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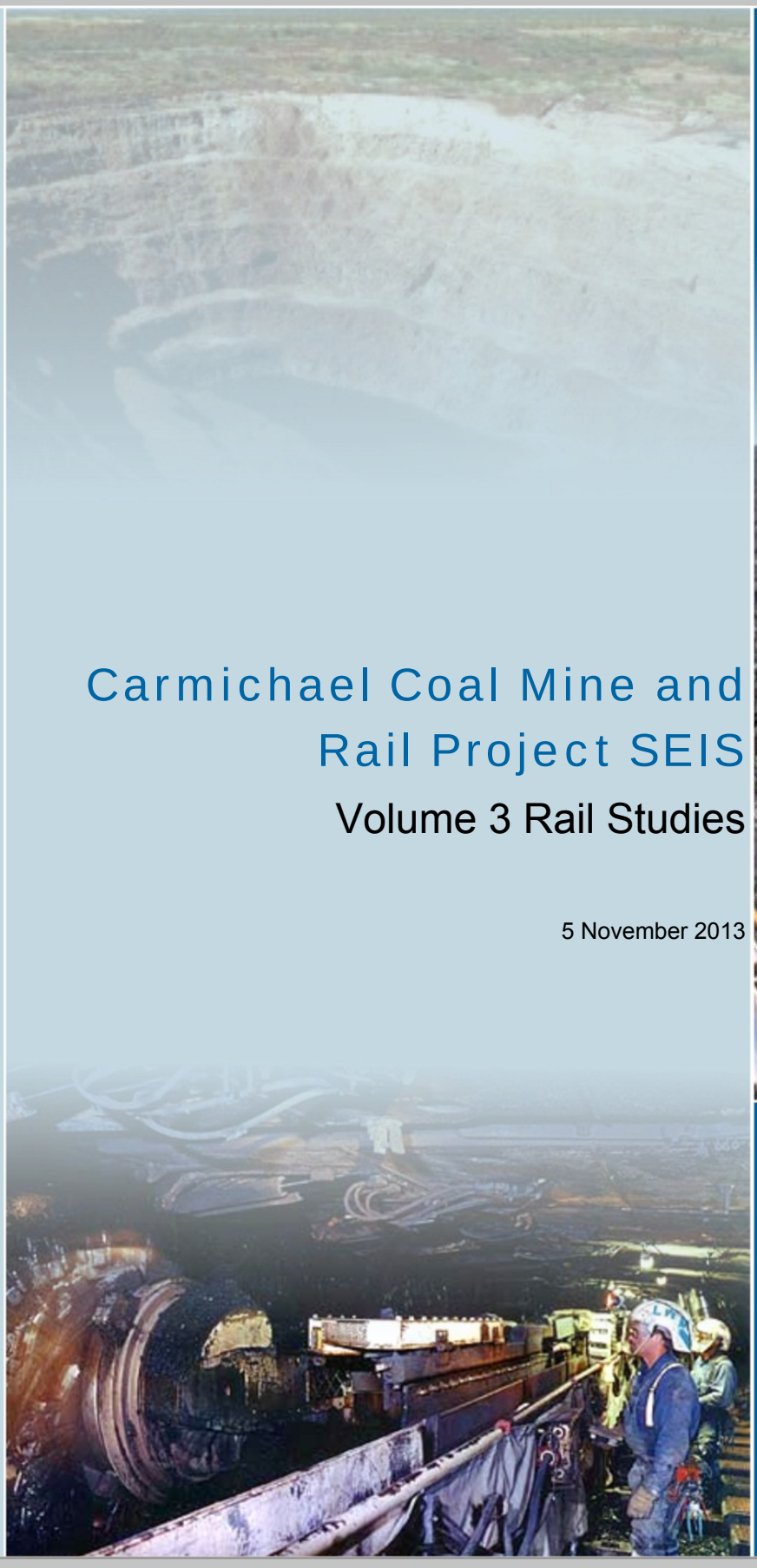

Carmichael Coal Mine and Rail Project SEIS

Volume 3 Rail Studies

5 November 2013

GHD

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1. Introduction

Volume 3 of the Supplementary Environment Impact Statement (SEIS) applies to the Project (Rail). The purpose of the document is to provide readers with an overview of Project (Rail) amendments, summary of comments received during the Environmental Impact Statement (EIS) submission period and how these comments have been addressed as part of the SEIS.

For each area of investigation the section is structured as follows:

- Introduction – this provides an overview of the elements of the amendments to project description relevant to the area of investigations and how they may impact the EIS findings. A description of updated or new studies relevant to the area of investigation is also provided.
- Summary of comments – this provides a brief description of the comments received in regard to the area of investigation grouped across common themes.
- Response to comments – this provides a summary of how each comment under the common themes and where necessary directs the reader to more detailed information within the Volume 4 appendices.
- Summary of commitments – this provides details of new commitments applicable to the Project based on the outcomes of the SEIS work or response to comments.

2. Project description

2.1 Introduction

This section of the SEIS provides an overview of the Project (Rail) and highlights the key changes to the Rail component of the Project since the EIS was submitted in December 2012. Environmental impacts associated with the amendments to the Project are addressed within the SEIS.

2.2 Project overview

Adani Mining Pty Ltd (Adani, the Proponent), commenced an EIS process for the Carmichael Coal Mine and Rail Project (the Project) in 2010. On 26 November 2010, the Queensland (Qld) Office of the Coordinator General declared the Project a 'significant project' and the Project was referred to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (referral No. 2010/5736). The Project was assessed to be a controlled action on the 6 January 2011 under section 75 and section 87 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The controlling provisions for the Project include:

- World Heritage properties (sections 12 & 15A)
- National Heritage places (sections 15B & 15C)
- Wetlands (Ramsar) (sections 16 & 17B)
- Listed threatened species and communities (sections 18 & 18A)
- Listed migratory species (sections 20 & 20A)
- The Great Barrier Reef Marine Park (sections 24B & 24C).

The Qld Government's EIS process has been accredited for the assessment under Part 8 of the EPBC Act in accordance with the bilateral agreement between the Commonwealth of Australia and the State of Queensland.

The Proponent prepared an EIS in accordance with the Terms of Reference (ToR) issued by the Qld Coordinator-General in May 2011 (Qld Government, 2011). The EIS process is managed under section 26(1) (a) of the *State Development and Public Works Act 1971,* which is administered by the Qld Government's Department of State Development, Infrastructure and Planning.

The EIS, submitted in December 2012, assessed the environmental, social and economic impacts associated with developing a 60 million tonne (product) per annum (Mtpa) thermal coal mine in the northern Galilee Basin, approximately 160 kilometres (km) north-west of Clermont, Central Queensland, Australia. Coal from the Project will be transported by rail to the existing Goonyella and Newlands rail systems, operated by Aurizon Operations Limited (Aurizon). The coal will be exported via the Port of Hay Point and the Point of Abbot Point over the 60 year (90 years in the EIS) mine life. The Carmichael Coal Rail will continue to operate for 90 years with a capacity of 100 Mtpa.

Project components are as follows:

- The Project (Mine): a greenfield coal mine over EPC 1690 and the eastern portion of EPC 1080, which includes both open cut and underground mining, on mine infrastructure and associated mine processing facilities (the Mine) and the Mine (offsite) infrastructure including a workers accommodation village and associated facilities, a permanent airport site, an industrial area and water supply infrastructure.
- The Project (Rail): a greenfield rail line connecting to mine to the existing Goonyella and Newlands rail systems to provide for the export of coal via the Port of Hay Point (Dudgeon Point expansion) and the Port of Abbot Point, respectively including:
  - Rail (west): a 120 km dual gauge portion running west from the Mine site east to Diamond Creek
  - Rail (east): a 69 km narrow gauge portion running east from Diamond Creek connecting to the Goonyella rail system south of Moranbah.
  - Quarries: five local quarries to extract quarry materials for construction and operational purposes.

2.3 Amendments to the Project (Rail)

The following sections highlight amendments to the initial Project (Rail) description that have occurred in the SEIS phase of the Project (Rail). All amendments have been identified in Figure 1.

