.4.2 Non-rural uses ..... 37
   - 3.5 Existing and proposed infrastructure ..... 41
     - 3.5.1 Road networks ..... 41
     - 3.5.2 Stock routes ..... 43
     - 3.5.3 Rail ..... 47
     - 3.5.4 Airports and landing strips ..... 47
     - 3.5.5 Ports ..... 48
     - 3.5.6 Gas and water ..... 48
     - 3.5.7 Energy and telecommunications ..... 49
   - 3.6 Designated areas ..... 52
     - 3.6.1 Abbot Point State Development Area ..... 52
     - 3.6.2 Protected areas ..... 52
     - 3.6.3 Restricted areas ..... 53
     - 3.6.4 Declared water storage catchments ..... 54
     - 3.6.5 Key resource areas ..... 54
4. Native title ..... 56
5. Key findings ..... 58

6. References ..... 60

# Table index

Table 3-1 NGBR Project property tenure ..... 17
Table 3-2 Mining, petroleum and mineral tenures ..... 21
Table 3-3 Summary of sensitive receptors ..... 37
Table 3-4 Major road crossings ..... 41
Table 3-5 Stock route crossings ..... 44

# Figure index

Figure 1-1 Project location ..... 9
Figure 3-1 Regional land use categories ..... 14
Figure 3-2 Local context and tenure ..... 16
Figure 3-3 Mining and petroleum tenure ..... 24
Figure 3-4 Land use ..... 29
Figure 3-5 Good Quality Agricultural Land ..... 31
Figure 3-6 Strategic Cropping Land ..... 34
Figure 3-7 Port of Abbot Point land use plan designation ..... 39
Figure 3-8 Sensitive receptors ..... 40
Figure 3-9 Stock routes ..... 46
Figure 3-10 Transport infrastructure ..... 50
Figure 3-11 Utilities ..... 51
Figure 3-12 Designated areas ..... 55
Figure 4-1 Native Title claims ..... 57

# Appendices

**Appendix A** - NGBR Optimisation Study

# Terms and abbreviations

| Term and abbreviations | Definition |
|---|---|
| Adani | Adani Mining Pty Ltd |
| APSDA | Abbot Point State Development Area |
| DEHP | Department of Environment and Heritage Protection |
| DERM | Former Department of Environment and Resource Management |
| DLGP | Department of Local Government and Planning |
| DNRM | Department of Natural Resources and Mines |
| DSDIP | Department of State Development, Infrastructure and Planning |
| DTMR | Department of Transport and Main Roads |
| EIS | Environmental Impact Statement |
| EPBC Act | *Environment Protection and Biodiversity Conservation Act 1999* |
| EPC | Exploration Permit for Coal |
| EPM | Exploration Permit for Minerals |
| EPP | Exploration Permit for Petroleum |
| Final NGBR Project footprint | The final NGBR Project footprint will accommodate all rail infrastructure required for construction and operation, scalable to accommodate 100 mtpa product coal transport, including passing loops, a maintenance road, rolling stock maintenance (provisioning, fuel storage and refuelling, maintenance, etc.), water supply and pipeline, track and signalling maintenance facilities, staff crib, accommodation and training facilities and other necessary infrastructure associated with the operational functions of the NGBR Project.<br><br>Temporary construction facilities are expected to include laydown areas, construction depots (warehousing, fuel storage, vehicle storage, administration facilities, etc.), sleeper manufacturing yards, construction accommodation camps, quarries and borrow pits, access tracks into the corridor and other necessary infrastructure associated with the construction functions of the NGBR Project. |
| Final rail corridor | The final rail corridor is a nominal 100 m wide corridor |
| GQAL | Good Quality Agricultural Land |
| IRC | Isaac Regional Council |
| LGA | Local government area |

| Term and abbreviations | Definition |
|---|---|
| MDL | Mineral Development Licence |
| MIW | Mackay, Isaac and Whitsunday |
| MIWRP | Mackay, Isaac and Whitsunday Regional Plan 2011 – 2031 |
| MR Act | *Mineral Resources Act 1989* |
| mtpa | Million tonnes per annum |
| NC Act | *Nature Conservation Act 1992* |
| NGBR | North Galilee Basin Rail |
| NGBR Project | North Galilee Basin Rail Project |
| NQBP | North Queensland Bulk Ports Corporation Limited |
| NT Act | *Native Title Act 1993* |
| Preliminary investigation corridor | The preliminary investigation corridor is a 1,000 m wide corridor |
| QI Plan | *Queensland Infrastructure Plan 2011* |
| RLRPA | Regional Landscape and Rural Production Area |
| SDA | State Development Area |
| SP Act | *Sustainable Planning Act 2009* |
| SP Regulation | *Sustainable Planning Regulation 2009* |
| TI Act | *Transport Infrastructure Act 1994* |
| TOR | Terms of Reference |
| VM Regulation | *Vegetation Management Regulation 2000* |
| WRC | Whitsunday Regional Council |

# 1. Introduction

## 1.1 Project overview

Adani Mining Pty Ltd (Adani) proposes the construction and operation of the North Galilee Basin Rail Project (NGBR Project), a multiuser, standard gauge, greenfield rail line that will transport coal from mines in the northern Galilee Basin to the Port of Abbot Point. The NGBR Project is approximately 300 km in length and connects the proposed Carmichael Coal Mine and Rail Project's east-west rail corridor, approximately 70 km east of the proposed Carmichael Coal Mine in the vicinity of Mistake Creek, with supporting infrastructure at the Port of Abbot Point (refer Figure 1-1). The NGBR Project will have an operational capacity of up to 100 million tonnes per annum (mtpa) of coal product expected to be sourced from both Adani and third-party mines in the northern Galilee Basin. Key features of the NGBR Project include:

- Approximately 300 km of standard gauge, bi-directional rail track located within a nominal 100 m wide rail corridor (the final rail corridor)
- A rail maintenance access road running parallel to the rail track for approximately 300 km and wholly within the final rail corridor
- Seven passing loops, each 4.3 km in length
- Signalling infrastructure
- Approximately 4.5 km of fill greater than 15 m in depth (11 locations) and approximately 3.4 km of cut greater than 15 m in depth (nine locations)
- At-grade and grade-separated road, rail, stock and occupational crossings
- Bridge and culvert structures at major waterways and drainage lines, and various other longitudinal and cross drainage structures
- A rolling stock maintenance facility near the Port of Abbot Point including provisioning line, train maintenance line, wagon and locomotive service sheds, wash bay and queuing line
- Five temporary accommodation camps for construction workers
- A temporary construction depot at the southern end of NGBR Project
- Temporary construction yards, concrete batching plants, bridge and track laydown areas and heavy vehicle turning circles.

During construction, quarries and borrow pits within acceptable haulage distances will be required to provide a cost effective source of fill, gravel, aggregate and ballast. The number and location of borrow pits and quarries will be investigated further during detailed design and each may require screening and crushing plants to process material.

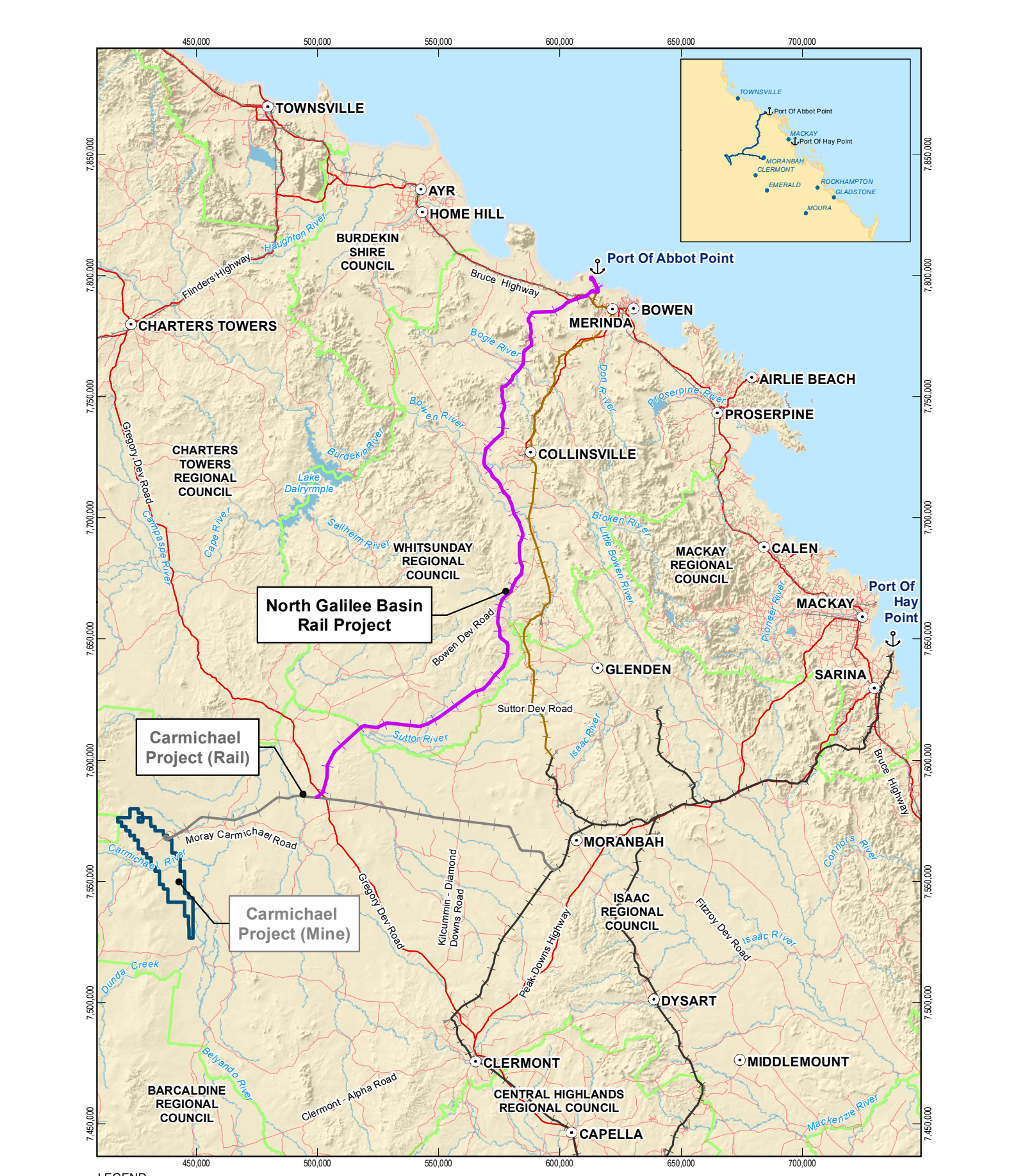
## 1.2 Scope of report

The objective of this land use and tenure report is to describe the existing land use and tenure values relevant to the NGBR Project, including the following values.

- State interests in land
- Freehold and leasehold property tenures
- Mining tenure

- Agricultural land uses
- Existing and proposed infrastructure
- Stock routes.

This land use and tenure report was prepared in accordance with the Terms of Reference (TOR) for the NGBR Project. A table that cross-references the contents of this report and the TOR is included as Volume 2 Appendix A Terms of reference cross-reference.




LEGEND

- Town
- Major Port
- Other Rail Network
- Goonyella System
- Newlands System
- Major Road
- Local Road
- Watercourse
- Local Government Area
- Carmichael Project (Rail)
- North Galilee Basin Rail
- Carmichael Project (Mine)



1:2,000,000 (at A4)

0 10 20 30 40 50

Kilometres

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

N

**Adani Mining Pty Ltd**

North Galilee Basin Rail Project

Project location

Job Number 41-26457
Revision B
Date 29 Aug 2013

Figure 1-1

G:\41\26457\06 GIS\Maps\MXD\0001_Overview\41_26457_0005_rev_b.mxd

Level 9, 145 Ann St Brisbane QLD 4000 T +61 7 3316 3000 F +61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data Source: © Commonwealth of Australia (Geoscience Australia): Town, Railways, Watercourses (2007); DNRM: LGA, (2011), Hillshade (2009); DMR: State Roads (2008); DME: EPC1690 (2010), EPC1080 (2011); Adani: Alignment Opt9 Rev3 (2012), NGBR: Alignment Opt6 Rev 2 (2013).

# 2. Methodology

## 2.1 Study area

Defining the study area helps to put geographical boundaries to the impact assessment. A number of factors have been considered in determining the study area for the NGBR Project, these considerations are:

- Location of the NGBR Project
- The NGBR Project footprint
- Nature and scale of potential project impacts
- Administrative areas such as council boundaries which influence factors including the provision of social infrastructure and services, regional plans and policies.

The study area for this land use and tenure report was defined at two levels:

- The regional study area (refer to Section 2.1.1)
- The local study area (refer to Section 2.1.2).

### 2.1.1 Regional study area

The regional study area is defined by the boundaries of the Isaac Regional Council (IRC), the Whitsunday Regional Council (WRC) and the Abbot Point State Development Area (APSDA) which contains the nominal 1,000 m investigation corridor (i.e. the preliminary investigation corridor).

Approximately 40 km of the preliminary investigation corridor will be located in IRC local government area (LGA), approximately 240 km will be located within the WRC LGA and 20 km located within the APSDA.

### 2.1.2 Local study area

The local study area is defined by the NGBR Project final rail corridor (i.e. within a nominal 100 m wide corridor) and immediately adjacent parcels of land, infrastructure, communities and land use. The local study area includes the 64 properties intersected by the rail corridor comprising of 27 leasehold lots, 36 freehold lots and one lot designated as 'Unallocated State Land'.

The key communities that will potentially be influenced by the NGBR Project are considered to be Bowen, Collinsville and Moranbah.

## 2.2 Data sources

Primary data and information were reviewed to assist in a clear understanding of the existing environment regarding land use and tenure. This included drawing on existing data sets, and undertaking geographic information system (GIS) analysis to accurately determine how the NGBR Project transects with key features. The data reviewed included:

- Volume 1 Chapter 2 Project description
- Volume 2 Appendix B Public consultation
- Volume 2 Appendix E Topography, geology, soils and land contamination

- Volume 2 Appendix F Nature conservation
- North Galilee Basin Rail Concept Design Report (Aarvee Associates 2013)
- Aerial photography
- Topographic maps
- Cadastral maps
- Title and tenure details of freehold and leasehold properties
- Mining tenures
- Native title claim areas and determinations
- Location of existing infrastructure, such as roads, rail lines, gas and water pipelines
- Stock route network maps
- Maps identifying sensitive receptors
- *Mackay, Isaac and Whitsunday Regional Plan* (DLGP 2012)
- *Abbot Point State Development Area Development Scheme* (State of Queensland 2012)
- *Bowen Shire Council Planning Scheme 2006* (Whitsunday Regional Council 2006)
- *Planning Scheme for Belyando Shire* (Isaac Regional Council 2008)
- Department of Environment and Heritage Protection (DEHP) Nature Refuge Program information available online
- Department of Environment and Resource Management (DERM) 2010 Guide to Tenure under the *Land Act 1994*.

## 2.3 Legislation and guidelines

Legislation relevant to this land use and tenure report is as follows.

- *Sustainable Planning Act 2009* and *Sustainable Planning Regulation 2009*
- *Transport Infrastructure Act 1994*
- *Land Act 1994*
- *Mineral Resources Act 1989*
- *Nature Conservation Act 1992*
- *Vegetation Management Act 1999* and *Vegetation Management Regulation 2000*
- *Stock Route Network Management Bill 2011*
- *Land Protection (Pest and Stock Route Management) Act 2002*
- *Transport Planning and Coordination Act 1994.*

An explanation of the above legislation and how it applies to the NGBR Project is provided in Volume 1 Chapter 20 Legislation and approvals.

## 2.4 Desktop assessment

The desktop assessment documented in this report involved the following tasks.

- Review of the *North Galilee Basin Rail Concept Design Report* (Aarvee Associates 2013) and determination of the study area
- Review of primary data (refer to Section 3.1) to determine the environmental values of the study area
- Discussion with state and local government agencies (refer to Section 3.2)
- Review of secondary EIS reports (refer to Section 3.5) to supplement an understanding of the environmental values of the study area
- Documentation and mapping of the environmental values of the study area.

## 2.5 Limitations

The level of detail of the land use and tenure report was limited to the information provided in the North Galilee Basin Rail Concept Design Report (Aarvee Associates 2013) and publicly available information.

# 3. Existing environment

## 3.1 Regional context

The preliminary investigation corridor occurs within the Brigalow Belt bioregion and the Burdekin Basin. The majority of the preliminary investigation corridor occurs within the WRC LGA, with the southern portion occurring within the IRC LGA, and the northern portion of the occurring in the APSDA.

The Burdekin Basin covers approximately 130,057 km$^2$ of north-east and central Queensland. Agriculture is the dominant land use in the Burdekin Basin (Dight 2009), where cattle grazing and cropping (predominantly sugar cane) account for 87 per cent of land use within the catchment (Dight 2009).

### 3.1.1 Isaac Regional Council

The IRC was formed in 2008 with the amalgamation of Belyando, Broadsound and Nebo Shire Councils. Approximately 40 km of the NGBR Project is located in IRC LGA (refer Figure 1-1). The LGA covers 58,862 km$^2$, with a population of approximately 23,000 people in 2011 (OESR 2012).

The IRC LGA contains a substantial portion of the Bowen Basin coal reserve which has triggered intensive mining operations in the region. Additionally, a well-established agricultural industry operates in the region; this industry comprises particularly pastoral farming, dry land grain cropping, and fruit and vegetable growing. National parks, state forest and wetlands also form part of the regional landscape.

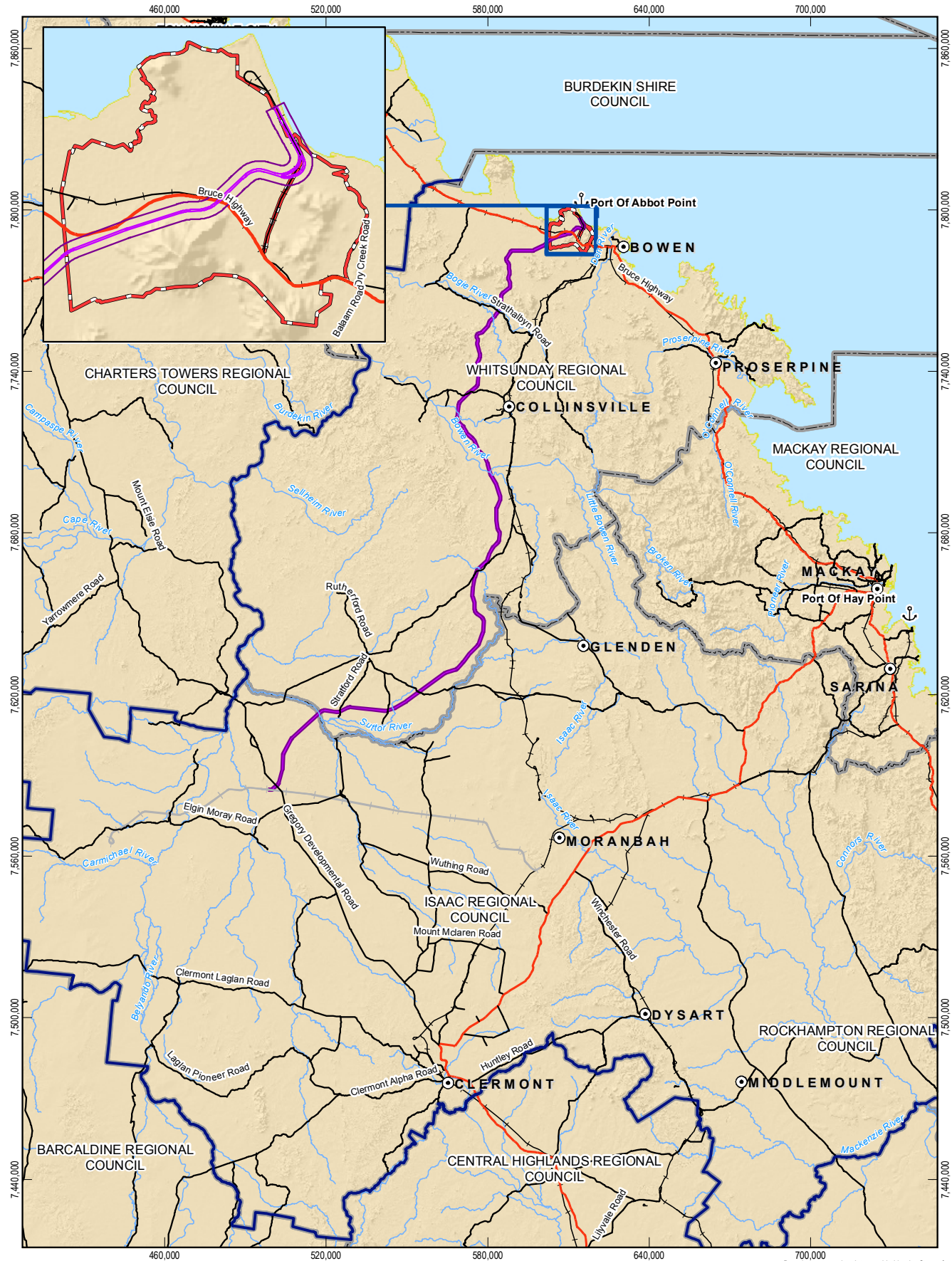
### 3.1.2 Whitsunday Regional Council

The WRC was formed in 2008 after the amalgamation of the Bowen and Whitsunday Shire Councils. The region covers an area of 23,871 km$^2$ with a total population of approximately 35,500 people in 2011; this population is expected to increase by 20,000 people by 2031 (Queensland Government 2011). Approximately 240 km of the NGBR Project is located in the WRC LGA (refer to Figure 1-1).

The importance of the region lies in its location as the gateway to the World Heritage listed Great Barrier Reef Marine Park and 74 tropical islands. This strategic location has driven the development of tourism industry followed by agriculture (horticulture and sugarcane) and more recently the infrastructure upgrades at the Port of Abbot Point have stimulated the growth in mining and industrial growth such as transport related industries and small scale manufacturing (Queensland Government 2012).

### 3.1.3 Abbot Point State Development Area

The APSDA comprises a total area of 16,230 ha and is located approximately 20 km from the town of Bowen. Declaration of the APSDA enables the State to facilitate and effectively manage the planned development and operation of the area and associated infrastructure for industrial purposes of regional, State and national significance (Queensland Government, 2012). Approximately 20 km of the preliminary investigation corridor is located within the APSDA between the southern boundary of the Port of Abbot Point and the south western boundary of the state development area (refer Figure 3-1 ).




LEGEND

- Population Centres
- Major Port
- Mackay Isaac Whitsunday Boundary
- Highway
- Main Road
- Carmichael Project (Rail)
- Railway
- Watercourse (Major)
- Abbot Point State Development Area Boundary
- Local Government Area
- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor



1:2,000,000 Paper Size A4

0 15 30 60

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

| | |
|---|---|
| Job Number | 41-26457 |
| Revision | B |
| Date | 26 Sep 2013 |

Regional Land Use Categories

Figure 3-1



Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GA: Populated Places, Railway, Watercourse/2007; Adani: NGBR Corridor 13/05/2013, NGBR Corridor 06/06/2013, Carmichael Project (Rail) 18/06/2013; DNRM: Roads/2010; Local Government Area/2011, Abbot Point SDA/2011. Created by:MS

## 3.2 Local context

As identified in Section 2.1.2, the local study area is defined by the NGBR Project final rail corridor (i.e. a nominal 100 m wide corridor) and immediately adjacent parcels of land, infrastructure, communities and land use. The local context is defined by the following:

- The NGBR Project final rail corridor traverses 27 leasehold lots, 36 freehold lots, and one unallocated state land lot as described in Section 3.3 (refer Figure 3-2)
- Existing infrastructure as defined in Section 3.5
- The nearby communities of Bowen, Collinsville and Moranbah, as described in Section 3.2.1
- The extent of the land traversed by the NGBR Project which is classified as production from relatively natural environments, as detailed in Section 3.4.

### 3.2.1 Local communities

Key cities and towns within the IRC and WRC regions relevant to the development and operation of the NGBR Project include the following:

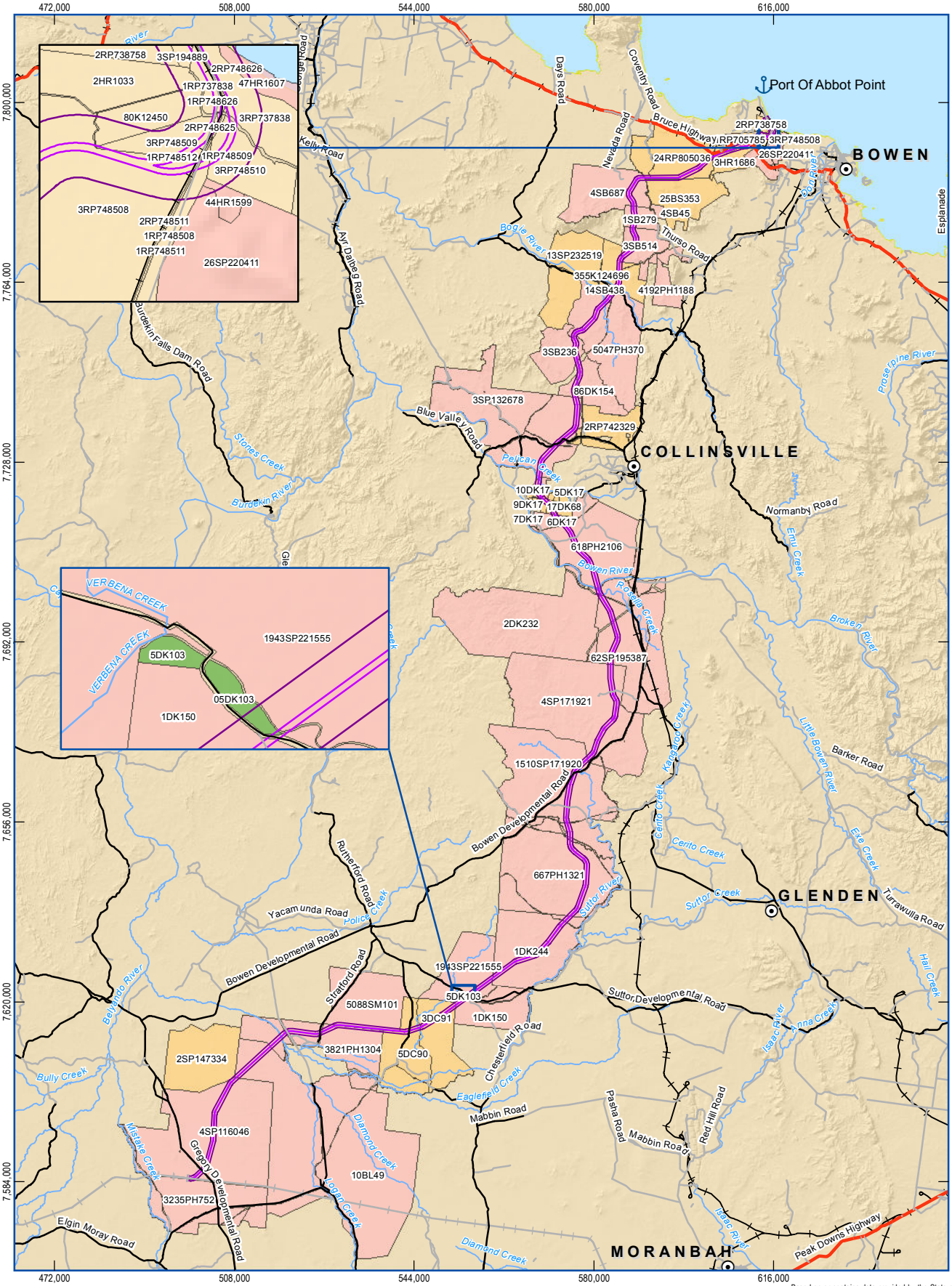
**Bowen**

Bowen was settled in the 1860s as a pastoral town and was in the Bowen Shire Council prior to its amalgamation with the Whitsunday Shire Council in 2008. In the initial days, land was used mainly for cattle grazing and timber gathering (Queensland Places 2013). The growth and development in Bowen was influenced by mining and improved access from the early 1900s. Today, Bowen is a commercial, business, service and administrative hub for the northern section of the WRC and is the largest town in the LGA. Bowen's local economy is based on a nationally significant horticulture industry, commercial fishing, aquaculture and a major salt processing facility (Queensland Government 2012). There are a number of emerging economic opportunities for Bowen and its surrounds due to the expansion of the Port of Abbot Point (approximately 20 km from Bowen). Opportunities include export of bulk commodities, large-scale industrial development, freight and logistics (Queensland Government 2012).

**Collinsville**

Collinsville is located in the Bowen Shire area of the WRC, about 270 km north-west of Mackay. The Collinsville area was first settled in 1860s as a grazing area with the Strathmore Station as the first grazing run in the district. Collinsville was originally known as Moongunya which is the Aboriginal name for coal (Whitsunday Regional Council 2013b). Coal mining activities have been part of early history of Collinsville; it was established in 1866 as a coal mining town spurring gradual growth in the area. However, the population remained low until the earlier years of the 20th century, when modern Collinsville was developed on advice from the Town Planning Association in 1922 (Queensland Places 2013). Today Collinsville serves as the WRC's main mining centre (Whitsunday Regional Council 2013b). Collinsville services the local community and the surrounding district with commercial, administrative, health and educational facilities and services.

Expansion of Collinsville is limited by adjacent mining tenures, proximity to the Newlands rail line and other constraints, such as flooding. Maximising the use of existing land within the township will be important in accommodating growth (Queensland Government 2012).




LEGEND

- Population Centres
- Major Port
- Highway
- Main Road
- Local Road
- Carmichael Project (Rail)
- Railway
- Watercourse (Major)
- Tenure
- Freehold
- Lands Lease
- Reserve
- State Land
- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor



1:1,100,000 Paper Size A4

0 9 18 36

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

# Local Context and Tenure

Job Number 41-26457
Revision A
Date 29 Aug 2013

Figure 3-2



Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GA: Populated Places, Railway, Watercourse/2007; Adani: NGBR Corridor 13/05/2013; DNRM: Roads/2010; DNRM: Cadastre/2013. Created by:MS

**Moranbah**

Moranbah is located 150 km south-west of Mackay and has a resident population of approximately 8,626 people (ABS 2011). Moranbah is a modern town which services the surrounding coal mining industry and associated support industries. Moranbah was originally established as a purpose built mining town in the early 1970s, and is the major regional activity and service centre for the mining and gas industries in the IRC LGA (DLGP 2011a). The *Mackay, Isaac and Whitsunday Regional Plan 2012* (MIWRP) states that Moranbah's role as the primary service centre will be maintained and further enhanced in the future.

## 3.3 Tenure

Tenure typically refers to a lease or freehold title which conveys possession of land to a person (DNRM 2013). The *Land Act 1994* is administered by the Minister for the Department of Natural Resources and Mines (DNRM). The object of the *Land Act 1994* requires land to be managed for the benefit of the people of Queensland by having regard to seven principles. These principles are sustainability, evaluation, development, community purpose, protection, consultation and administration (DNRM 2013). Rural leasehold land is land leased for agricultural, grazing or pastoral uses, and excludes leases over land within a reserve, state forest, timber reserve, national park, or other tenures under the *Nature Conservation Act 1992* (NC Act) (DNRM 2013). Land use refers to the primary use of the land, as permitted by the State and local government authorities.

### 3.3.1 Freehold and leasehold tenure

The occupation of land in Queensland may be defined under two broad tenure headings - freehold and non-freehold. Freehold land represents privately owned land alienated from the State. However, ownership by the titleholder is not absolute, as the State is empowered to withhold certain rights, such as the right to any minerals or petroleum. Non-freehold land is land under the control of the State of Queensland but which may be subject to a lease, permit or licence, reserved for a community purpose, dedicated as a road or subject to no tenure at all (DNRM 2013).

The NGBR Project traverses a total of 64 properties comprising of:

- 27 leasehold lots
- 36 freehold lots
- One lot deemed to be 'Unallocated State Land.

Refer to Table 3-1 for further details.

**Table 3-1 NGBR Project property tenure**

| Lot on plan | Area of lot (ha) | Area of lot within final rail corridor (ha) | Tenure |
|---|---|---|---|
| 10BL49 | 84531.7 | 93.7 | Leasehold |
| 10DK17 | 515.5 | 13.5 | Freehold |
| 13SP232519 | 21763.4 | 62.9 | Freehold |
| 1510SP171920 | 38570.1 | 176.3 | Leasehold |
| 151SP122338 | 7.9 | 0.0 | Leasehold |

| Lot on plan | Area of lot (ha) | Area of lot within final rail corridor (ha) | Tenure |
|---|---|---|---|
| 152SP122339 | 22.7 | 0.3 | Leasehold |
| 1943SP221555 | 13034.5 | 61.6 | Leasehold |
| 1DK150 | 10393.1 | 28.3 | Leasehold |
| 1DK244 | 22237.4 | 207.7 | Leasehold |
| 1RP705785 | 1369.1 | 16.0 | Freehold |
| 1RP737838 | 24.4 | 9.7 | Freehold |
| 1RP748508 | 69.6 | 1.7 | Freehold |
| 1RP748509 | 1.7 | 0.1 | Freehold |
| 1RP748510 | 0.9 | 0.9 | Freehold |
| 1RP748511 | 8.2 | 0.4 | Freehold |
| 1RP748512 | 1.3 | 0.1 | Freehold |
| 1RP748625 | 1.4 | 1.0 | Freehold |
| 1RP748626 | 3.6 | 2.8 | Freehold |
| 1RP748627 | 0.6 | 0.6 | Freehold |
| 1SB279 | 2700.7 | 52.6 | Leasehold |
| 24RP805036 | 13663.9 | 147.7 | Freehold |
| 2DK232 | 40679.5 | 2.1 | Leasehold |
| 2HR1724 | 432.2 | 35.2 | Freehold |
| 2RP748511 | 10.0 | 0.5 | Freehold |
| 2RP748626 | 4.7 | 4.1 | Freehold |
| 2RP748627 | 0.6 | 0.6 | Freehold |
| 3235PH752 | 20596.4 | 1.0 | Leasehold |
| 335SP227560 | 3.3 | 3.3 | Leasehold |
| 336SP227560 | 1.6 | 1.6 | Leasehold |
| 3821PH1304 | 5424.3 | 29.0 | Leasehold |
| 3DC91 | 11677.2 | 84.9 | Freehold |
| 3HR1686 | 2856.7 | 41.0 | Freehold |
| 3HR1711 | 287.4 | 0.2 | Freehold |
| 3RP737838 | 151.4 | 5.9 | Freehold |
| 3RP748508 | 754.6 | 40.3 | Freehold |
| 3RP748509 | 67.5 | 8.1 | Freehold |
| 3RP748510 | 113.7 | 8.0 | Freehold |
| 3SB236 | 7856.5 | 60.0 | Leasehold |

| Lot on plan | Area of lot (ha) | Area of lot within final rail corridor (ha) | Tenure |
|---|---|---|---|
| 3SB514 | 5643.6 | 95.3 | Leasehold |
| 3SP132678 | 39200.5 | 187.8 | Leasehold |
| 3SP194889 | 30.2 | 2.7 | Freehold |
| 47SP227557 | 5.9 | 5.9 | Leasehold |
| 4SB687 | 14069.6 | 78.1 | Leasehold |
| 4SP116046 | 47201.4 | 233.4 | Leasehold |
| 4SP171921 | 43947.5 | 235.8 | Leasehold |
| 4SP194889 | 0.3 | 0.3 | Freehold |
| 5047PH370 | 23142.7 | 127.0 | Leasehold |
| 5088SM101 | 16671.7 | 0.0 | Leasehold |
| 53SP243724 | 45.1 | 0.8 | Freehold |
| 56SP243724 | 15.4 | 0.1 | Freehold |
| 58SP243726 | 217.0 | 18.0 | Leasehold |
| 5DC90 | 13387.6 | 75.1 | Freehold |
| 5DK103 | 62.0 | 0.3 | Reserve |
| 5DK17 | 518.3 | 11.7 | Freehold |
| 5SP194888 | 0.1 | 0.1 | Freehold |
| 618PH2106 | 24923.1 | 176.1 | Leasehold |
| 62SP195387 | 29934.4 | 155.5 | Leasehold |
| 667PH1321 | 35467.4 | 173.2 | Leasehold |
| 6DK17 | 520.3 | 17.7 | Freehold |
| 6SP194888 | 10.0 | 3.9 | Freehold |
| 7DK17 | 521.2 | 13.7 | Freehold |
| 80K12450 | 83.8 | 0.0 | Freehold |
| 86DK154 | 6912.8 | 67.9 | Leasehold |
| 9DK17 | 515.7 | 26.3 | Freehold |

[1] Unallocated State Land

### 3.3.2 Mining and petroleum tenure

Under Section 8 of the *Mineral Resources Act 1989* (MR Act), the State owns gold, coal and all minerals on or below the surface of the land in Queensland. The MR Act provides the legislative framework for exploration, development and mining tenure (Queensland Government 2013). A permit, claim, license or lease may, among other things, authorise prospecting, exploration, mining, processing or transport of materials (including coal) under the provisions of the MR Act.

Several different mining tenements are granted and administered under the MR Act, as follows:

- Prospecting permit – this permit entitles the holder to prospect for and/or hand-mine for minerals and/or peg a mining lease or mining claim on the available land (excludes coal). There are two types of prospecting permits, namely a parcel prospecting permit (granted for a term of three months) and a district prospecting permit (granted for all available land within a mining district for a term of 1-12 months).
- Exploration permit – this permit is issued for the purposes of exploration, allowing the permit holder to determine the existence, quality and quantity of minerals on, in or under land by methods such as prospecting, geophysical surveys and other methods. This permit may eventually lead into an application for a mineral development licence or mining lease.
- Mineral Development Licence – this licence allows the holder to undertake geoscientific programs, mining feasibility studies, environmental, engineering and design studies so as to evaluate the potential for development of the defined resource. A mineral development license can be granted to the holder of an exploration permit for a period of up to five years where there is a significant mineral occurrence of possible economic potential.
- Mining Claim – a mining claim is granted to holders of prospecting permits to carry out small scale operations, which can be up to one hectare in area and can be granted for minerals other than coal. A person can hold or have an interest in a maximum of two mining claims at any one time.
- Mining Lease – lease granted for mining operations that entitle the holder to machine-mine specified minerals and carry out activities associated with mining or promoting the activity of mining. A mining lease can be granted for those minerals specified in either the prospecting permit, exploration permit or mineral development licence held prior to the grant of the lease.

A review of the Queensland Government, Department of Mines and Energy (2013) data illustrates that the NGBR Project traverses tenements comprising exploration permits for coal (EPCs), an exploration permit for petroleum (EPP), exploration permits for minerals (EPMs) and a petroleum pipeline licence (PPL) (refer Figure 3-3). However, the NGBR Project does not cross any existing mining lease or mineral development licence areas and therefore is not considered to sterilise any publically notified or known mineral resources by restricting the potential of the resource to be mined. The location of tenures in the regional study area is illustrated in Table 3-2.

The following three properties were further assessed by Xenith Consulting, due to their position in the northern Bowen Basin, and the interests in the land held by resource companies currently exploring or extracting coal reserves.

- 2DK232
- 618PH2106
- 62SP195387

The report concluded that coal intersections at these properties were generally thin, interbedded and/or heat affected. Six current EPCs were identified and ranked according to potential for coal resource and the area effectively sterilised by the NGBR Project. Three of the EPCs ranked ‘Mid – Low’, one ranked ‘Low’ and the remaining two ranked ‘Very Low’ (refer Appendix A).

**Table 3-2 Mining, petroleum and mineral tenures**

| Tenure | Holder | Status |
|---|---|---|
| Exploration permits for coal | | |
| EPC 2401 | Civil & Mining Resources Pty Ltd | Application |
| EPC 1321 | Brothers Mining Pty. Ltd. | Application |
| EPC 2451 | Civil & Mining Resources Pty Ltd | Application |
| EPC 1021 | Conarco Minerals Pty Ltd | Granted |
| EPC 968 | Argos (Qld) Pty Ltd | Granted |
| EPC 773 | Xstrata Coal Queensland Pty Ltd | Granted |
| EPC 768 | Rosella Creek Coal Pty Ltd | Granted |
| EPC 639 | Pelican Creek Coal Pty Ltd | Granted |
| EPC 586 | Bowen River Coal Pty Ltd | Granted |
| EPC 1320 | North Coal Pty Ltd | Granted |
| EPC 1518 | Endocoal Limited | Granted |
| EPC 1590 | Endocoal Limited | Granted |
| EPC 739 | Byerwen Coal Pty Ltd | Granted |
| EPC 2169 | Queensland Coal Investments Pty Ltd | Granted |
| Exploration permits for petroleum | | |
| EPP 688 | BNG (Surat) Pty Ltd | Granted |
| Exploration permits for minerals | | |
| EPM 25189 | Barlyne Mining Pty Ltd | Application |
| EPM 16527 | Drummond West Pty Ltd | Application |
| EPM 15485 | Energy Minerals Pty Ltd | Granted |
| EPM 19087 | Barlyne Mining Pty Ltd | Granted |
| EPM 18568 | Conquest Mining Pty Limited | Granted |
| EPM 14171 | Basin Gold Pty. Ltd. | Granted |
| EPM 18469 | Natural Resources Exploration Pty Ltd | Granted |
| EPM 14928 | Drummond West Pty Ltd | Granted |
| EPM 17703 | Zamia Resources Pty Limited | Granted |

| Tenure | Holder | Status |
|---|---|---|
| EPM 25137 | Conquest Mining Pty Limited | Application |
| EPM 12527 | Conquest Mining Pty Limited | Granted |
| EPM 13867 | Conquest Mining Pty Limited | Granted |
| EPM 25136 | Conquest Mining Pty Limited | Application |
| EPM 15805 | Conquest Mining Pty Limited | Granted |
| EPM 11147 | Conquest Mining Pty Limited | Granted |
| EPM 25294 | Kenex Pty Ltd | Application |
| Petroleum pipeline license | | |
| PPL 89 | North Queensland Pipeline No. 1 Pty Ltd | Granted |

### 3.3.3 Strategic port land

North Queensland Bulk Ports Corporation Limited (NQBP) developed the *Port of Abbot Point Land Use Plan 2010* in accordance with the statutory provisions of the *Transport Infrastructure Act 1994* (TI Act). It sets out NQBP's planning and development intent for its strategic port land at the Port of Abbot Point, giving careful consideration to core matters relevant to the local and regional area including environmental, economic and social sustainability (NQBP 2010).

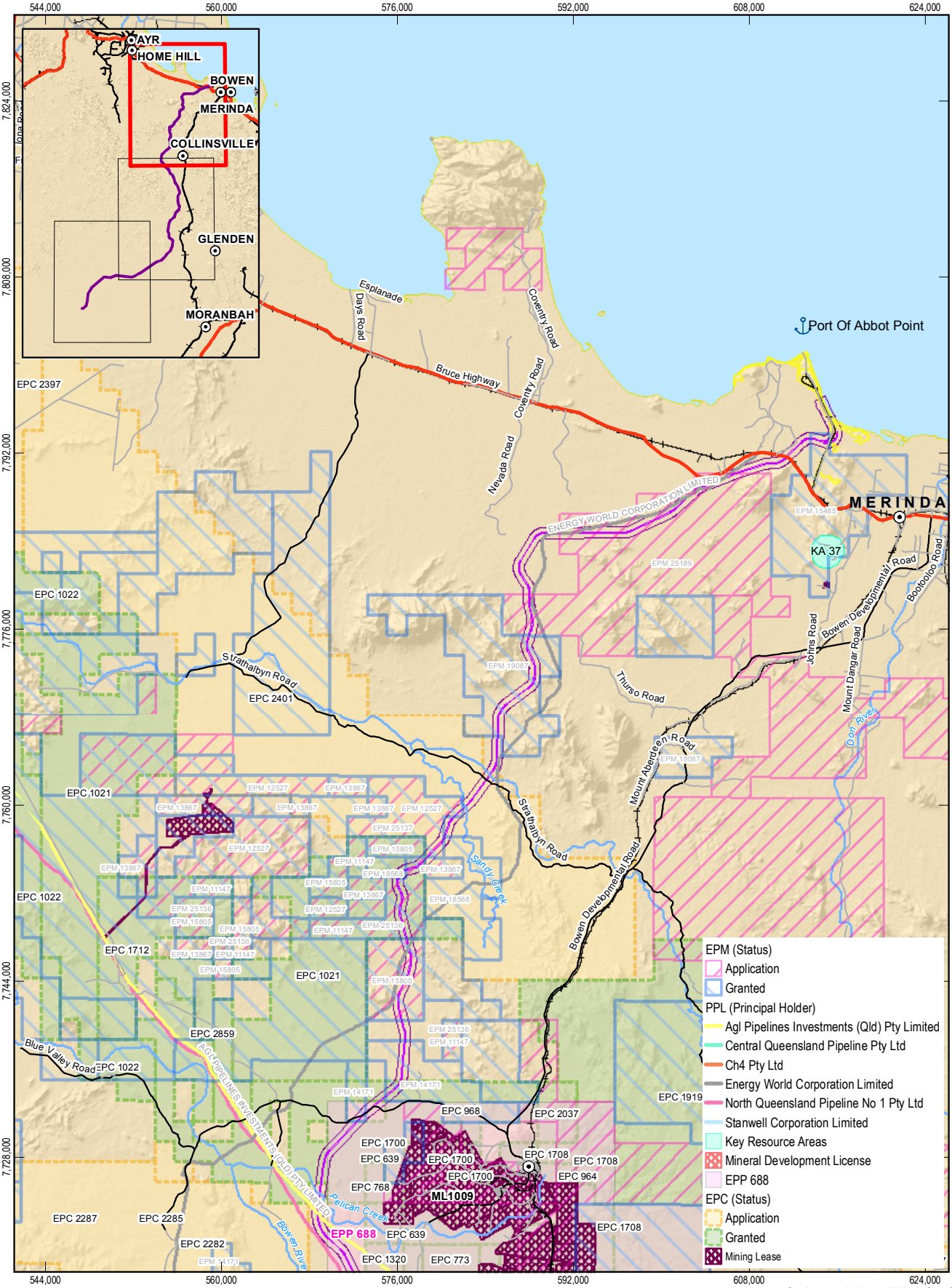
The northern extent of the NGBR Project alignment is over strategic port land within the boundaries of the *Port of Abbot Point Land Use Plan 2010* and this section of rail and any proposed infrastructure within the jurisdiction of the plan will therefore require development assessment.