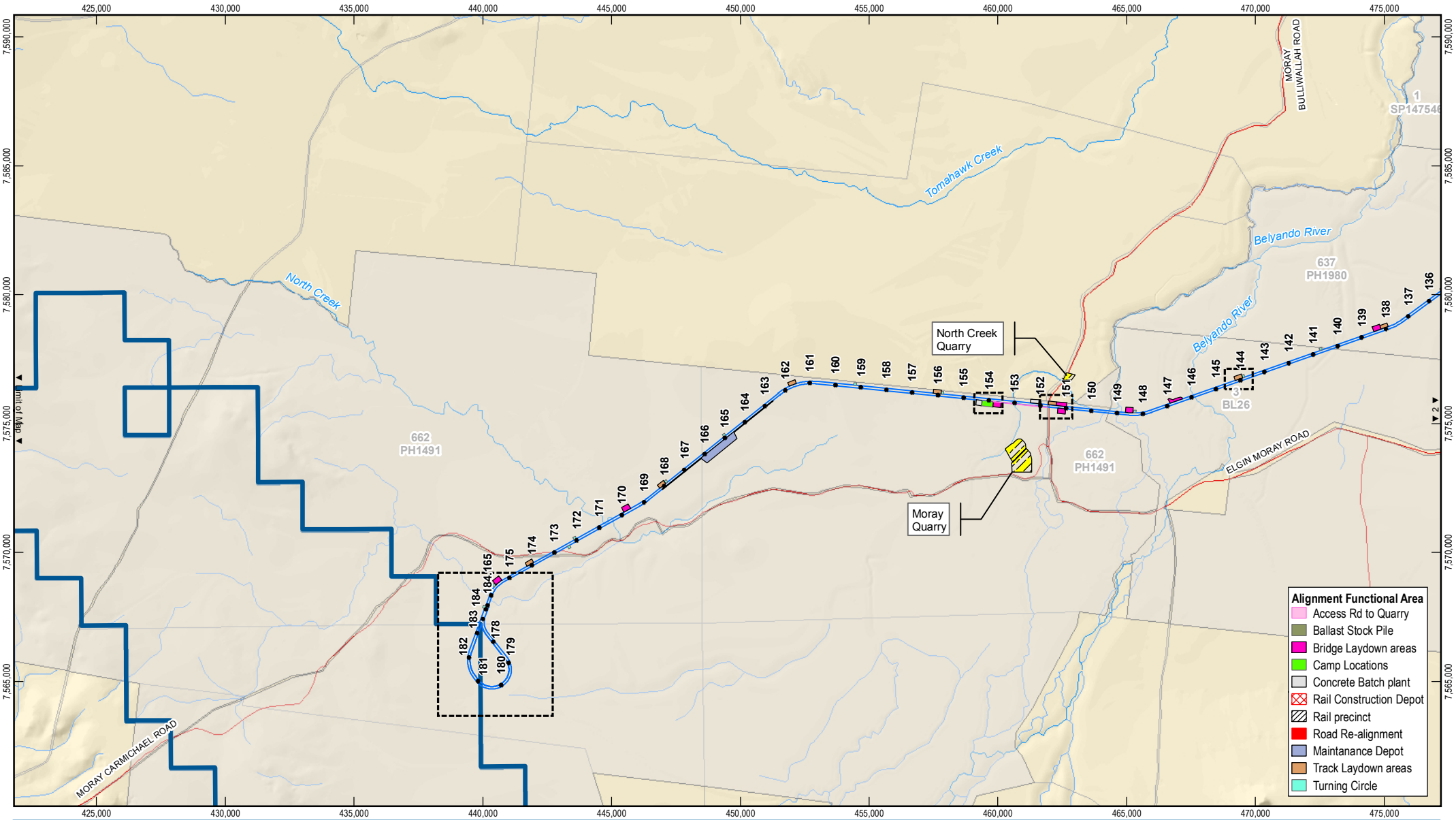
2.3.1 Rail balloon loop

The rail balloon loop located on Lot 662 PH1491 has been realigned approximately 2 km to the south east (from Eight Mile Creek) following a review of the mine product stockpile configurations and coal handling plant. As part of the realignment, the following associated rail infrastructure was realigned:

- Concrete batching plant at Chainage 182.500 in the EIS was removed
- Bridge laydown at Chainage 175.500 was reorientated 50 m south
- Turning circle (Chainage 176.000) was moved 400 m east to be adjacent to the bridge laydown areas
- Turning circle (Chainage 175.400) was moved 375 m south east onto the stem of the new loop

The following studies have been completed to support the amendment:

- Offsite Infrastructure Ecological Assessment Report (SEIS Volume 4, Appendix J5)
- Revised SP1 Property Map of Assessable Vegetation (SEIS Volume 4, Appendix C3)
- Revised SP1 Regional Vegetation Management Code Response (SEIS Volume 4, Appendix C3)



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Kilometres

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

N

LEGEND

- Project (Rail) Chainage
- Town
- Road
- Other Railway
- Watercourse
- Rail (West)
- Rail (East)
- Project (Mine)
- Quarry
- SEIS Project Changes
- Property Boundary
- Impacted Property

Adani Mining Pty Ltd

Carmichael Coal Mine and Rail Project SEIS

Amendments to Project (Rail)

Job Number	41-26422
Revision	B
Date	08-08-2013

Figure 1
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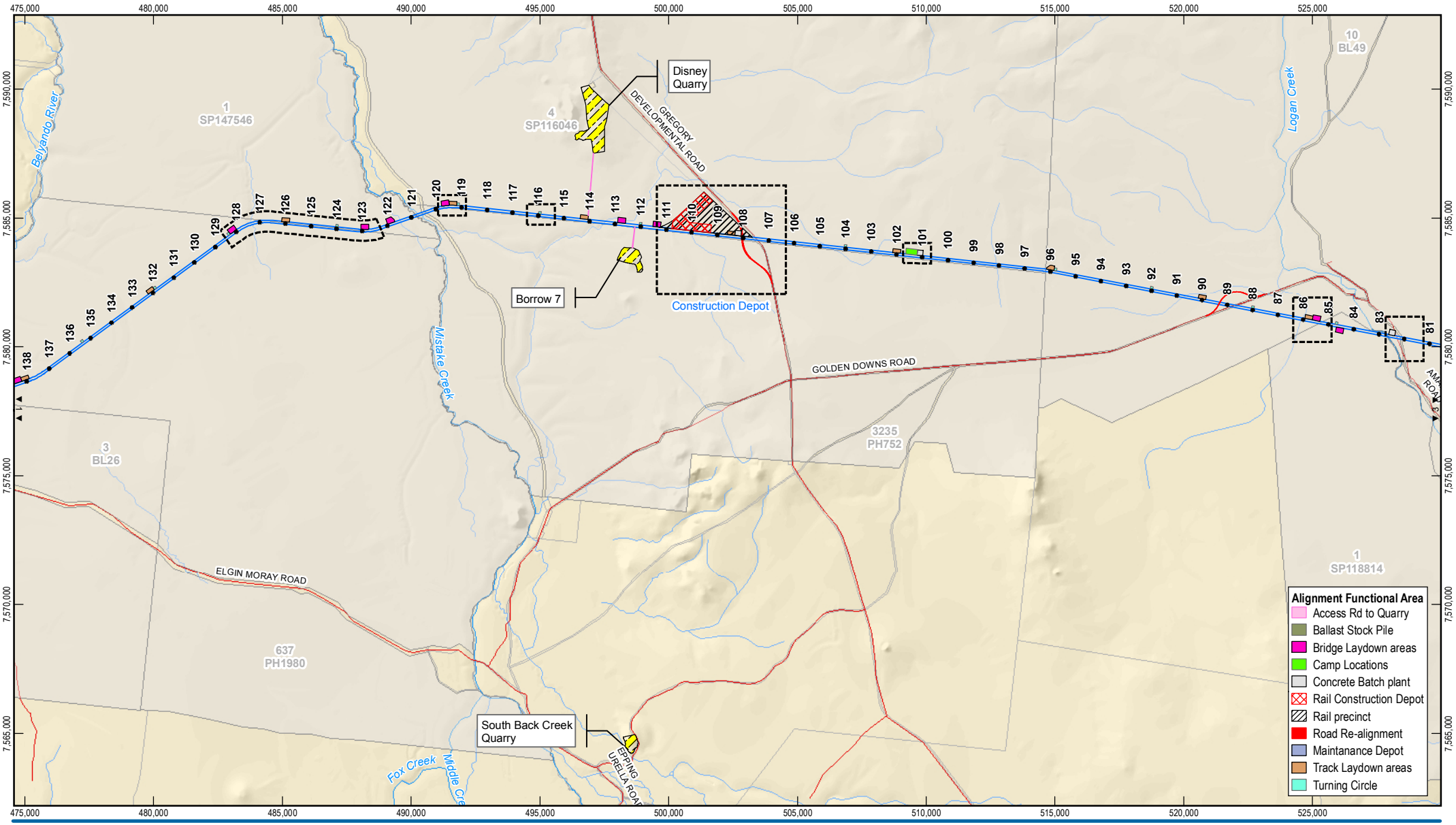

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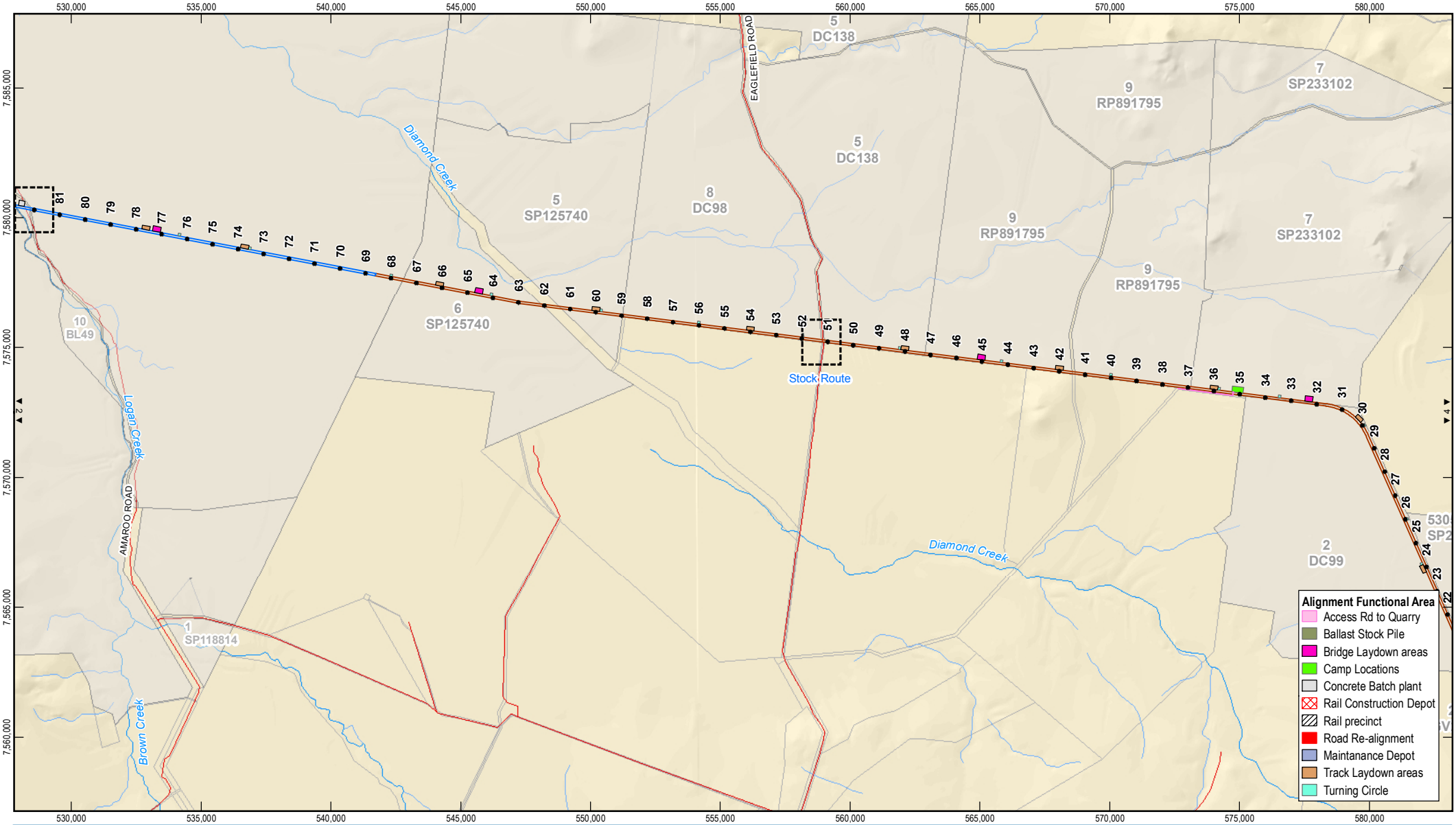
Data source: DNRM: DEM (2008), DCDB (2013), © Commonwealth of Australia (Geoscience Australia): Localities, Railways, Roads, Watercourse (2007); Adani: Project changes, Functional Areas, Alignment SP1 Opt11 Rev2, SP2 Opt 9 Rev 3 (2013); DME: EPC1690 (2010) / EPC1080 (2011). Created by: MS



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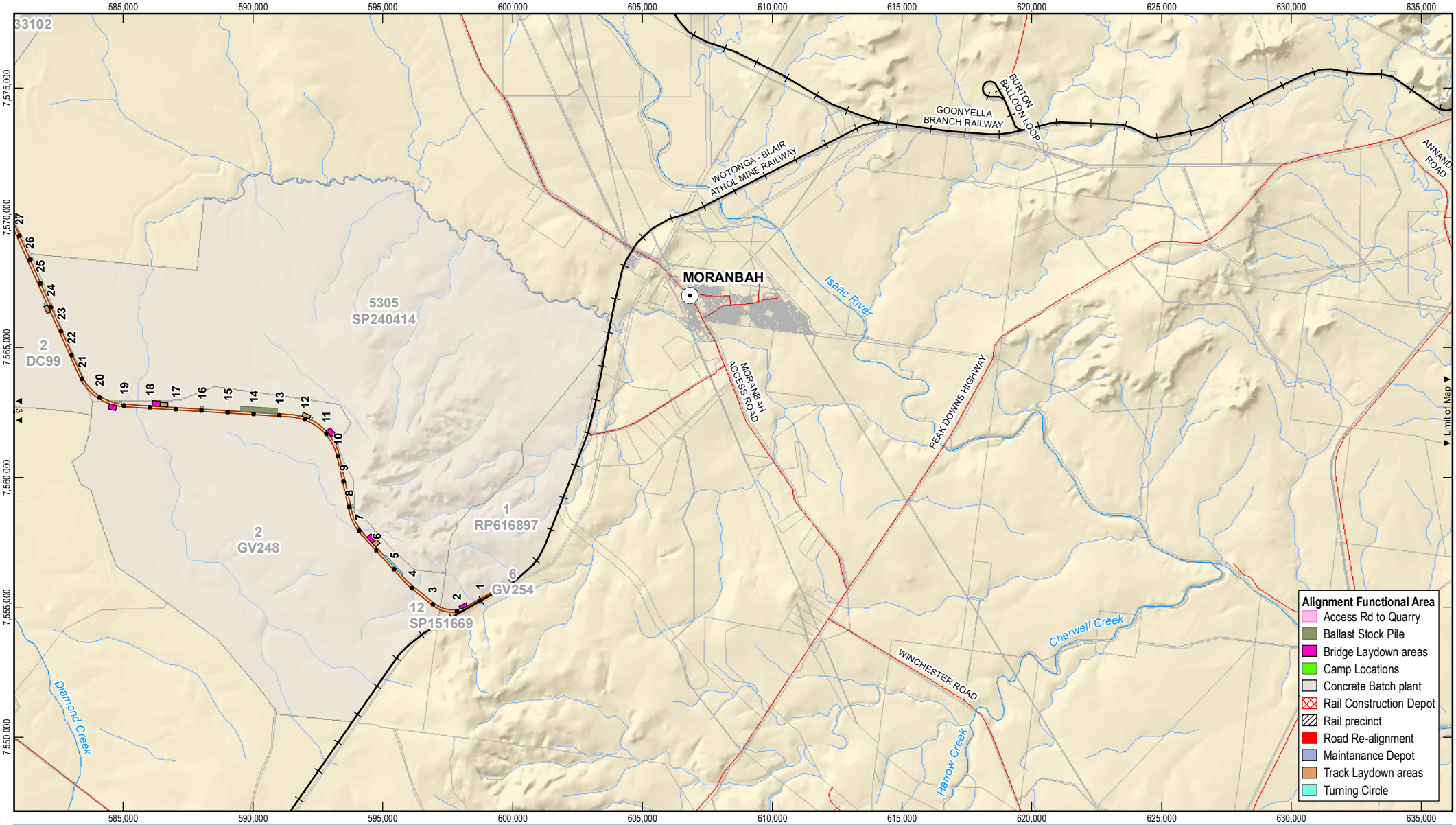

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Data source: DNRM: DEM (2008), DCDB (2013), © Commonwealth of Australia (Geoscience Australia): Localities, Railways, Roads, Watercourse (2007); Adani: Project changes, Functional Areas, Alignment SP1 Opt11 Rev2, SP2 Opt 9 Rev 3 (2013); DME: EPC1690 (2010) / EPC1080 (2011). Created by: MS

2.3.2 Construction Camps

The location of two construction camps has been amended:

- Construction Camp 3 is relocated 2 km west (Chainage 152.000) to be placed outside of the Belyando floodplain; and.
- Construction Camp 2 (Chainage 97.500) is relocated approximately 2.9 km west outside of a flood plain.

Material Change of use applications were provided in the EIS.