There are two assessment processes that apply to development on strategic port land:

- NQBP's 'Port Development Consent' process
- Assessment under the *Sustainable Planning Act 2009* (SP Act).

The *Port of Abbot Point Land Use Plan 2010* is the principal tool used by NQBP as the Assessment Manager for managing and assessing development on strategic port land. The *Port of Abbot Point Land Use Plan 2010* overrides the local government planning scheme for strategic port land (NQBP 2010).

Assessment of the *Port of Abbot Point Land Use Plan 2010* and how it applies to the NGBR Project is provided in Volume 1 Chapter 20 Legislation and approvals.




LEGEND

- Population Centres
- Major Port
- Highway
- Main Road
- Local Road
- Railway
- Watercourse (Major)
- Strategic Port Land
- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor



1:500,000 Paper Size A4

0 4 8 16

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**

North Galilee Basin Rail Project

# Mining and Petroleum Tenure

| | |
|---|---|
| Job Number | 41-26457 |
| Revision | B |
| Date | 01 Nov 2013 |

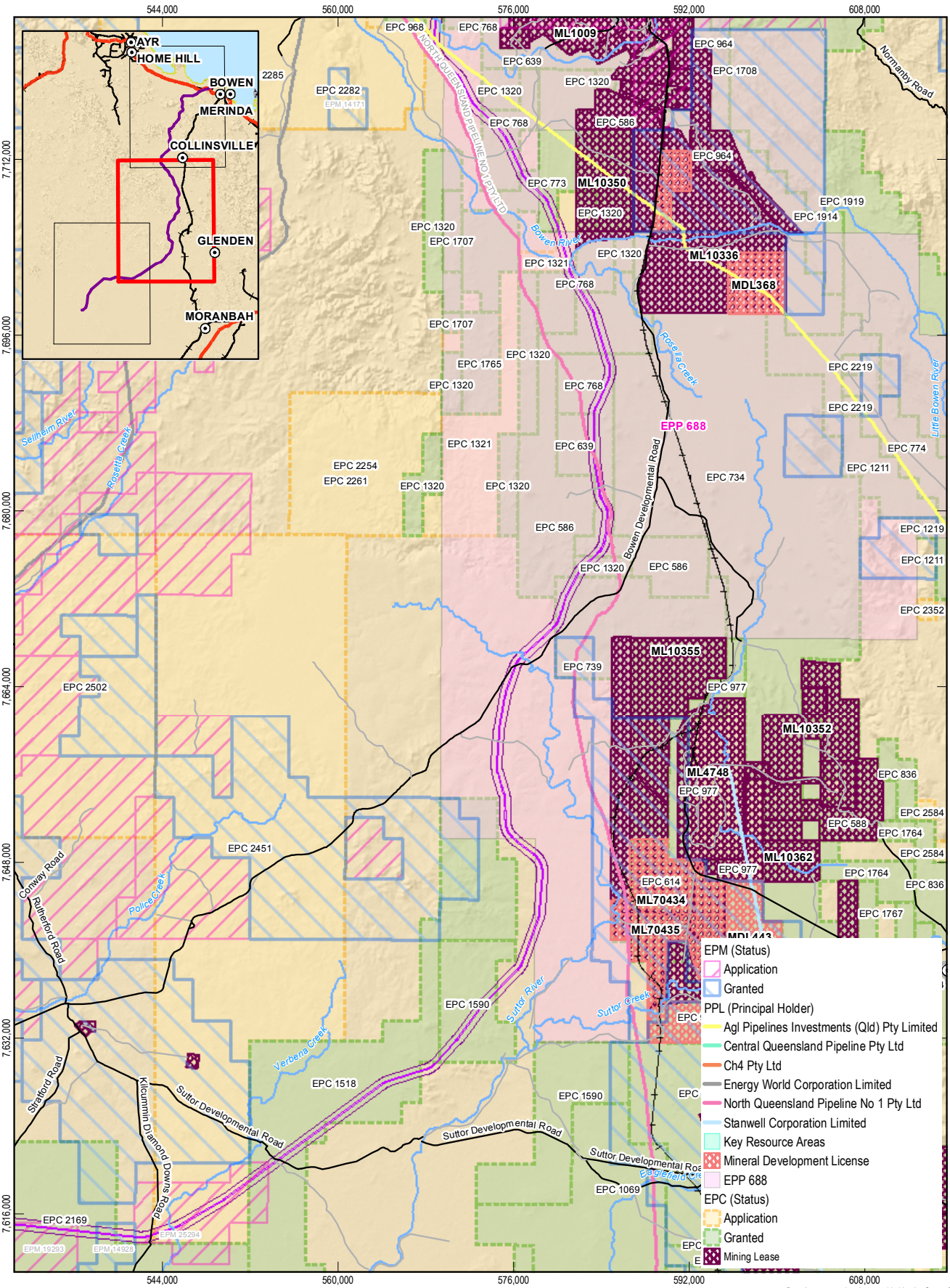
Figure 3-3
Sheet 1 of 3

G:\41\26457\06 GIS\Maps\MXD\0800_Landuse\41_26457_0805_rev_b.mxd

Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GA: Populated Places, Railway, Watercourse/2007; NGBR Corridor 13/05/2013, NGBR Corridor 06/06/2013, Carmichael Project (Rail) 18/06/2013; DNRM: Roads/2010, Strategic Portland/2010; DME: Mining Leases, Mineral Development Licences, Key Resource Area, EPC Boundary, EPM, PPL/2013. Created by:MS




LEGEND

Population Centres
Local Road
Railway
Main Road
Watercourse (Major)
North Galilee Basin Rail 1000m Corridor
North Galilee Basin Rail 100m Corridor



1:500,000 Paper Size A4

0 4 8 16

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**

North Galilee Basin Rail Project

# Mining and Petroleum Tenure

| | |
|---|---|
| Job Number | 41-26457 |
| Revision | B |
| Date | 01 Nov 2013 |

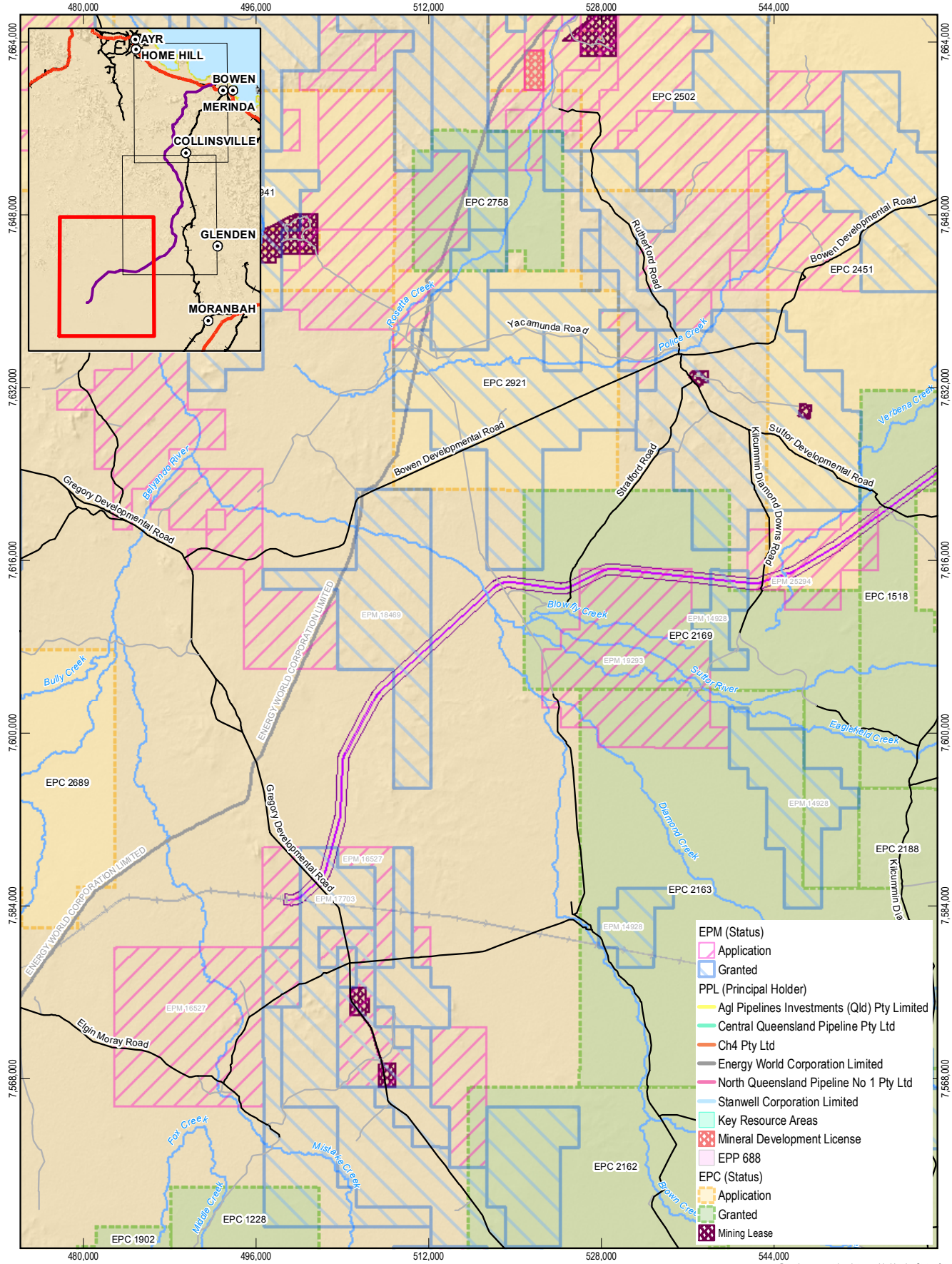
Figure 3-3
Sheet 2 of 3

G:\41\26457\06 GIS\Maps\MXD\0800_Landuse\41_26457_0805_rev_b.mxd

Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GA: Populated Places, Railway, Watercourse/2007; NGBR Corridor 13/05/2013, NGBR Corridor 06/06/2013, Carmichael Project (Rail) 18/06/2013; DNRM: Roads/2010, Strategic Portland/2010; DME: Mining Leases, Mineral Development Licences, Key Resource Area, EPC Boundary, EPM, PPL/2013. Created by:MS




LEGEND

Main Road
Local Road
Carmichael Project (Rail)
Watercourse (Major)
North Galilee Basin Rail 1000m Corridor
North Galilee Basin Rail 100m Corridor



1:500,000 Paper Size A4

0 4 8 16

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**

North Galilee Basin Rail Project

# Mining and Petroleum Tenure

Job Number 41-26457
Revision B
Date 01 Nov 2013

Figure 3-3
Sheet 3 of 3

G:\41\26457\06 GIS\Maps\MXD\0800_Landuse\41_26457_0805_rev_b.mxd

Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com


Data source: GA: Populated Places, Railway, Watercourse/2007; NGBR Corridor 13/05/2013, NGBR Corridor 06/06/2013, Carmichael Project (Rail) 18/06/2013; DNRM: Roads/2010, Strategic Portland/2010; DME: Mining Leases, Mineral Development Licences, Key Resource Area, EPC Boundary, EPM, PPL/2013. Created by:MS

## 3.4 Land use

The NGBR Project is located within the Regional Landscape and Rural Production Area (RLRPA) land use category under the MIWRP (refer Figure 3-1). The RLRPA includes land with significant biodiversity values, Good Quality Agricultural Land (GQAL), cultural and landscape heritage values, extractive resources of economic significance (e.g. mining), water catchments, native forests, coastal wetlands, land unsuitable for urban/rural residential purposes and rural towns and associated activities such as transport and telecommunication networks (DLGP 2012).

The extent of the land through which the NGBR Project traverses is classified as 'production from relatively natural environments'. Land use in the study area is predominantly for the purposes of cattle breeding and fattening (refer to Figure 3-4). Limited areas are defined as being for the purposes of cattle grazing and breeding.

The landscape of the NGBR Project final rail corridor is characterised by a combination of flat floodplains dominated by a number of creeks which have reasonably well defined channels but with wide floodplains that are inundated during flood events, and steeper undulating terrain associated with the Leichhardt and Clarke ranges. A number of nationally important wetlands are located in proximity of the NGBR Project including the Caley Valley wetland (at the Port of Abbot Point) and other wetlands associated with the Great Barrier Reef Marine Park, and the Bowen River: Birralee – Pelican Creek aggregation.

The main watercourses crossed by the NGBR Project final rail corridor comprise major waterways (including the Bowen River, Bogie River, Elliot River, Pelican Creek and Suttor River) and several smaller creeks and ephemeral water bodies. A discussion regarding water resources within the vicinity of the NGBR Project is presented in Volume 2 Appendix H1 Water resources and Volume 2 Appendix H2 Hydrology and hydraulics.

The NGBR Project also traverses a number of State-controlled roads, minor roads and stock crossings (refer to Sections 3.5.1 and 3.5.2).

### 3.4.1 Rural uses

GQAL is land which is capable of sustainable use for agriculture, with a reasonable level of inputs, and without causing degradation of land or other natural resources. In this context, agricultural land is defined as land used for crop or animal production, but excluding intensive animal uses such as feedlots, piggeries, poultry farms and plant nurseries based on either hydroponics or imported growth media (DPI & DHLGP 1993). Land use in the study area is predominantly for the purposes of cattle breeding and fattening (refer Figure 3-4). Limited areas are defined as being for the purposes of cattle grazing and breeding. Therefore, GQAL has the potential to be present throughout the study area (refer Figure 3-5).

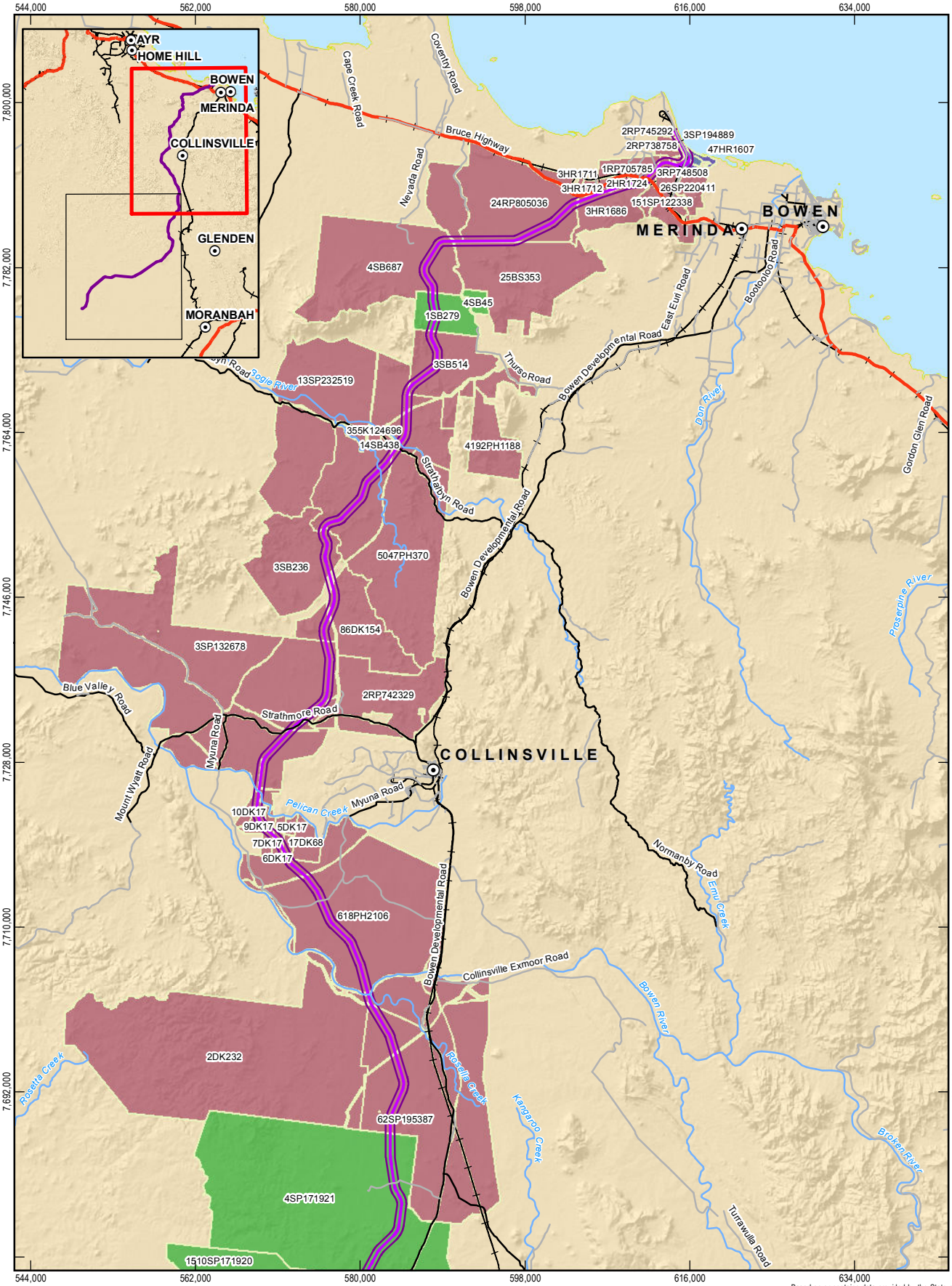
The Queensland Government considers that Strategic Cropping Land (SCL) i.e. high quality cropping land, is a finite resource that must be conserved and managed for the longer term (Queensland Government 2010). As a general aim, planning and approval powers should be used to protect such land from those developments that would lead to its permanent alienation or diminished productivity. The study area includes areas of potential SCL defined by the Western Cropping management zone and Coastal Queensland management zone (refer to Figure 3-6).

The Queensland Agricultural Land Audit (DAFF 2013) identified the current and potential land use in the Mackay, Isaac and Whitsunday region. Potential land use refers to the areas where

the majority of a particular land use occurs as well as where production could potentially occur. The current and potential land uses in the region are summarised in Table 3-3.

**Table 3-3 Current and potential land use (Mackay, Isaac and Whitsunday region)**

| Land use type | Current land use (per cent of region) | Potential land use (per cent of region) |
|---|---|---|
| Broadacre cropping | 2.52 % | 9.62 % |
| Sugarcane | 1.88 % | 7.06 % |
| Perennial horticulture | 0.02 % | 8.32 % |
| Annual horticulture | 0.10 % | 17.66 % |
| Grazing | 85.28 % | 92.88 % |
| Intensive livestock | 0.00 % | 23.84 % |
| Aquaculture | 0.00 % | 0.27 % |
| Other land use (non-agricultural land uses and also may include some forestry) | 10.20 % | N/A |




LEGEND

- Population Centres
- Highway
- Main Road
- Local Road
- Railway
- Watercourse (Major)

Land Use

- Cattle Breeding & Fattening
- Cattle Grazing & Breeding
- Harbour Industries
- Transport Terminal
- Vacant Rural Land
- Vacant Urban Land

- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor



1:600,000 Paper Size A4

0 4.5 9 18

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

Land Use

| | |
|---|---|
| Job Number | 41-26457 |
| Revision | A |
| Date | 29 Aug 2013 |

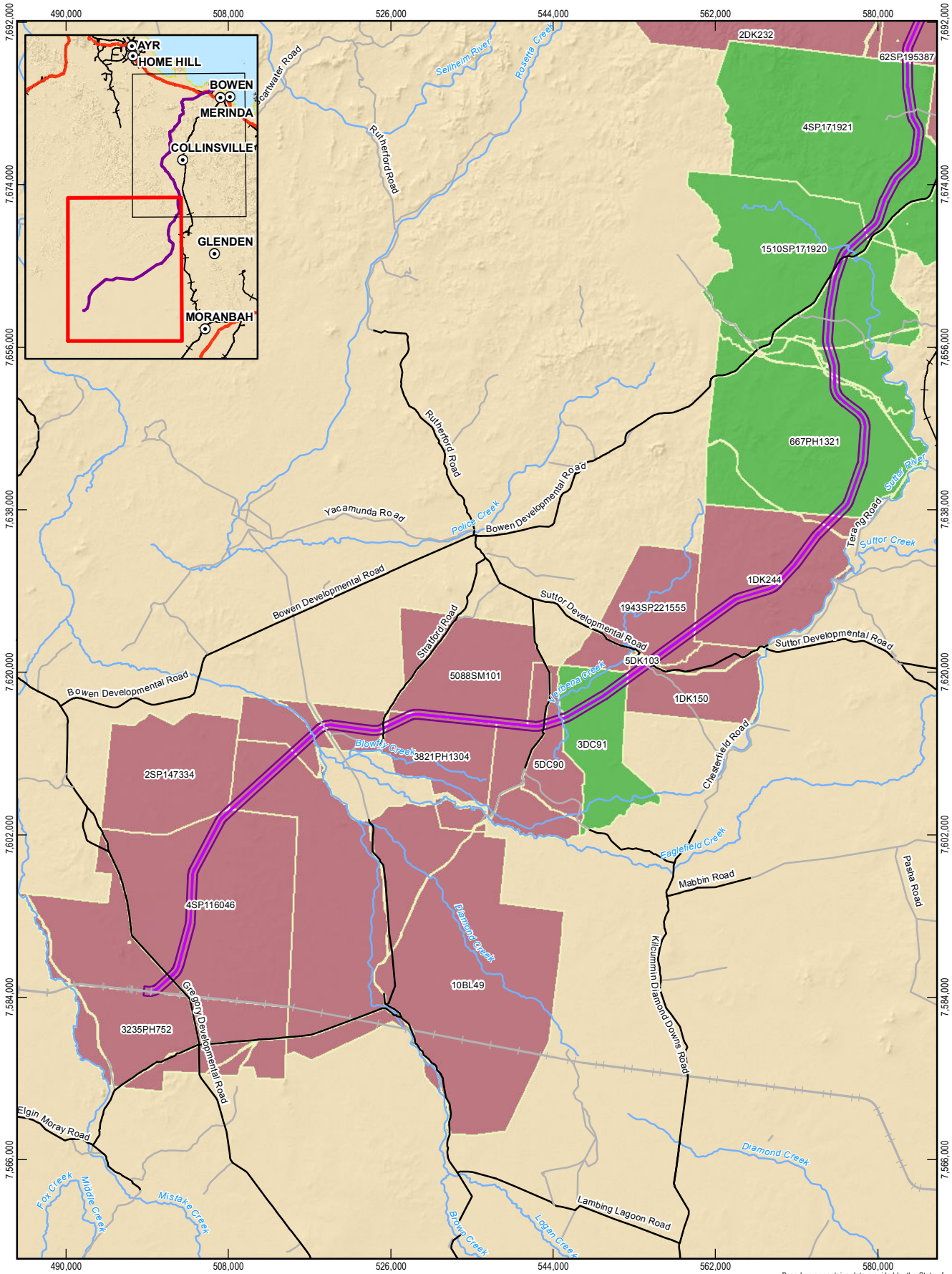
Figure 3-4
Sheet 1 of 2



Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GA: Populated Places, Railway, Watercourse/2007; Adani: Adani: NGBR Corridor 13/05/2013, NGBR Corridor 06/06/2013, Carmichael Project (Rail) 18/06/2013; DNRM: Roads/2010; GHD\DNRM: Land Use/2013. Created by:MS




LEGEND

Main Road
Local Road
Carmichael Project (Rail)
Watercourse (Major)

Land Use
Cattle Breeding & Fattening
Cattle Grazing & Breeding

North Galilee Basin Rail 1000m Corridor
North Galilee Basin Rail 100m Corridor



1:600,000 Paper Size A4

0 4.5 9 18

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

adani

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

Job Number 41-26457
Revision A
Date 29 Aug 2013

Land Use

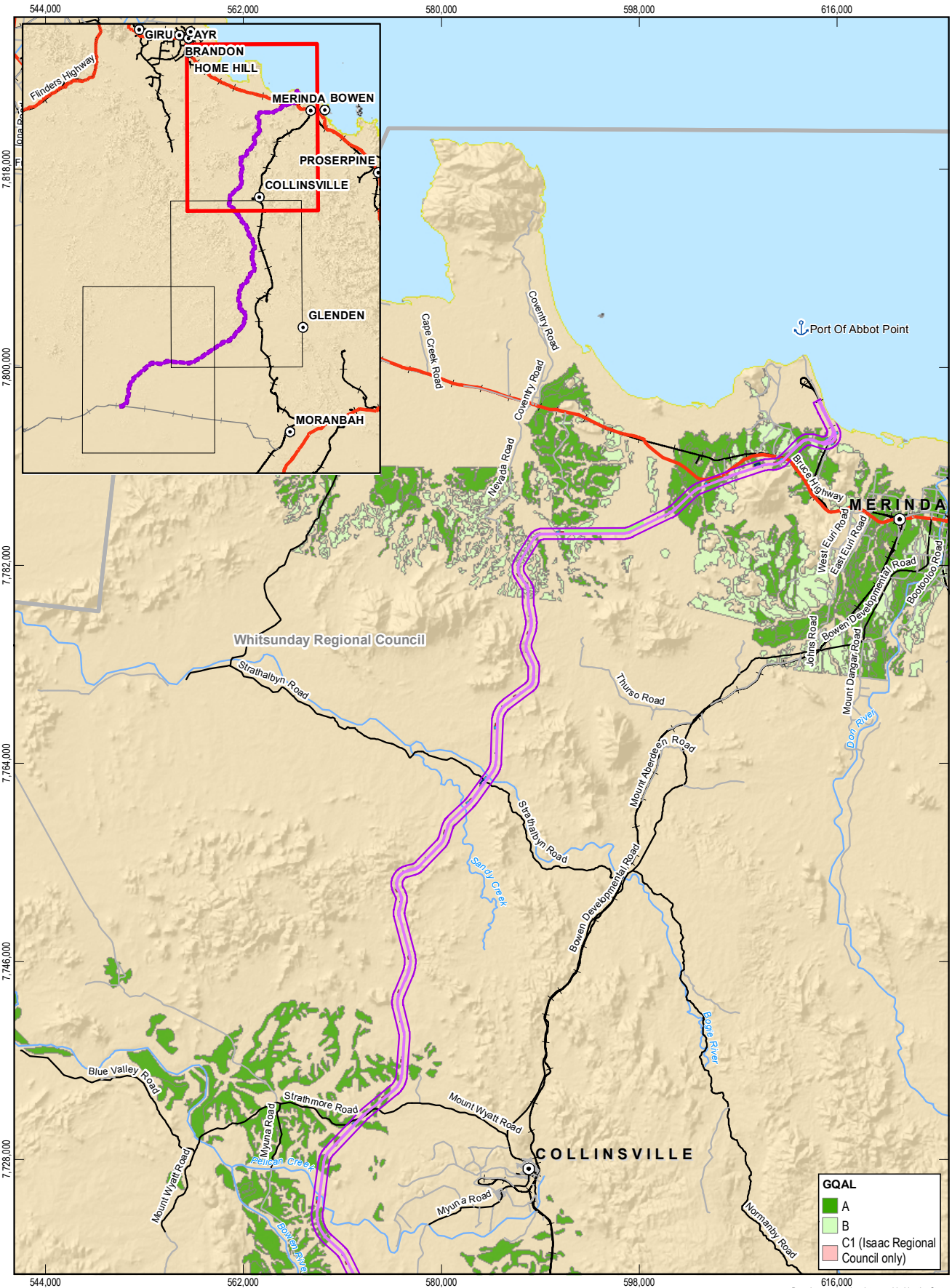
Figure 3-4
Sheet 2 of 2



Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GA: Populated Places, Railway, Watercourse/2007; Adani: Adani: NGBR Corridor 13/05/2013, NGBR Corridor 06/06/2013, Carmichael Project (Rail) 18/06/2013; DNRM: Roads/2010; GHD\DNRM: Land Use/2013. Created by:MS




LEGEND

- Population Centres
- Major Port
- Highway
- Main Road
- Local Road
- Railway
- Watercourse (Major)
- Local Government Area
- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor
- Ancillary Infrastructure Areas
- Bridge Laydown Area
- Concrete Batch Plant
- Construction Camp
- Rolling Stock Maintenance Depot
- Track Laydown Area
- Turning Circle



1:500,000 Paper Size A4

0 4.5 9 18

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

# Good Quality Agricultural Land

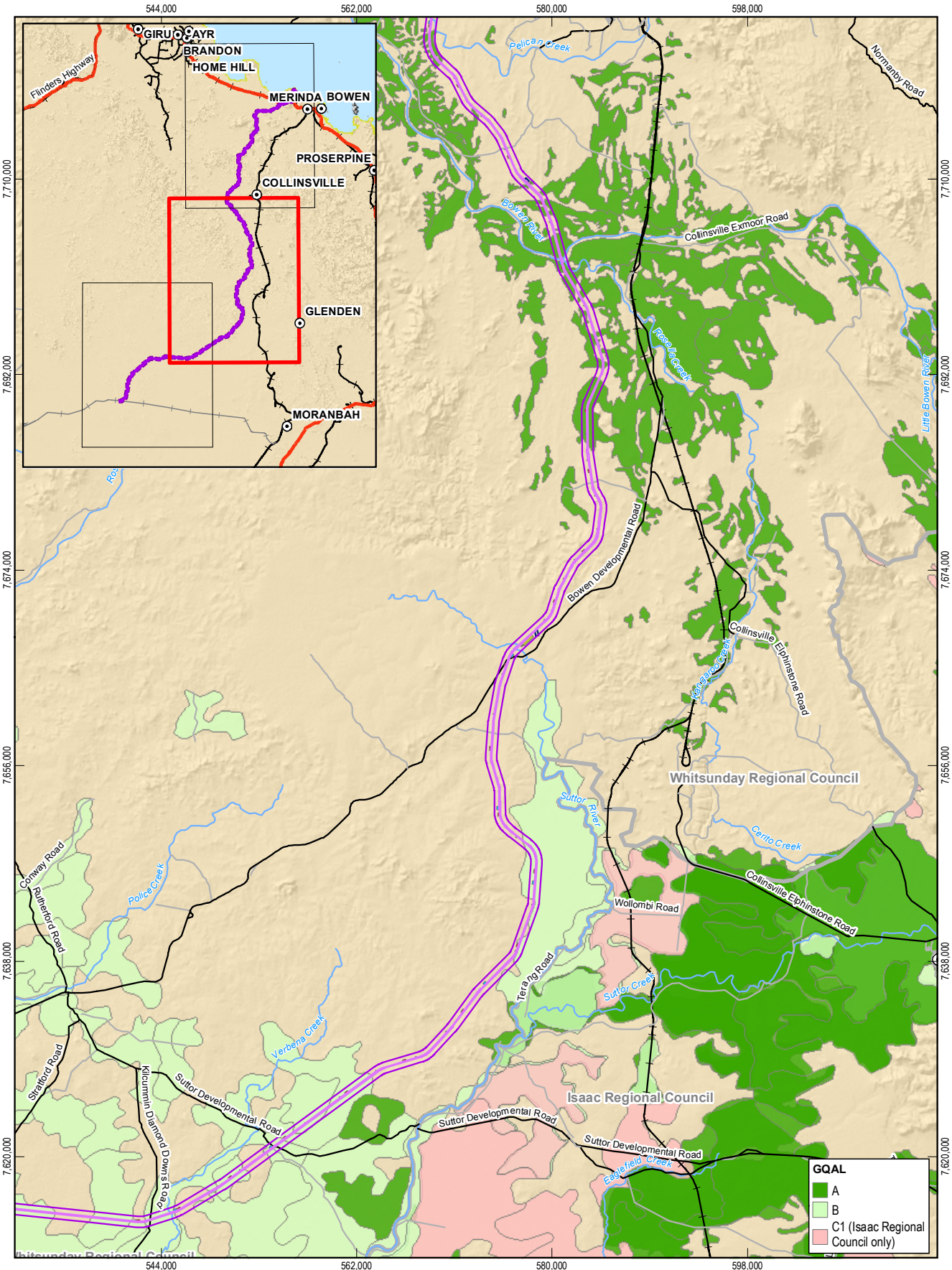
Job Number 41-26457
Revision A
Date 26 Sep 2013

Figure 3-5
Sheet 1 of 3

G:\41\26457\06 GIS\Maps\MXD\0400_Geology_Soils\41_26457_0429_rev_a.mxd

Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com


Data source: GA: Populated Places, Railway, Watercourse/2007; Adani: NGBR Corridor 06/06/2013, NGBR Corridor 13/05/2013, Carmichael Coal Rail EIS 23/07/2012; DNRM: Roads/2010, GQAL/2010. Created by:MS




LEGEND

- Population Centres
- Main Road
- Local Road
- Railway
- Watercourse (Major)
- Local Government Area
- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor
- Ancillary Infrastructure Areas
- Bridge Laydown Area
- Concrete Batch Plant
- Construction Camp
- Construction Yard
- Track Laydown Area
- Turning Circle



1:500,000 Paper Size A4

0 4.5 9 18

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

# Good Quality Agricultural Land

Job Number 41-26457
Revision A
Date 26 Sep 2013

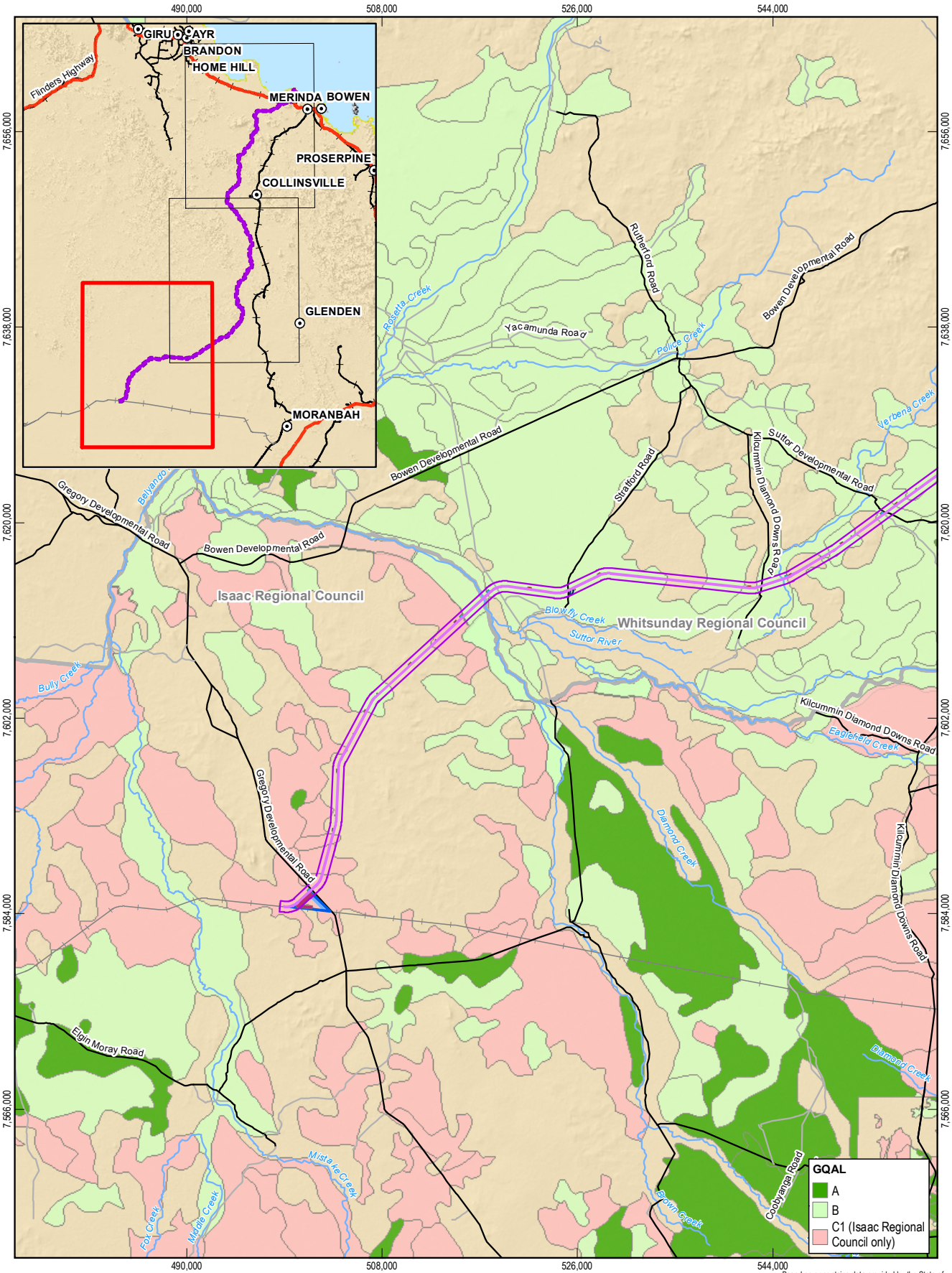
Figure 3-5
Sheet 2 of 3



Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GA: Populated Places, Railway, Watercourse/2007; Adani: NGBR Corridor 06/06/2013, NGBR Corridor 13/05/2013, Carmichael Coal Rail EIS 23/07/2012; DNRM: Roads/2010, GQAL/2010. Created by:MS




LEGEND

Main Road
Local Road
Carmichael Project (Rail)
Watercourse (Major)
Local Government Area
North Galilee Basin Rail 1000m Corridor
North Galilee Basin Rail 100m Corridor
Ancillary Infrastructure Areas
Bridge Laydown Area
Concrete Batch Plant
Construction Camp
Construction Depot Area
Rail Precinct Area
Track Laydown Area
Turning Circle



1:500,000 Paper Size A4

0 4.5 9 18

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

adani

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

# Good Quality Agricultural Land

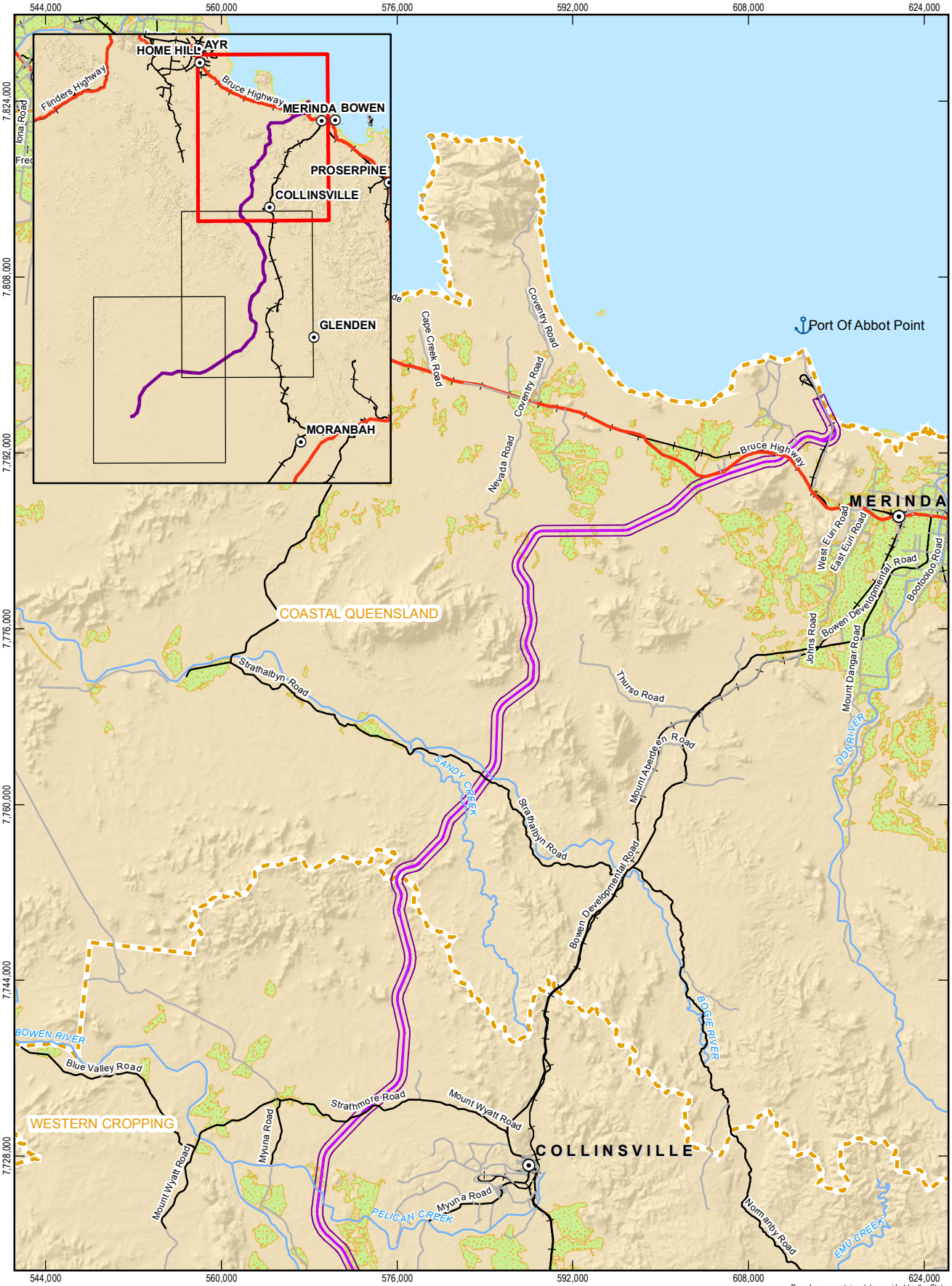
Job Number 41-26457
Revision A
Date 26 Sep 2013

Figure 3-5
Sheet 3 of 3

G:\41\26457\06 GIS\Maps\MXD\0400_Geology_Soils\41_26457_0429_rev_a.mxd

Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com


Data source: GA: Populated Places, Railway, Watercourse/2007; Adani: NGBR Corridor 06/06/2013, NGBR Corridor 13/05/2013, Carmichael Coal Rail EIS 23/07/2012; DNRM: Roads/2010, GQAL/2010. Created by:MS




LEGEND

- Population Centres
- Major Port
- Highway
- Main Road
- Local Road
- Railway
- Watercourse (Major)
- Strategic Cropping Land Zone
- Strategic Cropping Land
- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor



1:500,000 Paper Size A4

0 4 8 16

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

| | |
|---|---|
| Job Number | 41-26457 |
| Revision | A |
| Date | 28 Aug 2013 |

# Strategic Cropping Land

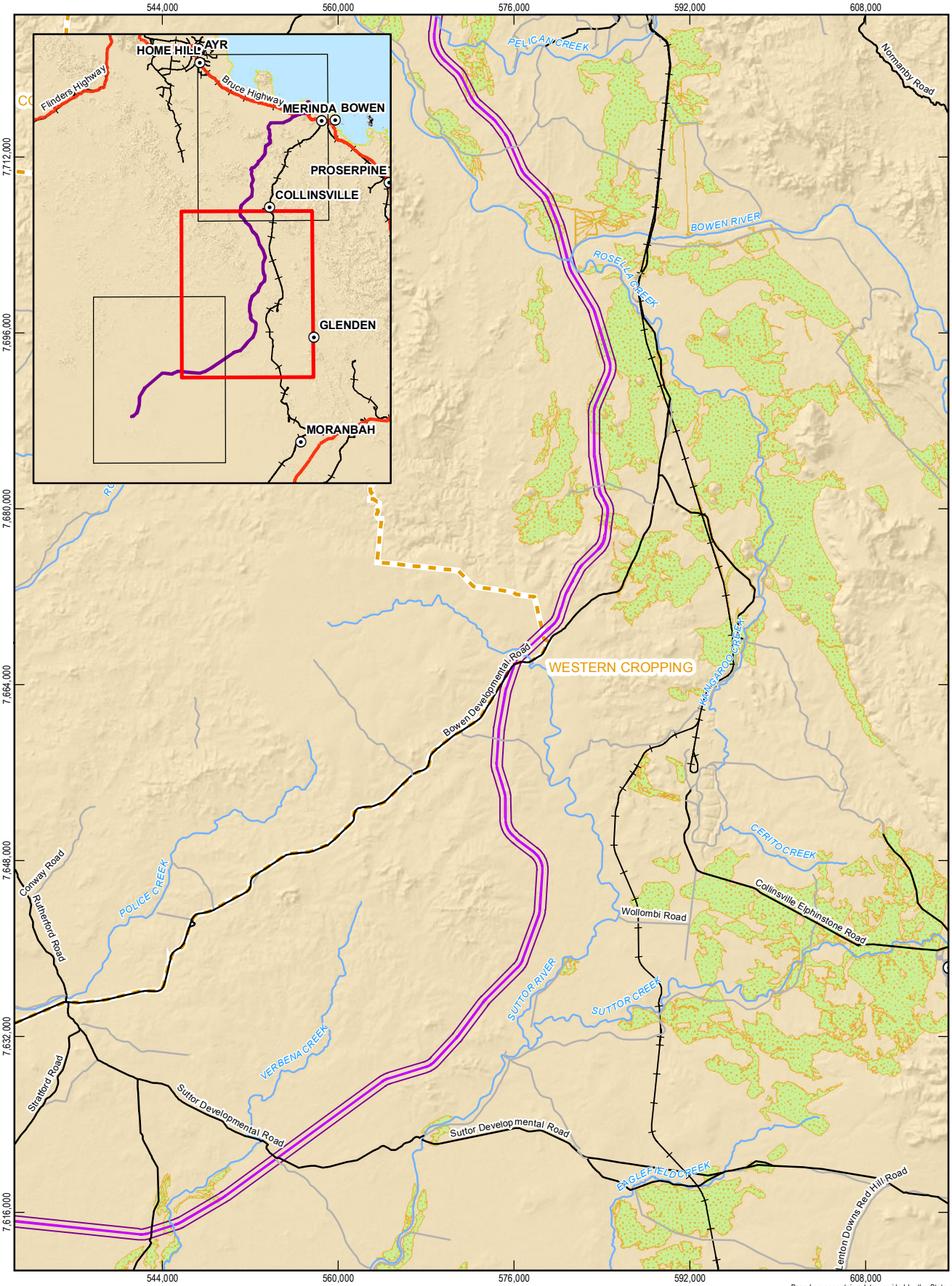
Figure 3-6
Sheet 1 of 3

G:\41\26457\06 GIS\Maps\MXD\0800_Landuse\41_26457_0814_rev_a.mxd

Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GA: Populated Places, Railway, Watercourse/2007; Adani: NGBR Corridor 03/05/2013; DNRM: Roads/2010; Conbined Soils/2010. Created by:MS




LEGEND

- Population Centres
- Local Road
- Railway
- Main Road
- Watercourse (Major)
- Strategic Cropping Land Zone
- Strategic Cropping Land
- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor



1:500,000 Paper Size A4

0 4 8 16

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

| | |
|---|---|
| Job Number | 41-26457 |
| Revision | A |
| Date | 28 Aug 2013 |

# Strategic Cropping Land

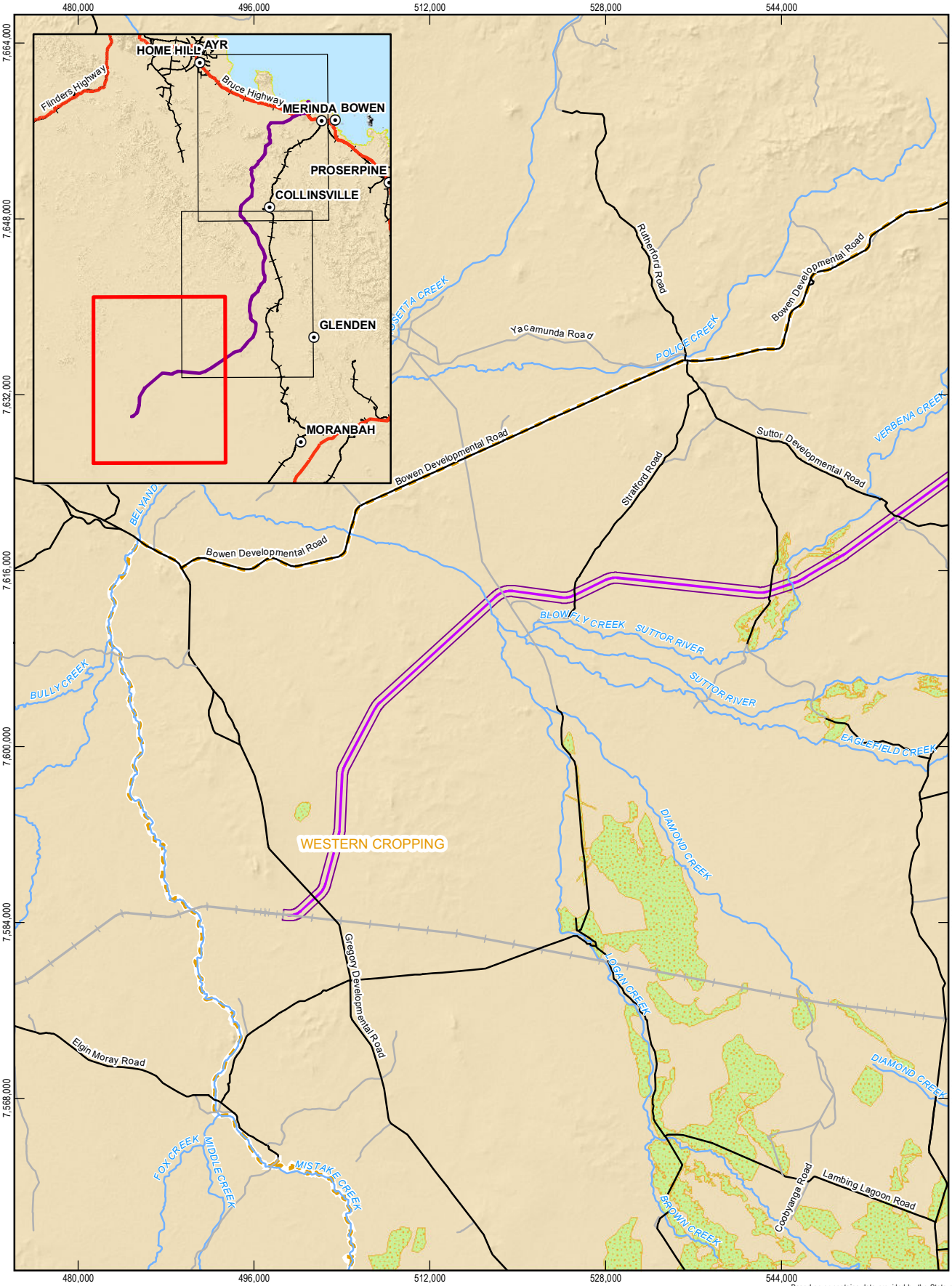
Figure 3-6
Sheet 2 of 3

G:\41\26457\06 GIS\Maps\MXD\0800_Landuse\41_26457_0814_rev_a.mxd

Level 9, 145 Ann Street Brisbane QLD 4000 Australia **T** 61 7 3316 3000 **F** 61 7 3316 3333 **E** bnemail@ghd.com **W** www.ghd.com



Data source: GA: Populated Places, Railway, Watercourse/2007; Adani: NGBR Corridor 03/05/2013; DNRM: Roads/2010; Conbined Soils/2010. Created by:MS




LEGEND

Main Road
Local Road
Carmichael Project (Rail)
Watercourse (Major)
Strategic Cropping Land Zone
Strategic Cropping Land
North Galilee Basin Rail 1000m Corridor
North Galilee Basin Rail 100m Corridor



1:500,000 Paper Size A4

0 4 8 16

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

GHD

adani

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

| | |
|---|---|
| Job Number | 41-26457 |
| Revision | A |
| Date | 28 Aug 2013 |

Strategic Cropping Land

Figure 3-6
Sheet 3 of 3



Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GA: Populated Places, Railway, Watercourse/2007; Adani: NGBR Corridor 03/05/2013; DNRM: Roads/2010; Conbined Soils/2010. Created by:MS

### 3.4.2 Non-rural uses

Non-rural land comprises land that is not for a rural purpose, including but not limited to land zoned as rural-residential, residential, urban, industrial and commercial.

At the Port of Abbot Point, the NGBR Project traverses land designated for industrial use including port handling activities and environmental buffers (refer to Figure 3-7).

The main residential areas surrounding the NGBR Project are located at Bowen, Collinsville and Moranbah. These areas are located in excess of 18 km from the NGBR Project preliminary investigation corridor.

The NGBR Project alignment has been designed to minimise impacts on the properties where possible, and avoid fragmentation of properties resulting in the creation of non-productive portions. Additionally, the NGBR Project has been designed to avoid homesteads and associated infrastructure where practical.

The NGBR Project study area is sparsely populated with the final rail corridor avoiding close contact with potential sensitive receptor locations. Sensitive receptors include homesteads as well as areas from which fixed or transient views would be possible. A total of 23 homesteads were identified within approximately six kilometres of the 1,000 m preliminary investigation corridor for the NGBR Project. The closest potentially sensitive receptor to the NGBR alignment is Stratford homestead, located approximately one kilometre from the NGBR Project. Identified homesteads are shown in Figure 3-8 and summarised in Table 3-4.

**Table 3-4 Summary of sensitive receptors**

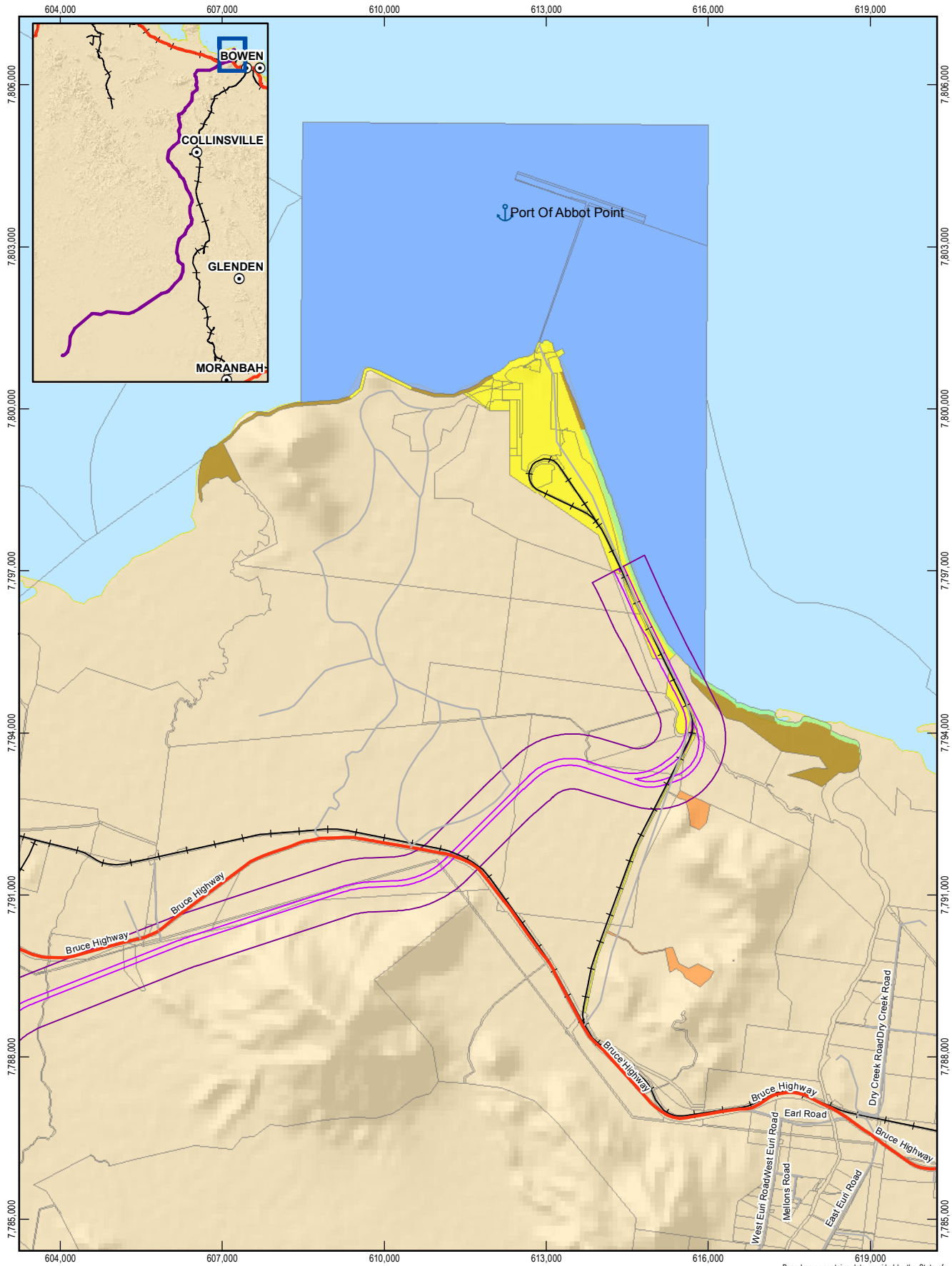
| Sensitive receptors | Easting, mE (GDA94) | Northing, mN (GDA94) | Approximate distance (m) from the final rail corridor | Description / name | Lot on plan |
|---|---|---|---|---|---|
| Homestead 1 | 609916 | 7794255 | 2,690 | Caley Valley | 255HR2027 |
| Homestead 2 | 604874 | 7790877 | 1,152 | Salisbury Plains | 3HR1712 |
| Homestead 3 | 585906 | 7784622 | 2,198 | Nevada | 4SB687 |
| Homestead 4 | 591656 | 7782269 | 2,581 | Glenore | 25SB353 |
| Homestead 5 | 592845 | 7775614 | 4,680 | Thurso | 1SB279 |
| Homestead 6 | 591975 | 7774322 | 3,776 | White Kangaroo | 3SB514 |
| Homestead 7 | 594112 | 7773398 | 5,674 | Mountain View | 76SP167797 |
| Homestead 8 | 581086 | 7764508 | 3,572 | Eton Vale | 355K124696 |
| Homestead 9 | 583141 | 7758004 | 2,071 | Glen Alpine | 5047PH370 |
| Homestead 10 | 573776 | 7744903 | 2,877 | Tabletop | 3SB236 |
| Homestead 11 | 577664 | 7743174 | 1,514 | Bakara | 86DK154 |
| Homestead 12 | 565463 | 7733205 | 6,158 | Strathmore | 3SP132678 |
| Homestead 13 | 563357 | 7723411 | 5,316 | Myuna | 14DK18 |
| Homestead 14 | 574094 | 7721935 | 3,863 | Pelican Creek | 4914PH1791 |

| Sensitive receptors | Easting, mE (GDA94) | Northing, mN (GDA94) | Approximate distance (m) from the final rail corridor | Description / name | Lot on plan |
|---|---|---|---|---|---|
| Homestead 15 | 569153 | 7714138 | 4,263 | Birralee | 618PH2106 |
| Homestead 16 | 586276 | 7700615 | 3,819 | Havilah | 62SP195387 |
| Homestead 17 | 580954 | 7681237 | 2,772 | Fig Tree | 4SP171921 |
| Homestead 18 | 579067 | 7655503 | 4,120 | Cerito | 1510SP171920 |
| Homestead 19 | 570319 | 7624819 | 4,931 | Terang | 1DK244 |
| Homestead 20 | 550182 | 7623709 | 4,694 | Glen Eva / Verbena | 1943SP221555 |
| Homestead 21 | 530696 | 7620414 | 5,159 | Warrigal | 5088SM101 |
| Homestead 22 | 519416 | 7613045 | 1,059 | Stratford | 3821PH1304 |
| Homestead 23 | 494429 | 7589483 | 6,584 | Disney | 4SP116046 |

The NGBR Project does not traverse any public recreation reserves. However, the final rail corridor does traverse the Bicentennial National Trail - a long distance, multi-use recreational trekking route, stretching 5,330 km from Cooktown in tropical far-north Queensland to Healesville in Victoria (BNT 2013). The trail follows local rivers from the Burdekin Dam to Collinsville, and crosses the final rail corridor at approximate chainage (Ch) 106.05 km, via Pelican Creek.

There are a number of sites surrounding the NGBR Project that are used for recreational purposes by the community and tourists. These areas include:

- Nairana National Park – located approximately 8.5 km west of the preliminary investigation corridor
- Hells Gate Nature Refuge – located approximately nine kilometres west of the preliminary investigation corridor
- Mount Pleasant Nature Refuge – located approximately eight kilometres east of the preliminary investigation corridor
- Aberdeen Nature Refuge – located approximately eight kilometres east of the preliminary investigation corridor
- Mount Aberdeen National Park – located approximately four kilometres southeast of the preliminary investigation corridor
- Mount Abbot National Park – located approximately eight kilometres northwest of the preliminary investigation corridor
- Abbot Bay Resources Reserve – located approximately seven kilometres north of the preliminary investigation corridor.




LEGEND

- Population Centres
- Major Port
- Highway
- Main Road
- Local Road
- Railway
- Watercourse (Major)
- Property Boundaries

Land Use Designation

- Port Handling Activities
- Port Related and Support Industry
- Offshore Port Infrastructure
- Special Mangement
- Environmental Buffer
- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor



1:100,000 Paper Size A4

0 0.75 1.5 3

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**

North Galilee Basin Rail Project

# Port of Abbot Point Land Use Plan Designation

Job Number 41-26457
Revision A
Date 28 Aug 2013

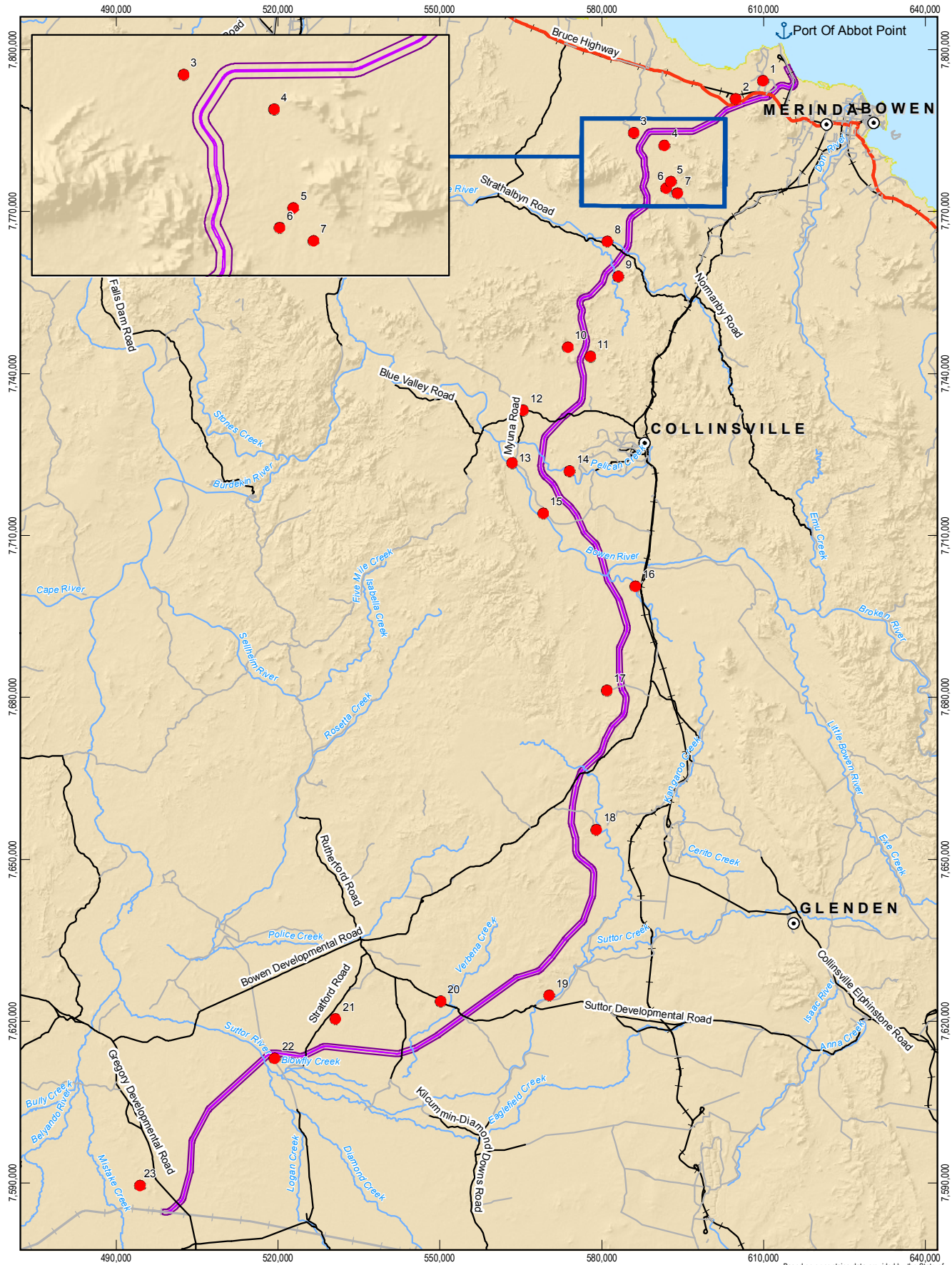
Figure 3-7

G:\41\26457\06 GIS\Maps\MXD\0800_Landuse\41_26457_0810_rev_a.mxd

145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GA: Populated Places, Railway, Airports, Watercourse/2007; NGBR Corridor 13/05/2013, NGBR Corridor 06/06/2013, Carmichael Project (Rail) 18/06/2013; DNRM: Roads; NQBP: Land Use Designation/2010. Created by:MS




LEGEND

- Population Centres
- Major Port
- Sensitive Receptors
- Highway
- Main Road
- Local Road
- Carmichael Project (Rail)
- Railway
- Watercourse (Major)
- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor



1:1,000,000 Paper Size A4

0 7.5 15 30

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

| | |
|---|---|
| Job Number | 41-26457 |
| Revision | A |
| Date | 29 Aug 2013 |

# Sensitive receptors

Figure 3-8

G:\41\26457\06 GIS\Maps\MXD\1600_ScenicAmenityLighting\41_26457_1602_rev_a.mxd

145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GA: Populated Places, Railway, Watercourse/2007; Adani: NGBR Corridor 13/05/2013, NGBR Corridor 06/06/2013, Carmichael Project (Rail) 18/06/2013; Adani\GA\GHD: Sensitive Receptors/2013; DNRM: Roads/2010. Created by:MS

## 3.5 Existing and proposed infrastructure

### 3.5.1 Road networks

An efficient road network is critical to the construction of the NGBR Project. Road infrastructure is governed by the TI Act which is administered by both State and local government. Categories of roads include State-controlled roads, local roads, and minor unsealed roads.

The NGBR Project will intersect public roads, gazetted public road reserves (unconstructed), occupational (private farm) tracks within private property boundaries and/or connecting adjoining properties of different ownership, gazetted stock routes, existing rail lines and other proposed rail corridors being planned (by others) and utility and services crossings (Aarvee Associates 2013).

A total of 20 public roads and road reserves are likely to be intersected by the NGBR Project, of which four are considered major roads (State-controlled roads) and 11 are minor roads (local roads), one is a private road owned by NQBP (crossed at three locations), and four are road reserves. Seven stock routes are crossed, three of which are shared public road access crossings (Aarvee Associates 2013).

**Table 3-5 Major road crossings**

| Road | Chainage | Classification | Owner |
|---|---|---|---|
| Abbot Point Road | -5.25 km | Private road | Private road owned by NQBP |
| Abbot Point Road | 6.11 km | Private road | Private road owned by NQBP passing through Lot 1 on RP748626. |
| Abbot Point Road | -6.70 km | Private road | Private road owned by NQBP passing through Lot 1 on RP748511. |
| Bruce Highway | 12.27 km | Major Road | DTMR State-controlled road passing through Lot 1 on RP705785 |
| Glenore Road | 34.05 km | Minor Road | WRC road passing through Lot 24 on RP805036. |
| Road / Stock Crossing (identified gazetted Stock route) | 57.34 km | Stock route | DNRM (Stock Route Management Unit) has governance over the easements which form part of the National Stock Route Network. Local governments should be contacted regarding permits or use of the stock route.<br>This stock route passing through Lot 13 on SP232519. |
| Strathalbyn Road | 61.58 km | Minor Road | WRC road passing through Lot 13 on SP232519. |
| Stock Crossing (identified gazetted Stock route) | 62.77 km | Stock route | DNRM (Stock Route Management Unit) has governance over the easements which form part of the National Stock Route Network. Local governments should be contacted regarding permits or use of the stock route.<br>This stock route passing adjacent to Lot 13 on SP232519 and Lot 504 on 7PH370. |

| Road | Chainage | Classification | Owner |
|---|---|---|---|
| Road / Stock Crossing (identified gazetted Stock route) | 79.55 km | Minor Road/ Stock route | DNRM (Stock Route Management Unit) has governance over the easements which form part of the National Stock Route Network. Local governments should be contacted regarding permits or use of the stock route.<br>WRC road passing adjacent to Lot 3 on SB236 and Lot 86 on DK154. |
| Road reserve (not constructed) | 83.70 km | Road reserve | WRC road passing through Lot 86 on DK154. |
| Strathmore Road & Stock Crossing gazetted Stock route) | 97.89 km | Minor Road / stock route | DNRM (Stock Route Management Unit) has governance over the easements which form part of the National Stock Route Network. Local governments should be contacted regarding permits or use of the stock route.<br>WRC road passing through Lot 3 on SP132678. |
| Road reserve (not constructed) | 117.11 km | Road reserve | WRC road. |
| Road Crossing (Minor Road) | 120.46 km | Minor Road | WRC road passing through Lot 618 on PH2106. |
| Stock Crossing (identified gazetted Stock route) | 133.32 km | Stock route | DNRM (Stock Route Management Unit) has governance over the easements which form part of the National Stock Route Network. Local governments should be contacted regarding permits or use of the stock route. |
| Road reserve (not constructed) | 139.27 km | Road reserve | WRC road passing through Lot 62 on SP195387. |
| Road Crossing | 153.92 km | Minor Road | WRC road passing through Lot 4 on SP171921. |
| Bowen Developmental Road | 173.20 km | Major Road | DTMR State-controlled road passing through Lot 1510 on SP171920.<br>A road diversion is proposed to maintain or improve horizontal geometry and to mitigate any resultant skew angle on the proposed bridge structure. |
| Cerito Road | 177.82 km | Minor Road | WRC road passing through Lot 1510 on SP171920. |
| Cerito Road | 180.25 km | Minor Road | WRC road passing through Lot 1510 on SP171920. |
| Stock Crossing (identified gazetted Stock route) | 186.37 km | Stock route | DNRM (Stock Route Management Unit) has governance over the easements which form part of the National Stock Route Network. Local governments should be contacted regarding permits or use of the stock route.<br>This stock route passing through Lot 1510 on SP171920. |

| Road | Chainage | Classification | Owner |
|---|---|---|---|
| Road reserve (not constructed) | 205.84 km | Road reserve | WRC road passing through Lot 1 on DK244. |
| Suttor Developmental Road | 231.27 km | Major Road | DTMR State controlled road passing adjacent to Lot 1943 on SP221555 and Lot 1 on DK150.<br>A road diversion is proposed to maintain or improve horizontal geometry and to mitigate any resultant skew angle on the proposed bridge structure. |
| Kilcummin Diamond Downs Road | 244.68 km | Minor Road | DNRM (Stock Route Management Unit) has governance over the easements which form part of the National Stock Route Network. Local governments should be contacted regarding permits or use of the stock route.<br>WRC road passing through Lot 5 on DC90. |
| Stratford Road | 262.95 km | Minor Road | IRC road passing through Lot 3821 on PH1304. |
| Stock Crossing (identified gazetted Stock route) | 269.63 km | Stock route | DNRM (Stock Route Management Unit) has governance over the easements which form part of the National Stock Route Network. Local governments should be contacted regarding permits or use of the stock route. |
| Gregory Development Road | 303.79 km | Major Road | DTMR State-controlled road passing through Lot 4 on SP116046. |

There are no current or proposed transport infrastructure upgrades occurring within the study area at a local, state or federal level with the exception of rehabilitation and overlay works occurring to Bowen Developmental Road (Bowen – Collinsville) which may result in an improvement in the capacity to transport heavy or large quantities of materials from Bowen or the Port of Abbot Point to the construction site.

### 3.5.2 Stock routes

The Queensland stock route network (SRN) is the network of stock routes and reserves for travelling stock in the State. The term ‘stock route’ describes a particular use of part of the State’s road network (DNRM 2013). The SRN is primarily used by the pastoral industry as an alternative to transporting stock by rail or road, and for pasture for emergency agistment and long-term grazing. It is used by utility companies to provide power lines, pipelines and telecommunications; and by the community generally for road transport, and recreational and other purposes such as beekeeping (DERM 2009).

Stock routes are corridors on roads, reserves, pastoral leases and unallocated state land along which stock are driven on foot. A stock route may be either a road that is declared to be a stock route under the *Land Protection Regulation 2003*, or it may simply be any route that has customarily been used for walking stock. Stock routes have no separate title or tenure from the underlying road reserve, and the same roads are used for walking and agisting stock, and vehicular transport (DERM 2009).

Management of the SRN is shared between the State government and local government under the *Land Protection (Pest and Stock Route Management) Act 2002*. Local governments are

responsible for day-to-day administration and management as well as some network maintenance, while the DNRM is responsible for providing policy and legislative advice, operational guidelines, and compliance support, reviewing decisions, managing asset maintenance, and training local government stock route officers (DNRM 2013).

According to the Queensland Stock Route Strategy 2009-2014, a number of values are associated with the land that makes up the SRN. These values include:

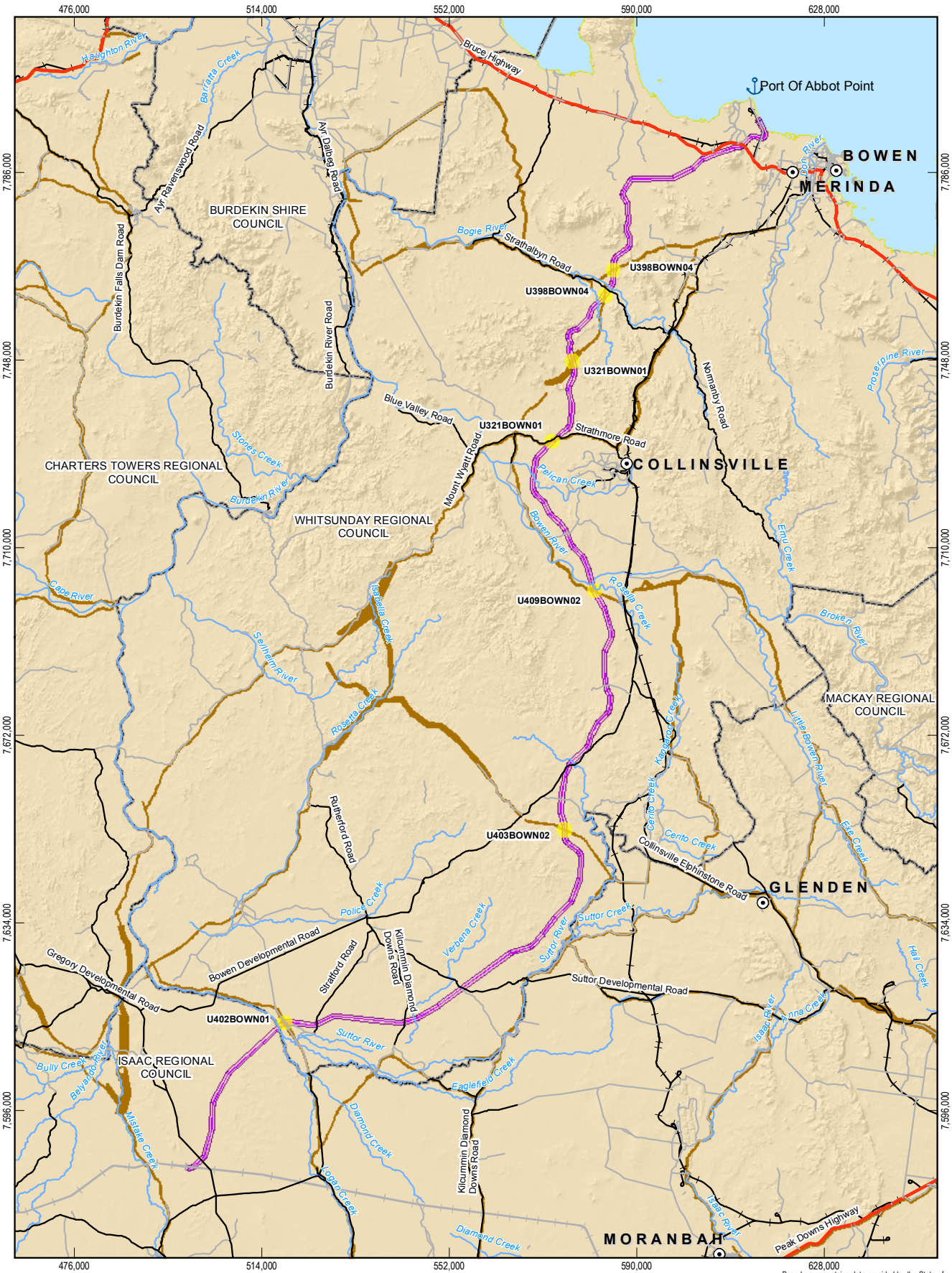
- Economic values associated with the high pastoral productivity of the land to meet the needs of travelling stock, as well as economic benefits to rural communities through having corridors of land to transport goods and services to and from these communities
- Environmental values associated with rich biodiversity, riparian areas and aesthetics, as well as value as a corridor linking areas of natural vegetation, which allows for wildlife movement across the landscape
- Cultural values associated with indigenous trade routes and sites of archaeological and cultural significance
- Social values associated with use of the land for purposes other than stock route activities such as horse riding or recreational fishing, providing access corridors linking isolated areas of the state, and benefiting rural communities (DERM 2009).

On the basis of DERM (2010) data, it has been identified that the NGBR Project traverses seven gazetted stock routes as shown on in Figure 3-8 and listed in Table 3-6.

**Table 3-6 Stock route crossings**

| Crossing | Crossing point (Ch) | Lot plan | Description |
|---|---|---|---|
| Road / Stock Crossing (identified gazetted Stock route) | 57.34 km | Lot 13 on SP232519 | Gazettal number U398BOWN05<br>DNRM (Stock Route Management Unit) has governance over the easements which form part of the National Stock Route Network. Local governments should be contacted regarding permits or use of the stock route.<br>WRC road passing through Lot 13 on SP232519. |
| Stock Crossing (identified gazetted Stock route) | 62.77 km | Lot 13 on SP232519 and Lot 504 on 7PH370. | Gazettal number U398BOWN04<br>This stock route lies adjacent to Lot 13 on SP232519 and Lot 504 on 7PH370. |
| Road / Stock Crossing (identified gazetted Stock route) | 79.55 km | Lot 3 on SB236 and Lot 86 on DK154. | Gazettal number U398BOWN04<br>WRC road adjacent to Lot 3 on SB236 and Lot 86 on DK154. |
| Strathmore Road and Stock Crossing | 97.89 km | Lot 3 on SP132678 | Gazettal number U321BOWN01<br>Minor Road (Stock Crossing) |

| Crossing | Crossing point (Ch) | Lot plan | Description |
|---|---|---|---|
| Stock Crossing (identified gazetted Stock route) | 133.32 km | State | Gazettal number U409BOWN02<br>DNRM (Stock Route Management Unit) has governance over the easements which form part of the National Stock Route Network. Local governments should be contacted regarding permits or use of the stock route. |
| Stock Crossing (identified gazetted Stock route) | 186.37 km | Lot 1510 on SP171920 | Gazettal number U403BOWN02<br>DNRM (Stock Route Management Unit) has governance over the easements which form part of the National Stock Route Network. Local governments should be contacted regarding permits or use of the stock route. |
| Stock Crossing (identified gazetted Stock route) | 269.63 km | State | Gazettal number U402BOWN01<br>DNRM (Stock Route Management Unit) has governance over the easements which form part of the National Stock Route Network. Local governments should be contacted regarding permits or use of the stock route. |




LEGEND

- Population Centres
- Major Port
- Highway
- Main Road
- Local Road
- Carmichael Project (Rail)
- Railway
- Watercourse (Major)
- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor
- Local Government Area
- Stock Route
- Stock Route Crossing



1:1,100,000 Paper Size A4

0 9 18 36

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

Job Number 41-26457
Revision A
Date 29 Aug 2013

Stock Routes

Figure 3-9

G:\41\26457\06 GIS\Maps\MXD\0800_Landuse\41_26457_0808_rev_a.mxd

145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com


Data source: GA: Populated Places, Railway, Airports, Watercourse/2007; NGBR Corridor 13/05/2013, NGBR Corridor 06/06/2013, Carmichael Project (Rail) 18/06/2013; DNRM: Roads, Stock Routes/2010. Created by:MS

### 3.5.3 Rail

Rail infrastructure is governed by the TI Act which provides a framework to allow rail transport infrastructure to be constructed, maintained, operated and managed effectively and efficiently.

The closest existing rail freight network within the vicinity of the NGBR Project is Aurizon's Newlands rail network which links the Port of Abbot Point coal terminal to Newlands Junction. The NGBR Project will run along the western extent of the Newlands rail network primarily interacting with this rail service in the northern section of the NGBR Project in the vicinity of the Port of Abbot Point. The Newlands rail network is also linked with the Goonyella rail network which services the Port of Hay Point south of Mackay via the Northern Missing Link (North Goonyella Junction to Newlands Junction) (Aurizon 2013).

The southern section of the NGBR Project will also adjoin the proposed Carmichael Coal Mine and Rail Project's rail infrastructure around Mistake Creek.

The NGBR Project is being proposed as a means of enabling product coal from the Carmichael Mine to be transported directly to the Port of Abbot Point, avoiding the Aurizon Goonyella and Newlands rail systems which are currently constrained (particularly in proximity to Moranbah) and with capacity fully allocated.

In addition to the NGBR Project, the following railway lines are proposed to be developed in the vicinity of, and may cross the NGBR Project:

- GVK-Hancock Prospecting Pty Ltd's proposed Alpha Coal and Rail Project, with the rail component running north-east from the Alpha Mine to the Port of Abbot Point
- Waratah Coal Pty Ltd's China First Project, gazetted as Galilee Coal Project (Northern Export Facility), with the rail component travelling north-east from a new coal mine near Alpha in the Galilee Basin to the Port of Abbot Point.

The rail line proposed by Alpha Coal has received approval and, if constructed, is likely to impact on or be impacted by the NGBR Project. Waratah Coal's proposal is still being assessed. If progressed, it may impact on or be impacted by the NGBR Project.

### 3.5.4 Airports and landing strips

Currently there are four airports located near to the NGBR Project. These airports are the Bowen Airport, Whitsunday Coast Airport, Moranbah Airport and Mackay Airport of which only the Whitsunday Coast Airport, Moranbah Airport and Mackay Airport are able to be serviced by flights from major airports such as Brisbane, Sydney and Townsville. The locations of these airports are shown on (refer to Figure 3-10).

Although Bowen Airport is not currently used by any major airline it does have the capacity for light aircraft and as such a regular service may be possible.

As at 8 July 2013, Whitsunday Coast Airport had approximately three commercial flight arrivals and three departures daily. These direct flights between Whitsunday Coast Airport and Brisbane Domestic Airport are provided by Virgin Australia and Jetstar (Whitsunday Regional Council 2013a).

In comparison, Mackay Airport has a considerably larger number of domestic flights in and out with an average of 20 arrivals and 20 departures daily with Qantas, Virgin Australia, Jetstar and Tiger Airways being the major users of the Mackay Airport (Mackay Airport 2013).

The Moranbah Airport also has a considerable large number of flights in and out with an average of 15 arrivals and 15 departures daily with Qantaslink - Sunstate Airlines and Virgin Australia. The flights operate between Moranbah and Brisbane, Cairns, Townsville and Sunshine Coast.

Further details on airports within the vicinity of the local study area are provided in Volume 1 Chapter 14 Transport.

### 3.5.5 Ports

Existing ports in the vicinity of the NGBR Project are the Ports of Abbot Point, Townsville, Mackay and Hay Point (refer Figure 3-10). All ports are controlled by North Queensland Bulk Ports Corporation with the exception of the Port of Townsville which is controlled by Port of Townsville Limited. The Port of Mackay primarily facilitates the export of sugar and sugar products, grain and petroleum, while the Ports at Abbot Point and Hay Point principally export coal. The Port of Hay Point is one of the largest coal export ports in the world (NQBP 2012). The Port of Townsville is Queensland's third largest multi-commodity port and exports metals, sugar, fertiliser, and molasses (Port of Townsville Limited, 2012).

Port expansion projects are currently being investigated and developed at the Port of Abbot Point, Port of Hay Point and Port of Townsville, including the following on behalf of Adani:

- Abbot Point Coal Terminal 0 (T0) Project, a new initially 35 mtpa and ultimately 70 mtpa Terminal for Adani Abbot Point Terminal Pty Ltd
- Dudgeon Point Coal Terminals Project (a significant (now coordinated) project under the *State Development and Public Works Organisation Act 1971* (SDPWO Act)), 180 mtpa expansion by North Queensland Bulk Ports Corporation for Adani Mining Pty Ltd (90 mtpa) and Dudgeon Point Project Management Pty Ltd (90 mtpa) (Adani Mining 2013).

Further details on ports within the vicinity of the local study area are provided in Volume 1 Chapter 14 Transport.

### 3.5.6 Gas and water

Coal mining activity in the Galilee Basin on the scale being planned requires access to significant quantities of water (DSDIP 2010). It is envisaged that mines will probably access water from various sources including local bores, mine dewatering, surface water harvesting and a new pipeline to existing or new storages (DSDIP 2010).

The NGBR Project intersects one gas pipeline and one water pipeline as follows (refer to Figure 3-11) (Aarvee Associates 2013):

- SunWater Burdekin to Moranbah Pipeline
- North Queensland Underground Gas Pipeline (Energy Infrastructure Management Pty Ltd).

SunWater constructed the Burdekin to Moranbah Pipeline to deliver water from the Gorge Weir on the Burdekin River to mining customers along the pipeline route to Moranbah (SunWater 2013). The NGBR Project alignment traverses the pipeline at chainage 150.7 km.

This pipeline is currently being augmented to reach its maximum capacity to service existing customers (SunWater 2013). However, additional supply is required to meet new customer demands. To meet this nominated supply, SunWater is constructing the Gorge Weir to Byerwen Pipeline to run parallel to the existing pipeline and increase available water pipeline capacity (SunWater 2013).

The North Queensland Gas Pipeline and associated facilities provide coal seam methane gas from the Moranbah fields to Townsville's Yabulu 220 MW combined cycle power station, other industrial customers in the Townsville area and the Moranbah power station. The underground pipeline is intersected by the NGBR Project at chainage 150.77 km (Aarvee Associates 2013).

### 3.5.7 Energy and telecommunications

Ergon Energy is responsible for electricity supply to the Mackay area (under its Distribution Authority) and has identified emerging limitations in the electricity network supplying Moranbah and the surrounding area (Ergon Energy 2011a).

The existing power supply in Moranbah comprises of Powerlink Queensland's T34 Moranbah substation which has three 132/66/11kV transformers supplying Moranbah town and the coal mine customers in the surrounding Bowen Basin coalfields (Ergon Energy 2011a). Ergon Energy owns and operates the 66kV switchyard in T34 Moranbah substation which connects four privately-owned and two Ergon Energy-owned 66kV feeders which supply the coal mines in the area (Ergon Energy 2011a).