The following studies have been completed to support the amendment (refer SEIS Volume 4, Appendix C3):

- MEDLI Modelling Report – Construction Camp 3 to support the Material Change of Use Application
- MEDLI Modelling Report – Construction Camp 2 to support the Material Change of Use Application

2.3.3 Laydown area

In order to minimise impact on landholders, the following laydown areas have been amended:

- The bridge and track laydown areas located at Chainage 151.000 on Lot 2 SP119 925 and Lot 662 PH1491 have been realigned to fit solely within Lot 662 PH1491. The laydown areas in the EIS were irregularly shaped to minimise vegetation clearing impacts on mapped regional ecosystems (RE). Further studies have identified that these locations do not contain any regional ecosystems (SEIS Volume 4 Appendix C3).
- The track laydown located at Chainage 85.500 in the EIS was positioned over two property boundaries (Lot 1 SP118814 and Lot 10 BL49). Following further investigation, the track laydown has been relocated approximately 600 m west to be located within Lot 10 BL49, minimising the impact of the Project on Lot 1 SP118814. Adani has also identified that a bridge laydown is required at this location to allow the construction of crossings in adjacent waterways. This is located immediately east of the track laydown at Chainage 85.500.
- The track laydown previously located at Chainage 119.800 in the EIS, was positioned over two property boundaries (Lot 3235 PH752 and Lot 4 SP166046). The track laydown area has been moved 500 m east to avoid overlapping these two properties at Chainage 119.600).

In addition, the following laydown areas have been relocated to optimise rail construction:

- A new bridge laydown area has been located on Lot 367 PH 1980 at Chainage 138.500 immediately adjacent on the west side of the track laydown area to support bridges works in adjacent waterways.
- The turning circle located on Lot 4 SP166046 at Chainage 119.500 in the EIS has been moved 300 m east to allow the relocation of a bridge laydown area (Chainage 119.200). The turning circle is still located within Lot 4 SP166046.

- The bridge laydown located on Lot 4 SP116046 at Chainage 117.500 in the EIS has been moved 2.1 m west within Lot 4 SP116046 to support bridge works over Mistake Creek (Chainage 119.600).
- The turning circle located in Lot 4 SP116046 at Chainage 116.000 in the EIS has been moved 50 m east (Chainage 115.950) and is still situated in Lot 4 SP116046.
- The concrete batching plant previously located on Lot 662 PH1491 at Chainage 152.000 was moved 2 m west outside of the Belyando floodplain to Chainage 154.500.
- As a result of the relocation of Construction Camp 3, the bridge laydown area located on Lot 662 PH1491 was moved 80 m east from Chainage 153.680 to Chainage 153.600.
- Concrete batching plant located at Chainage 94.500 on Lot 10BL49 was moved west to be situated on Lot 4 SP116046 at Chainage 100.200. The concrete batching plant has been relocated to improve travel efficiencies and to be located closer to source materials (ie. Borrow 7 and Disney Quarry).

The following studies / supporting information have been completed to support the above laydown area amendments:

- Revised SP1 Property Map of Assessable Vegetation (SEIS, Volume 4, Appendix C3)
- SP1 Laydown and Temporary Works Area Regional Vegetation Management Code Response (SEIS, Volume 4, Appendix C3)

2.3.4 Construction Depot (Rail Precinct)

The Construction Depot on Lot 4 SP116046 has been moved approximately 9 km west from Chainage 100.000 to Chainage 109.000 adjacent to the Gregory Development Road. The Construction Depot is now situated in close proximity to the Borrow 7 which will provide ballast material for the rail alignment. In addition, vehicles will be able to access the construction depot using the Gregory Developmental Road which provides all weather access. The Construction Depot includes:

- Flash Butt Welding Facility
- Chemical storage facility
- Ballast stockpiles
- Pipe Culvert Segment Laydown Area
- Sleeper Laydown Area
- Short Rail Laydown Area
- Bridge Girder Laydown Area
- Sewage Treatment Plant
- General storage / laydown area
- Office facility

The following studies / supporting information have been completed to support the relocation of the construction depot:

- Revised SP1 Property Map of Assessable Vegetation (SEIS, Volume 4, Appendix C3)

- SP1 Laydown and Temporary Works Area Regional Vegetation Management Code Response (SEIS, Volume 4, Appendix C3)
- Laydown Area Material Change of Use Development Application (SEIS, Volume 4, Appendix C3)
- Operational Works (Filling and Excavation) Permit Application (SEIS, Volume 4, Appendix C3)
- MEDLI Assessment for the Construction Depot (SEIS, Volume 4, Appendix C3)

2.3.5 Realignment of Rail Line on Goodoowada and Elgin Downs Property

In the Project EIS, the rail corridor was situated approximately 300 m south of the property boundary on Lot 637 PH1980 between Chainage 123.000 and Chainage 127.000, with the rail laydown areas located on the northern side of the rail corridor (within Lot 637 PH1980). Following consultation with the landholders, Adani has realigned the rail corridor approximately 300 m north to sit on the boundary of Lot 637 PH1980. Associated rail laydown areas are now located within Lot 1 SP47546 and include:

- Bridge laydown at Chainage 128.100 has been realigned slightly following the corridor realignment
- Track Laydown at Chainage 126.000 has been moved 200 m north
- Turning Circle at Chainage 124.000 has been moved 200 m north
- Bridge Laydown at Chainage 123.000 has been moved 125 m north

The following studies / supporting information have been completed to support the amendment:

- Revised SP1 Property Map of Assessable Vegetation (SEIS, Volume 4, Appendix C3)
- SP1 Laydown and Temporary Works Area Regional Vegetation Management Code Response (SEIS, Volume 4, Appendix C3)
- Laydown Area Material Change of Use Development Application (SEIS, Volume 4, Appendix C3)

2.3.6 Quarries

The EIS referenced the need for local and regional quarries to supply up to 12 million tonnes of fill material for the construction and operation of the Carmichael Coal Mine and Rail Project and associated local council road upgrades.

Through consultation with State and Federal Government Agencies, a review on the approvals pathway for the quarries has occurred, resulting in the inclusion of the quarries in the SEIS. To supply the necessary quarry material, Adani will develop five (5) quarries / borrows in proximity to the rail line for construction of the project, with one quarry (Borrow 7) being retained for the life of the mine. Table 1 provides further details on the quarry locations, tonnes to be excavated and proposed use.

The following studies have been undertaken to support the inclusion of the quarries in the SEIS. These include:

- Quarry Fauna Assessment Report

- Quarry EPBC Environmental Impact Assessment
- Vegetation Assessment including Property Map of Assessable Vegetation and Regional Vegetation Management Response Codes (where applicable)
- Noise Assessment
- Air Quality Assessment
- Traffic and Transport Assessment
- Conceptual Erosion and Sediment Control Plans.

Development permit applications including the abovementioned studies are available for each quarry in SEIS Volume 4, Appendix C5.

Table 1 Proposed quarries

Quarry Location	Type	Quantity of resource (tonnes)	Footprint (ha)	Depth (mbgl)	Materials
Disney (Lot 4 SP116046)	Quarry	11,750,000	92.57	5	Rail embankments, capping, sub-base and select fill
Borrow 7 (Lot 3235 PH752)	Borrow	19,930,000	36.17	15	Rail ballast, scour protection and aggregate
North Creek (Lot 2 SP119925)	Quarry	603,000	7.64	10	Rail ballast
Moray (Lot 662 PH1491)	Quarry	692,000	91.2	8	New road construction and rail embankments
South Back Creek (Lot 656 SP138788)	Quarry	4,516,395	55.5	15-16	Road base and ballast material

2.3.7 Stock routes

The Project (Rail) proposes impacts to three (3) stock routes. These are:

- Kilcummin Diamond Downs Road at Chainage 51.220
- Amaroo Road at Chainage 82.150; and
- Mistake Creek at Chainage 120.460.

The final treatment for the stock route crossings is currently being discussed with the Department of Natural Resources and Mines (DNRM) and Isaac Regional Council (IRC). Options include using reinforced concrete box culverts, realigning the stock route to run alongside the rail to bridges with holding yards at crossings and grade separation / at grade separation, where practical. The final treatments for these stock routes will be finalised after a

site visit and further discussions with DRNM and IRC in September 2013. Discussions are also being held with land holders in the area about all changes to stock routes.

2.3.8 Occupational crossings

Adani is continuing to liaise with property owners impacted by the Carmichael Rail corridor in relation to occupational corridors required along the corridor to minimise the impact of the project. The numbers and types of crossings required may change subject to further negotiations.

2.3.9 Construction timeframes

Construction timeframes associated with the Project (Rail) have changed from that identified in the Carmichael Coal Mine and Rail EIS. Construction of the Project (Rail) is now anticipated to commence in 2014, with completion of the alignment and operation of the first coal train expected to commence in late 2016.