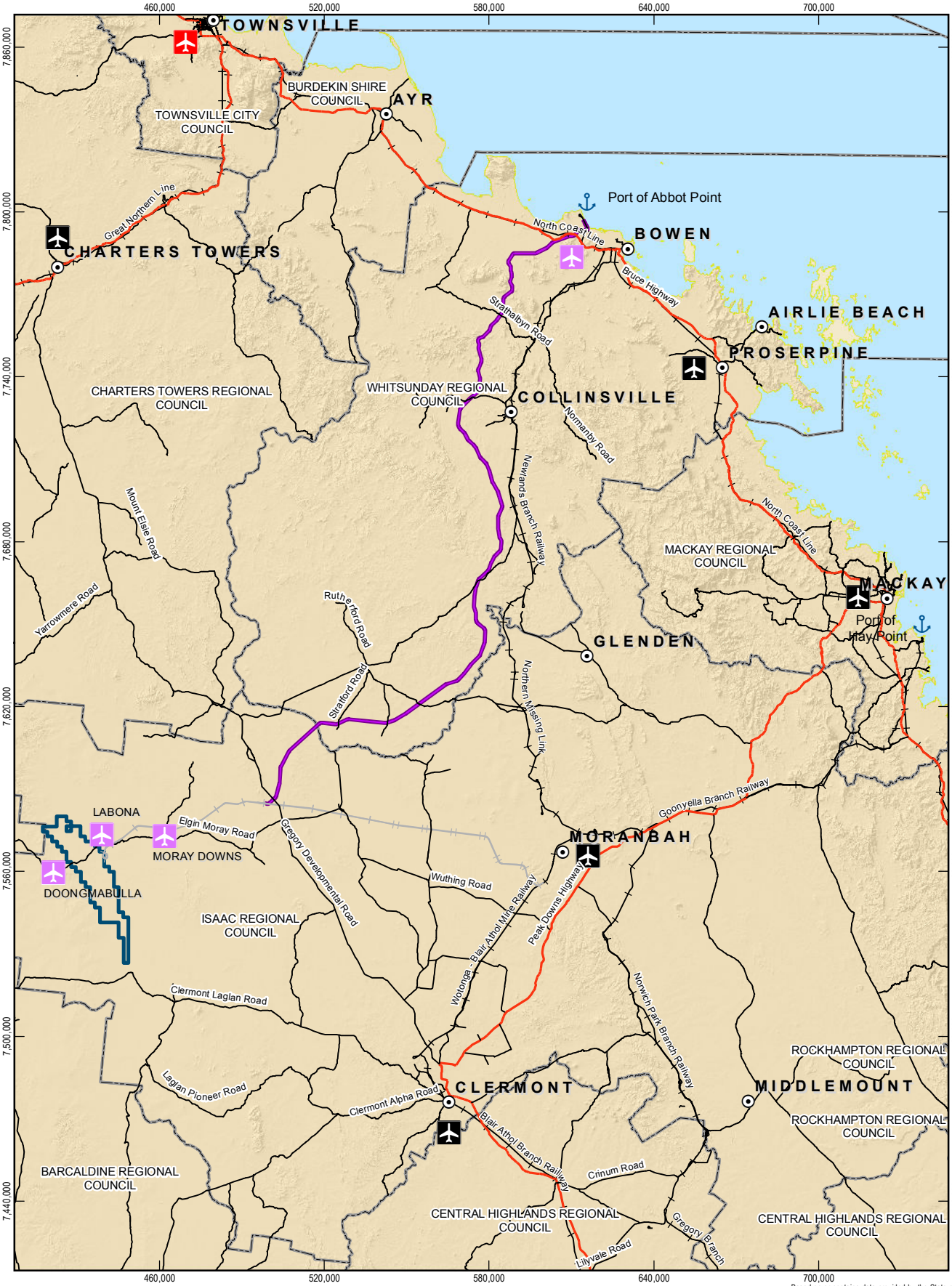
There are a total of 13 power lines (including two high voltage transmission lines) identified that cross the NGBR Project alignment including two high voltage transmission lines (refer to Figure 3-11) (Aarvee Associates 2013):

- Strathmore – Ross power line– 275 kV
- Collinsville – Clare power line– 132 kV.

The increase in electricity demand from the mining industry on the electricity supply network into the Bowen and Galilee Basin areas is expected to result in the need to augment the existing supply network, specifically the network supplying the Moranbah area. A number of new coal mines have requested connection to Ergon Energy's 66 kV network, and many existing coal mine customers have requested increases in their agreed demands (Ergon Energy 2012). Ergon Energy expect that augmentation of the network will be required if reliable supply is to be maintained (Ergon Energy 2012).

Telecommunications and fibre optics services along the NGBR Project final rail corridor include:

- Telstra Telecommunications cable crossing proposed railway at chainage 12.24 km
- Optus Telecommunications cable crossing proposed railway at 12.24 km
- Reef Networks cable crossing proposed railway at chainage 12.24 km (Aarvee Associates 2013).




LEGEND

- Population Centres
- Major Port
- Airport
- International
- Other
- Regional
- Railway
- Local Government Area
- Highway
- Main Road
- Carmichael Project (Rail)
- Carmichael Project (Mine)
- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor



1:2,000,000 Paper Size A4

0 15 30 60

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

| | |
|---|---|
| Job Number | 41-26457 |
| Revision | B |
| Date | 28 Aug 2013 |

Transport Infrastructure

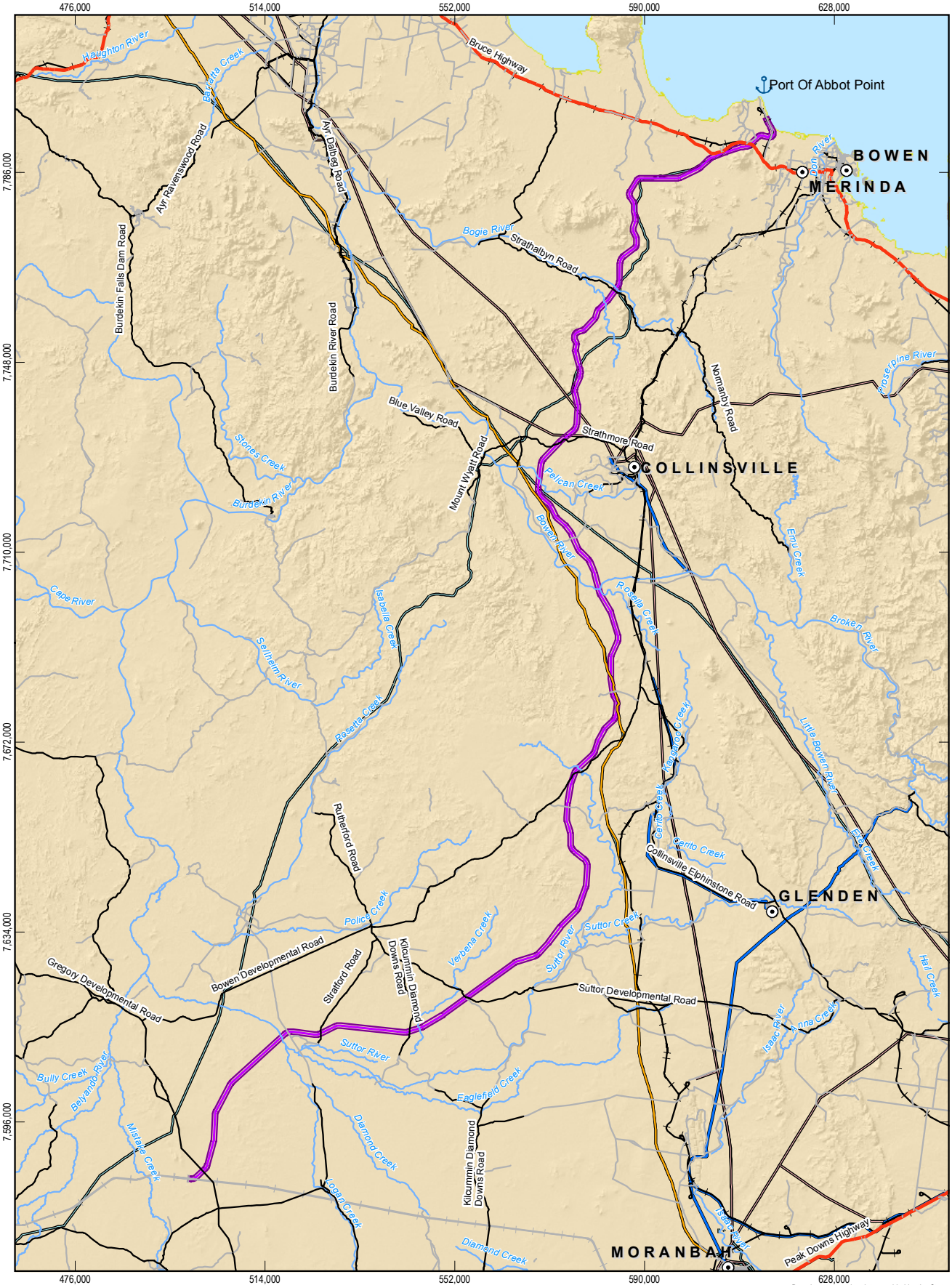
Figure 3-10

G:\41\26457\06 GIS\Maps\MXD\0800_Landuse\41_26457_0807_rev_b.mxd

Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GA: Populated Places, Railway, Airports, Watercourse/2007; NGBR Corridor 13/05/2013, NGBR Corridor 06/06/2013, Carmichael Project (Rail) 18/06/2013; DNRM: Roads, Local Government Areas/2010, Stock Routes/2012; DME: EPC1690 (2010), EPC1080 (2011). Created by:MS




LEGEND

- Population Centres
- Major Port
- Highway
- Main Road
- Local Road
- Carmichael Project (Rail)
- Railway
- Watercourse (Major)
- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor
- Powerlines
- Petroleum Pipelines
- Gas Pipelines
- Water Pipelines



1:1,100,000 Paper Size A4

0 9 18 36

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

Job Number 41-26457
Revision B
Date 28 Aug 2013

Utilities

Figure 3-11

G:\41\26457\06 GIS\Maps\MXD\0800_Landuse\41_26457_0813_rev_a.mxd

145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com


Data source: GA: Water Pipelines/2009, Populated Places, Railway, Airports, Watercourse, Powerlines/2007; NGBR Corridor 13/05/2013, NGBR Corridor 06/06/2013, Carmichael Project (Rail) 18/06/2013; DNRM: Roads/2010; DME: Petroleum Pipelines/2013. Created by:MS

## 3.6 Designated areas

### 3.6.1 Abbot Point State Development Area

Approximately 20 km of the preliminary investigation corridor is located within the APSDA between the southern boundary of the Port of Abbot Point and the south western boundary of the state development area. The NGBR Project falls within the following land use precincts under the *Abbot Point State Development Area Development Scheme 2012*:

- Environmental management/materials transportation precinct
- Industry precinct
- Restricted development precinct
- Infrastructure and corridors precinct.

The NGBR Project is defined as an 'infrastructure facility' under the Development Scheme and is considered to be a use that 'may meet the purpose of the land use designation', and is therefore a consistent use in the above precincts.

The consistency of the NGBR Project with the general intent and purpose of each precinct has been in Volume 1 Chapter 20 Legislation and approvals.

### 3.6.2 Protected areas

The NC Act nominates a protected area as any of the following land uses:

- A national park (scientific)
- A national park
- A national park (recovery)
- A conservation park
- A resources reserve.

Queensland comprises 472 protected areas, including 223 national parks, with a total area of 69,388 km² (DNRSR 2013). Protected areas, forests and marine parks are important for biodiversity conservation and preservation.

The NC Act makes provisions for the management of protected areas. This legislation introduced a range of classes of protected areas, each with a rigid management regime. Two classes being national parks and nature refuges comprise the majority of protected areas in Queensland.

Nature refuges are areas of land voluntarily dedicated and protected for conservation purposes while allowing compatible and sustainable land uses to continue. A nature refuge is to be managed to conserve the area's significant natural and cultural resources and provide for controlled use, taking into account the landholder's interests. However, unlike highly protected national parks, nature refuges remain subject to grazing and or mining land uses.

The NGBR Project preliminary investigation corridor does not intersect any mapped protected area estates. A GIS assessment identified seven protected areas that occur within 10 km of the preliminary investigation corridor, these include three national parks, three nature refuges and one resources reserve (refer to Figure 3-12). The seven protected areas and their locations in relation to the preliminary investigation corridor (from south to north) are:

- Nairana National Park – located approximately 8.5 km west of the preliminary investigation corridor
- Hells Gate Nature Refuge – located approximately nine kilometres west of the preliminary investigation corridor
- Mount Pleasant Nature Refuge – located approximately eight kilometres east of the preliminary investigation corridor
- Aberdeen Nature Refuge – located approximately eight kilometres east of the preliminary investigation corridor
- Mount Aberdeen National Park – located approximately four kilometres southeast of the preliminary investigation corridor
- Mount Abbot National Park – located approximately eight kilometres northwest of the preliminary investigation corridor
- Abbott Bay Resources Reserve – located approximately seven kilometres north of the preliminary investigation corridor.

The location of the protected areas in relation to the preliminary investigation corridor is presented in detail in Volume 1 Chapter 6 Nature conservation.

### 3.6.3 Restricted areas

Restricted areas (RA) can be described as areas of land that have varying conditions and restrictions placed over them. The restrictions vary according to areas, but relate primarily to the nature and type of mining or geothermal activity that may be undertaken in this area. There are a number of reasons as to why land is restricted - this could be for the protection of resources, creation of future urban development and protecting state infrastructure (such as dams and water facilities) (NRM 2013).

The NGBR Project traverses the following restricted areas:

- Restricted area 8 (RA8) Suttor Dam Site
- Restricted area 126 (RA126) Protection of Magnetite Resources.

The Suttor River dam site, defined as RA8 has been identified as affecting the NGBR Project alignment. RA8 was created under the *Mineral Resources Regulation 2003* to preserve an identified dam site for future development. The site is located at the junction of Suttor Creek and Suttor River in the vicinity of Eaglefield. The NBGR Project final rail corridor intersects RA8 between chainage 210.95 km to chainage 204.55 km and chainage 203.00 km to chainage 201.95 km (refer to Figure 3-12).

The Suttor River dam site (RA8) has a nominated referral entity. The nominated referral entities for an application for a mining tenement (other than a prospecting permit relating to the restricted area) are DNRM (Water) and the Department of Energy and Water Supply (DEWS). DNRM (Water) and DEWS are committed to identifying and preserving dam sites that may be required for future development. Consultation with DNRM (Water) and DEWS is required to identify requirements relating to development and location of the NGBR Project final rail corridor within RA8.

RA126 is also defined as a RA under the *Mineral Resources Regulation 2003* to preserve and protect magnetite resources. The restriction on the Abbot Point area as a result of the RA designation is that all mining tenements are prohibited in this area. The NGBR Project final rail corridor intersects RA126 between chainage three kilometres and chainage eight kilometres.

### 3.6.4 Declared water storage catchments

The NGBR Project study area is described based on four dominant catchments, mainly the Suttor River, Bowen River and the Lower Burdekin River catchments within the Burdekin Basin and the Don River catchment that makes up the Don Drainage Basin. The majority of the NGBR Project final rail corridor traverses the Burdekin River Basin.

The NGBR Project does not traverse any declared water storage catchment, but is approximately 15 km distant from the Burdekin Falls Dam declared catchment between approximate chainage 270 km and 300 km. The Peter Faust Dam declared catchment is the next nearest, approximately 50 km distant at approximate chainage 60 km.

### 3.6.5 Key resource areas

Key Resource Areas (KRAs) are extractive resources of State or regional significance as defined in State Planning Policy 2/07 Guideline – Protection of Extractive Resources. “Key resource areas contain the following elements:

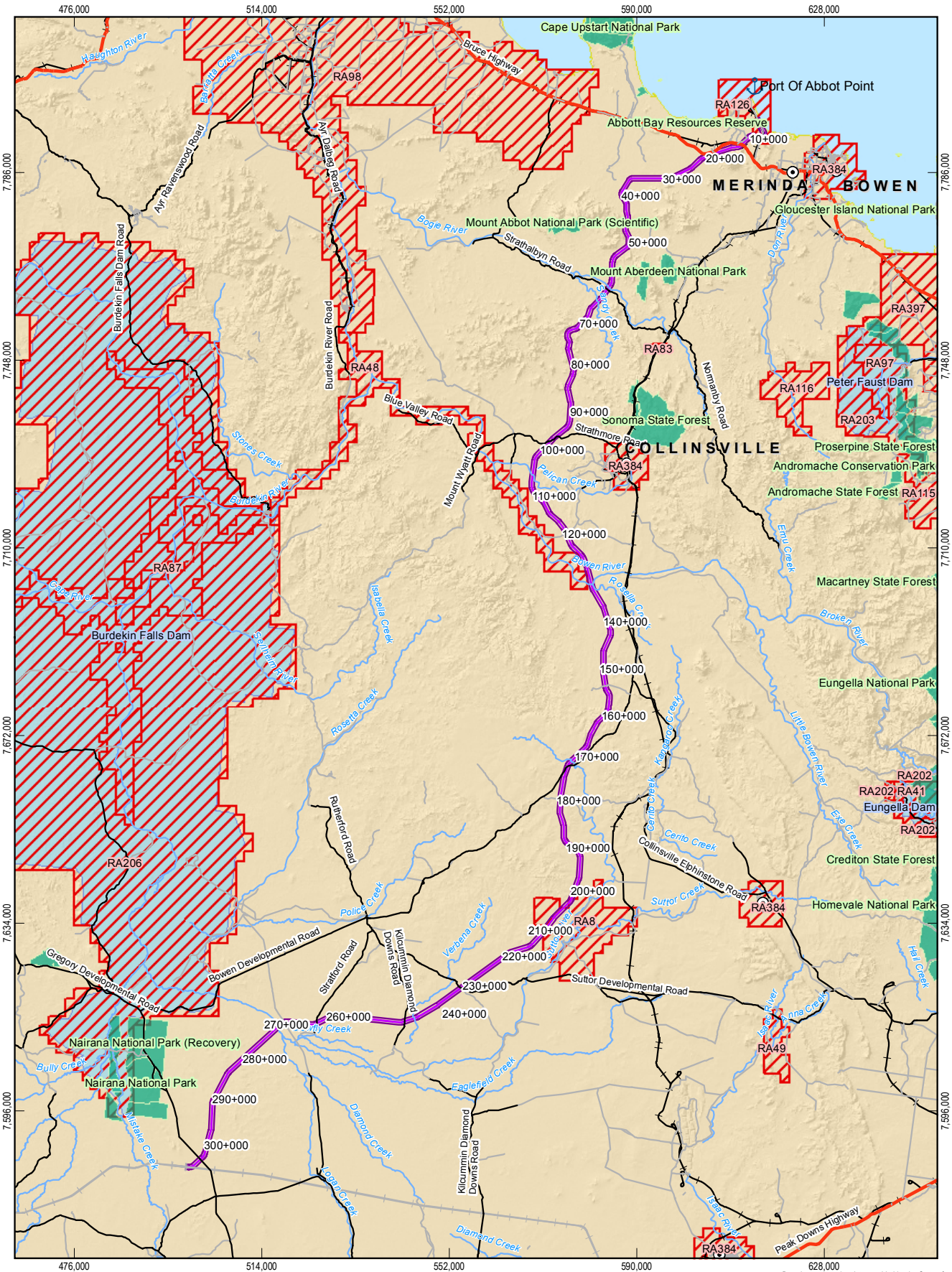
- A resource/processing area
- A separation area
- An associated transport route (which also includes a separation area) where such a link is needed from the resource/processing area to a major road or railway” (Queensland Government 2007).

Development is restricted on KRAs to protect the limited supply of raw construction materials that they contain.

Review of the Queensland Government, Mining and Safety Key Resource Area Maps (2013) identified the following KRAs within the MIW region:

- KRA 26 – Foxdale, Whitsunday Shire
- KRA 23 – The Cedars, Mackay
- KRA 24 – Farleigh, Mackay
- KRA 33 – Waitara, former Nebo Shire
- KRA 37 – West Euri Creek, Bowen.

The closest KRA to the NGBR Project is KRA 37 – West Euri Creek, Bowen, which is located approximately 8.7 km south of the alignment at chainage 14.6 km (refer to Figure 3-3). Assessment indicates that the NGBR Project will not have an impact upon any KRAs.




LEGEND

- Population Centres
- Major Port
- Highway
- Main Road
- Local Road
- Carmichael Project (Rail)
- Railway
- Watercourse (Major)
- Protected Area
- Restricted Areas
- Declared Water Storage Catchment
- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor



1:1,100,000 Paper Size A4

0 9 18 36

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

| | |
|---|---|
| Job Number | 41-26457 |
| Revision | A |
| Date | 30 Aug 2013 |

Designated Areas

Figure 3-12



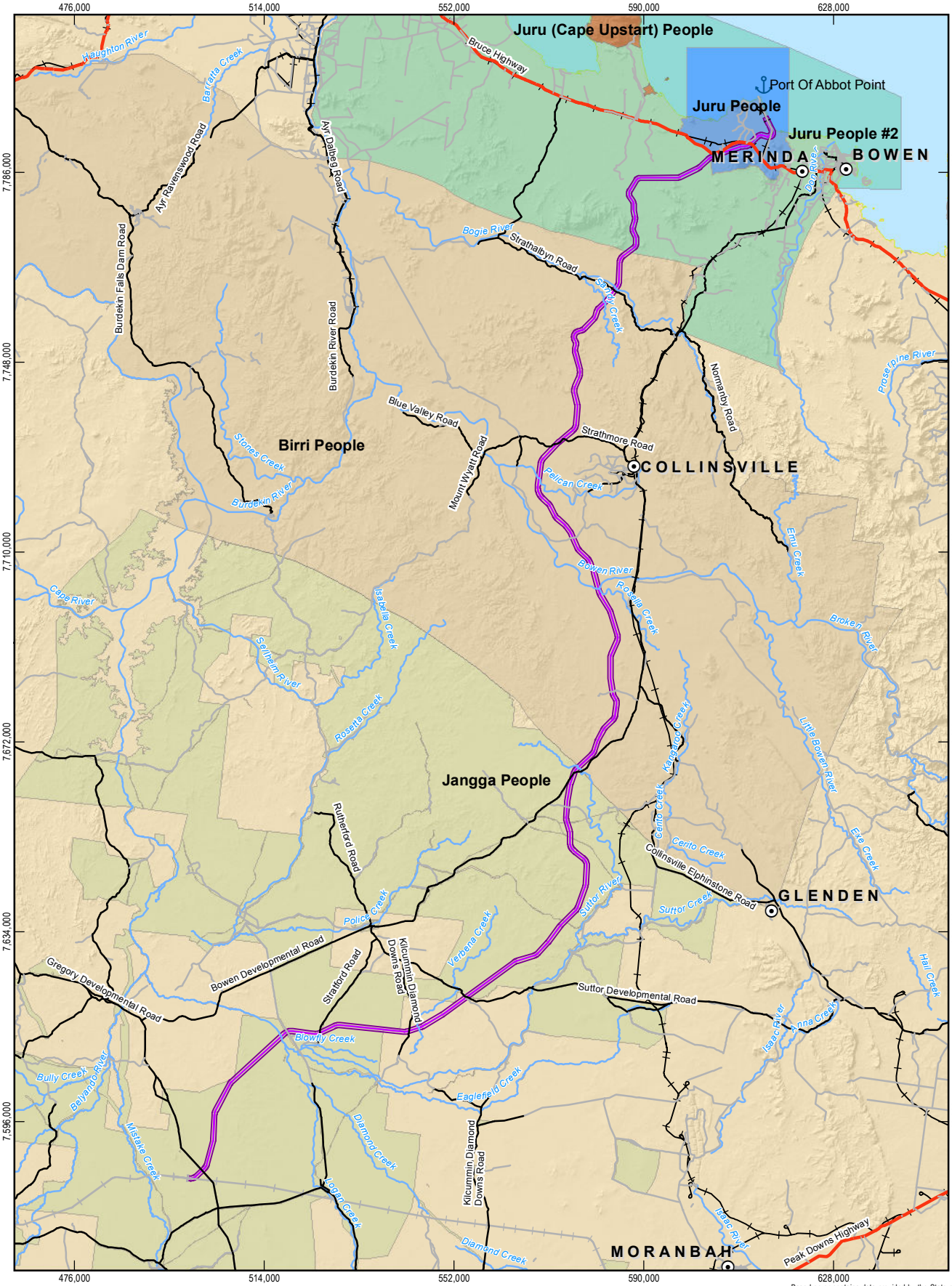
Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GA: Populated Places, Railway, Airports, Watercourse/2007; NGBR Corridor 13/05/2013, NGBR Corridor 06/06/2013, Carmichael Project (Rail) 18/06/2013; DNRM: Roads/2010, Declared Water Storage Catchments/2010, Protected Areas/2012; DME: Restricted Area/2013. Created by:MS

# 4. Native title

*The Native Title Act 1993* (NT Act) recognises the rights and interests of Indigenous people under their traditional laws and customs. A native title search has been undertaken on properties potentially impacted by the preliminary investigative corridor. The search indicated that part of the preliminary investigation corridor is located within the external boundaries of the Jangga People (QUD6230/98, QC98/10), Birri People (QUD6244/1998, QC98/12), Juru People (QUD554/2010, QC10/5) and Juru People No.2 (QUD07/2012, QC12/1) registered native title claims. Adani is in discussions with the Jangga People regarding the Carmichael Coal Mine and Rail Project and the NGBR Project (refer to Figure 4-1) (Adani Mining 2013). Indigenous Land Use Agreements and extinguishment assessments will be progressed with all relevant native title claimants. Adani will continue to engage with the Jangga, Birri, Juru People, and Juru People No. 2 and any others as identified (Adani Mining 2013).




LEGEND

- Population Centres
- Major Port
- Highway
- Main Road
- Local Road
- Carmichael Project (Rail)
- Railway
- Watercourse (Major)
- Native Title Claim
- Barada Barna People
- Birri People
- Juru People
- Juru People #2
- Jangga People
- Juru (Cape Upstart) People
- North Galilee Basin Rail 1000m Corridor
- North Galilee Basin Rail 100m Corridor



1:1,100,000 Paper Size A4

0 9 18 36

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

**Adani Mining Pty Ltd**
North Galilee Basin Rail Project

| | |
|---|---|
| Job Number | 41-26457 |
| Revision | A |
| Date | 29 Aug 2013 |

Native Title Claims

Figure 4-1



Level 9, 145 Ann Street Brisbane QLD 4000 Australia T 61 7 3316 3000 F 61 7 3316 3333 E bnemail@ghd.com W www.ghd.com



Data source: GA: Populated Places, Railway, Airports, Watercourse/2007; NGBR Corridor 13/05/2013, NGBR Corridor 06/06/2013, Carmichael Project (Rail) 18/06/2013; DNRM: Roads/2010; NNTT: Native Title Claims/2013. Created by:MS

# 5. Key findings

This report has been prepared to gain an understanding of the existing environment of the NGBR Project and to determine the potential impacts of the NGBR Project on the land use and tenure.

The NGBR Project traverses a total of 64 properties comprising of:

- 27 leasehold lots
- 36 freehold lots
- One lot deemed to be 'Unallocated State Land'.

The NGBR Project traverses tenements comprising exploration permits for coal (EPCs), exploration permits for minerals (EPMs), an exploration permit for petroleum (EPP) and a petroleum pipeline licence (PPL). However, the NGBR Project is not expected to cross any mining lease or mineral development licence areas.

The extent of the land through which the NGBR Project traverses is classified as production from relatively natural environments. Land use in the study area is predominantly for the purposes of cattle breeding and fattening. Limited areas are defined as being for the purposes of cattle fattening only and grains and cattle fattening.

The NGBR Project area is sparsely populated with the final rail corridor avoiding close contact with potential sensitive receptor locations. A total of 23 homesteads were identified within 10 km of the NGBR Project. The closest potentially sensitive receptor to the NGBR Project final rail corridor is Stratford Homestead formerly known as Lot 3821 on PH1304, located approximately one kilometre from the NGBR Project. Nine of the homesteads are within three kilometres of the final rail corridor.

A total of 20 public roads and road reserves are likely to be intersected by the NGBR Project, of which four are considered major roads (State-controlled roads) and 11 are minor roads (local roads), one is a private road owned by NQBP (crossed at three locations), and four are road reserves. Seven stock routes are crossed, three of which are shared public road access crossings. The alignment also traverses the Bicentennial National Trail - a long distance, multi-use recreational trekking route.

The NGBR Project traverses a number of existing utilities including one gas pipeline and one water pipeline, three telecommunications cables and 13 power lines (including two high voltage transmission lines) (Aarvee Associates 2013).

The NGBR Project preliminary investigation corridor does not intersect any mapped protected area estates. A GIS assessment identified seven protected areas that occur within 10 km of the preliminary investigation corridor, including three national parks, three nature refuges and one resources reserve.

The NGBR Project crosses the Suttor River dam site, a restricted area, between chainage 210.95 km to chainage 204.55 km and chainage 203.00 km to chainage 201.95 km. The NGBR Project does not traverse any declared water storage catchment, but is approximately 15 km distant from the Burdekin Falls Dam declared catchment between approximate chainage 270 km and 300 km.

The NGBR Project is located within the external boundaries of the Jangga People (QUD6230/98, QC98/10), Birri People (QUD6244/1998, QC98/12), Juru People (QUD554/2010, QC10/5) and Juru People No.2 (QUD07/2012, QC12/1) registered native title claims.

# 6. References

Aarvee Associates. 2013. North Galilee Basin Rail Concept Design Report, Draft Report –June 2013 prepared for Adani Mining Pty Ltd

Adani Mining Pty Ltd (Adani Mining), 2013, North Galilee Basin Rail Initial Advice Statement.

Aurizon, 2013, Newlands System Overview. Available from: http://www.aurizon.com.au/NETWORKSERVICES/RAILNETWORK/Pages/NewlandsSystem.aspx (Accessed 20/05/2013)

Australian Bureau of Statistics. 2012. Census of Population and Housing, 2011 Census, Basic Community Profile

Bicentennial National Trail (BNT), 2013, Bicentennial National Trail – About the Trail. Available from: http://www.bicentennialnationaltrail.com.au/about/history/ (Accessed at 21/06/2013)

Department of Environment and Resource Management (DERM), 2009, Queensland stock route network management strategy. Available from: http://www.nrm.qld.gov.au/land/stockroutes/pdf/stockroute_strategy_09_14.pdf (Accessed 15/06/2013)

Department of Local Government and Planning (DLGP), 2012, Mackay, Isaac and Whitsunday Regional Plan. Available from: http://www.parliament.qld.gov.au/Documents/TableOffice/TabledPapers/2012/5312T6545.pdf (Accessed 15/06/2013)

Department of Natural Resources and Mines (DNRM), 2013, Key resource area (KRA) maps. Available from: http://mines.industry.qld.gov.au/mining/key-resource-area-maps.htm (Accessed 03/07/2011).

Department of Primary Industries (DPI) and Department of Housing, Local Government and Planning (DHLGP), 1993, Planning Guidelines – the identification of Good Quality Agricultural Land. Available from: http://www.dsdip.qld.gov.au/resources/policy/plng-guide-identif-ag-land.pdf (Accessed 15/06/2013)

Department of State Development, Infrastructure and Planning, 2011, Mackay, Isaac and Whitsunday State Planning Regulatory Provisions. Available from: http://www.dlgp.qld.gov.au/resources/plan/miw/draft-plan/draft-miw-sprp.pdf. (Accessed 20/05/2013)

Dight I. 2009. Burdekin Water Quality Improvement Plan Catchment Atlas. NQ dry tropics, Townsville.

Ergon Energy, 2011a, Moranbah Request for Information. Available from: http://www.ergon.com.au/__data/assets/pdf_file/0003/26193/Moranbah-Area-Request-for-Information.pdf (Accessed 20/05/2013)

Ergon Energy, 2011b, Final Report, Proposed establishment of a new 66/11kV substation at Moranbah. Available from: http://www.ergon.com.au/__data/assets/pdf_file/0020/61517/Moranbah-Final-Report.pdf (Accessed 20/05/2013)

Ergon Energy, 2012, Network Management Plan Part B: Electrical Supply for Regional Queensland 2012/2013 to 2016/2017. Available from:

http://www.ergon.com.au/__data/assets/pdf_file/0010/6787/NMP-2012-17-Part-B-FINAL.pdf (Accessed 20/05/2013)

GHD, 2012, Carmichael Coal Mine and Rail - Draft Environmental Impact Statement.

Isaac Regional Council 2008, Planning Scheme for Belyando Shire, Available from http://www.isaac.qld.gov.au/c/document_library/get_file?p_l_id=6365991&folderId=6366321&name=DLFE-53014.pdf. (Accessed 20/05/2013)

Mackay Airport, 2013, Mackay Airport. Available from: http://mackayairport.com/default.aspx (Accessed 20/05/2013)

Natural Resources and Mines (DNRM), 2013, The Queensland Stock Route Network. Available from: http://www.nrm.qld.gov.au/land/stockroutes/#stock_routes_roads (Accessed 20/05/2013)

North Queensland Bulk Ports (NQBP), 2010, Port of Abbot Point Land Use Plan, North Queensland Bulk Ports Corporation Limited, Brisbane, Available from: http://www.nqbp.com.au/wp-content/uploads/2012/04/PortofAbbotPointLandUsePlan.pdf (Accessed 09/07/2013)

North Queensland Bulk Ports (NQBP), 2012. Explore our Ports. Available from: http://www.nqbp.com.au/ (Accessed 20/05/2013)

Office of Economic and Statistical Research (OESR). 2012. Queensland Regional Profiles: Central Highlands, Charters Towers, Isaac, Townsville, Mackay and Whitsunday Regions based on local government area. Available from www.oesr.qld.gov.au [2011 preliminary Census data]

Queensland Government, 2007. *State Planning Policy 2/07 Guideline – Protection of Extractive Resources*. Available from: http://mines.industry.qld.gov.au/assets/land-tenure-pdf/dme_stateplan_guideline.pdf (Accessed 9/07/2013)

Queensland Government, Department of Mines and Energy, 2011, Mining Tenement Data Layer.

Queensland Government 2010, Strategic cropping land Policy and planning framework Discussion paper, Department of Infrastructure and Planning

Queensland Government 2012, Abbot Point State Development Area Development Scheme, Available from http://www.dsdip.qld.gov.au/resources/plan/cg/abbot/abbot-point-sda-development-scheme.pdf. (Accessed 20/05/2013)

Queensland Government 2013, A guide to Land Tenure Under the Land Act 1994, State Land Administration of State Land Asset Management, Operational Support, Department of Natural Resources and Mines

Queensland Places .2013. Available from http://queenslandplaces.com.au (Accessed 20/05/2013)

Stock Route Network Management Bill 2011. Queensland Government. Available from: http://www.legislation.qld.gov.au/Bills/53PDF/2011/StockRouteB11.pdf.

SunWater, 2013, Gorge Weir to Byerwen Pipeline. Available from: http://www.sunwater.com.au/future-developments/gorge-weir-to-byerwen-pipeline/overview

Sustainable Planning Act 2009. Queensland Government. Available from: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/S/SustPlanA09.pdf.

Sustainable Planning Regulation 2009. Queensland Government. Available from: http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/S/SustPlanR09.pdf.

Whitsunday Regional Council 2006, Bowen Shire Council Planning Scheme 2006, Available from http://www.whitsunday.qld.gov.au/c/document_library/get_file?uuid=0e564b25-4dea-452a-824f-aaff3bf63d82&groupId=800153. (Accessed 15/06/2013)

Whitsunday Regional Council, 2013a, Aerodromes. Available from: http://www.whitsunday.qld.gov.au/aerodromes (Accessed 15/06/2013)

Whitsunday Regional Council, 2013b, History of Collinsville. Available from: http://www.whitsunday.qld.gov.au/history-of-collinsville (Accessed 15/06/2013)

# Appendices

# **Appendix A** - NGBR Optimisation Study

# NGBR Optimisation Study

(Northern Section Option 6 Revision 2)

# Havilah / Birralee Study

September 2013

# TABLE OF CONTENTS

1 Executive Summary ..... 1
2 Introduction ..... 6
3 Regional Geology ..... 10
3.1 Local Geology ..... 12
4 Exploration History ..... 14
5 Historic Data Review ..... 16
5.1 EPC2 ..... 16
5.2 EPC14 ..... 18
5.3 EPC44 ..... 20
5.4 EPC61 ..... 25
5.5 EPC120 ..... 27
5.6 EPC186 ..... 29
5.7 EPC253 ..... 31
5.8 EPC521 ..... 33
5.9 EPC586 ..... 36
5.10 EPC639 ..... 38
5.11 EPC773 ..... 40
6 Conclusions ..... 42
7 Bibliography ..... 47

# LIST OF TABLES

Table 1.1 – Ranking of Study Area Current EPC's ..... 1
Table 2.1 – Study Area Tenement Owners ..... 6
Table 4.1 - Exploration History within the Collinsville District ..... 14
Table 6.1 – Subset of EPC253 holes upon and within 500m of the proposed NGBR ..... 43
Table 6.2 – Ranking of Study Area Current EPC's ..... 45

# LIST OF FIGURES

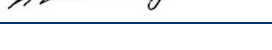
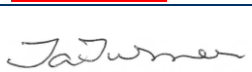
Figure 1.1 – Current EPCs Regional Geology and Potential Resource Areas ..... 4
Figure 1.2 – Current EPCs, ML's and MLAs ..... 5
Figure 2.1 – Current EPCs under the proposed NGBR ..... 8
Figure 2.2 – Regional Historic Drilling Information ..... 9
Figure 3.1 – Regional Geology of Queensland encountered in the NGBR ..... 11
Figure 3.2 – Stratigraphy of the Northern Bowen Basin ..... 12
Figure 5.1 – Historic EPC 2 Coverage of Current EPCs ..... 16
Figure 5.2 – Historic EPC 14 Coverage of Current EPCs ..... 18
Figure 5.3 – Historic EPC 44 Coverage of Current EPCs ..... 20
Figure 5.4 – Sample of R.D.H Holes proximal to Proposed NGBR Corridor ..... 22
Figure 5.5 –R.D.H Holes E Series Graphic Logs ..... 23
Figure 5.6 –R.D.H Holes F Series Graphic Logs ..... 24
Figure 5.7 – Historic EPC 61 Coverage of Current EPCs ..... 25
Figure 5.8 – Historic EPC 120 Coverage of Current EPCs ..... 27
Figure 5.9 – Historic EPC 186 Coverage of Current EPCs ..... 29
Figure 5.10 – Historic EPC 253 Coverage of Current EPCs ..... 31
Figure 5.11 – Historic EPC 521 Coverage of Current EPCs ..... 33
Figure 5.12 – Historic EPC 586 Coverage of Current EPCs ..... 36
Figure 5.13 – Historic EPC 639 Coverage of Current EPCs ..... 38
Figure 5.14 – Historic EPC 773 Coverage of Current EPCs ..... 40
Figure 6.1 – Havilah / Birralee Regional Geology ..... 44

# LIST OF APPENDICES

Appendix A. Drilling Information ..... 48

# Document Issue Approval

| Project & Document No: | Date: |
|---|---|
| Adani Mining Ltd NGBR Project | 11/09/2013 |
| **Title:** | **Revision No:** |
| NGBR- Option 6 Version 2: Havilah / Birralee Study | Draft |
| **Client:** | |
| Adani Mining Ltd | |

| | Name | Position | Signature | Date |
|---|---|---|---|---|
| **Prepared by:** | Martin Longland | Senior Geologist |  | 11/09/2013 |
| **Reviewed by:** | Brooke Davis | Coal Geologist |  | 11/09/2013 |
| **Approved by:** | Troy Turner | Manager Resource Development |  | 11/09/2013 |

# Distribution

| Organisation | Attention | No of hard copies | No of electronic copies | Actioned[1] |
|---|---|---|---|---|
| Adani Mining Ltd | Vinay Panday | 0 | 1 | |

1 – To be initialed and dated by the person who actions the issue of the documents.

# 1 EXECUTIVE SUMMARY

Xenith Consulting (Xenith) were commissioned by Adani Mining Ltd (Adani) to review all available information relating to the portion of their proposed option 6, revision 2: North Galilee Basin Rail (NGBR) corridor, with width of 100m, that traverses the Havilah and Birralee cattle properties in Central Queensland. The Havilah and Birralee 2 (south of Bowen River) properties are currently under the Joint Venture ownership of Sumisho Coal Australia, Itochu Coal Resources Australia, ICRA NCA, and Glencorp Coal Queensland. Birralee 1 (north of Bowen River) is under the ownership of Captain Nominees Pty Ltd. The focus of this study is restricted to the Exploration Permits for Coal (EPC) that lay within the study area.

As part of this study, Xenith undertook and internal ranking of the potential coal resource sterilisation, on tenements that lie within the Havilah and Birralee segment of the proposed NGBR. The ranking is according to increasing potential for coal resource and also evaluates the amount of tenure area effectively sterilised by the proposed NGBR corridor (Table 1.1) (Figure 1.1).

**Table 1.1 – Ranking of Study Area Current EPC's**

| Potential Resource Ranking | Current EPC Holders | Summary Comments |
|---|---|---|
| Mid - Low | EPC639 Pelican Creek Coal Pty | • The proposed NGBR traverses the eastern margin of the southern sub blocks of this tenure and within the Fort Cooper Coal Measures (FCCM) an accumulation of thin seams and tuffaceous interbeds.<br>• The potential for a small resource may exist within Moranbah Coal Measures (MCM), towards the western margin of these southern sub blocks and near the tenements' boundary with EPC586 and away from the proposed NGBR.<br>• The proposed NGBR traverses approximately 40ha (~4km of rail 100m wide) of the 1900ha associated with this southern sub block area.<br>• Within the southern sub blocks of EPC639 the proposed NGBR potentially overlies 1.2Mt of FCCM, assuming approximately 2m of cumulative coal at approximately 30m depth. A further 3m intersection of interbedded slightly heat affected coal and mudstone occurs at approximately 70m depth which could increase the coal tonnes to approximately 3.0Mt. |
| Mid – Low | EPC586 Bowen River Coal Pty Ltd | • The proposed NGBR traverses the northern extremity of the central sub blocks of this tenement.<br>• Historic drilling suggests that the more prospective area of the EPC is associated with the northern sub blocks away from the proposed NGBR, north of the Bowen River underlying the Drake Coal Project.<br>• Approximately 60 ha of the 7000ha central sub block area underlies the proposed NGBR corridor.<br>• Within the central sub block of the EPC the proposed NGBR potentially overlies 0.7Mt of intruded MCM at 20 to 30m (30ha at 1.5m thick coal) and a further 1.3Mt of slightly heat affected interbedded FCCM at 40m (30ha at 3m thick coal) in the south of the area.<br>• The MCM intersected in the historic drilling under the proposed NGBR has been largely intruded and the surrounding coal, heat affected. |

| | | |
|---|---|---|
| Mid - Low | EPC768 Rosella Creek Coal Pty Ltd | • EPC 768 is in three parts and is the EPC most traversed by the proposed NGBR. The proposed NGBR encompasses approximately 220ha of the total 12200ha associated with the EPC<br>• The southern extension of the EPC is underlain by the FCCM. The proposed NGBR potentially overlies 6.3Mt of interbedded mudstones and coal (140ha of ~3m thick coal at 70m in the north to 178m depth in the south).<br>• The central portion is underlain by MCM that have been predominately heat affected or interbedded. The proposed NGBR potentially overlies 0.4Mt of intruded and heat affected coal (20ha of ~1.5m thick coal at 20m).<br>• The northern portion of the EPC is underlain by CCM a hole drilled for EPC773 that lies 1 km to the south of EPC768 which penetrated the basement without intersecting coal. A further two holes drilled to the west intersected heavily intruded, heat affected coal seam within the CCM. The proposed NGBR potentially overlies approximately 2.7Mt of intruded and heat affected coal at depth (60ha of ~3m of cumulative coal at greater than 120m).<br>• Exploration data from the year 2000 onwards is not in the public domain and therefore an assessment of potential is difficult to establish. |
| Low | EPC773 Glencore Coal Queensland Pty Ltd | • The proposed NGBR traverses the central portion of the EPC and was explored for the southern extension of the Collinsville Coal Measures (CCM).<br>• Exploration within the historic relinquished portions of the EPC suggested that the basement material is shallower than expected and or that the extent of the intrusions were increasing to the south.<br>• Further exploration work was needed to target the extent of the intrusions and assess the structural controls on the CCM within the EPC<br>• The Majority of the EPC overlies the less prospective Blenheim and Exmoor Formations.<br>• Information indicates the corridor does not appear to contain likely economic coal. |
| Very Low | EPC1320 (1321) North Coal Pty Ltd | • Several sub blocks dispersed throughout area that were relinquished sub blocks from historic EPC's.<br>• The proposed NGBR traverses only one sub block area of EPC1320, that which sits between EPC739 and EPC 768. Which was historically relinquished on the basis of hosting inferior coal seams of the FCCM<br>• The proposed NGBR traverses only one sub block area of EPC1321, that which overlies the Bowen River portion of the potential NGBR and within the less prospective Exmoor Formation.<br>• Information indicates the corridor does not appear to contain likely economic coal. |
| Very Low | EPC739 Byerwen Coal Pty Ltd | • The proposed NGBR traverses the north western corner of EPC. The historic focus for exploration within the EPC was towards the south and east and away from proposed NGBR<br>• Historic sub blocks immediately to the north were relinquished on the basis of hosting inferior coal seams of the FCCM<br>• Information indicates the corridor does not appear to contain likely economic coal. |

The study area has been variously explored by numerous parties since the 1860's. Historic exploration has included but not been limited to photo geological studies, several mapping and field truthing programs and numerous drilling campaigns. Historic data exists for over 700 drillholes that include fully cored, partially cored and chip sampling. Not all drilling was sampled and or included associated down hole, geophysics but data exists for a number of samples taken throughout the various campaigns.

A summary of the historical literature intimates, that where coal exists it is either heat affected or thin and of poor quality. There have been a few noted intersections of coal of between 1 and 2m thickness within 100m from surface, however it was difficult to assess the lateral continuity in the east west direction which may be indicative of faulting or steeply dipping beds.

The majority of historic relinquishments were based on findings from the Mount Isa Mining Holdings Company Ltd (MIM Holdings), now fully owned by Glencore Xstrata PLC (Glencore) EPC253 exploration campaigns that began in the late 1970's and continued until the present. Many historic reports and the NGBR Havilah / Birralee Impact Study, reviewed the data from the Glencore drilling and made estimations of the coal resource potential. A subset of this drilling campaign that lay directly under the proposed NGBR corridor has been summarised for this study and the coal was generally found to be either heat affected, intruded and seams were thin and interbedded.

It is important to note that the majority of the historic relinquishments were based on historic assumptions that coal would be either too expensive or too difficult to extract from the intruded, thin seam or interbedded material. Future mining and processing techniques may alleviate some of these historical economic issues. However, what was not evident from the historic analysis was the degree to which the material was coked / cindered. An interpretation of the extents of the various intrusions was not undertaken as was the effect of faulting on the resource extents. It is possible that recent exploration has been able to define the intrusions and structural controls more effectively.

Historic exploration was generally focussed on near surface opencut resources within the Moranbah Coal Measures and Collinsville Coal Measures; it may be possible that there is potential for a deeper coal resource that could be accessed by underground mining methods or potential for mining within the Fort Cooper Coal Measures. It is our opinion that the impact of the NGBR on any potential future underground mining operation would be limited.

The current Mining Lease (ML) and Mining Lease applications (MLa's) and subsequently the significant coal resources, within the Collinsville region clearly lie to the east and south of the proposed NGBR corridor (Figure 1.2). The NGBR corridor as proposed is shown to stand off at a significant distance from these more prospective ML's / MLa's to mitigate any potential impacts.

The information in this report was derived from data in the public domain, any further estimate on the potential sterilised coal would require access to company data and documentation. The value of the potential sterilised coal would then be assessed by a conceptual mining plan and the economics associated with that analysis.

**Figure 1.1 – Current EPCs and Regional Geology of the Study Area**

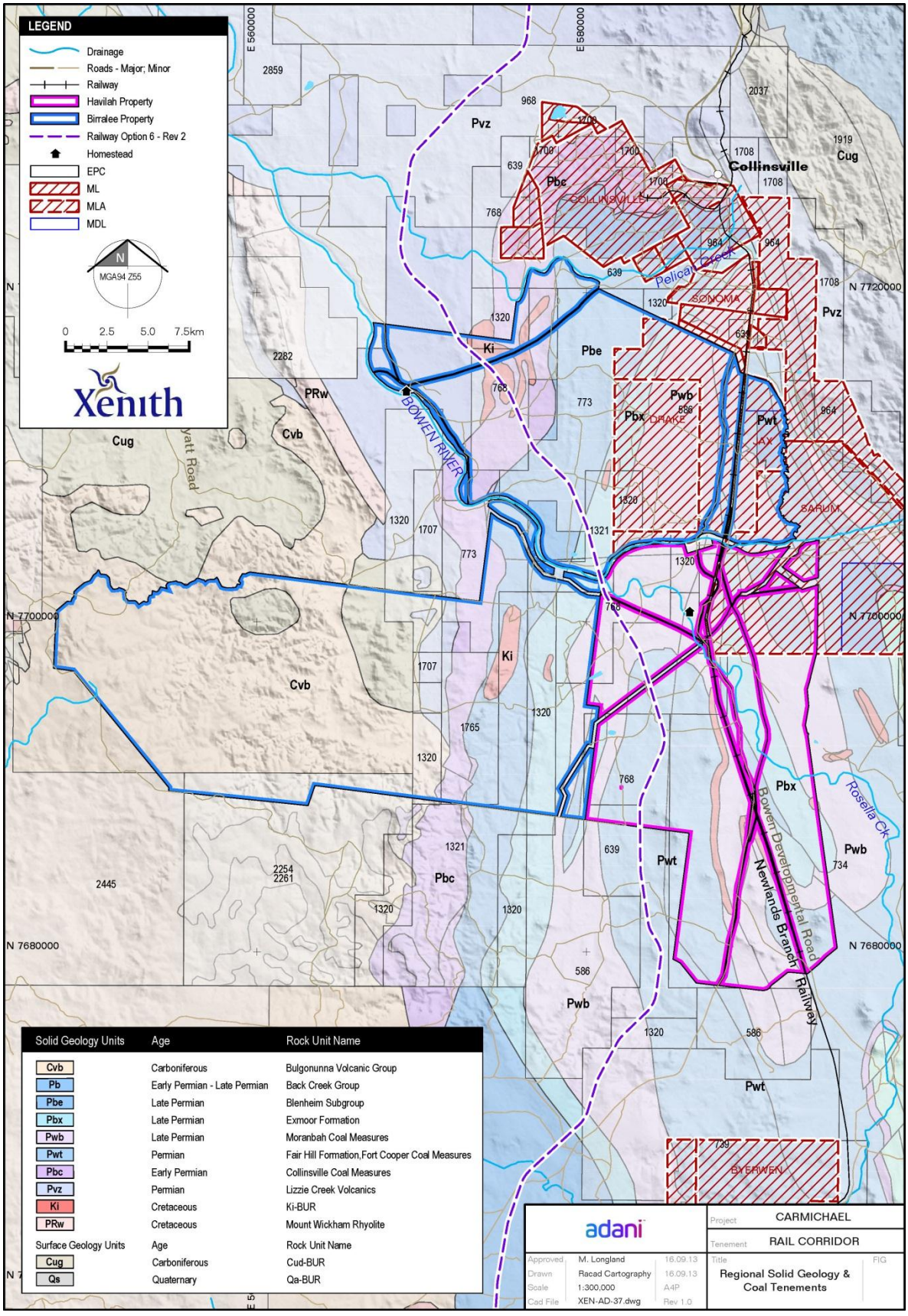
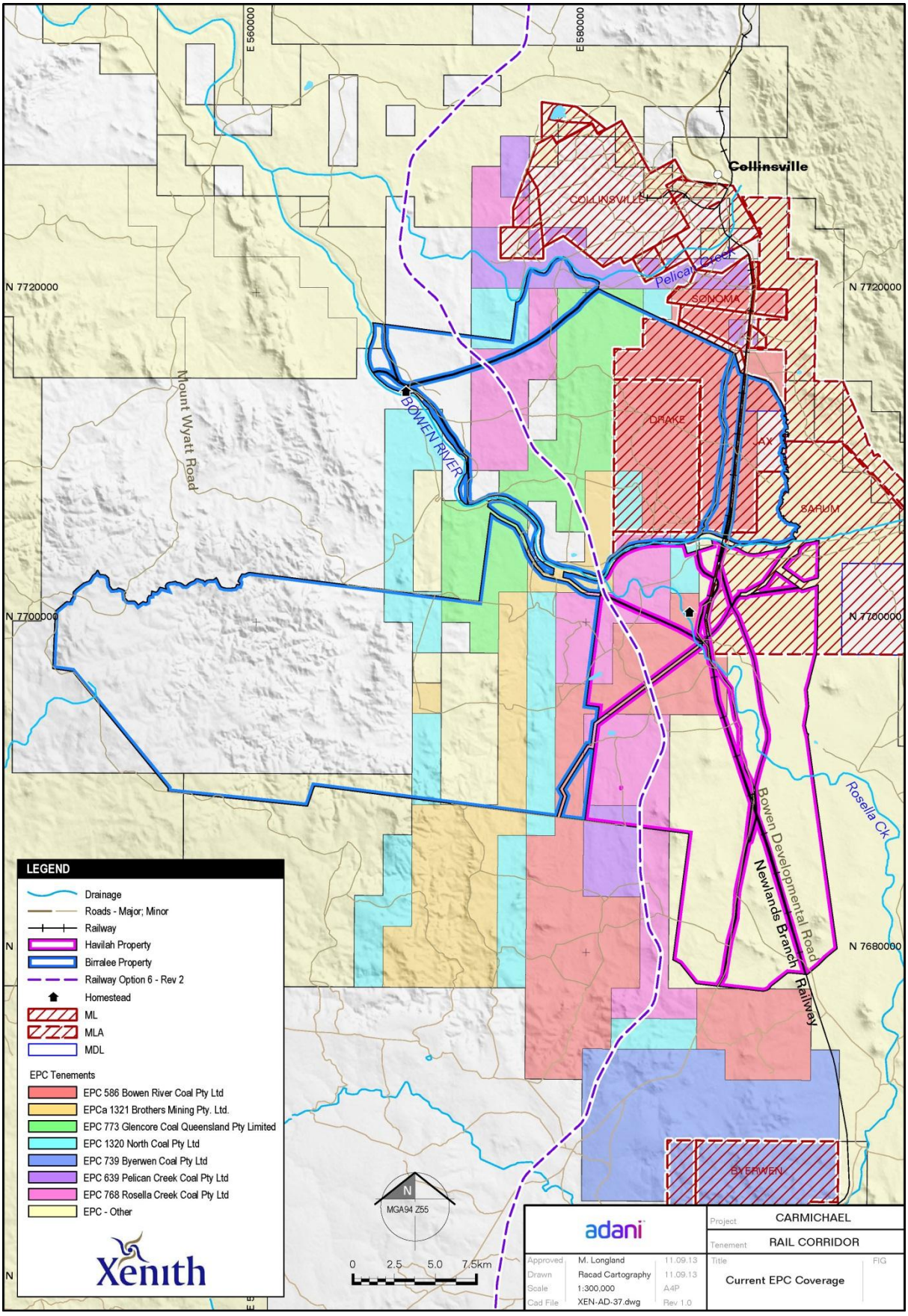


**Figure 1.2 – Current EPCs, ML's and MLAs**



# 2 INTRODUCTION

Xenith were commissioned by Adani to review all available information relating to the portion of their proposed NGBR corridor that traverses the Havilah and Birralee cattle properties in Queensland. The Havilah and Birralee cattle properties occur approximately 10km southwest of Collinsville, Queensland and extend for approximately 40km to the south and southwest. These properties form the study area for this report. The NGBR is the preferred rail alignment that will link the Adani – Carmichael Coal Project in the Galilee Basin to the port facility near Abbot Point, north of the Queensland town of Bowen.

**Table 2.1 – Study Area Property Owners**

| Property | Lot Plan | Owner | Tenure Type |
|---|---|---|---|
| Birralee Property 2 | L2 DK232 | SUMISHO COAL AUSTRALIA PTY LIMITED<br>ITOCHU COAL RESOURCES AUSTRALIA PTY LTD<br>ICRA NCA PTY LIMITED<br>GLENCORP COAL QUEENSLAND PTY LIMITED<br>GLENCORP COAL QUEENSLAND PTY LIMITED (TTE) | Leasehold [Rental] |
| Birralee Property 1 | L618 PH2106 | CAPTAIN NOMINEES PTY LTD | Leasehold [Rental] |
| Havilah Property | L62 SP195387 | SUMISHO COAL AUSTRALIA PTY LIMITED<br>ITOCHU COAL RESOURCES AUSTRALIA PTY LTD<br>ICRA NCA PTY LIMITED<br>GLENCORP COAL QUEENSLAND PTY LIMITED<br>GLENCORP COAL QUEENSLAND PTY LIMITED (TTE) | Leasehold [Rental] |

The proposed NGBR traverses a number of EPC's within the Havilah and Birralee area see Table 2.1 below (Figure 2.1).

**Table 2.2 – Study Area Tenement Owners**

| Current EPC and EPCa Holders | Expiry Date |
|---|---|
| EPC768 Rosella Creek Coal Pty Ltd | 28th March 2015 |
| EPC1320 (1321) North Coal Pty Ltd | 22nd December 2015 |
| EPC586 Bowen River Coal Pty Ltd | 27th November 2014 |
| EPC739 Byerwen Coal Pty Ltd | 24th November 2014 |
| EPC639 Pelican Creek Coal Pty | 11th December 2013 |
| EPC773 Glencore Coal Queensland Pty Ltd | 5th March 2018 |

All available literature and exploration data from the relevant historical EPCs throughout the study area was compiled and reviewed for this report. This review of exploration results over the study area affected by the proposed NGBR was undertaken to assess the likelihood and/or potential that a significant coal resource exists within the area. All available information was from the public domain documents and more recent exploration data was not considered. The series of exploration campaigns undertaken by MIM Holdings Pty Ltd, now Glencore, that began in the late 1970's and continued to present contributed a great deal of the geological information to this analysis (Figure 2.2).

This report summarises the results of the study, as at 11th September 2013.

**Figure 2.1 – Current EPCs under the proposed NGBR**

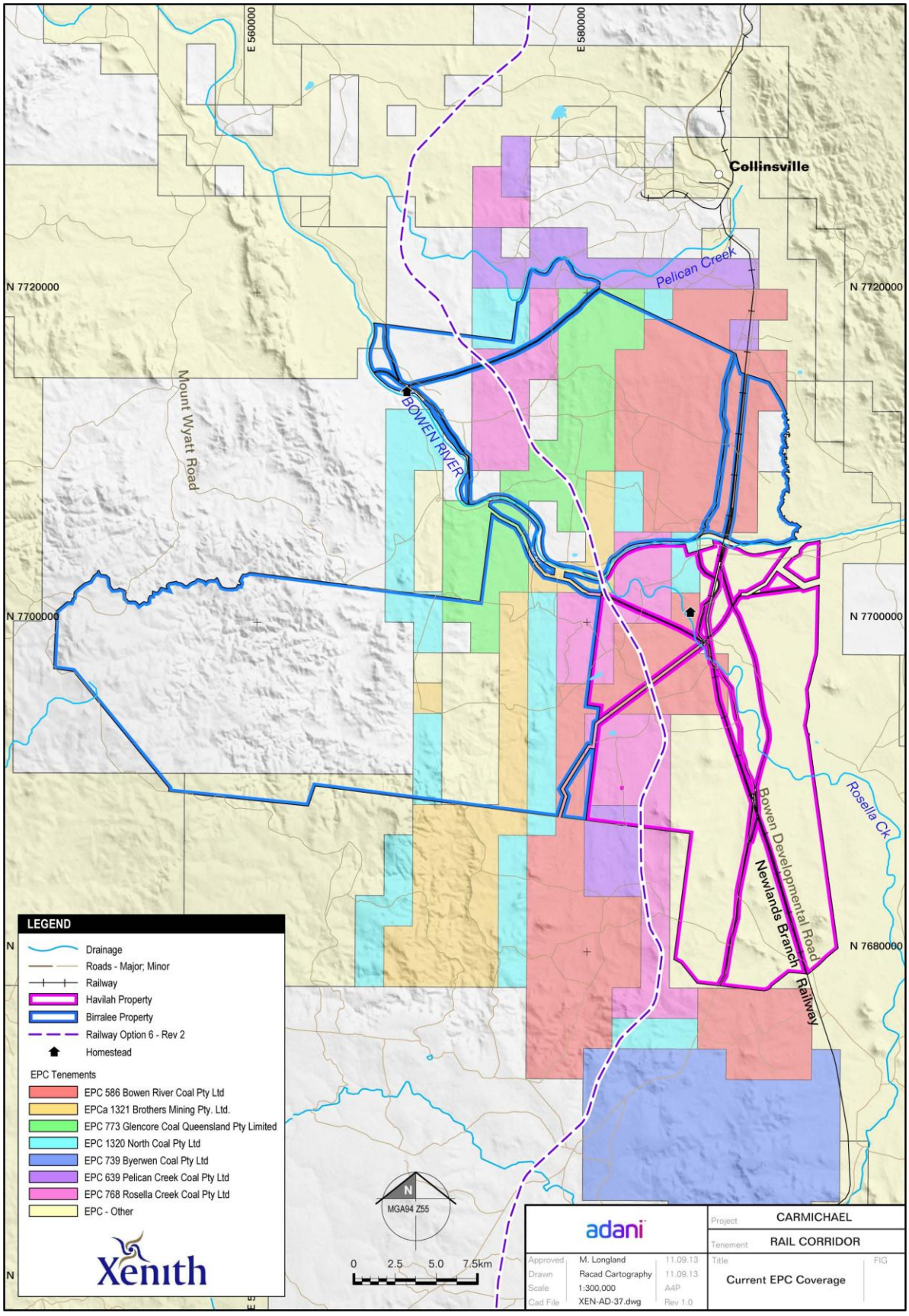
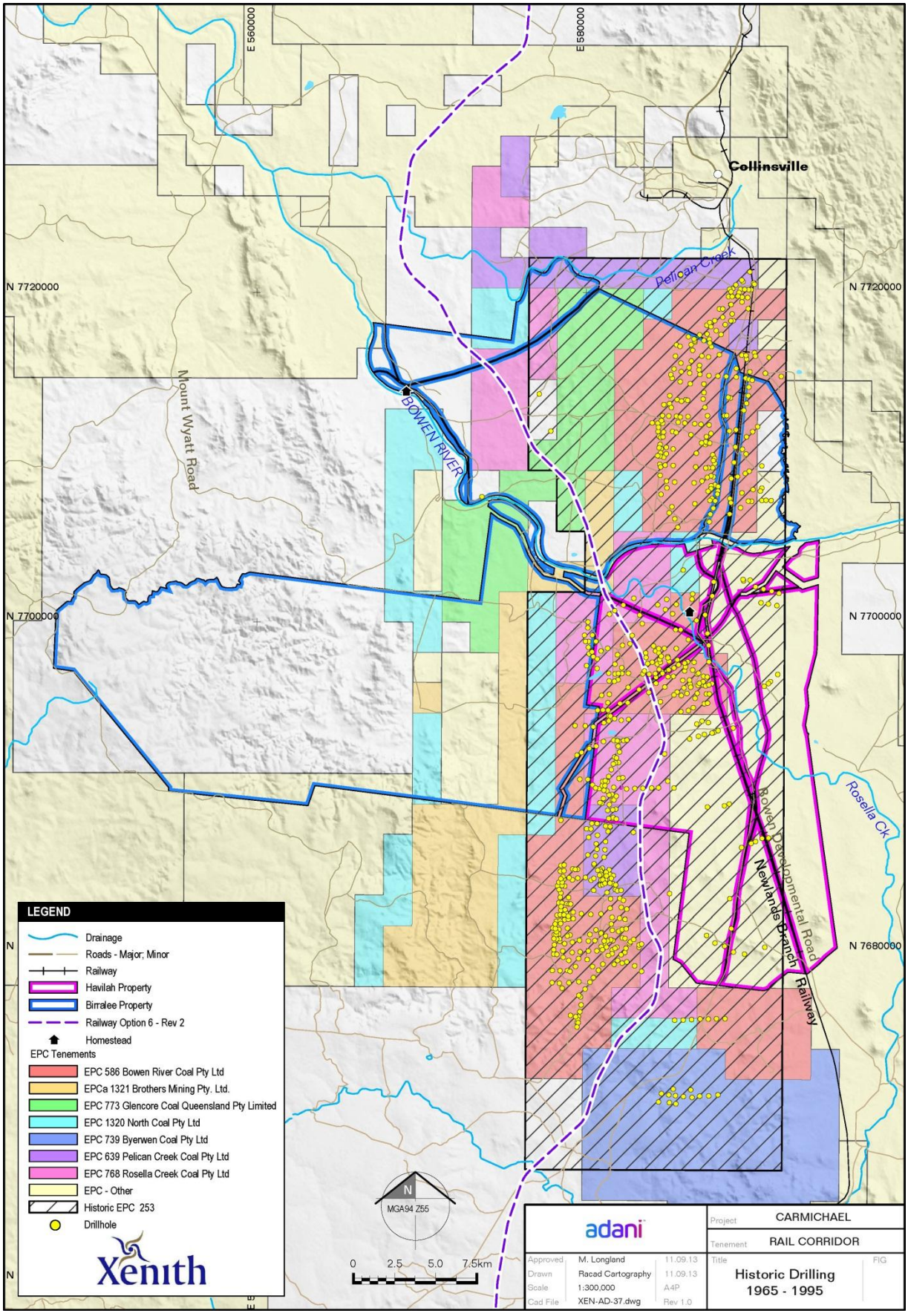


**Figure 2.2 – Regional Historic Drilling Information**



# 3 REGIONAL GEOLOGY

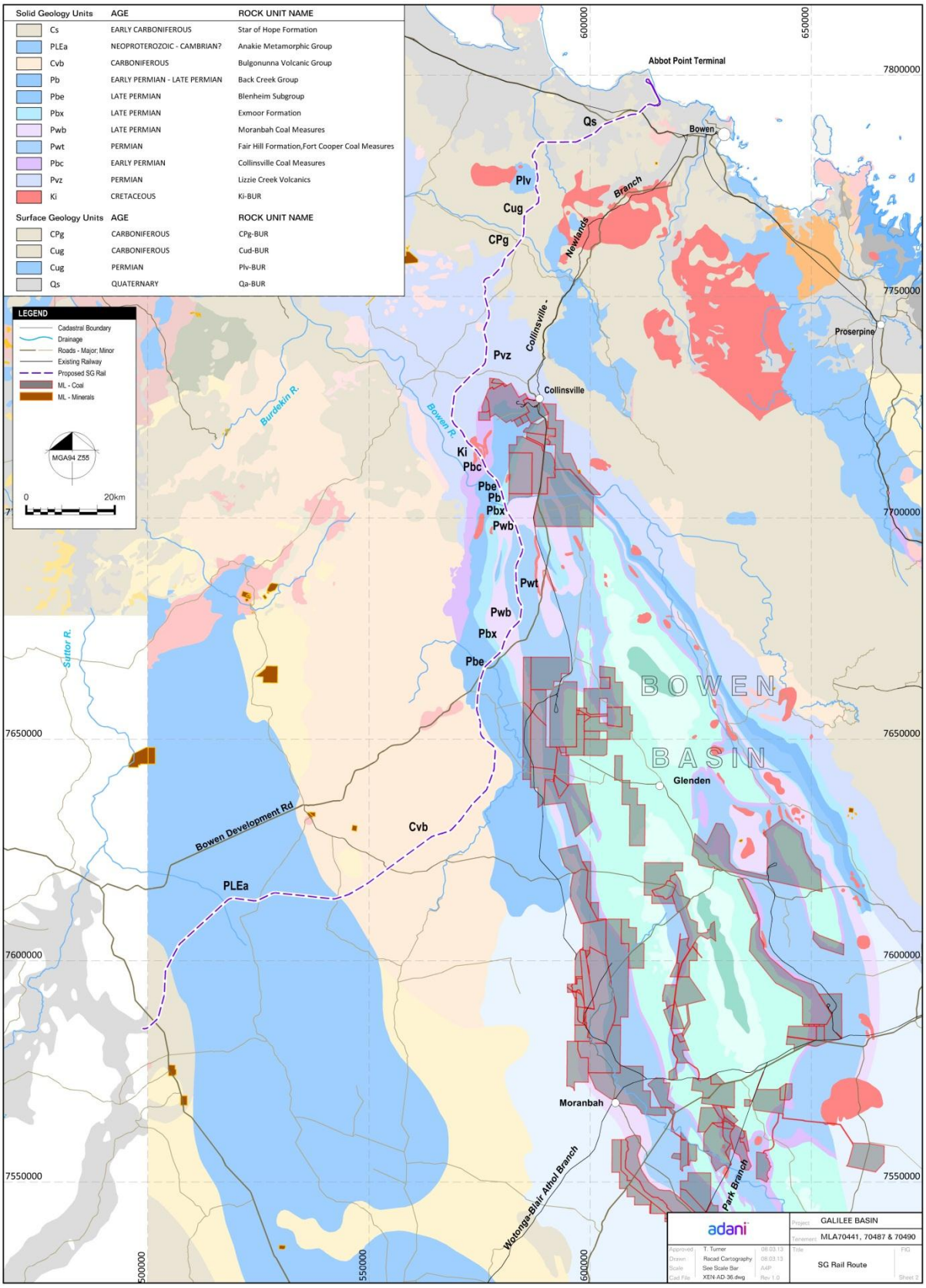
The Havilah and Birralee portion of the potential NGBR passes through the northwestern flank of the Bowen Basin.

The Bowen Basin is of Late to Early Permian in age and in this region thins and overlies intrusions of Devonian and Carboniferous volcanics and metamorphics. The Permian sequence cropping out in the Suttor River area was extensively weathered and laterised comprised mainly of sandstone. Most of the Eastern branch region is covered by the Tertiary Suttor Formation and Cainozoic alluvium and soils.

The foreland, Early Permian to Middle Triassic Bowen Basin of eastern Queensland occupies about 160,000 $km^2$, the southern half of which is covered by the Surat Basin. It has a maximum sediment thickness of about 10,000 metres concentrated in two north trending depo-centres, the Taroom Trough to the east and the Denison Trough to the west. Deposition in the basin commenced during an Early Permian extensional phase, with fluvial and lacustrine sediments and volcanics being deposited in a series of half-graben in the east while in the west a thick succession of coals and non-marine clastics. Following rifting there was a thermal subsidence phase extending from the mid Early to Late Permian, during which a basin-wide transgression allowed deposition of deltaic and shallow marine, predominantly clastic sediments as well as extensive coal measures. Foreland loading of the basin spread from east to west during the Late Permian, resulting in accelerated subsidence, which allowed the deposition of very thick succession of Late Permian marine and fluvial clastics, again with coal and Early to Middle Triassic fluvial and lacustrine clastics. Sedimentation in the basin was terminated by a Middle to Late Triassic contractional event.

Over 100 hydrocarbon accumulations have been discovered in the Bowen Basin, of which about one third are producing fields. Accumulations occur throughout the succession, but the most important reservoirs are in the Early Permian and Middle Triassic. Source rocks have been identified throughout the Permian and in the Middle Triassic and are mostly nonmarine. Proven plays comprise mostly anticlinal closures sometimes enhanced by a stratigraphic component, as well as fault rollovers. Other plays are largely untested. The Bowen Basin also has vast coal resources, with major open cut and underground coal mines in the north of the basin. Large volumes of methane gas are held at shallow depths within the Permian coals in the north and subsequently there is the potential for coal seam methane developments. The NGBR then travels east across the Connors-Auburn Province.

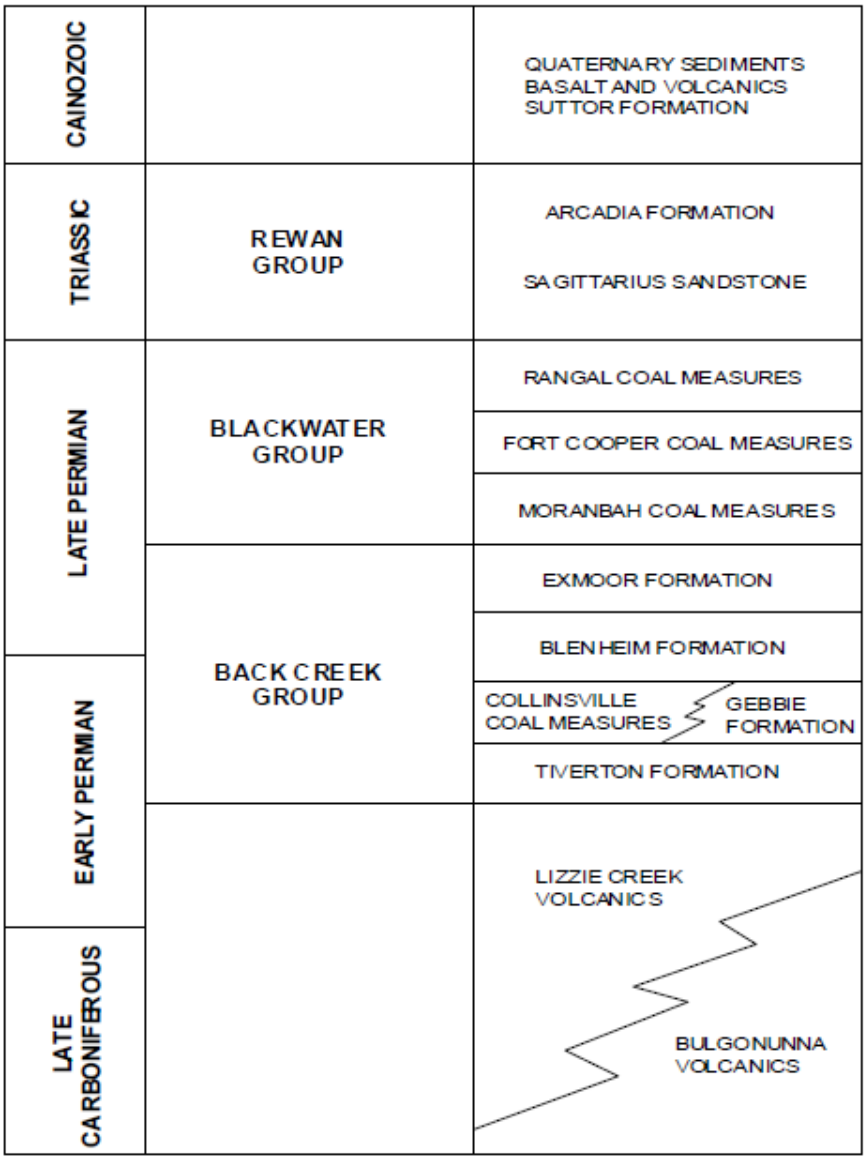
**Figure 3.1 – Regional Geology of Queensland encountered in the NGBR**



## 3.1 Local Geology

The NGBR corridor traverses the western flank of the northern extension of the Bowen Basin. The Havilah and Birralee sections of the NGBR corridor encompass an area of the Bowen Basin that contain the Basement Lizzie Creek Volcanics, Back Creek, Blackwater and Rewan Groups and are overlain by Cainozoic sediments, basalts and volcanics (Figures 3.1, 3.2)

**Figure 3.2 – Stratigraphy of the Northern Bowen Basin**




*"The Lizzie Creek Volcanics were deposited during the Early Permian and form the basal unit of the Bowen Basin. The volcanic assemblage comprises andesitic to dacitic flows and tuffs, rhyolite, agglomerate, and black siltstone. Unconformably overlying this sequence is the Collinsville Coal Measures, which is divided into an upper and lower member by the intervening bioturbated marine Glendoo Sandstone member, which thickens as both coal-bearing units pass laterally into the Gebbie Formation to the south and southeast. The sequence comprises up to nine persistent coal seams which are best developed in the north*

*around Collinsville and thin laterally to the west and south, where they grade into carbonaceous shale.*

*The Gebbie Formation ranges in thickness up to 600m and comprises quartzose sandstone, lithic labile sandstone, siltstone, carbonaceous shale, calcareous sandstone and coquinite.*

*The Collinsville Coal Measures and Gebbie Formation are conformably overlain by the Blenheim Formation, with the transition being marked by a coarse-grained sandstone or conglomerate. The Blenheim Formation ranges between 400-500m in thickness and typically comprises micaceous quartzose siltstones and labile sandstones that are richly fossiliferous in zones. This unit is conformably overlain by the Exmoor Formation, which reaches a maximum thickness of 110m and comprises sandstone, siltstone, mudstone with rare marine fossils, and minor coal seams. Overlying this sequence is the Moranbah Coal Measures, which represents the lowermost unit of the Blackwater Group.*

*The Moranbah Coal Measures reach a maximum thickness of around 480m and comprise cross-bedded lithic sandstone and siltstone, mudstone, coal, and abundant flow-orientated silicified and coalified fossil logs. Coal seams occurring within the sequence are generally clean and include only minor tuffaceous and mudstone bands. Conformably overlying the Moranbah Coal Measures are the Fort Cooper Coal Measures, which are distinguished from the former by the abundance of tuff bands and mudstone partings within coal seams.*
*The Fort Cooper Coal Measures comprise lithic sandstone, conglomerate, mudstone, carbonaceous shale, inferior coal, and numerous tuff horizons, and reaches a total thickness of approximately 200m. Sedimentary conditions were less static than those observed in the Moranbah Coal Measures, and rapid grain size fluctuations and seam splitting is common. The high inherent mineral matter and large number of tuff bands render even the best coal seams only marginally economic.*

*The Tertiary Suttor Formation rests unconformably on the Fort Cooper Coal Measures and consists predominantly of unconsolidated, poorly sorted fluviatile and well-bedded lacustrine quartzose sediments. Tertiary volcanism in the form of basaltic to basinitic plugs and associated flows also occur in the study area and appear to be related to northwest southeast trending basement structures"* (Pattison, 2006).

# 4 EXPLORATION HISTORY

Coal exploration companies have had a presence within the Collinsville District since the mid- to –late 1800's; with coal mining activities commencing as early as 1919. Presently, both exploration and mining companies are still actively exploring and mining within the Collinsville area. Exploration work has included reconnaissance work such as geological mapping and exploration drilling including, open and cored holes, as well as geophysical surveys used to delineate the prevalent igneous intrusions in the area. A brief summary of the exploration history within the Collinsville area during this period has been illustrated in Table 4.1 below:

**Table 4.1 - Exploration History within the Collinsville District**

| Year | Company | Tenement | Exploration Summary | Targeted Coal Measures | Comments |
|---|---|---|---|---|---|
| 1866 | - | - | - | - | Collinsville district recognised as a potential coal mining area |
| 1879 | - | - | - | - | Bowen River Coalfield formally declared |
| 1914 – 1916 | - | - | - | CCM | CCM defined. |
| 1919 | - | - | - | CCM | Mining of the CCM commences |
| Late 1950's | Bowen Consolidated Coal Mines & Queensland Department of Mines | - | Extensive drilling | CCM | - |
| 1964 – 1965 | BHP Company Limited | ATP2C | 3 exploration wells (997.46 m drilled) | MCM | Exploration undertaken in the ***Havilah to Cockatoo Creek*** area. All coal seams were either intruded by feldspar porphyry sills or poor coal quality |
| 1966 | Clutha Development Pty Ltd | ATP14C | Geological mapping | MCM | Significant igneous intrusions identified in the areas to the north and south of the Bowen River. |
| 1968 | Dacon Pty Ltd and Coal and | ATP44C | 2 fully-cored holes (472 m drilled) and 57 | MCM | Significant coal intersections within the |

| | | | | | |
|---|---|---|---|---|---|
| | Allied Industries Pty Ltd | | open holes (3,300 m drilled) | | MCM. |
| 1972 | Griffin Queensland Exploration NL | ATP119C | 51 open holes and fully-cored holes | FCCM and Rangal Coal Measures ("RCM") | - |
| 1972 | Bowen Consolidated Coal Mines Ltd | ATP120C | 15 open holes (2,102.5 m drilled) | CCM and MCM | Blocks of potentially minable coal were considered too small to warrant explorations |
| 1979 - 1983 | MIM Holdings Limited | EPC253 (ATP253C) | 1979 – 1980: Total of 144 holes drilled totalling 6,939.19 m including 251.5 m of coring and ground magnetometer surveys<br><br>1981: Total of 2,117.43 m of open holes drilled plus 1,080.48 m of core to further define small deposits<br><br>1981 – 1983: Further exploration work undertaken to further define the 'Pipeline Deposit' | MCM | Successfully delineated the Cockatoo Ck. No. 1 coking coal deposit. Combined results of drilling and geophysical surveys delineated 5 small deposits in the area |
| 1994 | MIM Holdings Ltd | MDL180 | LOX drilling and other additional drilling undertaken | - | - |
| 2000 | MIM Holdings Ltd | ML 10250 | - | - | Mining operations commenced in early 2001 (reserves exhausted in early 2004) |

Since the year 2000 exploration phase, it is assumed that exploration has continued but no public data exists for this at the time of the study.

# 5 HISTORIC DATA REVIEW

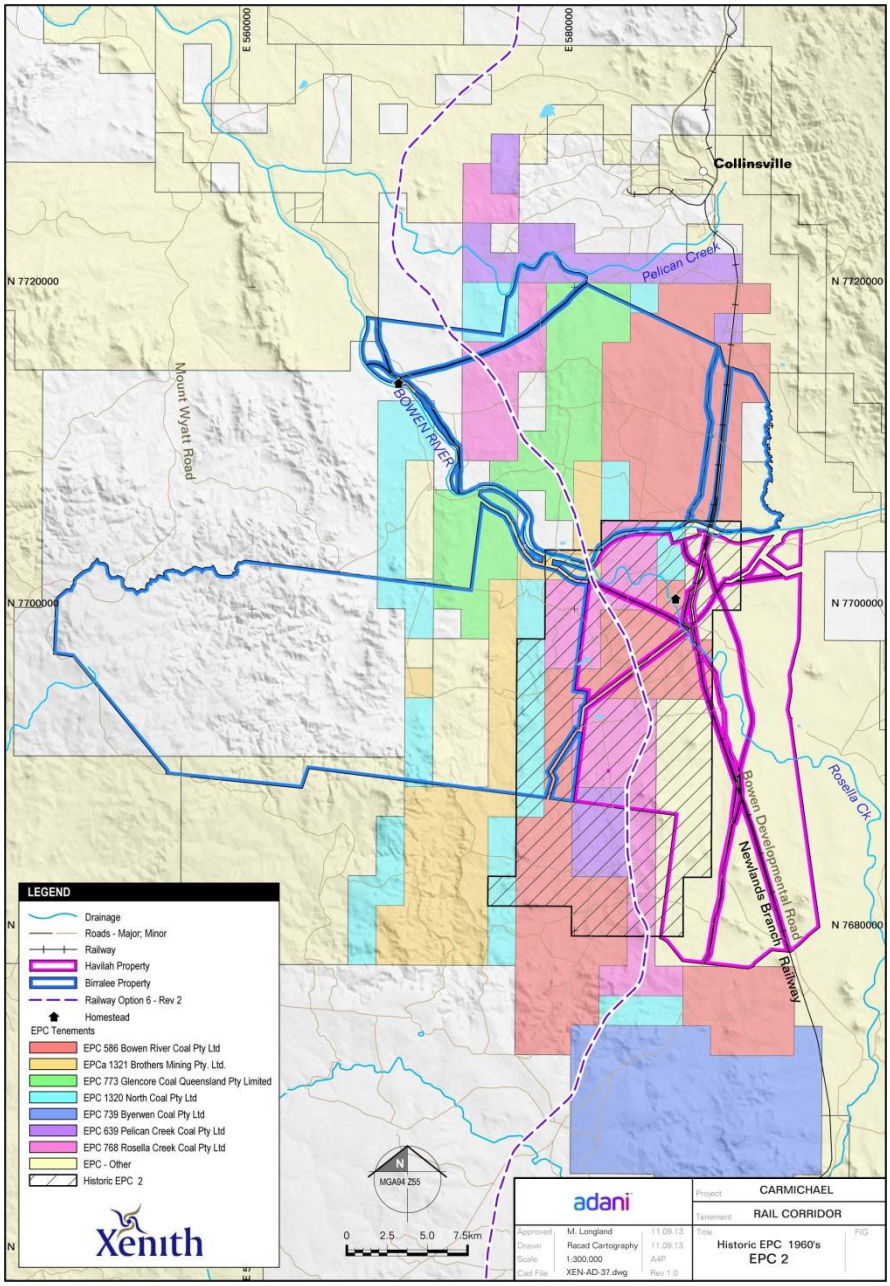
## 5.1 EPC2

Broken Hill Pty Co Ltd

Report No's: 1679, 1680, 1754,

Coverage of Current EPC: Covers southern blocks of EPC768, small portion of northern block EPC1321, Central portion of EPC586, Covers the entire southern rail associated block of EPC639 (Figure 5.1).

**Figure 5.1 – Historic EPC 2 Coverage of Current EPCs**



Historic EPC Overview: Historic exploration included field surveys and three drilled bores, BHP Havilah 1, BHP Havilah 2 and BHP Havilah 3 in 1965. Exact collar locations were difficult to establish and estimated locations were obtained from historic plans for this analysis. There was a noted predominance of cindered coal in the three bore logs. With the exception of Seam E towards the base of the FCCM in Havilah No 1, all coal seams of workable thickness in bores were intruded or were of poor quality unsuitable for coking purposes. The EPC was recommended to be abandoned and work was ceased once it was learnt of lease application by Sentinel Mining co.

Reference: Havilah Coal Prospecting Area – Final Report, I Blayden, 30th September, 1965 (QDEX: CR1754)

Exploration History:

- Bore drilled to depth ~104m near Havilah Homestead in 1886. Similar geology noted to Havilah 3 bore.
- Regional survey, Isbell (1954,1955)
- Regional survey and mapping by geologists of the Bureau of Mineral Resources and Queensland Geological Survey for the Bowen South 1:250,000 Geological Series Map (Sheet S.F. 55-3)

Two seams were identified from this early exploration, the Havilah Seam outcropping in Rosella Creek near the Collinsville – Mt Coolon road crossing and the Daintree Seam outcropping in the Bowen River ~400m downstream from its juncture with Rosella Creek both seams are intruded by sill rock (Blayden, 1965).

Summary of Exploration: Havilah No1 bore located in the centre of EPC2 was drilled to ~307m and intersected nine coal seams designated A to I. Seams below E Seam were either intruded or of inferior quality. The Upper seams were generally poor quality however seams A and E were sampled. Havilah No.2 bore drilled in the south of EPC2 to a depth of ~406m intersecting nine coal horizons. No economic section was encountered therefore no sampling was undertaken. The first seven coal seams were correlated with the nine seams from Havilah No.1 bore. Havilah No 3 bore is located in the north of EPC2 near the Havilah homestead and was used to investigate the findings from the bore drilled in 1886. Havilah No 3 bore was drilled to ~285m and 5 coal seams were intersected all of which were intruded and cindered. Correlation between this bore and bores 1 and 2 was not attempted due to the interpreted presence of an intervening fault.

The coal seams encountered in bore 1 and 2 were grouped into two sections an Upper and a Lower. The Upper included seams A to D and were generally not intruded individual plies average less than 0.15m in thickness with some attaining 0.5m thickness. The Lower included seams E to I and were less banded than the upper seams and generally intruded. With the exception of Seam E in Havilah No1 bore all lower seams were intruded. The most prospective seam encountered in the area is Seam E in Havilah No 1 bore it was logged as ~2.7m thick at a depth of 178m.