2.4 Updates to studies

A number of studies have been undertaken since the release of the EIS. The list of studies undertaken as part of the SEIS includes:

- Rail:
  - Draft Rehabilitation Management Strategy – Rail (SEIS Volume 4, Appendix X)
  - Rail Flood Modelling Report (SEIS Volume 4, Appendix S1)
  - Rail Bushfire Management Plan (SEIS Volume 4, Appendix S2)
  - Rail Strategic Cropping Land Assessment (SEIS Volume 4, Appendix T1)
  - Soil Survey Methodology (SEIS Volume 4, Appendix T2)
  - Rail Fauna Crossing Strategy Report (SEIS Volume 4, Appendix U)
  - Rail Emergency Management Plan (SEIS Volume 4, Appendix V)
  - Rail Environmental Management Plan (SEIS Volume 4, Appendix W)
  - MEDLI Modelling assessments for the Construction Depot, Maintenance Facility, Construction Camps 1 – 3 (SEIS Volume 4, Appendix C3)
  - Species Management Program (Least Concern) (SEIS Volume 4, Appendix C3)
  - Threatened Species Management Plan (SEIS Volume 4, Appendix C3)
  - Watercourse Determination and Riverine Protection Permit Review (SEIS, Volume 4, Appendix C3)
  - Revised Property Map of Assessable Vegetation and Regional Vegetation Management Code Response (SEIS Volume 4, Appendix C3)
- Quarries:
  - EPBC Environmental Impact Assessment Report
  - Fauna Assessment Report
  - Vegetation Assessment including Property Map of Assessable Vegetation and Regional Vegetation Management Response Codes (where applicable)
  - Traffic and Transport Impact Assessments
  - Air Quality Impact Assessment

- Noise Assessment
- Conceptual Erosion and Sediment Control Plans

Development permit applications including the abovementioned studies are available for each quarry in SEIS Volume 4, Appendix C4.

2.5 Summary of comments

Summary of key submissions raised on the EIS relevant to Project Description (Rail) include:

- Unclear rail alignment through Myra, Mallawa, Wyena, Mabbin, Nibbereena, Kimberly and Denham Park Stations

A copy of the Submissions Register for the Carmichael Coal Mine and Rail EIS is located in the SEIS Volume 4 Appendix A.

2.6 Response to comments

Myra, Mallawa, Wyena, Mabbin, Nibbereena, Kimberly and Denham Park Stations are not located along the Carmichael Coal Rail alignment. As such, these properties are unlikely to be impacted by the Project.

3. Climate, natural hazards and climate change

3.1 Introduction

This section of the SEIS provides an overview of the amendments to the Project (Rail) and additional work undertaken in relation to climate, natural hazards and climate change, since the EIS was made available for public comment in December 2012. A summary of key submissions is provided with response to these key matters. Response to individual submissions is provided in Volume 4 Appendix A.

3.1.1 Amendments to project description

Overview

The changes to the Project (Rail) relevant to the climate, natural hazards and climate change chapter include:

- a change in the location of the rail loop
- a minor change to the rail alignment
- the addition of five quarries

Rail

The proposed rail loop is to be relocated to the south east of the previous rail loop assessed in the EIS. Another change to the rail alignment consists of approximately 4.7 km of the dual gauge portion of the Rail (west) being aligned approximately 140 m north of the rail alignment proposed in the EIS.

The results of the EIS in relation to climate, natural hazards and climate change will not change significantly as the proposed alignment changes are minor and will not change those impacts predicted in the EIS.

Quarries

Five quarries are now proposed as part of the Project (Rail). The proposed quarries were not included within the climate, natural hazards and climate change assessment in the EIS. The quarries are required to provide the quarry material for the construction of infrastructure associated with the mine and rail including, but not limited to, roads, camps, pads, dams and mine civil works.

Development applications for the five quarries are included as part of the SEIS for the Project (refer to SEIS Volume 4 Appendix C5 Quarry Applications). The information in the approval documentation shows that the quarries are located on sites with no known flooding, landslide or fire hazard mapping.

Adani have provided ongoing environmental management and mitigation commitments within the approvals documentation. These environmental management commitments address construction and operational requirements under the *Environmental Protection Act 1994*, Environmental Protection Regulation 2008 and subordinate legislation.

A detailed description and impact assessment has been undertaken for each of the five quarries (refer to SEIS Volume 4 Appendix C5 Quarry Applications). An overview of each quarry is provided below.

3.1.2 Update to studies

As a result of the Project changes listed above the following additional studies and reports have been undertaken for the Project (Rail):

- Quarry Approvals Documentation (refer to SEIS Volume 4 Appendix C5)
- Rail Flood Modelling (refer to SEIS Volume 4, Appendix S1)

3.1.3 Assessment of quarries

Back Creek South Quarry

The South Back Creek Quarry is located on a site with no known flooding, landslide or fire hazard mapping. The Back Creek South Quarry will be a short term operation commencing in early 2014 and operating until April 2016. Due to the temporary nature of the quarry it is not expected that climate change will have an impact.

Disney Quarry

The Disney Quarry is located on a site with no known flooding, landslide or fire hazard mapping. The Disney Quarry will be a short term operation commencing in 2014 and operating until construction of the Project (Rail) is completed. Due to the temporary nature of the quarry it is not expected that climate change will have an impact.

Borrow 7 Quarry

Borrow 7 Quarry development is located on a site with no known flooding, landslide or fire hazard mapping. The Quarry will operate during the Project (Rail) construction period and then continue to operate for the life of the Mine providing approximately 100,000 tonne per annum of material for maintenance purposes. Based on the location of the Quarry it is not anticipated that climate change, such as increased runoff, will impact the operations of the facility.

North Creek Quarry

The proposed North Creek Quarry is located on a site with no known flooding impacts or landslide hazard mapping. In addition, the site is mapped as low bushfire risk. The North Creek Quarry will be a short term operation commencing in late 2014 and operating until construction of the Project (Rail) is completed. Due to the temporary nature of the quarry it is not expected that climate change will have an impact.

Moray Quarry

The proposed Moray Quarry is located on a site which is considered above the standard flood level of 202 m AHD. In addition, the site is mapped as low to moderate bushfire risk. The Moray Quarry will be a short term operation commencing in late 2014 and operating until construction of the Project (Rail) is completed. Due to the temporary nature of the quarry it is not expected that climate change will have an impact.

3.2 Summary of comments

Issues raised in these submissions included:

- Increase in extreme weather (flooding) and impacts on cattle and grain properties
- Cumulative flooding impacts on the Galilee Basin
- Definition of flood levels
- Historic flood models

A table that provides responses or cross references to the responses to individual comments is provided in SEIS Volume 4 Appendix A.

3.3 Response to comments

3.3.1 Increase in extreme weather events and impact on cattle and grain producers

Comments in regard to the impact of flooding on existing cattle and grain properties are noted. Detailed flood modelling has been undertaken and has been included in the Rail Flood Modelling Report (refer to SEIS Volume 4 Appendix S1).

Modelling has been conducted based on the implementation of drainage design criteria, as outlined in Table 2.

Table 2 Major floodplain environmental design criteria (subject to landholder negotiations)

Receiving environment	Criterion
Critical Infrastructure	0.2 m maximum
Housing Areas	0.1 m maximum
Other Areas	Limited to 0.3 m where practicable
Non-critical infrastructure/ housing or uninhabited areas	0.5 m maximum

With the recommended waterway drainage structures, afflux levels adjacent to the proposed railway generally meet the design criteria, with minor localised areas of inundation exceeding 0.5 m; these areas are limited in extent, localised to areas adjacent to the alignment and have minimal impact upon existing infrastructure and velocities. Afflux and velocity results for the post-development case meet the nominated Project Design Criteria requirements at most of the critical locations.

Based on the modelling limited impact to cattle grazing and grain producers is expected.

According to the Queensland Government Scientific Advisory Group (SAG) guidelines (Qld Government 2010a and Qld Government 2010b), rainfall is likely to increase or decrease by 5 percent per degree of global warming. The Project (Mine and Rail) is designed to be operational until 2071. The SAG recommends adopting a 4 degree increase in temperature by 2100. This corresponds to a 10 to 15 percent increase in rainfall intensity over the Project operational life. By inputting these increased intensities to the hydrologic model it is possible to estimate potential peak flow rates under climate change conditions. The increase in rainfall intensity is expected to produces an estimated 20 percent increase in runoff. However, this estimated increase in runoff is highly speculative and other climate change scenarios are possible as well.

The risk of climate change over the period of the Project operations should be considered during future planning and design. Potential increases in peak flow rates and the resultant impact they may have on the operation of the flood protection infrastructure are of particular risk in this regard. However, considering the large uncertainties regarding climate change in general at this stage and that the EIS ToR did not require modelling against climate change scenarios, this assessment has not been incorporated into flood modelling.

Ongoing consultation with land holders regarding flood management will be undertaken by Adani.

3.3.2 Cumulative flooding impacts on the Galilee Basin

Comments regarding the cumulative impacts of the Project (Rail) on land form changes have been noted. Assessment of cumulative geomorphic changes has been included in the updated Cumulative Impact Assessment (refer to SEIS Volume 1 Section 9 Cumulative Impacts).

3.3.3 Definition of flood levels

Comments regarding known flood risk are noted. Detailed flood modelling has been undertaken and has been included in the Rail Flood Modelling Report (refer to SEIS Volume 4 Appendix S1).

Design criterion of flood levels are described in Table 2.

3.3.4 Historic flood levels

Comments regarding historic flood levels have been noted. Detailed flood modelling has been undertaken and has been included in the Rail Flood Modelling Report (refer to SEIS Volume 4 Appendix S1).

Modelling has considered the historic flood levels and data, where available, to input to modelling.

3.4 Amendments to commitments

The following commitment has been made regarding flood management adjacent to private land ‘ongoing consultation with land holders regarding flood management will be undertaken by Adani’.

4. Land

4.1 Introduction

This section of the SEIS provides an overview of the amendments to the Project (Rail) and additional work undertaken in relation land, since the EIS was made available for public comment in December 2012. A summary of key submissions is provided with response to these key matters. Response to individual submissions is provided in Volume 4 Appendix A.

4.1.1 Amendments to project description

Overview

The changes to the Project (Rail) relevant to the land chapter include:

- a change in the location of the rail loop
- a minor change to the rail alignment
- the addition of five quarries

Rail

The proposed rail loop is to be relocated to the south east of the previous rail loop assessed in the EIS. In addition the rail alignment consists of approximately 4.7 km of the dual gauge portion of the Rail (west) which has been realigned approximately 140 m north of the rail corridor.

The results of the impact assessment included in the EIS in relation to land will not change significantly as the land use and tenure of the proposed alignment changes are the same as the previous alignment, being leasehold land for cattle breeding and fattening. The changes to areas of good quality agricultural land (GQAL) and strategic cropping land (SCL) impacted by the Project (Rail) are presented in Table 3 and Table 4.

The changes to the alignment are minor and impacts on the scenic amenity of residences will remain the same as those predicted in the EIS.

Table 3 Good quality agricultural land within the Project (Rail) including quarries

EIS		SEIS	
GQAL Class	Area within the Project (Rail) (ha)*	GQAL Class	Area within the Project (Rail) (ha)*
A	157.705	A	192
B1	1479.69	B1	420
C1	1681.20	C1	1308

Table 4 Strategic cropping land within the Project (Rail) (including quarries)

Strategic Cropping Land	Area within the Project (Rail) (ha)*
EIS	218.97
SEIS	154.17

Quarries

Five quarries are now proposed as part of the Project (Rail). The proposed quarries were not included within the land assessment in the EIS. The quarries are required to provide the quarry material for the construction of infrastructure associated with the mine and rail including, but not limited to, roads, camps, pads, dams and mine civil works.

Site details for each quarry are provided in Table 5.

Table 5 Quarry site details

Quarry	Project footprint (ha)	Real property description	Lot area (ha)	Tenure/land use
South Back Creek	55.5	Lot 656 SP138788	32,700	Leasehold Quarrying and cattle breeding / fattening
Disney	92.57	Lot 4 SP116046 ABL55	47,600	Leasehold Cattle breeding / fattening
Borrow 7	36.17	Lot 3235 PH752	20,700	Leasehold Cattle breeding / fattening
North Creek	7.64	Lot 2 SP119925	47,600	Leasehold Cattle breeding / fattening
Moray	91.2	Lot 662 PH1491	120.7	Leasehold Pastoral lease

4.1.2 Update to studies

As a result of the Project changes listed above the following additional studies and reports have been undertaken for the Project (Rail):

- Application for five quarries (refer to SEIS Volume 4 Appendix C5)
- Strategic Cropping Land Assessment (refer to SEIS Volume 4 Appendix T1)
- Soil Survey Methodology – Rail (refer to SEIS Volume 4 Appendix T2)

4.1.3 Land assessment of quarries

Developmental applications for the five quarries are included with the SEIS for the Project (refer to SEIS Volume 4 Appendix C5 Quarry Applications). The land use and planning assessment for the quarries are provided within the approval documents. The land use assessments established that the quarries are generally consistent with the requirements of the Belyando Shire Planning Scheme 2009 (BSPS) and State Planning instruments.

The approval documentation also provides an assessment of the quarry impacts in relation to:

- scenic amenity and lighting
- topography, geology and soils
- land contamination
- land use and tenure

The impact assessments undertaken in the approval documentation determined that the quarry activities will be acceptable and no major or high risk impacts on the above land components are likely (refer to SEIS Volume 4 Appendix C5 Quarry Applications).

Back Creek South Quarry

The Back Creek South Quarry is a new hard rock quarry proposed to be located on Lot 656 SP138788 with direct access to Elgin Road. The site is approximately 10 km west of the Gregory Developmental Road, and approximately 102 km north-west of Clermont in the Isaac Regional Council (IRC) area. The quarry will have a total operational footprint of 55.5 ha and a depth of between 15 – 16 m below ground level

The Back Creek South Quarry site is cleared, contains a significant amount of exotic species, has no watercourses and is subject to intermittent quarry extraction. The topography of the surrounding area is generally flat except for the small rocky outcrop reaching 225 m AHD which will be utilised for Back Creek South Quarry.

The lot is zoned Rural under the BSPS and is primarily used for agricultural activities. There is an existing IRC quarry area adjacent to the site. The land use assessment in the approval documentation established that the quarry is generally consistent with the requirements of the BSPS and State Planning instruments.

Disney Quarry

The Disney Quarry is a new embankment material quarry proposed to be located on Lot 4 SP116046 with an access road through easement ABL55, which connects the Gregory Developmental Road to Lot 1 BL55 (note: Lot 1 BL55 is not part of the proposal). The quarry has a proposed operational footprint of 92.57 ha and a depth of five metres below ground level.

The lot is zoned Rural under the BSPS and is primarily used for agricultural activities. The site is within an area primarily used for cattle grazing; however it is a large and topographically complex site that remains well vegetated over much of its extent.

The land use assessment in the approval documentation established that the quarry is generally consistent with the requirements of the BSPS and State Planning instruments.

Borrow 7 Quarry

Borrow 7 Quarry is a new hard rock quarry proposed to be located on Lot 3235 PH752, with a single extraction area covering a total of 36.17 ha. The site is approximately 5 km west of the Gregory Developmental Road, and approximately 120 km north-west of Clermont in IRC area. The lot is zoned Rural under the BSPS and is primarily used for agricultural activities. Borrow 7 is a large and topographically complex site that is generally vacant of vegetation, contains a significant amount of exotic species and has no watercourses.

The land use assessment in the approval documentation established that the quarry is generally consistent with the requirements of the BSPS and State Planning instruments.

North Creek Quarry

North Creek Quarry is a new road base and embankment material quarry proposed to be located on Lot 2 SP119925, approximately 135 km north of Clermont. The site is adjacent to the eastern side of Bulliwallah Road, which connects to Moray Carmichael Road in the south and the Gregory Developmental Road in the north. The quarry has a proposed operational footprint of 7.64 ha and a depth of approximately 10 m below ground level

North Creek Quarry is cleared, contains a significant amount of exotic species, has no watercourses and is subject to intermittent quarry extraction. The topography of the site is generally flat except for the small sedimentary rock outcrop and existing topsoil stockpiles which will be utilised for North Creek Quarry

The lot is within the IRC area and is zoned Rural under the BSPS and although the property is primarily used for agricultural activities, the site of the proposed North Creek Quarry has been utilised for historic quarrying operations.

The land use assessment in the approval documentation established that the quarry is generally consistent with the requirements of the BSPS and State Planning instruments.

Moray Quarry

The proposed Moray Quarry is an expansion of an existing road construction and embankment material quarry proposed to be located on Lot 662 PH1491 with site access directly onto the realigned Moray Carmichael Road. The quarry has a proposed operational footprint of 91.2 ha and a depth of 8 m below ground level.

Moray Quarry is cleared, contains a significant amount of exotic species, has no watercourses and is subject to intermittent quarry extraction. The topography of the site is generally flat except for the small sedimentary rock outcrop in the southern section of the site.

The site is bounded by Bulliwallah Road to the east and Moray Carmichael Road to the south-east, approximately 145 km north of Clermont in the IRC area. The lots are zoned Rural under the BSPS and are primarily used for agricultural activities.

4.2 Summary of comments

Comments raised in the submissions included:

- impacts on private land holder Environmental Risk Management Plans (ERMPs)
- visual impacts on private residences
- land management after flood events
- land severance impacts on residences and grazing businesses
- loss of good quality agricultural land, strategic cropping land and long term impacts on agricultural viability
- impacts on grazing business
- management of stock route network
- impact on resources and other tenure such as MDLs and EPMs
- impacts on agricultural productivity.

A table that provides responses or cross references to the responses to individual comments is provided in SEIS Volume 4, Appendix A.

4.3 Response to comments

4.3.1 Environmental risk management plans

Ongoing consultation between land holders and Adani regarding specific management measures contained within Environmental Risk Management Plans (ERMPs) will be undertaken and where appropriate included within the Environmental Management Plan –Rail (EMP) for the Project (Rail) (refer to SEIS Volume 4 Appendix W).

4.3.2 Visual impacts

A Landscape Visual Impact Assessment was undertaken for the Project (Rail) in the EIS (Volume 4, Appendix X). This report concluded that the landscape and visual impacts of the Project (Rail) were of a moderate and / or minor to not significant for the viewing locations assessed. This assessment also concluded that due to the nature of the Project (Rail) there would be a permanent impact on the visual landscape and amenity for some viewing locations within the Project (Rail).