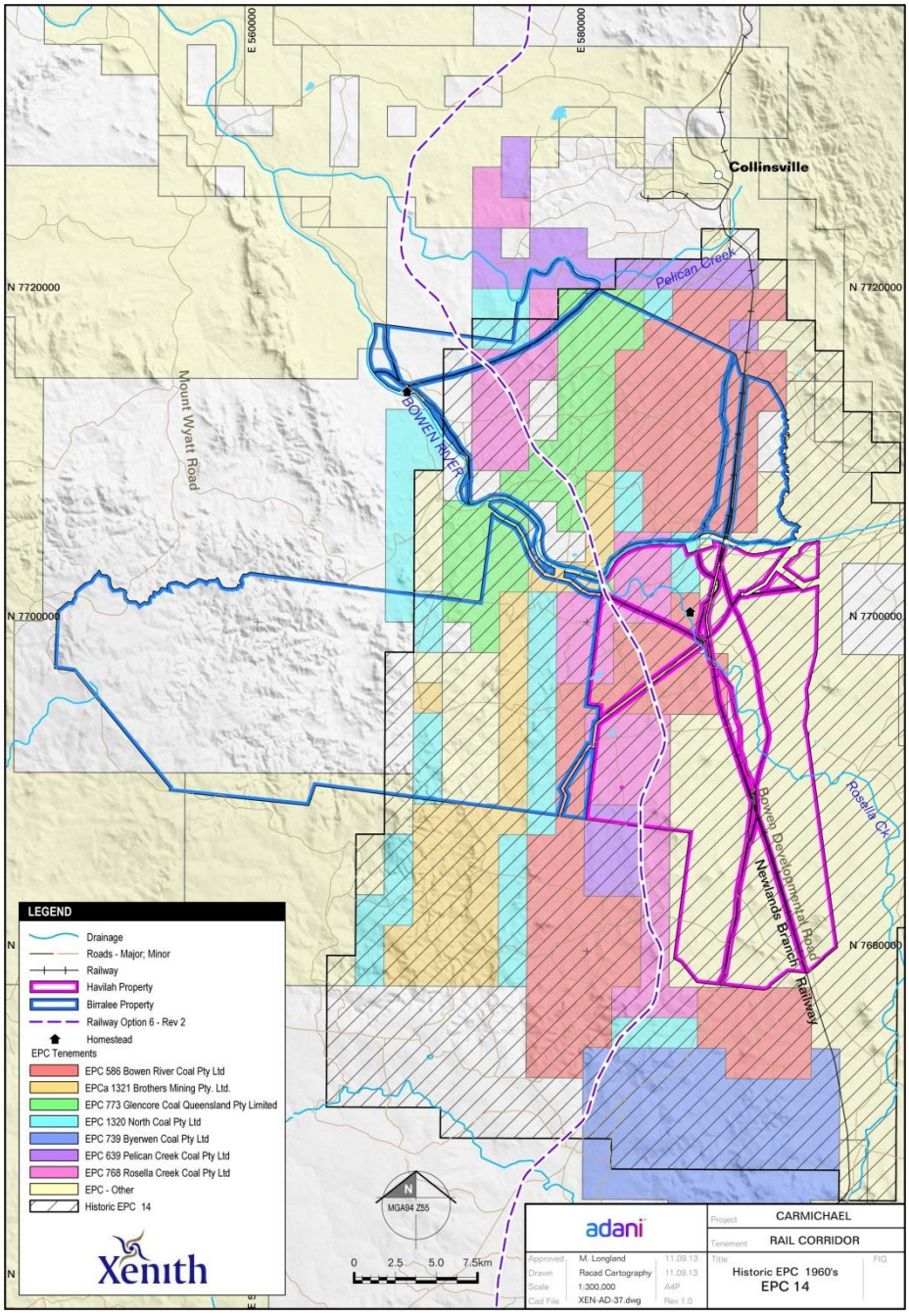
## 5.2 EPC14

EPC14 Clutha Development Pty Ltd (Sentinel Mining Co)

Report No's: 1845

Coverage of Current EPC: Covers all the potential NGBR associated southern blocks of EPC768, covers entire EPC773, Covers entire EPCa1321, Covers entire EPC586, Covers all south eastern portion of EPC1320, Covers Rail Corridor associated southern block EPC639 North western rail portion of EPC739

**Figure 5.2 – Historic EPC 14 Coverage of Current EPCs**



Historic EPC Overview: Historical exploration was limited to outcrop assessment and geological interpretation from aerial photography. The survey revealed that the greater part of the historic EPC14 was covered by volcanic intrusions. Field work was largely restricted to the northern an eastern areas of EPC14 as the western section of historic EPC14 was underexplored because of largely barren marine sediments that were disturbed and cut by rivers and gulleys. It was assumed that there were no potential mining areas.

Reference: Queensland Coal Exploration Project Report Period Ending February, 28th,1966 (QDEX: CR1845)

Summary of Exploration: The information contained in this report for EPC14 does not provide sufficient evidence for the prospectivity of a significant coal resource located with the Havilah Birralee areas. The interpretations are largely surface observations and general assumptions.

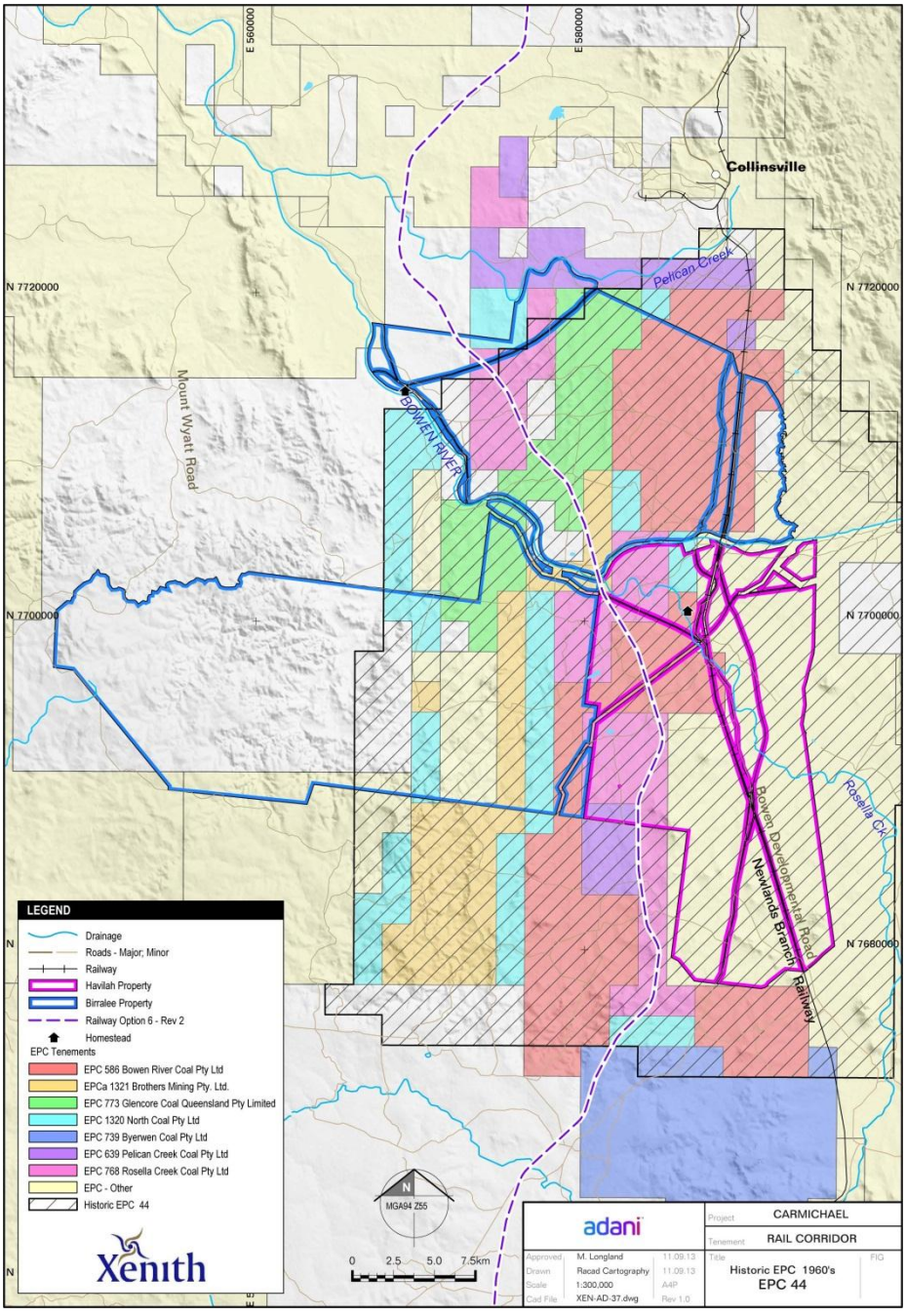
## 5.3 EPC44

EPC44 Dacon Collieries Pty Ltd

Report No's: 3330, 2689

Coverage of Current EPC: The southern rail associated blocks of EPC768, Completes EPC773, Complete EPCa1321, Almost entire EPC586 except southern portion on rail corridor, Covers Rail Corridor associated southern block EPC639, Covers northern non rail portion of EPC739

**Figure 5.3 – Historic EPC 44 Coverage of Current EPCs**



Historic EPC Overview: The EPC44 report suggests that the CCM, in the subject area, have lessened coal content due to marine incursion and seam deterioration and are extensively intruded and thus have no economic potential. The more prospective coal seams of the German Creek Coal Measures and RCM are so extensively intruded by feldspar porphyry sills, associated with the structural evolution of the area, that the area holds no economic potential even for limited mining operations. Same conclusion was reached from surface mapping in 1929. Historic mining assumptions would need to be factored in to make a detailed analysis.

Exploration History: Exploration was undertaken to supplement the previously drilled BHP Co Ltd holes and to examine the German Creek Coal Measures on the western and northern flanks of the Bowen Basin. The exploration program comprised two cored holes, 57 rotary no cored holes and one partly cored hole non cored hole. Due to interpreted inferior coal quality only one series of samples was submitted for analysis.

Summary of Exploration: The 57 rotary holes (R.D.H. series) were arranged in east west section lines from north to south within EPC44. The available graphic logs (QDEX: CR2689) suggest that coal seams encountered in the drilling were difficult to correlate between holes. A thick coal seam was intersected in the drilling in holes B2, C2, D2 and E2 that was potentially correlatable with the cored hole B.R.E.A 2, from this program, north of the Bowen River and with a lower seam from the BHP bores. In each case however it was destroyed by igneous intrusion. The increased coal thickness in RDH E2 (Figure 5.2) is believed to be associated with faulting or steeply dipping beds. See figures 5.1, 5.2 and 5.3 below for sample area of RDH sections lines and borehole locations. In each of the graphic logs the coal seam is in black.

**Figure 5.4 – Sample of R.D.H Holes proximal to Proposed NGBR Corridor**

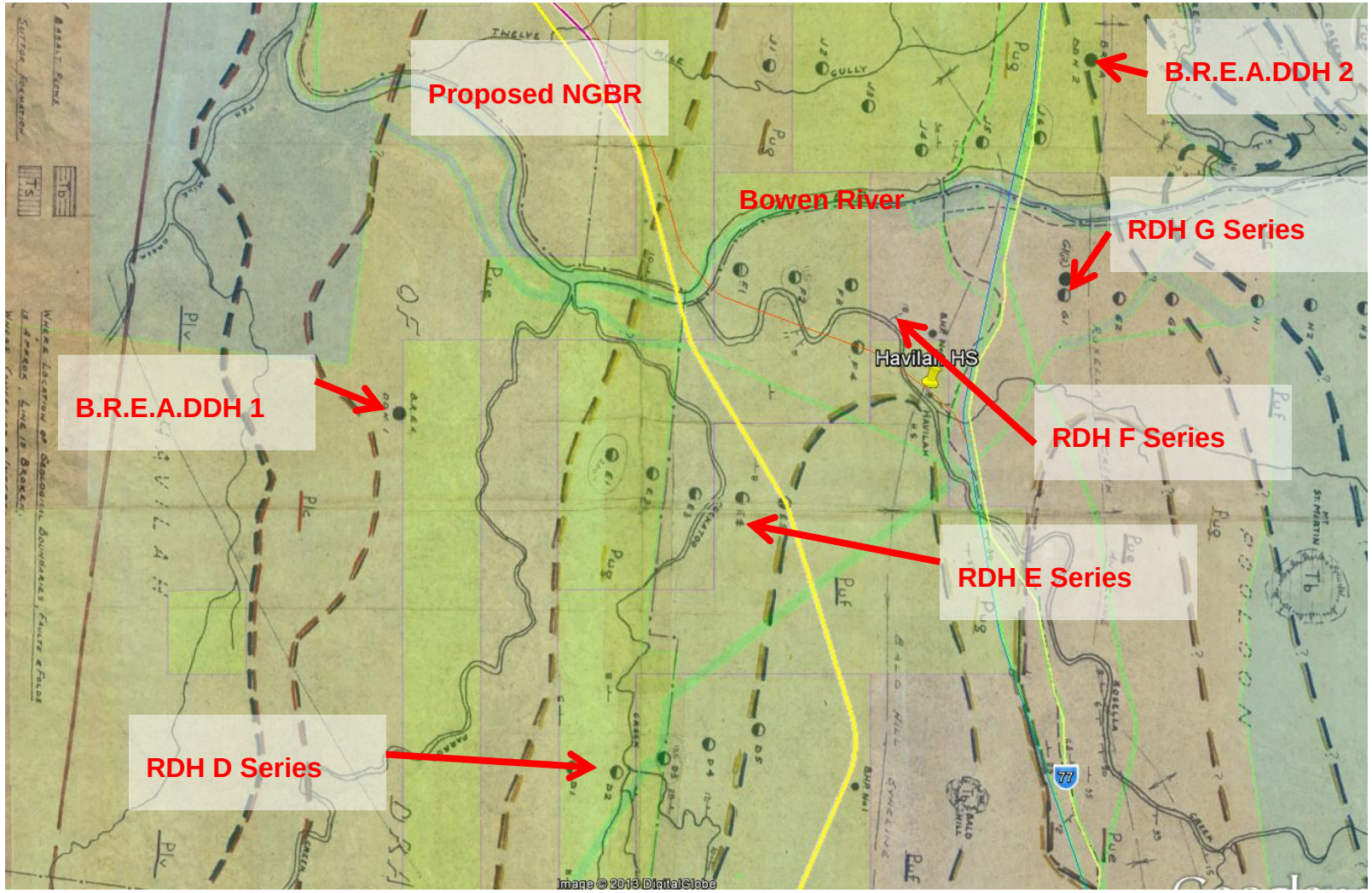


**Figure 5.5 –R.D.H Holes E Series Graphic Logs**

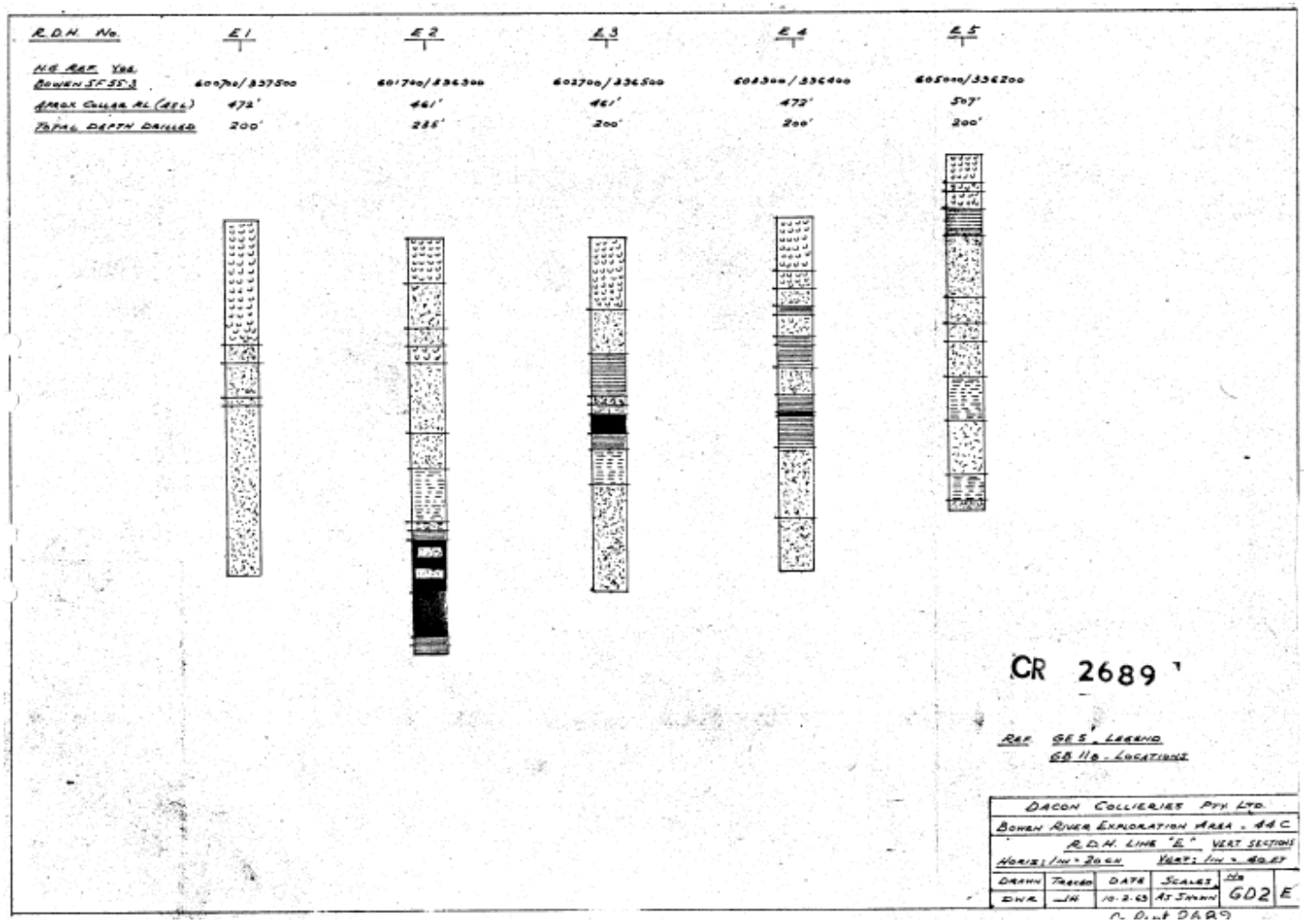
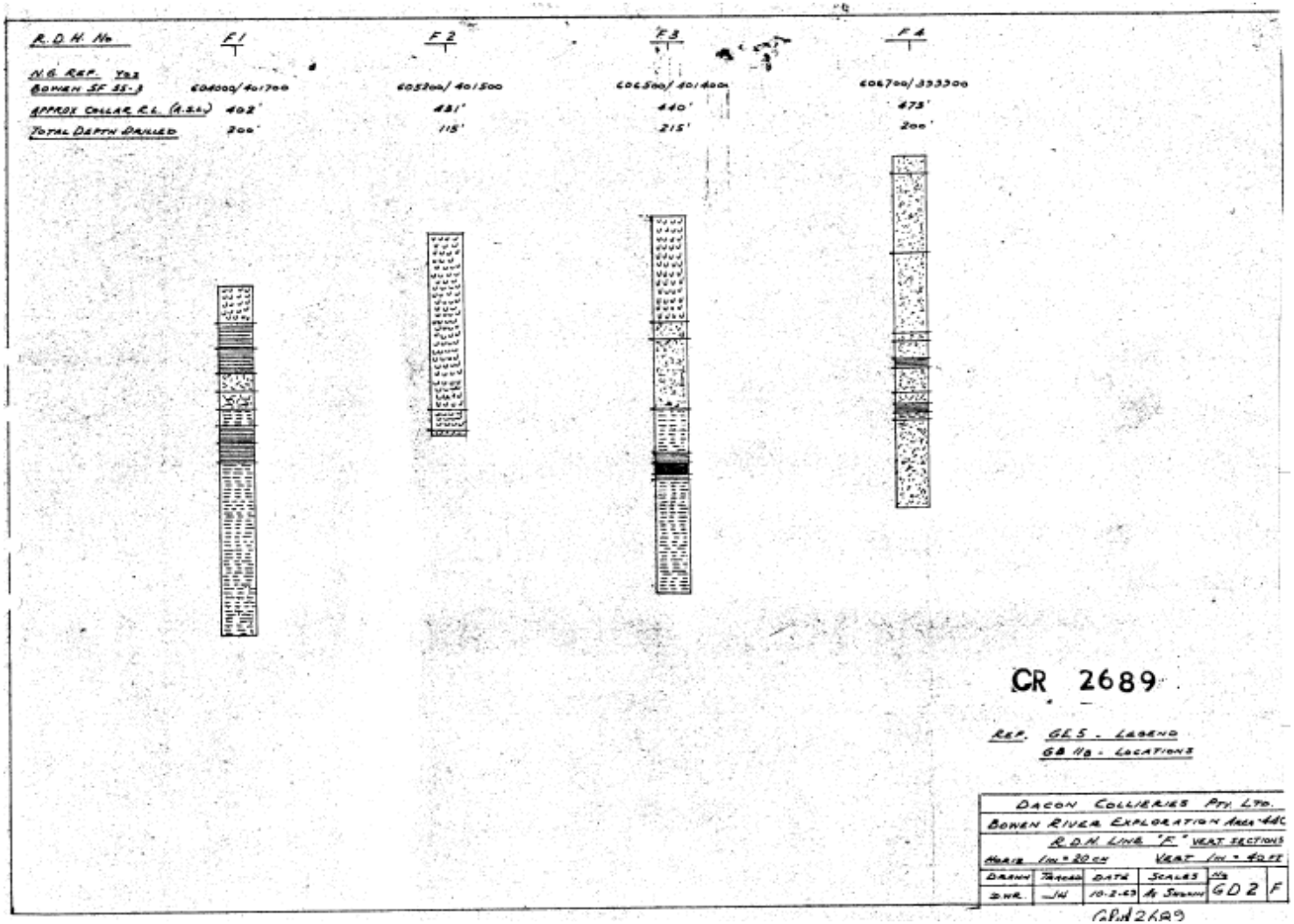


**Figure 5.6 –R.D.H Holes F Series Graphic Logs**



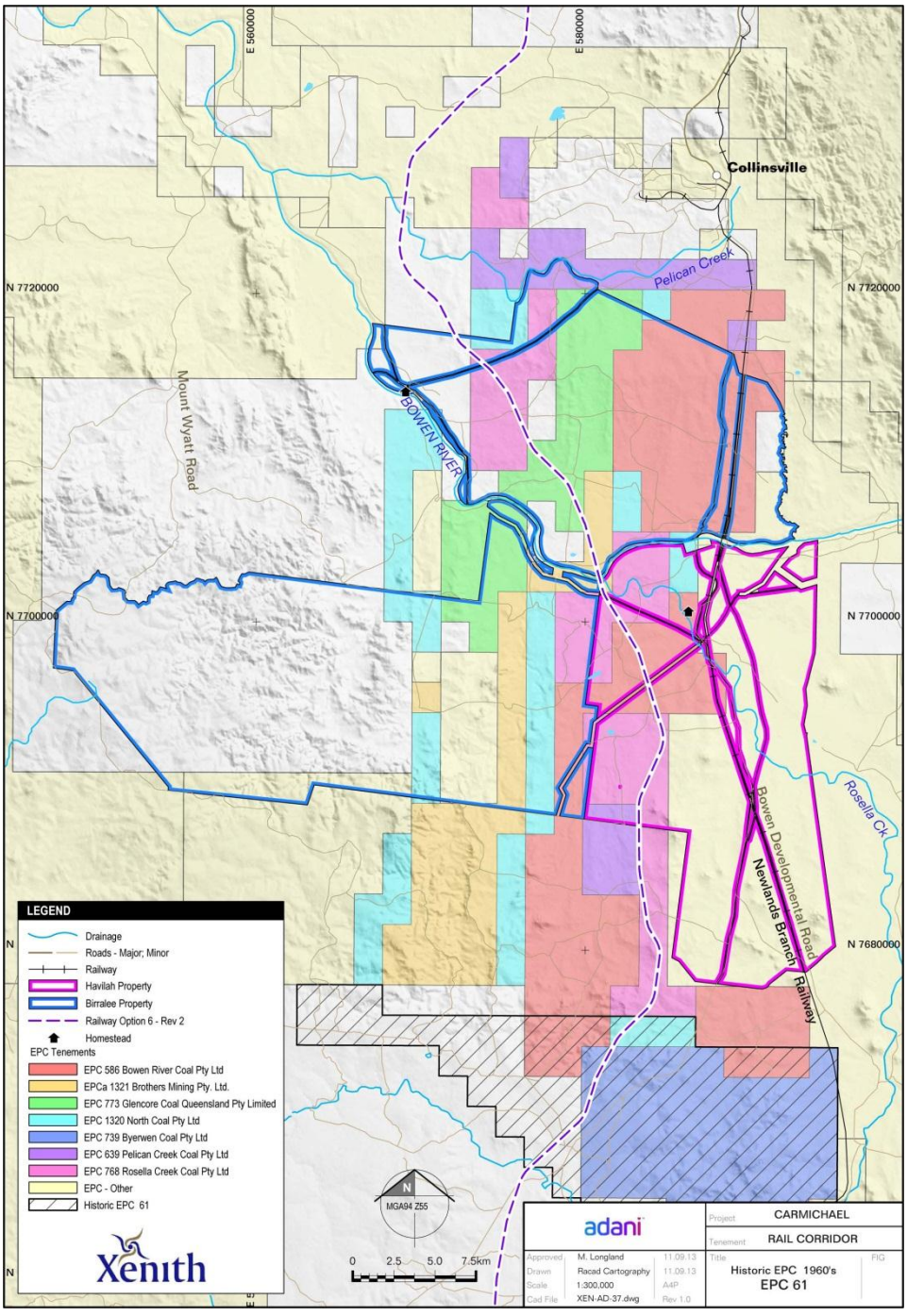
## 5.4 EPC61

EPC61 Griffin Coal Mining Company (Griffin Queensland Exploration N.L.)

Report No's: 5329, 3451, 4169, 3814

Coverage of Current EPC: Historic EPC 61 covers southern rail extremities of EPC586, Covers northern area of northern block of current EPC739.

**Figure 5.7 – Historic EPC 61 Coverage of Current EPCs**



Historic EPC Overview: Historic exploration included 64 drilled holes. Area was relinquished due to the presence and effect of intrusions on coal seams. The cost of further exploration and little prospect of obtaining an economic mining area lead to the area being relinquished

Reference: Griffin Queensland Exploration N.L. Authority to prospect 61C, Relinquishment Report for 1st January, 1970. Griffin Queensland Exploration N.L. Authority to prospect 61C, Relinquishment Report for areas relinquished on 27th May, 1974.

Historic Exploration: A total of 64 holes were drilled within the relinquished area.

Summary of Exploration: Although area under historic EPC61 does not overlay area of interest for this study purpose some information for the northern area of Current EPC739 is pertinent. The majority of the exploration was focussed in the east of EPC61 and away from the proposed NGBR corridor. The western portion near the NGBR was interpreted to be underlain by significant Tertiary cover several hundred feet thick with intrusive sills present throughout.

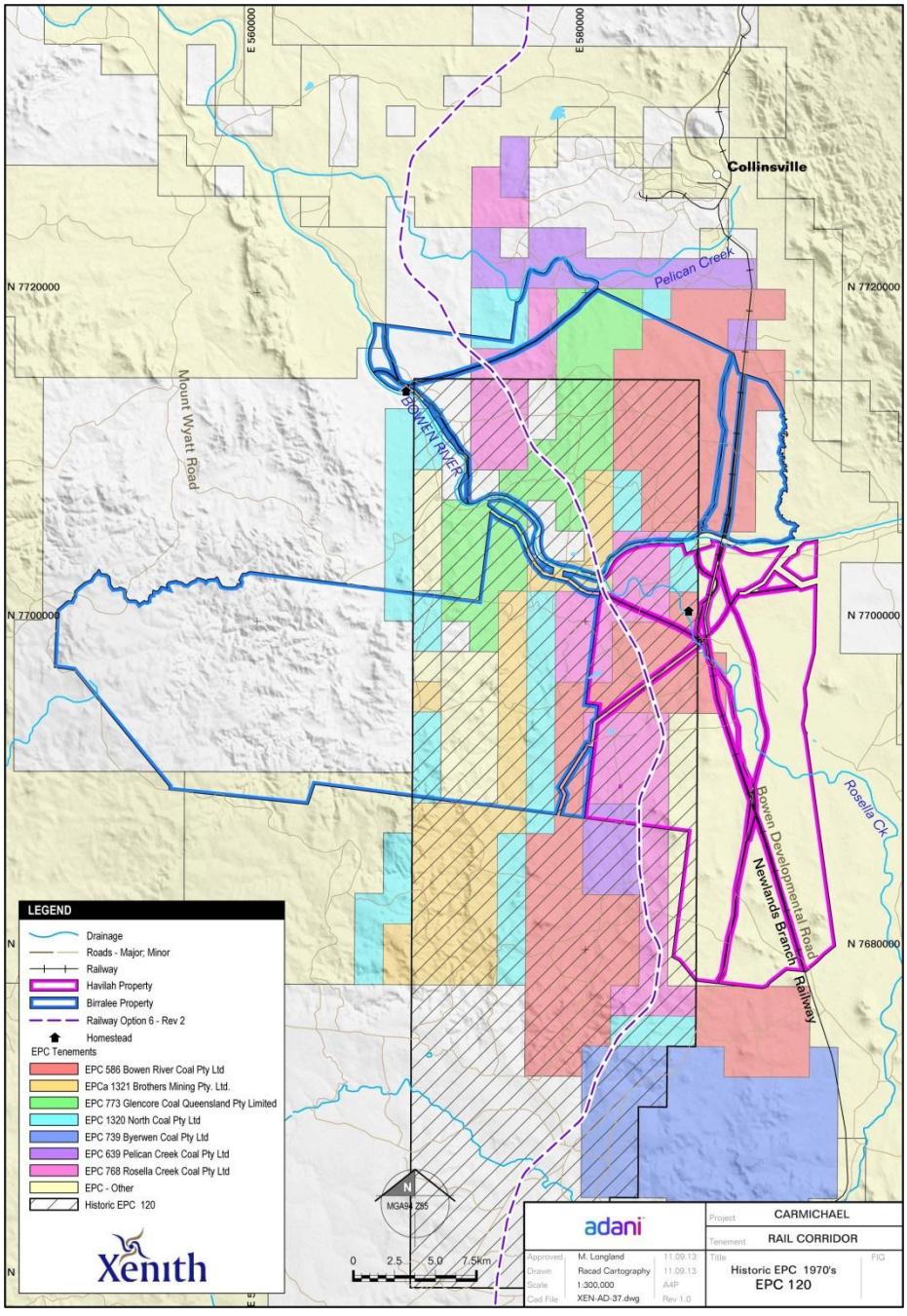
## 5.5 EPC120

EPC120 Bowen Consolidated Coal Mines Ltd

Report No's: 4618, 4370

Coverage of Current EPC: Covers majority of southern blocks of EPC768, Southern rail Portion of EPC773, Majority of EPCa1321, The western proposed NGBR Corridor associated portion of EPC586, Southern rail perimeter block of EPC639, North western portion including north west corner encountered in NGBR zone

**Figure 5.8 – Historic EPC 120 Coverage of Current EPCs**



Historic EPC Overview: Historic exploration included 15 chip holes and analysis of one cored hole (N.S. 18). All coal measures encountered in the drilling were intruded by dacitic sills. Historic interpretation estimated that the blocks of non-intruded coal would be too small to be potentially economic

Summary of Exploration: The exploration undertaken on this tenement included 15 open holes (meterage totalling 2,102.5 m). The portion of the exploration undertaken north of the Bowen River, which included seven holes, targeted the Moranbah Coal Measures (3 holes drilled) and the Collinsville Coal Measures in the Twelve Mile Station area. The results from this exploration were generally discouraging, only traces of coal with the CCM were intersected.

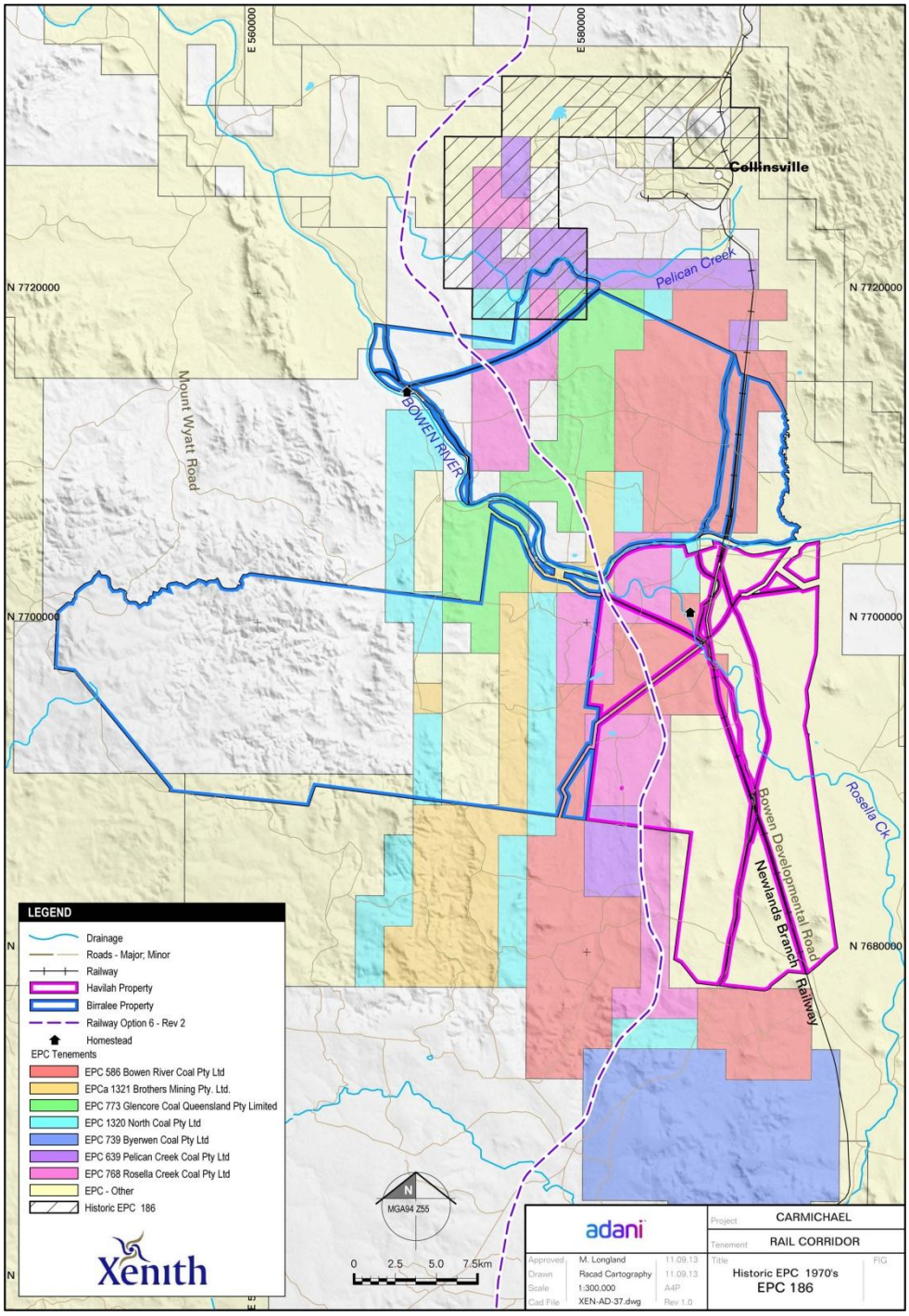
## 5.6 EPC186

EPC186 Bowen Consolidated Coal Mines Ltd (Carpentaria Exploration Co Pty Ltd)

Report No's: 5542, 6813

Coverage of Current EPC: Historic EPC186 covers non rail, northern portion of EPC1320.

**Figure 5.9 – Historic EPC 186 Coverage of Current EPCs**



Historic EPC Overview: EPC186 was located to the east of and is skirted by the proposed NGBR and serves as a guide to the exploration across the current EPC. The majority of the information refers to the Crush Creek Member a unit identified in the sub basin north of the Collinsville Coal Measures. It is considered unlikely that Crush Creek Member contains significant coal. It is stated that there was little prospect for intruded areas of the Blake or Bowen seams yet the thin and sulphurous Scott or Denison seams have some potential.

Summary for Optimisation Study: Regional information for area northeast of Havilah and Birralee region away from the proposed NGBR corridor.

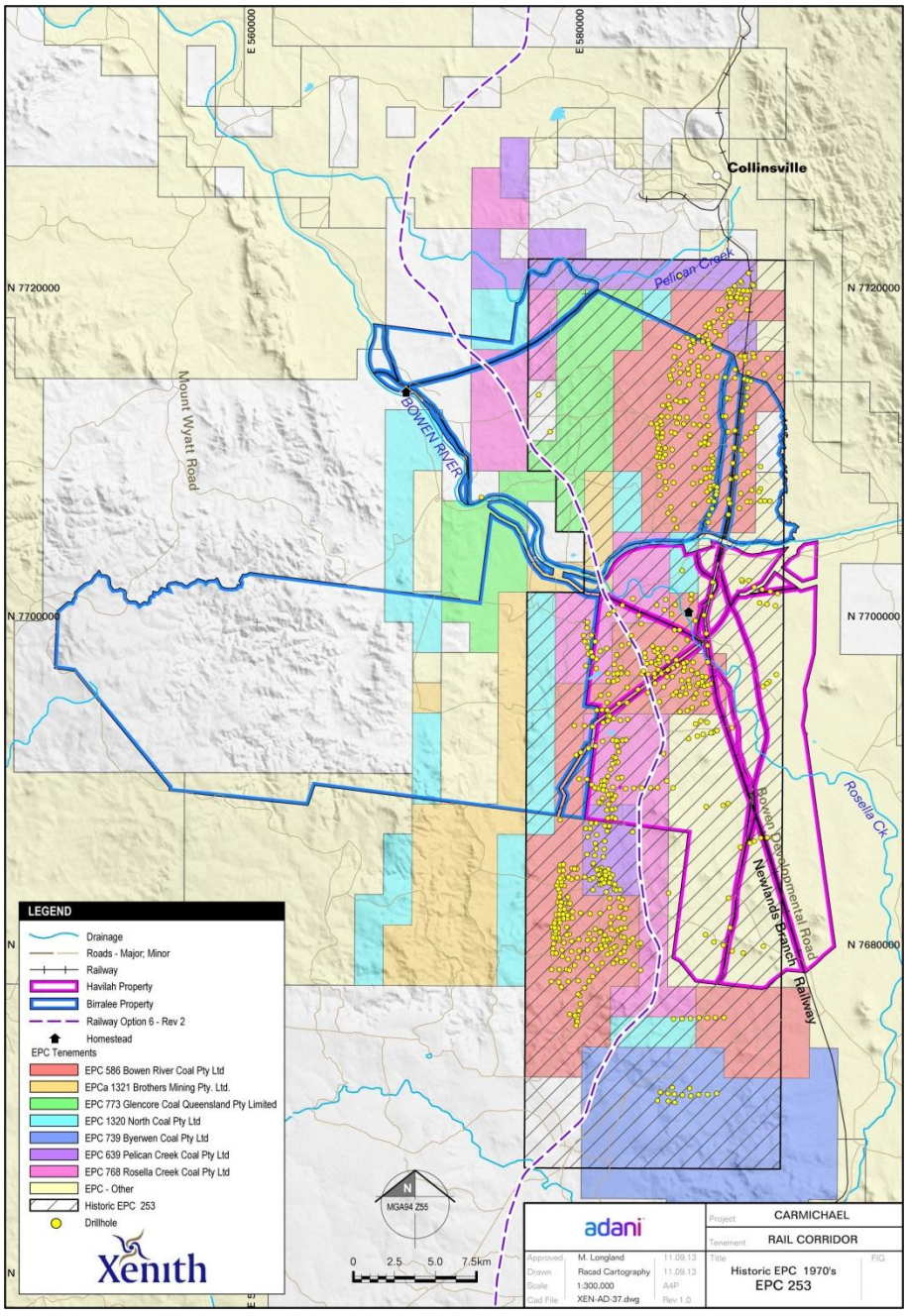
## 5.7 EPC253

EPC253 MIM Holdings, Collinsville Coal Co Pty Ltd

Report No's: 23122, 12847, 10181, 11168, 26834, 26833, 10795, 24946, 25246, 11819, 26835, 27992, 8727, 13637, 12398, 16068, 17984, 9502, 9132, 26837, 7800

Coverage of Current EPC: Southern blocks of EPC768, Eastern portion of EPC773 associated with proposed NGBR. Rail Portion of EPCa1321, Historic EPC covers almost entire EPC586, Southern block of EPC639 neighbouring rail corridor, Northern portion of Current EPC739 in particular that area associated with NGBR

**Figure 5.10 – Historic EPC 253 Coverage of Current EPCs**



Historic EPC Overview: Historic Exploration included several drilling campaigns with over 700 chipped or partially cored holes and 12.75km of orientation resistivity. In the area relinquished the coal seams encountered were generally thin sometimes cindered and commonly contain numerous tuffaceous interbeds. Seams were noted to be of variable coal quality and the area was thought to only support a small operation.

Reference: Mount Isa Mines Limited, EPC 253 Havilah, Report on the Nineteen Sub-blocks Relinquished on July 1995, P A J Sides.

Historic Exploration: Number of Drilling campaigns that began in the late 1970s, in conjunction with magnetometer surveys and field mapping

Summary of Exploration: Drilling adequately covers the majority of the Havilah area in question and most of the current EPC's. The drillholes appear to confirm the initial findings from the three holes drilled by BHP Co Ltd in the 1960's. There appears to be two sections of seams an Upper and Lower. The Upper seams are generally interbedded with numerous plies but included less of the intrusions evident elsewhere. The Lower seams are less interbedded but are predominately intruded. Several intersections of interbanded coal up to 2m thick, were described in the drilling, these plies have a north south strike length of 1 to 2 km, but were less extensive in the east west direction. This could be suggestive of steeply dipping bedding or extensive faulting within the region.

As seen in Figure 5.10 the proposed NGBR corridor travels between the main focus section areas of the historic drilling. A subset of the holes that underlay the proposed corridor or were within 100 of the corridor, were reviewed for this report the results for which are included in Appendix 1.

The exploration drilling undertaken as part of EPC253 formed the basis of the majority of the evidence for relinquishment for most of the proceeding tenures over the area in question.

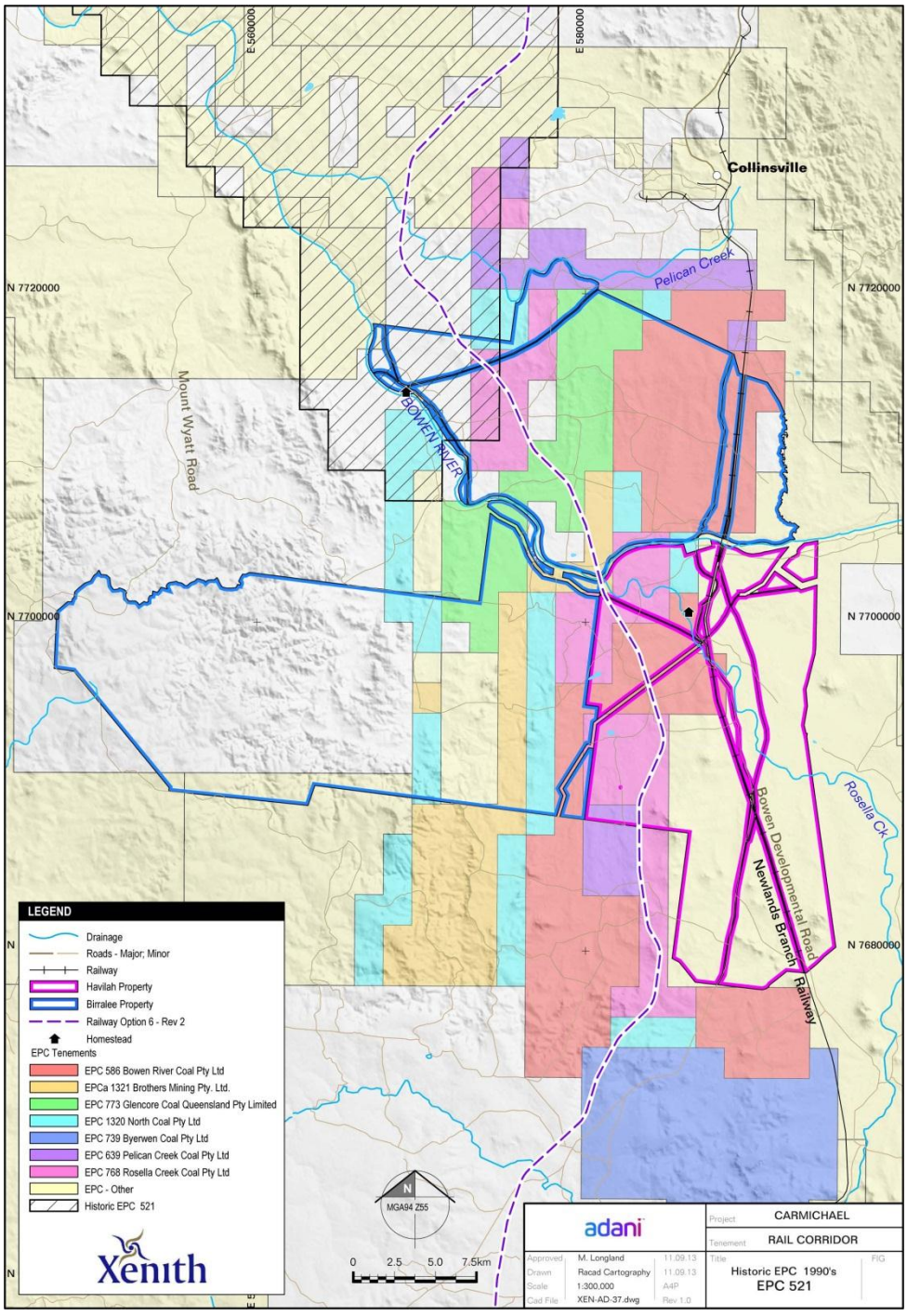
## 5.8 EPC521

EPC521 Coal and Allied Operations Pty Ltd

Report No's: 281212, 27637, 30439, 27313, 25432, 28122, 26191

Coverage of Current EPC: non rail small portion of north western corner, North western portion of EPC1320 and only area that impinges on the proposed railway zone, see Figure 5.11.