As outlined in the EIS the assessment process was objective and described changes factually, however it was acknowledged that visual impacts can be highly personal and hence subjective and therefore individuals were likely to associate different visual experiences to the Study Area.

The landscape and visual impacts of the Project (Rail) will occur both during the construction and operational phases and measures to minimise these impacts have been included within the Project (Rail) EMP (refer to SEIS Volume 4 Appendix W).

4.3.3 Flood management

A comment was raised regarding post flood management, specifically, who will move the obstructions (silt, logs) to pipes after a flooding event.

Ongoing consultation will be undertaken between Adani and landholders regarding flood modelling and flood impacts. The removal of obstructions after flooding will be an integral part of Adani's management of the rail corridor. The Rail EMP includes provisions for environmental monitoring, management and mitigation through construction and operations (refer to SEIS Volume 4 Appendix W).

4.3.4 Land severance impacts

The key comments regarding land severance related to land access (vehicles/livestock), decrease in land values and usability and access to water on severed parcels. Ongoing consultation will be undertaken by Adani with land holders and government agencies regarding land access and occupational crossings of the rail corridor. Consultation will also include discussions with land holders and IRC regarding the safe management of cattle on at grade railway crossing access during construction and operations.

4.3.5 Grazing businesses

Cattle management

Ongoing consultation with land holders regarding cattle management on railway crossings will be undertaken by Adani. This includes corridor management, fencing, gates and holding yards. Mitigation and management measures for impacts on grazing activities have been included within the Project (Rail) EMP (refer to SEIS Volume 4 Appendix W).

Coal dust

Comments regarding coal dust impacts on grazing activities have been noted. Submissions related to air quality impacts including mitigation and management measures relating to coal dust management are discussed further in Volume 3 Section 7 Air Quality.

4.3.6 Loss of agricultural land

Strategic cropping land

A strategic cropping land (SCL) Assessment has been undertaken for the Project (Rail) (refer to SEIS Volume 4 Appendix T1). Twenty triggered SCL polygons will be intersected by the Study Area, eight of which are devoted to rail infrastructure and twelve of which are devoted to ancillary infrastructure. The proposed quarries will not impact SCL.

A history of cropping assessment has determined that two properties (Avon Downs and Lambing Lagoon) containing 11 SCL polygons that have a history of cropping. The remaining nine polygons are within four properties that do not have a history of cropping and are not considered to be SCL. An application to DNRM will be submitted for these properties, separate to this SEIS, with the supporting evidence provided.

Adani proposes to accept the triggered SCL that passed the history of cropping assessment as actual SCL and no field verification of SCL is proposed to be undertaken.

Rail soils characterisation

DNRM requested a more detailed soil assessment to be undertaken as per the terms of reference. A soil survey will be undertaken for the Project (Rail). A soil survey methodology has been prepared and will be submitted to DNRM prior to undertaking the assessment (refer to SEIS Volume 4 Appendix T2).

4.3.7 Loss of stock route network

Comments regarding stock route management have been noted. The final treatment for the stock route crossings is currently being discussed with the Department of Natural Resources and Mines (DNRM) and Isaac Regional Council (IRC). The final treatments for these stock routes will be finalised after a site visit and further discussions with DRNM and IRC in September 2013. Discussions are also being held with land holders in the area about all changes to stock routes.

Further to this, information regarding maintenance and management of the stock route has been included as per the project commitments outlined within the EIS.

4.3.8 Impacts on agricultural productivity

On 26th March 2013, the Coordinator General requested that the SEIS include details of mitigation measures to address land severance and potential impacts on pasture and cattle health. This section has been prepared in response to this request and it describes potential impacts of the Project (Rail) and ways of avoiding or reducing such impacts.

Many of the properties affected by the Project (Rail) are large landholdings, with the smaller landholdings tending to be within 50 km of Moranbah. The Project (Rail) alignment tends to follow property boundaries along these smaller landholdings significantly reducing the potential for adverse impacts, including land fragmentation. Properties affected by the Project (Rail) are predominantly classified as rural leasehold land used for the purposes of agricultural, grazing or pastoral activities. The Project (Rail) traverses 11 leasehold properties and 10 freehold properties, while quarry developments affect five properties.

Pastoral farming is undertaken across the study area with small areas of cropping to provide cattle fodder. Many properties comprise a mix of productive grazing land used for 'finishing' cattle prior to market sale, and less productive land used for general grazing.

Pastoral farming practices within Australia are generally similar between most areas, however within this area it is important to acknowledge there will be some specific practices which will be impacted and discussed further with each landholder on an individual basis. As negotiations with individual landholder's progress, property management practices will be better understood.

Most properties are managed as single production units, some as part of a larger property network elsewhere in Queensland. There are however some properties that are managed as a single production unit for efficiency. These are generally contiguous properties owned by members of the same family.

The Project (Rail) has potential to impact upon the productivity of agricultural, grazing or pastoral activities through indirect and direct means. Potential impacts and proposed ways of reducing or avoiding these impacts are described below.

Adani is in ongoing consultation with rail and mine landholders. Rail landholders continue to be informed about technical studies and the rail design development including information where relevant on proposed crossing treatments, construction and operational infrastructure, flood modelling and proposed drainage treatments. Adani will continue to consult with the landholders during the detailed design phase of the project to ensure that they are fully informed of the design process and the proposed mitigation measures specific to their property operations.

Impact on strategic cropping land and agricultural land

As detailed within Section 4.3.6 of this document, SCL assessment has been undertaken for the Project (Rail) (refer to SEIS Volume 4 Appendix T1) which identified that twenty triggered SCL polygons will be intersected by the Study Area, eight of which are devoted to rail infrastructure and twelve of which are devoted to ancillary infrastructure. The proposed quarries will not impact SCL.

A history of cropping assessment has determined that two properties (Avon Downs and Lambing Lagoon) containing 11 SCL polygons have a history of cropping. The remaining nine polygons are within four properties that do not have a history of cropping and are not considered to be SCL. An application to DNRM will be submitted for these properties, separate to this SEIS, with the supporting evidence provided.

Adani proposes to accept the triggered SCL that passed the history of cropping assessment as actual SCL and no field verification of SCL is proposed to be undertaken.

Property severance

The construction and operation of the Project (Rail) may fragment properties which may in turn affect stock movements, maintenance and access tracks, and decrease land values and usability and access to water on severed parcels.

So as to mitigate or reduce these impacts, the Project (Rail) has been designed to maximise the distance of the Project (Rail) from homesteads and associated improvements such as sheds. The Project (Rail) also follows cadastral boundaries to avoid fragmentation or intrusion of properties. The design preserves access tracks within and between properties where possible. Private tracks will be joined to local roads or grade separated where possible to preserve their utility. Occupational crossings will be constructed to provide access typically under the Project (Rail).

To address the uncertainty on land use effects on land values, the voluntary purchase of properties significantly affected could be undertaken. Where there is direct loss of agricultural production, purchasing the property (ies) in part or whole will be considered where impact is likely to be significant. Where potential for reduced access to property arises, Adani will work with landowners to minimise impact including implementing measures such as agreeing on the location of easements to reduce impacts, e.g. outside property boundaries and/or along fence lines, rather than through middle of property where practicable. The provision of appropriate access and ability to cross easements has been considered and negotiated with individual landholders. Infrastructure and facilities impacts will be avoided as far as possible, and where impacted replaced on a like for like basis. The crossing of pastoral property and farm access roads will be minimised and alternative access provided during unavoidable construction activities as appropriate.

To mitigate the introduction/transfer of weeds/disease (biosecurity), Adani will develop appropriate biosecurity protocols including, but not limited to, potentially restricted access and vehicle/plant wash down. Information will also be provided on road closures/detours and alternative routes provided in appropriate media and with signage during railway construction. Following construction, adequate reinstatement of agricultural properties as reasonably practical, along with appropriate rehabilitation to ensure post construction condition is suitable for the intended use will be undertaken.

Ongoing consultation will be undertaken by Adani with landholders and government agencies regarding land access, occupational crossings of the rail corridor, decrease in land values and usability and access to water on severed parcels. Consultation will also include discussions with landholders and IRC regarding the safe management of cattle on at grade railway crossing access during construction and operations. For further information related to severance of properties refer to the SEIS, Volume 4, Appendix E Revised Economic Assessment and Section 4.3.4 of this document.

Flooding

The Project EIS identified twelve major waterways and 76 minor waterways and overland flow paths that will be crossed by the Project (Rail). The major waterway crossings will comprise either a bridge or culvert or a combination of both depending on the predicted depth of water.

Crossings of the smaller waterways will also consist of either a bridge or culvert or a combination of both but will predominantly be a culvert only (Volume 3, Section 6 of the EIS).

During the construction of the project, construction of temporary bridge/causeways over the waterway channels is a potential barrier to waterway flows. This could potentially cause flooding if there is insufficient hydraulic capacity to convey the flood flows, or the waterway becomes blocked by debris.