**Figure 5.11 – Historic EPC 521 Coverage of Current EPCs**



Historic EPC Overview: Historic EPC521 is of little direct value to interpretation across EPC773, it has been utilised primarily for a regional understanding. Historic exploration has included field mapping and interpretation of airborne magnetic and radiometric data. The rail corridor appears to straddle the area between the Bowen Basin and the Lizzie Creek Volcanics which could contain the Crush Creek Coal Member a potential coal source. The portion of the EPC covered by the proposed NGBR has not been identified as an area of drilling interest for potential resource. The underlying geology is mapped predominately as volcanic material. The potential for prospects of mineable thickness was in the author's opinion regarded as remote.

Reference: Exploration Permit No 521C Strathmore Report on period 23 April 96 to 2 January 97 and Final Report, 1997.

Historic Exploration:

- Field mapping of surface geology
- Interpretation of the BMR aeromagnetic data for identification of major sub-basins
- Stratigraphic drilling program consisting of three HQ3 diamond drill holes in the deepest part of the structure. Holes were named S1C, S2/2AC and S3C.
- Geophysical program – trial gravity and ground magnetic survey over 8km$^2$ aimed at finding a tool to map the subsurface geomorphology and locate anomalies that may indicate the presence of coal
- Petrological sampling and analysis
- High density magnetic mapping of the palaeochannel

Summary of Exploration: Coal and Allied discovered an extensive Early Permian palaeo-drainage system containing thick intervals of fluvial and lacustrine sediments at two widely separated stratigraphic horizons. This provided a geological framework in which to focus exploration for coal.

Geological mapping and the structural interpretation of detailed aeromagnetic data in 1993 to 1994 revealed a deep linear structure, believed to be a palaeo-channel, extending for a distance more than 30km in the north-western part of the EPC.

A three hole stratigraphic drilling program carried out in 1994 to 1995 found water-lain sediments; thereby confirming the Early Permian landform in the area included a system of freshwater rivers and lakes. Drilling confirmed that the upper horizons contain thin coal bands and carbonaceous shales in some areas (hole S1C); with other areas producing no coal bands in the upper horizons (hole S3C). One hole (S3C) showed the lower horizon contained coal-bearing fluvial sediments despite the higher energy environment of the enclosing sediments.

Trial gravity and ground magnetic surveys carried out in 1995 tested the suitability of these exploration techniques for tracing the distribution of the preferred lower horizon. The study was carried out over an 8km$^2$ area centred over hole S3C. The data indicated that the first magnetic response obtained from the interpretation of the detailed aeromagnetics represented the base of the upper sedimentary horizon along the full length of the palaeo-channel, suggesting that the base of the upper horizon is consistently in the order of 100 to 200 m, and the prospective lower horizon exceeds this depth over the tenement areas.

In the case of the lower horizon, Coal and Allied expected there to be reasonable grounds for examining the potential for the development of mineable thicknesses of coal. However, they concluded that the depth of the sequence would be too great for open-cut mining and the high incidence of faulting precluded underground mining.

Coal and Allied determined that the upper horizons could also host deposits amenable to open-cut mining, but the likelihood of potentially mineable thicknesses of coal having developed in the sequence was extinguished by the pervasive incidence of volcanic and volcanically derived detritus.

Despite considering the area to have a low level of prospectivity, Coal and Allied carried out a high density magnetic survey over 55.8km$^2$ of the palaeo-drainage system in 1996. Two gravity lows that could indicate accumulations of carbonaceous or coaly matter were identified in this survey; however, in late 1996 the company filed documentation to relinquish the areas.

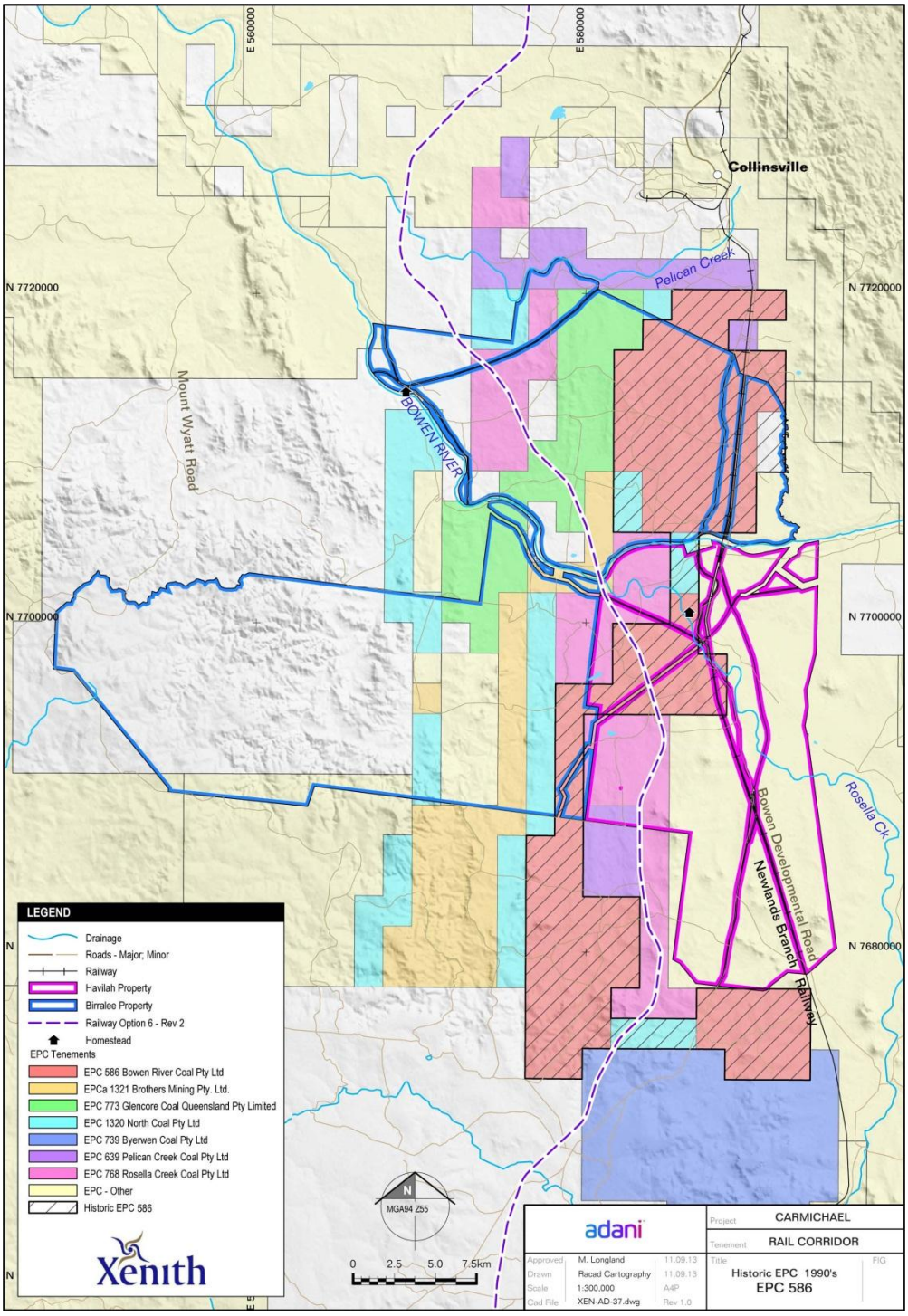
## 5.9 EPC586

Tenure Holder: Bowen River Coal Pty Ltd

Report No's: 37248

Coverage of Current EPC: Complete coverage

**Figure 5.12 – Historic EPC 586 Coverage of Current EPCs**



Historic EPC Overview: Historic EPC 586 sub blocks were relinquished due to proximity to the Bowen River and the intruded MCM, which host the target seams. There is inconclusive evidence as to the potential for an economic coal resource across the remainder of EPC586. The region was considered of poor potential for a large scale economic coal resource, and deferred to the potential for smaller operations. In general coal encountered was predominately cindered, intruded, of small thickness or included stony bands. The coal encountered was also of varying quality. It must be said that some of the historic assumptions would be based on historic economic factors or historic mining techniques which may or may not be pertinent to present circumstances.

Reference: Q Coal Pty Ltd, EPC586 Bowen River, Report on Area Relinquished, 27 November 2003, C. I. Pattison.

Historic Exploration: Geological interpretation of aerial photographs and investigation of historic drilling information from EPC253 (MIM Holdings Pty Ltd)

Summary of Exploration: Three areas separate areas were relinquished from the historic EPC586 sub blocks. Each area was relinquished for different reasons the Twelve Mile South area was deemed to be west of the subcrop of the MCM and not prospective for coal, the Bowen River area was relinquished due to an excess of unconsolidated cover and the Figtree area (current EPC1020) included sedimentary material of the less prospective FCCM. It was interpreted from QCoal field mapping that the MCM occurred at considerable depth in the Figtree area and relinquishment was recommended.

The Drake Coal Project exists within the northern sub block areas of EPC586 north of the Bowen River. The MCM host the target seams for this project

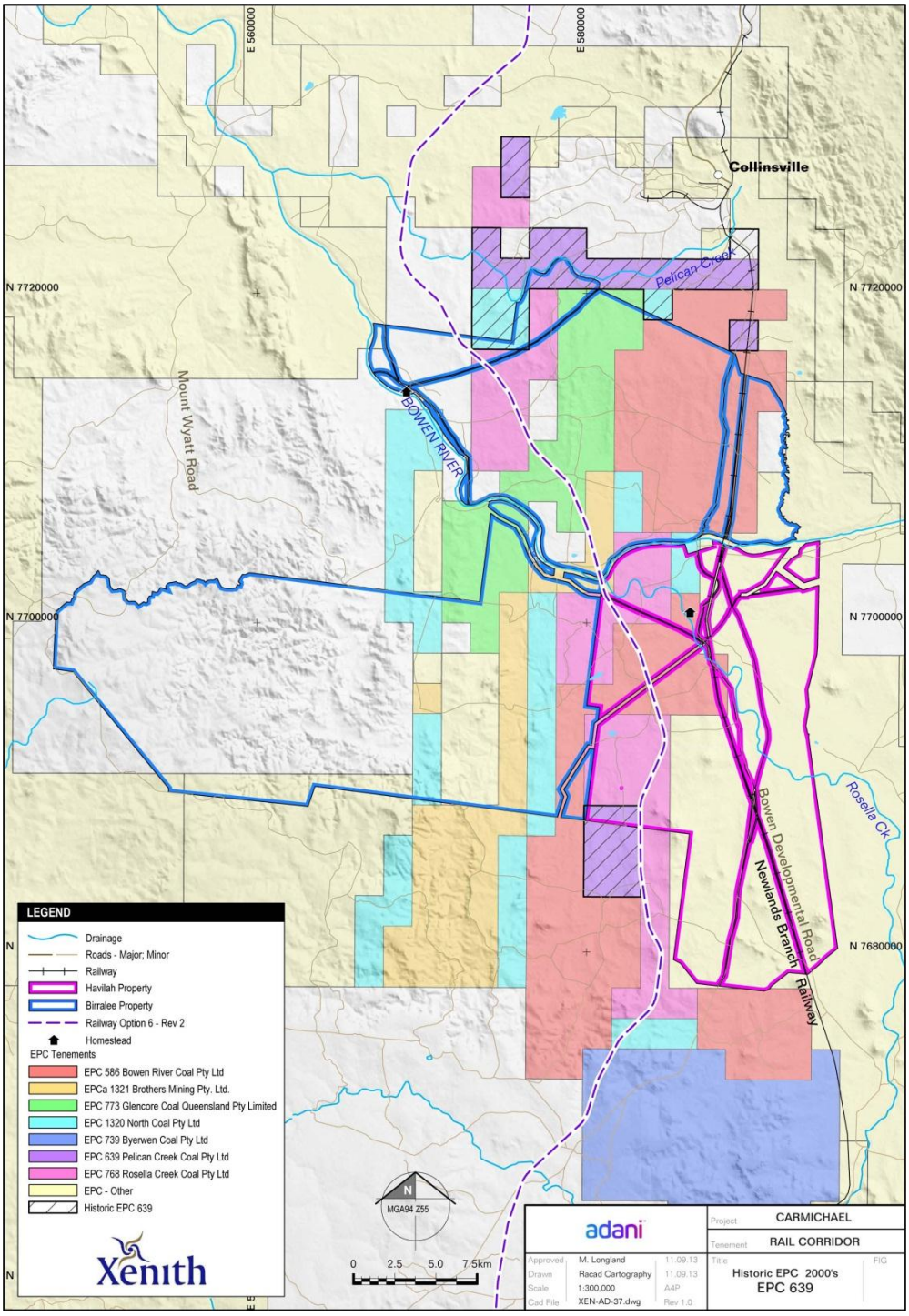
## 5.10 EPC639

EPC639 Pelican Creek Coal

Report No's: 44679

Coverage of Current EPC: Full Coverage

**Figure 5.13 – Historic EPC 639 Coverage of Current EPCs**



Summary: Relinquished areas based on surface mapping of outcropping sills. It was deemed apparent from available data that coal seam replacement by igneous sills becomes more commonplace along strike moving south away from Collinsville. Given mapped surface outcropping of the sills in the area, and the concomitant universal destruction of host coal seams, no further exploration was considered warranted.

Reference: Q Coal Pty Ltd.EPC639 Pelican Creek Report on Areas Relinquished in December 2006

Historic Exploration: Q Coal appraised historic geological mapping data and results of previous drilling which led to the relinquishment of southern sub blocks from the northern accumulation of sub blocks of EPC639 towards the NGBR proposed corridor north of the Bowen River.

Summary of Exploration: No data from contemporary and historic exploration was available for appraisal. The more prospective areas of EPC639 were retained for future exploration. The proposed NGBR only traverses the eastern margin of the southern extremity of EPC639 which overlies the Late Permian Blackwater Group.

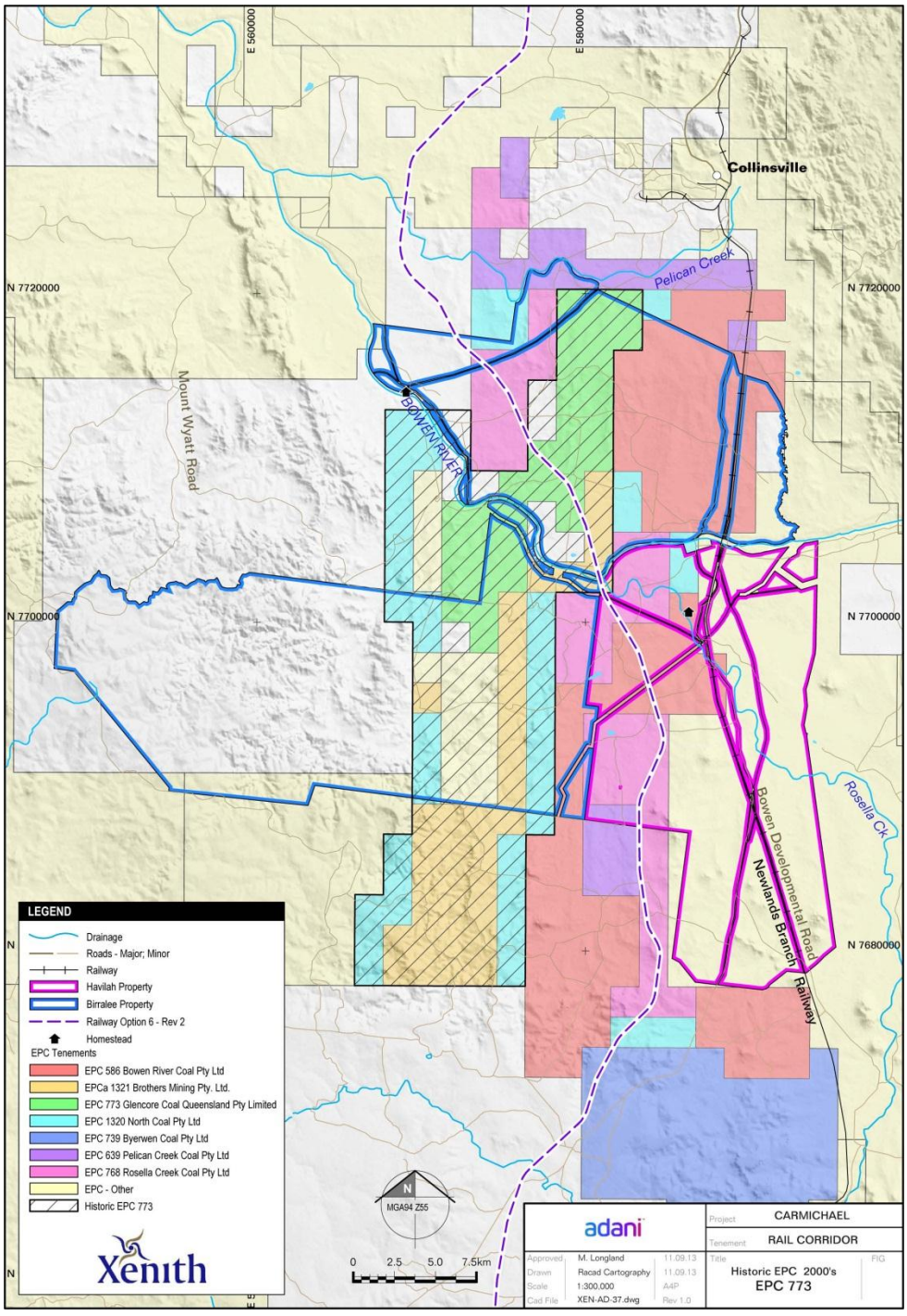
## 5.11 EPC773

EPC773 NCA Joint Venture still Current (surrounding tenure)

Report No's: 44687, 56526, 63400, 38645

Coverage of Current EPC: Current EPC remainder of historic EPC773, Covers entire area of current EPCa1321 application, No coverage of current EPC586 regional information only

**Figure 5.14 – Historic EPC 773 Coverage of Current EPCs**



Historic EPC Overview: Historic exploration included drilling, field mapping and photo interpretation. Relinquishments made because of either proximity to the Bowen River, widespread igneous intrusions and thin, stony coaly material. North eastern portion along the sub-crop line is still current and contains southern extension of the Lower Permian CCM. No indication of any coal seams existing in the EPC773 area as yet.

Reference: Various yearly relinquishment reports, in particular EPC773 Rosella Central Queensland, Partial Relinquishment Report 5th March 2013, for Xstrata Coal Queensland Pty Ltd, R Johnson.

Historic Exploration: Drill Program of 16 drill holes and a 2D seismic program were undertaken in 2005 / 2006, airborne magnetics, photo-geological interpretation.

Summary of Exploration: April 2006 drill program allowed for the identification of areas for relinquishment of sub blocks that included either the underlying basement material, very thin seams of stony coal material at depth, too structurally complex to be considered prospective for coal exploration, or based on proximity of the Bowen River. Details from the drilling are not publically available but consisted of 16 open holes that span the length of the EPC.

It was noted in several of the relinquishment reports that limited drilling data exists for the area and that future exploration work should include the investigation of structure and the delineation of the Cretaceous intrusions present in the area.

Two holes (RS0001 & RS0003) located in the central portion of the EPC (north of the Bowen River) have intersected intruded, heat affected 0.5m – 3m thick coal seams at depths greater than 120m.

Drill hole H10223, located just north of the Bowen River in the central portion of the EPC has penetrated the basement without intersecting any coal seams. The areas of the EPC to the west and northwest of this hole are dominated by the Bowen River

# 6 CONCLUSIONS

The proposed NGBR corridor traverses the western flank of the northern extension of the Bowen Basin. The Havilah and Birralee sections of the proposed NGBR corridor encompass an area of the Bowen Basin that contain the Basement Lizzie Creek Volcanics, Back Creek, Blackwater and Rewan Groups and are overlain by Cainozoic sediments, basalts and volcanics.

The proposed NGBR in the study area begins in the south and west of the Havilah area (Figure 6.1) and traverses the Fort Cooper Coal Measures (FCCM) which is summarised as a Coal Measure with high inherent mineral matter that comprises a large number of tuff bands. The most prospective seams in the FCCM are generally considered marginally economic. The current EPCs with underlying FCCM are EPC1320, the southern sub blocks of EPC768 and EPC639 and the southern central sub blocks of EPC586.

The proposed NGBR continues north traversing the Moranbah Coal Measures (MCM) near the divergence of the Bowen River and Rosella Creek (Figure 6.1). Coal was intersected in the drilling but was largely thin interbedded and / or heat affected. The subset of the Glencore holes, from historic EPC253, that were underlying or within the 500m of the proposed NGBR corridor are included in Table 6.1 below. The data suggests that coal is intersected less than 50m from surface, however very few intersections of greater than 0.5m of non-heat affected coal exist. A shallow approximately 2 – 10m thick igneous intrusion is intersected in the drilling (H510, H667 and H516) approaching the Bowen River. The current EPC's with underlying MCM within the study area are the northern central sub blocks of EPC586 and central sub blocks of EPC768.

The proposed NGBR continues through the Exmoor and Blenheim Formations that form the top units of the Back Creek Group, they are interpreted as a marine transgression from the description of the deposition history of the area. Very little coal exists within these units apart from a thin seam within the top 20m of the Exmoor Formation. The current EPC's with underlying Blenheim and Exmoor Formation within the study area are EPC1321 and EPC773.

The proposed NGBR continues through the Collinsville Coal Measures (CCM) in an area that is interpreted as having several Cretaceous igneous intrusions. The drilling to date is limited and the majority of exploration information is not in the public domain. Relinquishment reports of sub blocks from historic EPC773 nearby has intimated that CCM intersected within the two holes drilled to the east of EPC768, indicate the coal can be 0.5 to 3m thick and occurs at depths greater than 120m and the CCM includes numerous intrusions. One hole, H10223 drilled approximately 1km to the south of the northern group of sub blocks in EPC768, intersected the basement without intersecting coal.

The evidence suggests that coal intersections exist within the corridor of the proposed NGBR but they are in general thin, interbedded and or heat affected. The potential for a resource within the shallow FCCM underlying the proposed NGBR is low, as the coal, when not heat affected is considered marginally economic. Drilling within the MCM and CCM underlying the proposed NGBR contains numerous intersections of igneous intrusions and thin interbedded heat affected coal. The extent of the various intrusions is not well documented in the historic literature and exploration to establish this extent would be pertinent to any future resource calculation.

**Table 6.1 – Subset of EPC253 holes upon and within 500m of the proposed NGBR**

| Proximity | Holed Id | Easting | Northing | Total Depth | Core | Stratigraphic Horizon | Comment |
|---|---|---|---|---|---|---|---|
| Within NGBR | H12 | 581720 | 7700680 | 65 | | MCM | 0.65m of cindered coal at 24m |
| Within NGBR | H510 | 581400 | 7700460 | 28.2 | | MCM | 0.07m @ 18.5m, 1.24m @23m and 0.12m @ 26.2m of cindered coal, ~2 to 4m of igneous interbedded material between |
| Within NGBR | H516 | 582650 | 7698670 | 24.6 | 12.5 | MCM | From 12.1m to 19.1m minor <0.5m band of cindered coal and approximately 4m of igneous intrusion |
| Within NGBR | H529 | 583790 | 7695720 | 34.1 | | MCM | cindered coal 29.6-32.6 some clay interbeds (comment core cuts as if high ash coke) |
| Within NGBR | H530 | 583420 | 7696850 | 33 | 8 | MCM | no record |
| Within NGBR | H531 | 583530 | 7697020 | 6 | 0 | MCM | no record |
| Within NGBR | H657 | 583420 | 7689900 | 45.83 | | FCCM | Heat affected interbedded mudstones and coal 17-23m , interbedded stony coal 26-27.3m, minor <0.1m coal bands, dull heat affected coal 28.5-28.1, 31.5-32.1, interbedded stony slightly heat affected coal and tuff (~60% coal) 35.8 – 44m depth. |
| Within NGBR | H667 | 582770 | 7699170 | 60 | 0 | FCCM | Igneous Intrusion from 1.5m to 11m depth no coal |
| Within NGBR | H759 | 583810 | 7696820 | 61 | 8 | FCCM | no record |
| Within 500m | H122 | 582850 | 7687220 | 51 | | MCM | Coal at 51m was approximately 10% of 2m intersection of Interbedded carbonaceous mudstones |
| Within 500m | H489 | 583600 | 7698120 | 21.37 | 8.37 | MCM | no record |
| Within 500m | H495 | 583620 | 7697840 | 27.15 | 6.15 | MCM | no record |
| Within 500m | H511 | 582240 | 7701020 | 47.1 | | MCM | 0.92 m cindered coal at 35.3-36.2, and minor bands of cindered coal throughout. Intrusion 6.4m in coal at 36.6m depth. |
| Within 500m | H532 | 584230 | 7696650 | 64.6 | 13.6 | MCM | no record |
| Within 500m | H536 | 583710 | 7697470 | 35 | 7 | MCM | no record |
| Within 500m | H6 | 584000 | 7697560 | 24 | 0 | MCM | no record |
| Within 500m | H655 | 582940 | 7689890 | 75.8 | | FCCM | Interbedded with siltstone and muds stone and or heat affected coal 19-22m, 23-24m, 58-64.3, 66.3-71.6m, best intersection dull coal 72-75.2 interbedded coal and minor mudstone. 2m of Igneous intrusion from 4-6m depth (basalt?) |
| Within 500m | H656 | 583960 | 7689920 | 75.4 | | FCCM | interbedded coal and mudstones 71-74m depth slightly heat affected |
| Within 500m | H750R | 584220 | 7696270 | 71.4 | 6.22 | FCCM | no record |
| Within 500m | H752 | 584180 | 7696860 | 13.8 | 2.8 | FCCM | no record |
| Within 500m | H95 | 584490 | 7695140 | 50 | | MCM / FCCM | weathered interbedded coal 11-12m, 13-14m, interbedded coal and tuff (coal 10%) 21-22m, coal dull 40% 44-47m, |

**Figure 6.1 – Havilah / Birralee Regional Geology**

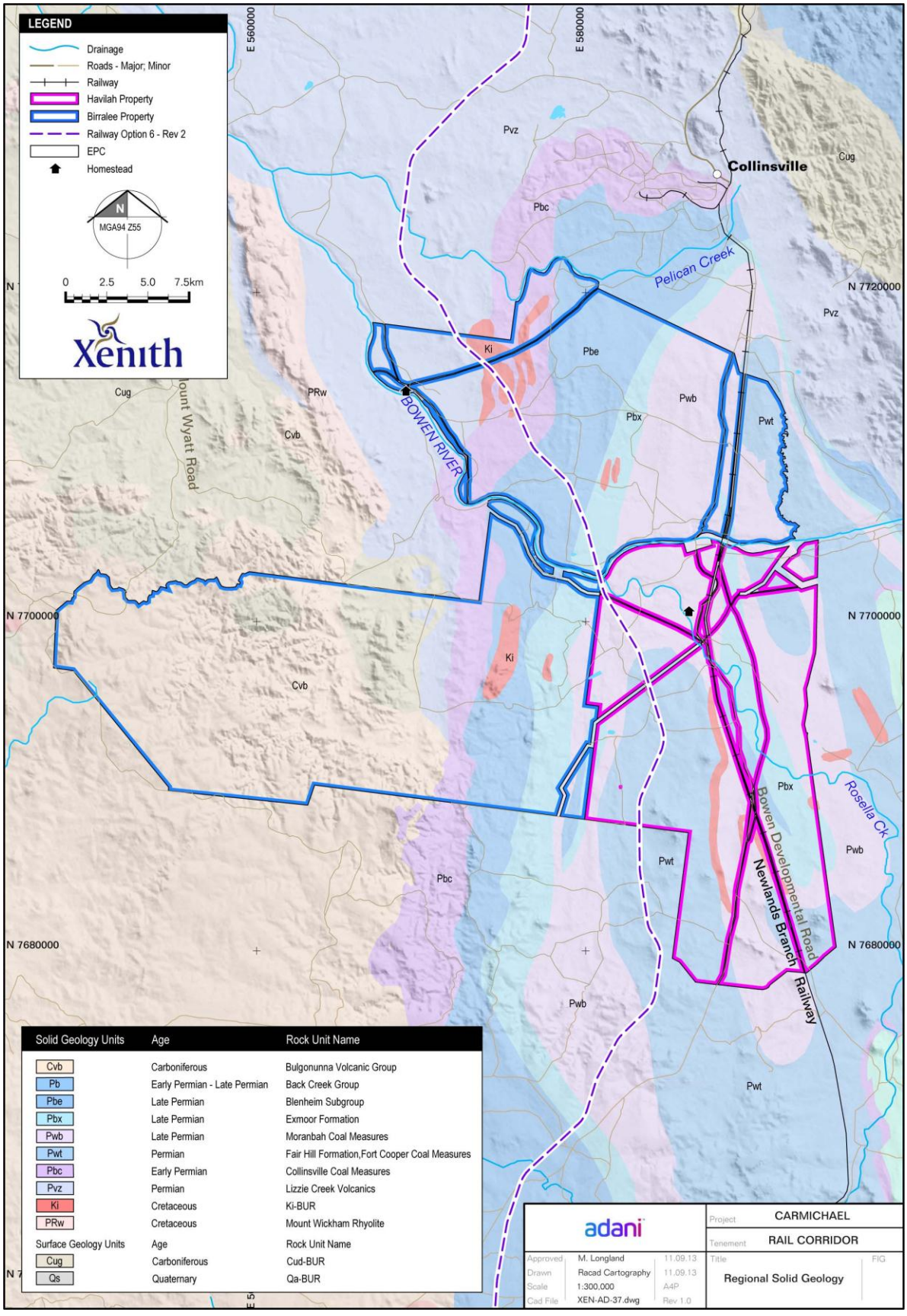


**Table 6.2 – Ranking of Study Area Current EPC's**

| Potential Resource Ranking | Current EPC Holders | Summary Comments |
|---|---|---|
| Mid - Low | EPC639 Pelican Creek Coal Pty | • The proposed NGBR traverses the eastern margin of the southern sub blocks of this tenure and within the Fort Cooper Coal Measures (FCCM) an accumulation of thin seams and tuffaceous interbeds.<br>• The potential for a small resource may exist within Moranbah Coal Measures (MCM), towards the western margin of these southern sub blocks and near the tenements' boundary with EPC586 and away from the proposed NGBR.<br>• The proposed NGBR traverses approximately 40ha of the 1900ha associated with this southern sub block area.<br>• Within the southern sub blocks of EPC639 the proposed NGBR potentially overlies 1.2Mt of FCCM, assuming approximately 2m of cumulative coal at approximately 30m depth. A further 3m intersection of interbedded slightly heat affected coal and mudstone occurs at approximately 70m depth which could increase the coal tonnes to approximately 3.0Mt. |
| Mid – Low | EPC586 Bowen River Coal Pty Ltd | • The proposed NGBR traverses the northern extremity of the central sub blocks of this tenement.<br>• Historic drilling suggests that the more prospective area of the EPC is associated with the northern sub blocks away from the proposed NGBR, north of the Bowen River underlying the Drake Coal Project.<br>• Approximately 60 ha of the 7000ha central sub block area that underlies the proposed NGBR corridor.<br>• Within the central sub block of the EPC the proposed NGBR potentially overlies 0.7Mt of intruded MCM at 20 to 30m (30ha at 1.5m thick coal) and a further 1.3Mt of slightly heat affected interbedded FCCM at 40m (30ha at 3m thick coal) in the south of the area.<br>• The MCM intersected in the historic drilling under the proposed NGBR has been largely intruded and the surrounding coal, heat affected. |
| Mid - Low | EPC768 Rosella Creek Coal Pty Ltd | • EPC 768 is in three parts and is the EPC most traversed by the proposed NGBR. The proposed NGBR encompasses approximately 220ha of the total 12200ha associated with the EPC<br>• The southern extension of the EPC is underlain by the FCCM. The proposed NGBR potentially overlies 6.3Mt of interbedded mudstones and coal (140ha of ~3m thick coal at 70m in the north to 178m depth in the south).<br>• The central portion is underlain by MCM that have been predominately heat affected or interbedded. The proposed NGBR potentially overlies 0.4Mt of intruded and heat affected coal (20ha of ~1.5m thick coal at 20m).<br>• The northern portion of the EPC is underlain by CCM a hole drilled for EPC773 that lies 1 km to the south of EPC768 which penetrated the basement without intersecting coal. A further two holes drilled to the west intersected heavily intruded, heat affected coal seam within the CCM. The proposed NGBR potentially overlies approximately 2.7Mt of intruded and heat affected coal at depth (60ha of ~3m of cumulative coal at greater than 120m).<br>• Exploration data from the year 2000 onwards is not in the public domain and therefore an assessment of potential is difficult to establish. |

| | | |
|---|---|---|
| Low | EPC773 Glencore Coal Queensland Pty Ltd | • The proposed NGBR traverses the central portion of the EPC and was explored for the southern extension of the Collinsville Coal Measures (CCM).<br>• Exploration within the historic relinquished portions of the EPC suggested that the basement material is shallower than expected and or that the extent of the intrusions were increasing to the south.<br>• Further exploration work was needed to target the extent of the intrusions and assess the structural controls on the CCM within the EPC<br>• The Majority of the EPC overlies the less prospective Blenheim and Exmoor Formations.<br>• Information indicates the corridor does not appear to contain likely economic coal. |
| Very Low | EPC1320 (1321) North Coal Pty Ltd | • Several sub blocks dispersed throughout area that were relinquished sub blocks from historic EPC's.<br>• The proposed NGBR traverses only one sub block area of EPC1320, that which sits between EPC739 and EPC 768. Which was historically relinquished on the basis of hosting inferior coal seams of the FCCM<br>• The proposed NGBR traverses only one sub block area of EPC1321, that which overlies the Bowen River portion of the potential NGBR and within the less prospective Exmoor Formation.<br>• Information indicates the corridor does not appear to contain likely economic coal. |
| Very Low | EPC739 Byerwen Coal Pty Ltd | • The proposed NGBR traverses the north western corner of EPC. The historic focus for exploration within the EPC was towards the south and east and away from proposed NGBR<br>• Historic sub blocks immediately to the north were relinquished on the basis of hosting inferior coal seams of the FCCM<br>• Information indicates the corridor does not appear to contain likely economic coal. |

Area calculations were all based on the proposed width for the NGBR corridor of 100m and then the distance traversed across the current EPC. Coal tonnages were calculated on an average thickness of coal seam at a relative density of 1.5 g/cc multiplied by the calculation of area sterilised under the proposed NGBR. The values are an estimate based on average coal thickness from holes directly impacted by the rail corridor. There was no depth limit applied to the estimate of potential coal tonages.

The ranking devised for each EPC took into consideration the prospectivity of the interpreted underlying geology and how much area would potentially be sterilised by the proposed corridor. More weight was given to those areas with underlying MCM and CCM at shallow depths as these units were those targeted by historic exploration. The FCCM received a lower weighting as this had historically been considered as sub-economic.

# 7 BIBLIOGRAPHY

Blayden, I. (1965). *Havilah Coal Prospecting Area - Final Report.*

Pattison, C. I. (2006). *Q Coal Pty Ltd, EPC639 Pelican Creek, Report on Areas Relinquished in December 2006.*

# Appendix A. DRILLING INFORMATION

| Holed Id | Easting | Northing | Collar | Total Depth | Core |
|---|---|---|---|---|---|
| C717 | 585720 | 7721090 | 216 | 355.87 | 32.09 |
| G121 | 591610 | 7696810 | 148.0 | 60 | |
| G122 | 591170 | 7696380 | 153.0 | 70 | |
| G123 | 590790 | 7696090 | 149.0 | 62 | |
| G133 | 591040 | 7696260 | 153.0 | 32 | |
| H10 | 586290 | 7696220 | 215.7 | 19.34 | 1.95 |
| H100 | 581070 | 7684530 | 190.0 | 45 | |
| H101D | 580470 | 7685250 | 208.0 | 128 | |
| H103 | 581160 | 7684330 | 191.0 | 45.58 | |
| H104 | 581160 | 7680420 | 222.6 | 50 | 0 |
| H105 | 581030 | 7684710 | 191.0 | 48.7 | |
| H106 | 581250 | 7683570 | 198.0 | 39 | |
| H107 | 581470 | 7683190 | 198.0 | 53 | |
| H108 | 580960 | 7685040 | 196.0 | 53 | |
| H11 | 581500 | 7681670 | 212.0 | 25.88 | |
| H110 | 579190 | 7682370 | 222.5 | 50 | 0 |
| H111 | 578750 | 7682350 | 222.3 | 50 | 0 |
| H113 | 578220 | 7682200 | 222.3 | 50 | 0 |
| H114 | 579690 | 7682280 | 22.14 | 50 | 0 |
| H115 | 580260 | 7682240 | 22.06 | 50 | 0 |
| H116 | 580890 | 7682270 | 22.11 | 41 | 0 |
| H117 | 581570 | 7681290 | 221.9 | 50 | 0 |
| H118 | 581950 | 7681230 | 222.9 | 50 | 0 |
| H119 | 581230 | 7684600 | 219.3 | 68.8 | |
| H12 | 581720 | 7700680 | 141.0 | 65 | |
| H120 | 581420 | 7684680 | 191.0 | 79.8 | |
| H121 | 580580 | 7681320 | 221.2 | 54 | 0 |
| H122 | 582850 | 7687220 | 187.0 | 51 | |
| H125 | 581590 | 7684110 | 196.0 | 34.37 | |
| H126 | 581770 | 7684030 | 166.0 | 59 | |
| H127 | 581380 | 7684950 | 191.0 | 80.46 | |
| H128 | 581430 | 7684140 | 192.0 | 56 | |
| H129 | 581190 | 7684800 | 186.0 | 51.87 | |
| H13 | 580080 | 7699640 | 134.0 | 8 | |
| H130 | 580830 | 7684950 | 194.0 | 34.34 | |
| H131 | 580865 | 7684840 | 191.0 | 35 | |
| H132 | 581060 | 7684170 | 196.0 | 31.32 | |
| H133 | 581210 | 7684580 | 197.0 | 31.99 | |
| H134 | 580950 | 7684225 | 199.4 | 15.51 | |
| H136 | 581630 | 7684590 | 192.0 | 46.76 | |

| | | | | | |
|---|---|---|---|---|---|
| H137 | 580550 | 7685790 | 198.0 | 40 | |
| H138 | 580640 | 7686190 | 192.0 | 41 | |
| H139 | 580590 | 7686530 | 190.0 | 27 | |
| H14 | 580010 | 7697340 | 145.0 | 65 | |
| H140 | 580670 | 7687050 | 185.0 | 37 | |
| H141 | 580010 | 7687440 | 185.0 | 49 | |
| H142 | 580270 | 7687430 | 190.0 | 36 | |
| H143 | 580140 | 7686920 | 192.0 | 50 | |
| H144 | 580090 | 7685850 | 192.0 | 50 | |
| H145 | 581120 | 7686170 | 195.0 | 46 | |
| H146 | 581070 | 7685710 | 197.0 | 50 | |
| H147 | 581160 | 7686660 | 187.0 | 50 | |
| H148 | 581320 | 7687280 | 182.0 | 50 | |
| H149 | 581430 | 7687550 | 180.0 | 55 | |
| H15 | 580650 | 7697750 | 139.0 | 65.77 | |
| H150 | 581760 | 7683750 | 179.0 | 20.08 | |
| H151 | 581440 | 7687540 | 180.0 | 21.86 | |
| H152 | 581600 | 7688060 | 183.0 | 61.03 | |
| H152L | 581625 | 7688125 | 183.0 | 61.35 | |
| H153 | 581790 | 7688630 | 182.0 | 47.24 | |
| H154 | 581600 | 7688600 | 183.0 | 63.61 | |
| H155 | 581580 | 7689190 | 175.0 | 44.88 | |
| H156 | 581550 | 7689540 | 174.0 | 32.82 | |
| H157 | 581660 | 7689950 | 175.0 | 27.31 | |
| H158 | 581379 | 7689489 | 175.0 | 41.55 | |
| H159 | 581674 | 7689197 | 183.0 | 81 | |
| H16 | 585880 | 7703140 | 140.0 | 35 | |
| H160 | 581810 | 7689420 | 184.0 | 75.51 | |
| H161 | 581810 | 7688040 | 186.0 | 66.73 | |
| H163 | 581350 | 7688060 | 177.0 | 36.2 | |
| H165 | 581390 | 7688918 | 172.1 | 64 | |
| H166 | 581168 | 7687606 | 179.6 | 52.98 | |
| H167 | 581288 | 7688556 | 177.7 | 61.57 | |
| H168 | 581439 | 7687576 | 180.0 | 55.12 | |
| H169 | 581870 | 7683680 | 216.0 | 28.62 | |
| H17 | 581570 | 7680100 | 222.5 | 22.84 | 0 |
| H170 | 581440 | 7682610 | 203.0 | 41.2 | |
| H171 | 582010 | 7682020 | 210.0 | 44 | |
| H172 | 582110 | 7682660 | 219.0 | 33.59 | |
| H173 | 581560 | 7682070 | 206.0 | 37 | |
| H175 | 582170 | 7681340 | 219.0 | 40 | |
| H174 | 582030 | 7683210 | 205.0 | 49 | |
| H176 | 581610 | 7680670 | 221.8 | 56.5 | 15.5 |
| H177 | 580920 | 7681150 | 222 | 88 | 13 |

| | | | | | |
|---|---|---|---|---|---|
| H178 | 580210 | 7681040 | 221.4 | 81 | 0 |
| H179 | 582180 | 7680840 | 223 | 50 | 6 |
| H18 | 580880 | 7681110 | 222.1 | 112.4 | 0 |
| H180 | 582620 | 7680490 | 224.3 | 50 | 0 |
| H181 | 582330 | 7679950 | 222.9 | 76.62 | 7 |
| H182 | 581850 | 7680270 | 222.4 | 71 | 4 |
| H183 | 582670 | 7680600 | 223.8 | 40 | 2 |
| H184 | 582340 | 7680800 | 223.5 | 28 | 6 |
| H185 | 583200 | 7680270 | 255.0 | 50 | |
| H186 | 583190 | 7680410 | 252.0 | 68.11 | |
| H187 | 582410 | 7681380 | 221.0 | 33 | |
| H188 | 582340 | 7681950 | 212.0 | 22 | |
| H189 | 582450 | 7682560 | 224.0 | 54 | |
| H19 | 581160 | 7680950 | 221.7 | 23.25 | 8.25 |
| H190 | 582240 | 7683100 | 205.0 | 49.63 | |
| H191 | 582100 | 7683700 | 194.0 | 36.44 | |
| H192 | 583350 | 7680460 | 248.0 | 28 | |
| H193 | 582870 | 7680730 | 223.4 | 50 | 0 |
| H194 | 582390 | 7680200 | 224 | 87 | 13 |
| H195 | 578010 | 7680110 | 224.2 | 71.2 | 9.2 |
| H196 | 578560 | 7680040 | 223 | 105 | 4 |
| H197 | 579130 | 7679950 | 222.9 | 70 | 5 |
| H198 | 580630 | 7680050 | 223.5 | 70 | 8 |
| H199 | 580120 | 7680040 | 222.6 | 63 | 0 |
| H20 | 580900 | 7680300 | 222.8 | 41 | 0 |
| H200 | 579620 | 7679980 | 223.2 | 65 | 12 |
| H204 | 578170 | 7681830 | 223.8 | 60 | 12 |
| H205 | 578630 | 7684380 | 203.0 | 82 | |
| H206 | 578460 | 7685220 | 200.0 | 64.91 | |
| H207 | 581000 | 7679240 | 235.0 | 65 | |
| H208 | 580730 | 7678870 | 239.0 | 65 | |
| H209 | 580430 | 7678430 | 244.0 | 70 | |
| H21 | 588800 | 7681400 | 207.0 | 43 | |
| H210 | 578400 | 7681865 | 222.601 | 82 | 22 |
| H211 | 577960 | 7681430 | 224.75 | 39.91 | 9.91 |
| H212 | 578330 | 7681350 | 223.555 | 78.16 | 13.16 |
| H213 | 578325 | 7682940 | 221.67 | 50 | 6 |
| H214 | 578510 | 7682945 | 221.495 | 55.02 | 7 |
| H215 | 578690 | 7683960 | 205.4 | 81 | |
| H216 | 578510 | 7684000 | 207.0 | 82 | |
| H217 | 578650 | 7685240 | 199.1 | 82 | |
| H218 | 578240 | 7683970 | 209.3 | 28.06 | |
| H219 | 578440 | 7682500 | 221.945 | 65.51 | 18.51 |
| H22 | 588700 | 7683200 | 188.0 | 63 | |

| | | | | | |
|---|---|---|---|---|---|
| H220 | 578050 | 7681025 | 222.682 | 42.41 | 22.41 |
| H221 | 578300 | 7681070 | 222.649 | 76 | 5 |
| H222 | 580210 | 7678150 | 242.0 | 70 | |
| H223 | 579925 | 7677720 | 240.0 | 42 | |
| H224 | 579640 | 7677260 | 242.0 | 70 | |
| H225 | 579430 | 7675700 | 253.0 | 70 | |
| H226 | 579510 | 7676050 | 248.0 | 71 | |
| H226R | 579510 | 7676050 | 248.0 | 35.86 | |
| H227 | 579600 | 7676350 | 245.0 | 60.11 | |
| H228 | 579680 | 7676760 | 250.0 | 63 | |
| H229 | 578384 | 7680627 | 222.394 | 65.16 | 14 |
| H229 | 578384 | 7680627 | 223.9 | 65.16 | |
| H23 | 586410 | 7671150 | 280.0 | 97.46 | |
| H230 | 578160 | 7681025 | 222.693 | 63 | 24 |
| H231 | 578180 | 7681200 | 223.161 | 63 | 27 |
| H232 | 578110 | 7681390 | 224.098 | 63 | 31 |
| H233 | 578100 | 7681670 | 223.483 | 58.46 | 18.46 |
| H234 | 578430 | 7681700 | 222.995 | 84.61 | 14.61 |
| H235 | 578405 | 7682225 | 222.989 | 41.41 | 29 |
| H236 | 578640 | 7682210 | 222.462 | 72.49 | 14.49 |
| H237 | 578460 | 7682710 | 221.767 | 42.01 | 16.01 |
| H238 | 578443 | 7683535 | 210.8 | 60.96 | |
| H239 | 578335 | 7684194 | 205.3 | 39.77 | |
| H24 | 589540 | 7702480 | 144.0 | 43.72 | |
| H240 | 578345 | 7683750 | 208.0 | 55 | |
| H240R | 578345 | 7683750 | 208.0 | 26.97 | |
| H241 | 578525 | 7684204 | 203.1 | 60.58 | |
| H242 | 578420 | 7684860 | 200.8 | 47.86 | |
| H243 | 578635 | 7684885 | 203.6 | 81.81 | |
| H244 | 578370 | 7680775 | 222.415 | 57.5 | 9 |
| H246 | 578020 | 7679840 | 223.795 | 77.25 | 24.25 |
| H247 | 578405 | 7683280 | 219.3 | 45.3 | |
| H248 | 578570 | 7684530 | 201.0 | 59.57 | |
| H249 | 578187 | 7680762 | 222.157 | 33.75 | 7.75 |
| H25 | 590870 | 7715090 | 218.0 | 100 | |
| H250 | 578050 | 7680415 | 223.199 | 48.55 | 8.55 |
| H251 | 579470 | 7675870 | 240.0 | 50 | |
| H252 | 579500 | 7675680 | 252.0 | 43.39 | |
| H253 | 579420 | 7675425 | 269.0 | 32 | |
| H253R | 579420 | 7675425 | 269.0 | 22.5 | |
| H253R | 579420 | 7675425 | 269.0 | 9 | |
| H253RR | 579420 | 7675425 | 269.0 | 49.65 | |
| H254 | 577920 | 7678850 | 224.3 | 81.2 | 4.2 |
| H257 | 579350 | 7676050 | 240.0 | 77 | |

| | | | | | |
|---|---|---|---|---|---|
| H258 | 581480 | 7680720 | 221.5 | 26.11 | 5.11 |
| H26 | 590210 | 7716340 | 200.0 | 95 | |
| H261 | 589720 | 7715960 | 199.0 | 60 | |
| H261R | 589430 | 7716200 | 197.0 | 61 | |
| H265 | 589100 | 7715380 | 190.0 | 38 | |
| H267A | 588740 | 7713590 | 178.0 | 38 | |
| H267B | 588610 | 7713630 | 181.0 | 24 | |
| H268 | 588680 | 7711590 | 179.0 | 24 | |
| H269A | 588380 | 7712530 | 172.0 | 20 | |
| H269B | 588520 | 7712530 | 174.0 | 30 | |
| H27 | 590250 | 7716140 | 204.0 | 19.33 | |
| H270 | 589050 | 7710620 | 173.0 | 63.6 | |
| H273 | 585465 | 7712490 | 175 | 34 | 8 |
| H274 | 585505 | 7713500 | 181 | 26 | 7 |
| H275 | 585700 | 7714590 | 183 | 30 | 6 |
| H276 | 586225 | 7715440 | 181 | 90 | 7 |
| H277 | 586370 | 7715840 | 181 | 32 | 8 |
| H279 | 587585 | 7716700 | 178.0 | 75.3 | |
| H280 | 586170 | 7712460 | 175 | 33.3 | 15 |
| H281 | 586040 | 7713495 | 184 | 33.2 | 20 |
| H282 | 586135 | 7713460 | 184 | 43 | 17 |
| H283 | 586310 | 7714460 | 192 | 52 | 23 |
| H284 | 586840 | 7715305 | 188.0 | 43 | |
| H285 | 587410 | 7716080 | 184.0 | 70 | |
| H286 | 588070 | 7716230 | 175.0 | 33 | |
| H287 | 589930 | 7721250 | 178.0 | 66 | |
| H288 | 590000 | 7720170 | 181.0 | 70 | |
| H289 | 589830 | 7719020 | 178.0 | 75 | |
| H29 | 587230 | 7710760 | 215.6 | 95 | 8 |
| H292 | 589510 | 7712840 | 187.0 | 51 | |
| H293 | 589090 | 7711660 | 178.0 | 90.2 | |
| H294 | 588960 | 7709680 | 156.0 | 51 | |
| H295 | 588700 | 7707490 | 160.0 | 64 | |
| H296 | 588690 | 7706550 | 157.0 | 52 | |
| H297 | 587730 | 7702440 | 139.0 | 80 | |
| H298 | 587210 | 7700430 | 140.0 | 52 | |
| H299 | 587640 | 7701570 | 140.0 | 62 | |
| H3 | 586190 | 7698930 | 214 | 24.67 | 24.67 |
| H30 | 587660 | 7710140 | 216.3 | 29 | 0 |
| H300 | 587350 | 7699300 | 136.0 | 72 | |
| H301 | 588910 | 7693560 | 152.0 | 6 | |
| H302 | 588000 | 7693400 | 165.5 | 22.2 | |
| H303 | 587725 | 7693275 | 169.9 | 93 | |
| H304 | 587630 | 7693260 | 173.2 | 93 | |

| | | | | | |
|---|---|---|---|---|---|
| H305 | 587160 | 7693170 | 176.1 | 93 | |
| H306 | 586805 | 7693050,00 | 169.5 | 93 | |
| H307 | 586270 | 7692900 | 181.0 | 70 | |
| H308 | 587350 | 7688760 | 181.0 | 70 | |
| H309 | 588670 | 7688950 | 165.0 | 70 | |
| H312 | 590010 | 7686590 | 195.0 | 41 | |
| H313 | 585890 | 7671200 | 269.0 | 80 | |
| H314 | 586330 | 7671600 | 260.0 | 80 | |
| H315 | 586875 | 7671220 | 261.0 | 70 | |
| H317 | 584995 | 7671300 | 273.0 | 71 | |
| H318 | 585270 | 7671650 | 274.0 | 90 | |
| H319 | 585040 | 7670830 | 284.0 | 83 | |
| H320 | 585430 | 7670760 | 281.0 | 93 | |
| H321 | 584380 | 7670875 | 285.0 | 93 | |
| H322 | 587430 | 7671240 | 258.0 | 80 | |
| H323 | 587980 | 7671300 | 252.0 | 80 | |
| H324 | 586900 | 7675910 | 248.0 | 80 | |
| H325 | 586380 | 7675870 | 251.0 | 84 | |
| H326 | 585880 | 7675840 | 256.0 | 80 | |
| H327 | 585350 | 7675830 | 259.0 | 77 | |
| H328 | 587890 | 7675920 | 241.0 | 80 | |
| H329 | 588420 | 7675920 | 236.0 | 80 | |
| H330 | 587400 | 7675900 | 242.0 | 80 | |
| H331 | 581660 | 7692815 | 165.0 | 85 | |
| H332 | 581930 | 7692460 | 166.0 | 24 | |
| H333 | 584330 | 7712060 | 215.4 | 23.2 | 6.26 |
| H334 | 583990 | 7712090 | 214.6 | 12.9 | 0 |
| H335 | 584350 | 7711570 | 215.3 | 48 | 6 |
| H336 | 584380 | 7711820 | 215.5 | 25.8 | 6.8 |
| H337 | 584420 | 7711270 | 215.5 | 28.6 | 13.6 |
| H338 | 584520 | 7711200 | 215.7 | 39 | 10 |
| H339 | 584480 | 7710780 | 215.8 | 47 | 18 |
| H34 | 584550 | 7671380 | 270.0 | 102.22 | |
| H340 | 584690 | 7710000 | 215.8 | 60 | 33 |
| H341 | 584780 | 7709520 | 215.7 | 55.6 | 36.6 |
| H342 | 584840 | 7708550 | 146.0 | 80 | |
| H343 | 584860 | 7708549 | 146.0 | 15 | |
| H344 | 584880 | 7708130 | 140.0 | 65 | |
| H345 | 585190 | 7706990 | 140.0 | 70 | |
| H346 | 585370 | 7706250 | 140.0 | 71 | |
| H347 | 585550 | 7705750 | 141.0 | 85.9 | |
| H348 | 584630 | 7712060 | 216.4 | 56 | 28 |
| H349 | 584710 | 7713190 | 215.9 | 38 | 9 |
| H350 | 585050 | 7713250 | 166 | 36 | 16 |

| | | | | | |
|---|---|---|---|---|---|
| H351 | 585060 | 7713740 | 170 | 52.7 | 24 |
| H352 | 585200 | 7714790 | 177 | 69.4 | 32 |
| H353 | 585400 | 7716140 | 176 | 80 | 5 |
| H354 | 585470 | 7716820 | 216.8 | 35 | 22 |
| H355 | 585690 | 7716730 | 217 | 38.2 | 28.2 |
| H356 | 586190 | 7717320 | 216.1 | 36.1 | 25.1 |
| H357 | 586440 | 7716490 | 216.8 | 80 | 23 |
| H358 | 586580 | 7717170 | 216.4 | 70 | 18 |
| H36 | 587565 | 7711435 | 155.0 | 50 | |
| H360 | 586880 | 7717430 | 167.0 | 75 | |
| H361 | 587320 | 7717480 | 167.0 | 73 | |
| H362 | 587310 | 7718020 | 165.0 | 29 | |
| H363 | 587560 | 7717930 | 167.0 | 38 | |
| H364 | 587490 | 7718180 | 167.0 | 29 | |
| H365 | 587460 | 7717160 | 172.0 | 38 | |
| H366 | 587130 | 7717090 | 172.0 | 66 | |
| H367 | 587490 | 7716930 | 175.0 | 64 | |
| H368 | 588170 | 7717450 | 173.0 | 52 | |
| H369 | 587880 | 7717680 | 168.0 | 69 | |
| H37 | 587450 | 7711960 | 159.0 | 50 | |
| H370 | 587790 | 7718290 | 169.0 | 31 | |
| H371 | 588280 | 7718500 | 172.0 | 74 | |
| H372 | 588430 | 7718050 | 173.0 | 79 | |
| H375 | 588910 | 7718290 | 178.0 | 70 | |
| H376 | 588850 | 7718700 | 177.0 | 74 | |
| H377 | 588745 | 7719260 | 174.0 | 14 | |
| H377R | 588755 | 7719275 | 174.0 | 51 | |
| H377R | 588780 | 7719275 | 174.0 | 84 | |
| H378 | 587430 | 7698580 | 142.0 | 66 | |
| H379 | 587440 | 7697570 | 213.9 | 52 | 0 |
| H38 | 586960 | 7711990 | 165.0 | 50 | |
| H380 | 588800 | 7708710 | 152.0 | 52 | |
| H384 | 589180 | 7708820 | 155.0 | 51 | |
| H385 | 586680 | 7710240 | 145.0 | 43 | |
| H386 | 586640 | 7709400 | 146.0 | 29 | |
| H387 | 585260 | 7709490 | 151.0 | 43.23 | |
| H388 | 585360 | 7708490 | 142.0 | 56 | |
| H389 | 585260 | 7710500 | 164.0 | 35.2 | |
| H39 | 586570 | 7712030 | 165 | 50 | |
| H390 | 585230 | 7711570 | 166 | 34 | 5 |
| H391 | 586530 | 7708440 | 143.0 | 47.7 | |
| H392 | 587020 | 7708550 | 214.9 | 38.3 | 5 |
| H393 | 587720 | 7708810 | 215 | 52 | 9 |
| H394 | 587800 | 7708320 | 214.4 | 43 | 6 |

| | | | | | |
|---|---|---|---|---|---|
| H395 | 587670 | 7709350 | 216 | 61 | 22 |
| H396 | 587560 | 7708870 | 215.2 | 48 | 11 |
| H397 | 587990 | 7708230 | 214.5 | 41.3 | 7.3 |
| H398 | 587780 | 7709920 | 216.4 | 67 | 26 |
| H399 | 589640 | 7709010 | 165.0 | 71 | |
| H3I6 | 585400 | 7671250 | 274.0 | 80 | |
| H4 | 584070 | 7698530 | 214.4 | 61 | 0 |
| H40 | 585980 | 7712075 | 167 | 50 | |
| H400 | 587400 | 7709350 | 215.3 | 24.7 | 7.7 |
| H401 | 589440 | 7707830 | 167.0 | 49.9 | |
| H402 | 589360 | 7706930 | 165.0 | 29.7 | |
| H403 | 589850 | 7720170 | 181.0 | 43.5 | |
| H404 | 589350 | 7720200 | 178.0 | 43 | |
| H409 | 589890 | 7709150 | 161.0 | 90 | |
| H41 | 585575 | 7712125 | 165 | 50 | |
| H410 | 589780 | 7719690 | 180.0 | 33.3 | |
| H411 | 590650 | 7709470 | 176.0 | 139 | |
| H412 | 590140 | 7720580 | 182.0 | 66.8 | |
| H413 | 588870 | 7720220 | 177.0 | 101 | |
| H417 | 585000 | 7712502 | 216.3 | 47 | 0 |
| H417L | 585000 | 7712502 | 216.3 | 44.14 | 17.14 |
| H418 | 585150 | 7713015 | 166 | 39 | |
| H418L | 585150 | 7713015 | 166 | 34.17 | 14.17 |
| H42 | 586350 | 7711360 | 161 | 50 | |
| H420 | 585120 | 7715015 | 176 | 51 | |
| H421 | 584680 | 7711525 | 216.2 | 57 | 0 |
| H421L | 584680 | 7711525 | 216.2 | 54.46 | 28.46 |
| H422 | 584540 | 7710504 | 216.3 | 52.69 | 0 |
| H422L | 584540 | 7710504 | 216.3 | 49 | 15 |
| H423 | 586360 | 7716835 | 216.4 | 45 | 0 |
| H424 | 586585 | 7716980 | 216.5 | 39 | 0 |
| H425 | 586570 | 7717065 | 216.4 | 33 | 0 |
| H426 | 588775 | 7707230 | 156.0 | 54 | |
| H427 | 589450 | 7719710 | 179.0 | 27.9 | |
| H43 | 587330 | 7710870 | 150.0 | 50 | |
| H431 | 590210 | 7720500 | 181.0 | 35 | |
| H432 | 589510 | 7720650 | 180.0 | 90.6 | |
| H435 | 584500 | 7710275 | 215.9 | 40.7 | 23.7 |
| H436 | 584465 | 7710065 | 215.7 | 38.3 | 13.3 |
| H437 | 584320 | 7710085 | 215.1 | 17 | 10 |
| H438 | 584420 | 7710575 | 215.9 | 21.9 | 14.9 |
| H439 | 584450 | 7709570 | 215.1 | 36.9 | 16.9 |
| H440 | 586540 | 7717170 | 216.4 | 33 | 0 |
| H440L | 586540 | 7717170 | 216.4 | 31.78 | 11.78 |

| | | | | | |
|---|---|---|---|---|---|
| H441 | 581500 | 7684430 | 194.0 | 44 | |
| H441L | 581500 | 7684430 | 194.0 | 40.68 | |
| H442 | 585730 | 7715720 | 177 | 25.69 | |
| H443 | 584850 | 7710600 | 216.5 | 84 | 50 |
| H444 | 587800 | 7709620 | 216 | 56.9 | 14.9 |
| H445 | 587250 | 7709340 | 215.2 | 13.7 | 4.7 |
| H446 | 587340 | 7708770 | 215.2 | 24.3 | 8.3 |
| H447 | 587570 | 7708260 | 214.4 | 30.7 | 5.7 |
| H448 | 587980 | 7707940 | 214.5 | 44.9 | 7.9 |
| H449 | 587560 | 7708085 | 214.3 | 36.5 | 7.5 |
| H450 | 587950 | 7707750 | 214.6 | 60.5 | 5.5 |
| H451 | 587700 | 7709800 | 216.2 | 49.4 | 33.4 |
| H452 | 587390 | 7707935 | 214.3 | 36.1 | 15.1 |
| H453 | 587625 | 7707500 | 214.7 | 47 | 0 |
| H454 | 587500 | 7707380 | 214.5 | 90 | 73 |
| H455 | 584500 | 7709410 | 215 | 38.4 | 18.4 |
| H456 | 584480 | 7708900 | 145.0 | 57.9 | |
| H459 | 584530 | 7707740 | 137.0 | 63.1 | |
| H46 | 587290 | 7711245 | 152.0 | 50 | |
| H460 | 585030 | 7706620 | 138.0 | 51.8 | |
| H461 | 584840 | 7710200 | 216.4 | 75.8 | 41.8 |
| H462 | 584640 | 7711235 | 216 | 43.8 | 22.8 |
| H463 | 587700 | 7706900 | 156.0 | 46.7 | |
| H464 | 587520 | 7706530 | 146.0 | 29 | |
| H465 | 587460 | 7706080 | 153.0 | 27.8 | |
| H466 | 584620 | 7712530 | 215.5 | 15 | 0 |
| H467 | 584550 | 7712220 | 215.5 | 34 | 0 |
| H468 | 589720 | 7711240 | 175.0 | 155 | |
| H469 | 586590 | 7707170 | 141.0 | 33.3 | |
| H47 | 587240 | 7710940 | 155.0 | 13.84 | |
| H470 | 589700 | 7710190 | 160.0 | 18 | |
| H470R | 589700 | 7710190 | 160.0 | 15 | |
| H471 | 590650 | 7708120 | 157.0 | 52.9 | |
| H476 | 589470 | 7710480 | 163.0 | 25 | |
| H476R | 589470 | 7710480 | 163.0 | 92.4 | |
| H48 | 586990 | 7710860 | 150.0 | 57 | |
| H480 | 590565 | 7707940 | 157.0 | 49.63 | |
| H481 | 590650 | 7707370 | 151.0 | 48.7 | |
| H482 | 589500 | 7702580 | 144.0 | 126 | |
| H483 | 589940 | 7702530 | 146.0 | 101 | |
| H484 | 585720 | 7699530 | 213.8 | 119 | 21 |
| H485 | 585420 | 7699530 | 213.8 | 47 | 0 |
| H486 | 584200 | 7698230 | 214.6 | 16 | 8 |
| H487 | 590120 | 7708030 | 168.0 | 43.9 | |

| | | | | | |
|---|---|---|---|---|---|
| H488 | 590900 | 7707390 | 149.0 | 27.6 | |
| H489 | 583600 | 7698120 | 215.6 | 21.37 | 8.37 |
| H49 | 587485 | 7710850 | 161.0 | 37 | |
| H490 | 589680 | 7716180 | 195.0 | 38.17 | |
| H491R | 591220 | 7707360 | 150.0 | 49.9 | |
| H492 | 587820 | 7707350 | 215 | 78.1 | 29.1 |
| H493 | 590030 | 7707320 | 152.0 | 59 | |
| H494 | 589825 | 7707330 | 162.0 | 29.75 | |
| H495 | 583620 | 7697840 | 215.4 | 27.15 | 6.15 |
| H497 | 583390 | 7699900 | 151.0 | 17.9 | |
| H498 | 583230 | 7700420 | 147.0 | 91.5 | |
| H499 | 582880 | 7701430 | 134.0 | 36.4 | |
| H5 | 584730 | 7698400 | 213.9 | 24 | 0 |
| H50 | 587350 | 7712520 | 163.0 | 50 | |
| H502 | 585030 | 7697605 | 214.6 | 25.2 | 7.2 |
| H503 | 584295 | 7697450 | 215 | 77.3 | 20.3 |
| H504 | 585310 | 7697200 | 214.4 | 26.6 | 6.6 |
| H505 | 585850 | 7696450 | 214.9 | 39.4 | 11.4 |
| H506 | 584760 | 7696050 | 216.1 | 79.1 | 21.1 |
| H506 | 584760 | 7696050 | 161.0 | 79.1 | |
| H508 | 583200 | 7695895 | 151.0 | 19.8 | |
| H51 | 587195 | 7713030 | 168.0 | 50 | |
| H510 | 581400 | 7700460 | 133.0 | 28.2 | |
| H511 | 582240 | 7701020 | 133.0 | 47.1 | |
| H512 | 584790 | 7700750 | 139.0 | 49.9 | |
| H514 | 584330 | 7701040 | 147.0 | 52.2 | |
| H515 | 584870 | 7701370 | 138.0 | 40.4 | |
| H516 | 582650 | 7698670 | 215.3 | 24.6 | 12.5 |
| H517 | 585960 | 7697030 | 214.9 | 24.4 | 4.4 |
| H518 | 586100 | 7695660 | 159 | 58.08 | 14 |
| H519 | 585760 | 7695530 | 166 | 82.2 | 31.2 |
| H52 | 587080 | 7713530 | 174.0 | 50 | |
| H520 | 586190 | 7694610 | 166 | 27.7 | 4.7 |
| H521 | 585730 | 7694550 | 172 | 29.9 | 9.9 |
| H522 | 586720 | 7696830 | 216.1 | 27 | 10 |
| H523 | 586700 | 7693800 | 167.0 | 43.1 | |
| H524 | 587020 | 7693980 | 171.0 | 54.7 | |
| H525 | 586480 | 7694790 | 161 | 28.5 | 7.5 |
| H526 | 586730 | 7695670 | 163 | 54.6 | 12.6 |
| H527 | 587610 | 7696250 | 214.9 | 80 | 0 |
| H528 | 586530 | 7697540 | 215.7 | 48.7 | 6.7 |
| H529 | 583790 | 7695720 | 165.0 | 34.1 | |
| H53 | 587130 | 7713920 | 179.0 | 50 | |
| H530 | 583420 | 7696850 | 215.7 | 33 | 8 |

| | | | | | |
|---|---|---|---|---|---|
| H531 | 583530 | 7697020 | 216 | 6 | 0 |
| H532 | 584230 | 7696650 | 216.3 | 64.6 | 13.6 |
| H533 | 586690 | 7700090 | 138.0 | 63.6 | |
| H534 | 586410 | 7701380 | 132.0 | 36.5 | |
| H535 | 585515 | 7697700 | 214.3 | 54.8 | 7.8 |
| H536 | 583710 | 7697470 | 215.5 | 35 | 7 |
| H537 | 584405 | 7698110 | 214.5 | 14.9 | 7.9 |
| H538 | 584950 | 7696675 | 215.6 | 59.2 | 32.2 |
| H539 | 585970 | 7697500 | 214.9 | 75.3 | 26 |
| H54 | 587130 | 7714440 | 191.0 | 50 | |
| H540 | 586330 | 7696030 | 215.5 | 49.6 | 22.6 |
| H540L | 586330 | 7696030 | 215.5 | 50.5 | 23.5 |
| H541 | 588380 | 7688830 | 170.0 | 60 | |
| H546 | 588390 | 7680330 | 209.0 | 60 | |
| H547 | 587800 | 7680520 | 225.0 | 60 | |
| H548 | 587300 | 7680970 | 225.0 | 60 | |
| H549 | 590000 | 7686550 | 227.0 | 55 | |
| H55 | 585760 | 7715200 | 181 | 50 | |
| H550 | 589420 | 7686290 | 198.0 | 70 | |
| H551 | 588920 | 7679970 | 221.0 | 60 | |
| H552 | 590270 | 7686670 | 195.0 | 59 | |
| H553 | 590660 | 7686850 | 197.0 | 60 | |
| H554 | 591050 | 7686880 | 184.0 | 60 | |
| H555 | 587120 | 7696150 | 215.3 | 77.5 | 21.5 |
| H556 | 581040 | 7692740 | 163.0 | 65 | |
| H557 | 580590 | 7692460 | 164.0 | 60 | |
| H558 | 580170 | 7692320 | 160.0 | 60 | |
| H559 | 579700 | 7692070 | 152.0 | 60 | |
| H56 | 586270 | 7715110 | 187 | 50 | |
| H56 | 586270 | 7715110 | 187.0 | 50 | |
| H560 | 579420 | 7691910 | 153.0 | 54 | |
| H562 | 582550 | 7696880 | 215.2 | 60 | 13 |
| H563 | 581730 | 7696850 | 213.9 | 60 | 7.8 |
| H564 | 581360 | 7696890 | 213.5 | 53 | 9.1 |
| H564 | 581360 | 7696890 | 135.0 | 53 | |
| H565 | 582150 | 7696870 | 214.6 | 59 | 14.2 |
| H566 | 582190 | 7698570 | 214.2 | 60 | 0 |
| H567 | 587230 | 7696110 | 215.4 | 96 | 7 |
| H568 | 588690 | 7720200 | 176.0 | 59 | |
| H569 | 589075 | 7720470 | 175.0 | 96.3 | |
| H57 | 586890 | 7715030 | 195.0 | 50 | |
| H570 | 589430 | 7720760 | 178.0 | 74.8 | |
| H571 | 588630 | 7719750 | 175.0 | 83.4 | |
| H572 | 588835 | 7719750 | 175.0 | 20 | |

| | | | | | |
|---|---|---|---|---|---|
| H572R | 588840 | 7719750 | 175.0 | 108.5 | |
| H573 | 588070 | 7719000 | 170.0 | 30.5 | |
| H574 | 588270 | 7719000 | 172.0 | 32.5 | |
| H575 | 589440 | 7719420 | 177.0 | 48 | |
| H576 | 589270 | 7719990 | 178.0 | 59 | |
| H577 | 588775 | 7718280 | 177.0 | 72 | |
| H578 | 591080 | 7716060 | 194.0 | 85 | |
| H579 | 591830 | 7714900 | 218.0 | 29 | |
| H579R | 591830 | 7714900 | 218.0 | 101 | |
| H58 | 587440 | 7714960 | 196.0 | 50 | |
| H580 | 590270 | 7702130 | 148.0 | 100 | |
| H581 | 590750 | 7701990 | 151.0 | 100 | |
| H582 | 591240 | 7701860 | 153.0 | 79 | |
| H583 | 591690 | 7701730 | 153.0 | 33.3 | |
| H586 | 591560 | 7700990 | 146.0 | 108 | |
| H587 | 591040 | 7701090 | 145.5 | 95 | |
| H588 | 590600 | 7701160 | 147.0 | 101 | |
| H59 | 585320 | 7715360 | 172 | 50 | |
| H591 | 581940 | 7696870 | 214.3 | 78 | 9.3 |
| H592 | 582140 | 7697210 | 214.2 | 60 | 10.6 |
| H593 | 581740 | 7697430 | 213.6 | 83 | 0 |
| H594 | 581930 | 7696495 | 214.0 | 53.1 | 6.2 |
| H595 | 587080 | 7696370 | 215.4 | 70.3 | 10.3 |
| H596 | 587280 | 7695630 | 162 | 106.79 | 22.49 |
| H597 | 587460 | 7695630 | 160 | 101 | 9 |
| H598 | 590090 | 7711550 | 181.0 | 147 | |
| H599 | 589560 | 7712840 | 184.0 | 110 | |
| H6 | 584000 | 7697560 | 215 | 24 | 0 |
| H60 | 587980 | 7714930 | 197.0 | 50 | |
| H603 | 581740 | 7680200 | 222.3 | 47.56 | 14.56 |
| H604 | 582100 | 7679810 | 222.7 | 53.78 | 3.78 |
| H605 | 578400 | 7678840 | 224.5 | 104.47 | 17.47 |
| H605 | 578400 | 7678840 | 245.0 | 104.47 | |
| H607 | 578580 | 7679650 | 223.5 | 77.33 | 10.33 |
| H608 | 582440 | 7679380 | 232.0 | 17.34 | |
| H609 | 582930 | 7679130 | 237.0 | 18.37 | |
| H61 | 588490 | 7714900 | 194.0 | 56 | |
| H610 | 583350 | 7678810 | 245.0 | 63 | |
| H611 | 578210 | 7679830 | 223.3 | 86.94 | 14.94 |
| H612 | 578360 | 7678080 | 225 | 72.07 | 4.07 |
| H613 | 579540 | 7678170 | 223.9 | 190.4 | 9 |
| H614 | 577910 | 7678120 | 225.5 | 47.04 | 6.04 |
| H615 | 580360 | 7679100 | 235.0 | 49.39 | |
| H616 | 579340 | 7679100 | 223.2 | 138.4 | 26 |

| | | | | | |
|---|---|---|---|---|---|
| H617 | 580050 | 7679510 | 223.5 | 61.17 | 3 |
| H618 | 580120 | 7680650 | 222 | 111.4 | 0 |
| H619 | 580520 | 7680670 | 222.3 | 57.4 | 6 |
| H62 | 589100 | 7714870 | 191.0 | 50 | |
| H622 | 578670 | 7680480 | 223.1 | 109.68 | 7.68 |
| H623 | 581210 | 7680280 | 222.5 | 90 | 9 |
| H624 | 581890 | 7679470 | 223.5 | 43 | 6 |
| H624 | 581890 | 7679470 | 235.0 | 43 | |
| H625 | 581560 | 7679870 | 222.8 | 62.27 | 8.27 |
| H626 | 578030 | 7680780 | 223 | 83.69 | 18 |
| H628 | 578850 | 7678850 | 223.8 | 190 | 4 |
| H629 | 579010 | 7678800 | 223.1 | 70.99 | 6.99 |
| H630 | 578670 | 7681940 | 222.5 | 104.12 | 9.12 |
| H631 | 578810 | 7682890 | 221.3 | 99.76 | 8.76 |
| H632 | 579000 | 7681001 | 222.5 | 151.37 | 20.37 |
| H633 | 580970 | 7680110 | 223.2 | 58 | 0 |
| H634 | 581680 | 7679230 | 243.0 | 75 | |
| H637 | 579030 | 7676120 | 280.0 | 66 | |
| H638 | 579540 | 7677350 | 280.0 | 99 | |
| H639 | 581280 | 7680650 | 222.3 | 33.27 | 6.27 |
| H64 | 586860 | 7715580 | 186.0 | 50 | |
| H640 | 581080 | 7680650 | 222 | 19.52 | 6.52 |
| H641 | 582170 | 7679300 | 234.0 | 87.2 | |
| H642 | 578840 | 7680946 | 222.7 | 121.08 | 18.08 |
| H643 | 578940 | 7678110 | 224.7 | 147 | 17 |
| H645 | 578700 | 7682520 | 221.9 | 99.4 | 15.4 |
| H646 | 579200 | 7681990 | 222.9 | 185.33 | 12.33 |
| H647 | 581970 | 7690500 | 176.0 | 46.53 | |
| H648 | 582210 | 7690540 | 172.0 | 29.2 | |
| H649 | 581950 | 7691460 | 170.0 | 41.57 | |
| H650 | 578930 | 7679460 | 223 | 63 | 5 |
| H651 | 578520 | 7677780 | 225.9 | 225.4 | 0 |
| H652 | 579140 | 7680570 | 222.7 | 142 | 35 |
| H653 | 581960 | 7692760 | 165.0 | 66.7 | |
| H654 | 582430 | 7689870 | 174.0 | 69.37 | |
| H655 | 582940 | 7689890 | 177.0 | 75.8 | |
| H656 | 583960 | 7689920 | 185.0 | 75.4 | |
| H657 | 583420 | 7689900 | 188.0 | 45.83 | |
| H658 | 581330 | 7679770 | 223 | 40.29 | 5.29 |
| H659 | 579570 | 7680690 | 222.9 | 183.4 | 6 |
| H662 | 579530 | 7679580 | 223.1 | 144.72 | 3.72 |
| H663 | 589590 | 7679840 | 240.0 | 150.4 | |
| H665 | 590830 | 7680270 | 214.0 | 147 | |
| H666 | 586260 | 7696470 | 215.2 | 177.4 | 26 |

| | | | | | |
|---|---|---|---|---|---|
| H667 | 582770 | 7699170 | 215.2 | 60 | 0 |
| H668 | 581890 | 7698000 | 214.1 | 51 | 16 |
| H669 | 584380 | 7689930 | 186.0 | 105 | |
| H67 | 580360 | 7699200 | 135.0 | 50 | |
| H670 | 587100 | 7696700 | 215 | 49.5 | 10.5 |
| H671R | 586440 | 7697080 | 215.9 | 23.84 | 6.84 |
| H672 | 585590 | 7697390 | 214.5 | 23 | 3 |
| H673 | 584580 | 7696980 | 215.6 | 54 | 0 |
| H674L | 584620 | 7696870 | 215.7 | 58.84 | 16.44 |
| H675 | 587440 | 7696180 | 215.2 | 54.54 | 12.54 |
| H676 | 589670 | 7714800 | 197.0 | 16.5 | |
| H677 | 589870 | 7714730 | 202.0 | 111 | |
| H678 | 590060 | 7714670 | 203.0 | 51.5 | |
| H679 | 589860 | 7714250 | 206.0 | 31.1 | |
| H68 | 580580 | 7698810 | 137.0 | 50 | |
| H680 | 590400 | 7711850 | 189.0 | 82 | |
| H681 | 589820 | 7713740 | 205.0 | 78 | |
| H682 | 589720 | 7713270 | 196.0 | 49 | |
| H683 | 589930 | 7715180 | 197.0 | 23.5 | |
| H684 | 585440 | 7711500 | 172 | 101 | |
| H685 | 585700 | 7712440 | 172 | 60 | |
| H686 | 585770 | 7713410 | 177 | 80 | 11 |
| H687 | 587010 | 7716150 | 173.0 | 96.4 | |
| H688 | 588780 | 7720050 | 176.0 | 78.1 | |
| H689 | 589160 | 7719780 | 177.0 | 18 | |
| H689R | 589200 | 7719780 | 177.0 | 17 | |
| H69 | 580890 | 7698230 | 136.0 | 50 | |
| H691 | 589610 | 7720190 | 180.0 | 36.1 | |
| H693 | 587155 | 7695030 | 171 | 89.3 | 8.3 |
| H694 | 587345 | 7695075 | 173 | 83 | |
| H695 | 587395 | 7693890 | 174.0 | 80 | |
| H696 | 587330 | 7696660 | 214.6 | 54 | 5 |
| H697 | 581700 | 7696390 | 214.1 | 73 | 8.6 |
| H698 | 585450 | 7701060 | 136.0 | 84 | |
| H699 | 585225 | 7700490 | 131.0 | 66 | |
| H7 | 584420 | 7697120 | 216 | 9.44 | 3.44 |
| H70 | 579880 | 7699190 | 138.0 | 46 | |
| H700 | 581290 | 7698400 | 213.5 | 36.6 | 7.8 |
| H700 | 581290 | 7698400 | 135.0 | 36.6 | |
| H701 | 580920 | 7695540 | 148.0 | 103 | |
| H702 | 580680 | 7694640 | 154.0 | 65 | |
| H703 | 581000 | 7694650 | 154.0 | 33 | |
| H704 | 581380 | 7696420 | 214.3 | 125 | 6 |
| H704 | 581380 | 7696420 | 143.0 | 125 | |

| | | | | | |
|---|---|---|---|---|---|
| H705 | 581390 | 7695600 | 151.0 | 149.5 | |
| H706 | 581310 | 7694640 | 153.0 | 67 | |
| H707 | 581060 | 7693880 | 157.0 | 33 | |
| H708 | 581360 | 7693990 | 160.0 | 49 | |
| H709 | 581710 | 7694125 | 159.0 | 147 | |
| H71 | 580140 | 7698810 | 141.0 | 54 | |
| H710 | 580360 | 7690100 | 177.0 | 55 | |
| H711 | 580780 | 7689880 | 179.0 | 100 | |
| H712 | 584940 | 7690340 | 180.0 | 121 | |
| H713 | 585320 | 7689920 | 185.0 | 105 | |
| H714 | 581240 | 7689740 | 170.0 | 49 | |
| H716 | 581020 | 7689280 | 175.0 | 64.2 | |
| H717 | 580930 | 7688990 | 180.0 | 53 | |
| H718 | 580980 | 7690320 | 167.0 | 56 | |
| H719 | 580960 | 7690060 | 175.0 | 68 | |
| H72 | 580120 | 7698460 | 141.0 | 51 | |
| H720 | 581120 | 7690060 | 168.0 | 41.1 | |
| H721 | 581260 | 7690310 | 167.0 | 55.4 | |
| H722 | 581360 | 7690610 | 166.0 | 56 | |
| H723 | 580560 | 7689920 | 178.0 | 100 | |
| H724 | 580080 | 7690440 | 167.0 | 34 | |
| H725 | 579600 | 7690450 | 162.0 | 91 | |
| H727 | 578450 | 7687960 | 181.0 | 66 | |
| H728 | 581510 | 7691030 | 174.0 | 55 | |
| H729 | 581760 | 7691440 | 172.0 | 57.3 | |
| H73 | 580100 | 7700000 | 131.0 | 68 | |
| H730 | 581630 | 7691380 | 172.0 | 51 | |
| H731 | 581710 | 7691790 | 170.0 | 28 | |
| H732 | 581825 | 7691740 | 170.0 | 43 | |
| H733 | 582010 | 7692100 | 169.0 | 61 | |
| H734 | 582260 | 7692800 | 164.0 | 49 | |
| H735 | 581300 | 7695100 | 152.0 | 91.3 | |
| H736 | 581350 | 7694290 | 155.0 | 50 | |
| H737 | 581460 | 7694280 | 155.0 | 93.7 | |
| H738 | 580815 | 7689020 | 183.0 | 33 | |
| H739 | 581140 | 7690360 | 167.0 | 28.7 | |
| H74 | 579940 | 7698810 | 141.0 | 50 | |
| H740 | 585969.5 | 7697499 | 214.9 | 20 | 0 |
| H740R | 585968.5 | 7697500 | 217.9 | 20.4 | 8.4 |
| H741 | 586010 | 7697270 | 215.4 | 30 | 10 |
| H742 | 586120 | 7697530 | 215.6 | 24 | 6 |
| H743 | 586140 | 7697580 | 215.5 | 20 | 5 |
| H744 | 585008 | 7697035 | 214.7 | 11.8 | 2.8 |
| H745 | 585000 | 7697060 | 214.8 | 9.5 | 3.5 |

| | | | | | |
|---|---|---|---|---|---|
| H746 | 585280 | 7696700 | 214.8 | 10.4 | 3.4 |
| H747 | 584993.5 | 7697089 | 214.7 | 7.1 | 3.1 |
| H748 | 584930 | 7697890 | 214.3 | 11.5 | 4.5 |
| H749 | 584950 | 7697820 | 214.4 | 14.7 | 6.7 |
| H75 | 580160 | 7698070 | 140.0 | 50 | |
| H750 | 584220 | 7696270 | 216.6 | 71.2 | 19.2 |
| H750R | 584220 | 7696270 | 216.6 | 71.4 | 6.22 |
| H751 | 585510 | 7695740 | 160 | 86 | 8.56 |
| H752 | 584180 | 7696860 | 215.9 | 13.8 | 2.8 |
| H753 | 586770 | 7696150 | 216.2 | 17.1 | 10.1 |
| H754 | 586850 | 7696270 | 216.1 | 11.1 | 3.1 |
| H755 | 586600 | 7695360 | 160 | 71.2 | 14.2 |
| H756 | 585972 | 7697499 | 215.3 | 24 | 0 |
| H757 | 585967 | 7697501 | 215.3 | 24 | 0 |
| H758 | 584490 | 7697540 | 214.8 | 30.7 | 10.7 |
| H759 | 583810 | 7696820 | 216.2 | 61 | 8 |
| H76 | 580340 | 7698180 | 138.0 | 64 | |
| H760 | 584450 | 7697720 | 214.5 | 23.4 | 6.4 |
| H761 | 584540 | 7697920 | 214.4 | 14.6 | 4.6 |
| H762 | 585965 | 7697501 | 215.3 | 24 | 0 |
| H763 | 580640 | 7687750 | 184.0 | 134 | |
| H764 | 580330 | 7687770 | 184.0 | 114.5 | |
| H765 | 580280 | 7684310 | 210.0 | 94.5 | |
| H766 | 580470 | 7685310 | 211.0 | 48 | |
| H767 | 580440 | 7683700 | 214.0 | 89 | |
| H768 | 578910 | 7683260 | 208.0 | 66 | |
| H769 | 578950 | 7682870 | 221.5 | 47.8 | 9.8 |
| H77 | 580420 | 7697890 | 138.0 | 60.03 | |
| H770 | 578900 | 7681960 | 223.2 | 140 | 0 |
| H771 | 582120 | 7694030 | 159.0 | 70.7 | |
| H772 | 582040 | 7695050 | 152.0 | 72 | |
| H773 | 582510 | 7695090 | 152.0 | 37.2 | |
| H774 | 582560 | 7694080 | 157.5 | 55 | |
| H775 | 581870 | 7692780 | 165.0 | 60 | |
| H776 | 578900 | 7682150 | 223.1 | 77 | 0 |
| H777 | 579140 | 7684340 | 201.0 | 36.8 | |
| H778 | 579170 | 7685000 | 195.0 | 48 | |
| H779 | 582540 | 7696020 | 214.5 | 30 | 0 |
| H779 | 582540 | 7696020 | 145.0 | 30 | |
| H78 | 580640 | 7697180 | 180.0 | 33 | |
| H780 | 582460 | 7692820 | 164.0 | 30 | |
| H781 | 579460 | 7684980 | 195.0 | 54 | |
| H782 | 579320 | 7684980 | 195.0 | 42 | |
| H783 | 579040 | 7682870 | 221.7 | 65 | 7 |

| | | | | | |
|---|---|---|---|---|---|
| H784 | 578857 | 7681420 | 224 | 123.86 | 22.86 |
| H7I5 | 581060 | 7689780 | 173.0 | 62 | |
| H8 | 585460 | 7698390 | 214.1 | 23.69 | 23.69 |
| H80 | 578440 | 7684400 | 205.0 | 50 | |
| H81 | 578960 | 7684470 | 197.0 | 50 | |
| H82 | 579480 | 7684440 | 196.0 | 50 | |
| H83 | 579950 | 7684480 | 199.0 | 49 | |
| H84 | 580450 | 7684430 | 210.0 | 55 | |
| H85 | 580890 | 7684330 | 198.0 | 50 | |
| H85D | 580890 | 7684330 | 198.0 | 78 | |
| H86 | 580990 | 7684350 | 194.0 | 32 | |
| H87 | 580880 | 7684670 | 196.0 | 34 | |
| H88 | 580850 | 7684010 | 202.0 | 41 | |
| H89 | 579310 | 7693700 | 147.0 | 4 | |
| H9 | 586800 | 7696890 | 215.6 | 32.18 | 32.18 |
| H90 | 579930 | 7693680 | 156.0 | 50 | |
| H91 | 580420 | 7693640 | 158.0 | 50 | |
| H92 | 585920 | 7696000 | 215.7 | 50 | 0 |
| H93 | 584390 | 7698380 | 214.2 | 50 | 0 |
| H94 | 585320 | 7695560 | 156 | 50 | |
| H95 | 584490 | 7695140 | 165.0 | 50 | |
| H96 | 580800 | 7684620 | 199.0 | 19.57 | |
| H97 | 580990 | 7684050 | 198.0 | 24 | |
| H98 | 581120 | 7684120 | 195.0 | 38 | |
| H99 | 580680 | 7684920 | 202.0 | 18 | |
| Havilah No.1 | 584749 | 7691986 | 1000.0 | 307 | |
| Havilah No.2 | 585052 | 7683499 | 1000.0 | 406 | |
| Havilah No.3 | 586446 | 7701693 | 1000.0 | 285 | |
| H10223 | 573653.3 | 7707604 | 119.3 | 210.02 | |
| RS0001 | 577842.3 | 7711595 | 166.6 | 456 | |
| RS0003 | 577131.5 | 7713834 | 149.7 | 422 | |

GHD

145 Ann Street Brisbane QLD 4000
GPO Box 668 Brisbane QLD 4001
T: (07) 3316 3000 F: (07) 3316 3333 E: bnemail@ghd.com



G:\41\26457\WP\447425.docx

Document Status

| Rev No. | Author | Reviewer | | Approved for Issue | | |
|---|---|---|---|---|---|---|
| | | Name | Signature | Name | Signature | Date |
| A | D Russell | C Boon | DRAFT | P Bradley | Draft | 1/07/2013 |
| B | D Russell | C Boon | DRAFT | P Bradley | Draft | 11/07/2013 |
| 0 | D Russell | C Boon |  | P Bradley |  | 22/08/2013 |

www.ghd.com