Construction phase activities within major watercourse are as far as is possible, likely to be limited to the drier periods and the risk of additional flooding of the floodplains is considered low. However, the following mitigation measures are proposed:

- Complete construction in dry periods to minimise the risk of flood occurrence;
- If a causeway is used provide sufficient hydraulic capacity to allow the conveyance of natural flows with minimal increase in velocity or afflux;
- Keep low flow channel and any culverts through site clear of debris;
- Conduct a detailed scour assessment to determine the appropriate depth of cover or scour protection measures to be adopted at each crossing. The detail design of the creek crossings will incorporate works and measures to minimise the risk of damage to the creek banks during construction; change in the sediment regime at the crossing and the risk of creek bank collapse or erosion during flood events.

Flood level and flow assessments were undertaken in the EIS based upon the preliminary concept design (EIS Volume 3, Section 6). Additional studies have now been undertaken to assess any potential flood impacts on properties as a result of the proposed design of the rail based on the following:

- Before and after rail development scenarios;
- Ground truthing of major watercourses and catchments;
- Consideration of anecdotal evidence of historic flood levels and stream gauge data (where available).

Flood level and flow limits for approved railway projects in Central Queensland have been used to determine acceptable impact criteria for the Project. The results of this assessment indicate that any flood impacts from the proposed rail design are within these criteria.

Flood inundation duration modelling will be undertaken at the detailed design phase. Adani's Hydrology Project Design Criteria (Section 2.4 of Appendix S1) stipulates the following: "Any increase in duration (modelled) of flooding inundation is not to exceed an average across the modelled extent of 72 hours or 20% (whichever is greater) of existing inundation durations during the 50 year ARI event. This is unless specific circumstances where inundation durations post-development can be tolerated in conjunction with landholder agreement. Inundation durations shall be measured from when the water depth is greater than 300mm on the rising limb of the hydrograph to when the water depth is equal to 300mm on the falling limb of the hydrograph."Ongoing consultation will be undertaken between Adani and landholders regarding flood modelling and flood impacts. The removal of obstructions (silt, logs) to pipes after flooding will be an integral part of Adani’s management of the rail corridor. The Rail EMP includes provisions for environmental monitoring, management and mitigation through construction and operations (refer to SEIS Volume 4 Appendix W).

Stock watering and farm use

It is not expected that the construction phase of the Project (Rail) will adversely impact on water quantity associated with stock watering and farm use. It is understood that water required for construction phase (for earthworks, dust suppression, concrete batching plants, potable water, etc) will be imported to construction sites. With respect to water quality, there are potential impacts to stock watering and farm use associated with the potential for contamination and increased turbidity (through sedimentation and additional total dissolved solids (TSS)). Raised sediment levels, cement residues and hydrocarbon spillages diminish the value of the water as a farm supply. Potable use of these water supplies would require increased treatment. Irrigation lines can become clogged and downstream farm dams can silt up, diminishing capacity of seasons storage. Good water quality is essential for successful stock production. Poor water quality is less palatable to animals leading to poor health and impaired fertility. If river and/or creek flows are temporarily impounded by the construction phase embankments, this can potentially reduce the supply of downstream stock water and/or irrigation supply. Sediment liberated by scouring can potentially have adverse water quality effects, which may adversely affect stock.

The potential impacts to stock watering and farm use are expected to be limited during the operational phase because it is not intended that the railway will permanently divert, abstract or take water from any of the rivers and creeks. In order to address potential deterioration in water quality Adani will undertake a comprehensive suite of erosion and sediment control measures and ensure that construction within watercourses will be undertaken during the drier periods, as far as practicable. For further information refer to the EIS Volume 3, Section 6.

Disruption to stock movement

The construction and operation of the Project (Rail) has potential to disrupt stock movement through the existing stock route network. This may lead to stock distress, reduced pastoral productivity and higher stock transportation costs. Constraints to stock movement may also prevent stock from reaching important areas of pasture or water during drought and thereby potentially increasing stock mortality. Other impacts include disruption to cattle operations as a result of paddock gates being left open or damage to property infrastructure throughout the construction stage of the project.

In order to avoid or reduce these impacts, Adani is negotiating stock and occupational crossing locations and proposing to fence the majority of the proposed alignment. Adani is also working with landholders regarding land acquisition and compensation. Land acquisition processes can be stressful and time consuming for landholders and Adani is following established protocols in this regard. Landholders also have access to support from valuers, legal advisers and other professionals at no cost to themselves as part of the land acquisition and compensation process. Refer to Volume 4, Appendix D2 for further information.

Noise and vibration

Potential and predicted operational and construction noise and vibration impacts of the Project (Rail) have been identified and analysed on the basis of a desktop analysis combined with acoustic modelling. The assessment was undertaken on the basis of 9 sensitive receptors and concluded that the rail noise is expected to meet the noise targets in accordance with relevant noise standards and policies. Similarly operational vibration targets will be readily met at all identified receptors (refer to Volume 4, Appendix AF Rail Noise and Vibration for further information). Current research indicates that there are no government policies or widely

accepted guidelines with regard to noise criteria for animals. However, it is recognised that sudden noise has potential to startle or upset domestic livestock and pets. Heggies Pty Ltd conducted a literature review as part of their assessment of blasting noise impacts on livestock for the proposed Caval Ridge Coal Mine Project (Heggies, 2009). Heggies cites results from a study on the response of farm animals to sonic booms, which indicated that reactions of sheep, horses and cattle to sonic booms (12b dB to 136 dB) were considered slight to mild.

The study indicated that analysis of data from 42 herds did not show any evidence that flyovers or proximity to the ends of the active runways had an effect on the milk production of the herds. Animal installations were selected for observations on animal behaviour under sonic boom conditions. Numbers of animals observed in this study were about 10,000 commercial feedlot beef cattle, 100 horses, 150 sheep and 320 lactating dairy cattle. Booms during the test period were scheduled at varying intervals during the morning hours Monday to Friday of each week.

Results of the study showed that the reactions of the sheep and horses to sonic booms were slight. Dairy cattle were little affected by sonic booms (125 dB to 136 dB). Only 19 of 104 booms produced even a mild reaction, as evidenced by a temporary cessation of eating, rising of heads, or slight startle effects in a few of those being milked. Milk production was not affected during the test period, as evidenced by total and individual milk yield.

Heggies conclude that apart from the possibility of noise from blasting startling birds and therefore over time possibly changing where they nest, no adverse impacts on animals are predicted for this project. Given that there is no conclusive information available to confirm that should birds be startled they will change where they nest, noise impacts on animal life surrounding the Project (Rail) are considered acceptable. For further information regarding noise and vibration impacts refer to Volume 4, Appendix AF of the EIS.

Coal dust

Potential environmental impacts of coal dust from construction of the rail and operation of the coal trains, inclusive of fugitive coal dust from the wagons were assessed against the environmental values that enhance or protect qualities relating to health and biodiversity of ecosystems, human health and wellbeing, aesthetics and agricultural use (EIS Volume 4, Appendix AD Rail Air Quality Report). Eight sensitive receptor locations are within 5 km of the Project (Rail). The nearest receptor on the north side is 1.6 km of the railway line with the nearest receptor on the south side being the Project (Mine) workers accommodation village situated 2.45 km distant.

The construction of the Project (Rail) will result in dust emissions along the corridor which will be nearby a limited number of sensitive receptors. Given the distances involved (no sensitive receptors within 1.7 km) it is very unlikely that construction dust impacts will be an issue.

During operation phase of the Project (Rail), potential fugitive dust emissions from the wagons will include particulate matter (PM) of all three sub-types of total suspended particles (TSP), PM less than 10 µm (PM_{10}) and PM less than 2.5 µm ($PM_{2.5}$). For the more significant dust considerations, predicted TSP, PM_{10} and $PM_{2.5}$ concentrations from the operation of the diesel locomotives with coal train fugitive dust emissions demonstrate that the most influential pollutants are PM_{10} and $PM_{2.5}$. At the southern fence-line of the Project (Rail) there are nominal exceedances, of the air quality objectives. But these goals are for human health and the sensitive receptor locations, at greater than 3 km distant, are well outside the impact zone of

within 50 m of the fence-line for the daily averaged goals and within 161 m for the annually averaged $PM_{2.5}$ goal.

For the assessment of the amenity impact of dust deposition, the maximum incremental dust deposition level was found to be below the deposition guideline equivalent of 2 g/m^2/month at and beyond 50 m from the track centre line. As such coal dust deposition is unlikely to have a major impact on the flora and fauna within the surrounding region given the low deposition rates at the boundary fences. Connell Hatch (2008) reported on measured values along Queensland coal rail corridors as having values for coal deposition rates being well below values indicated in the literature as potentially having an impact on crops and livestock. Moreover, observational records show that within the rail alignment the highest values of about 90 mg/m²/day occur but this quickly decreases with distance from the corridor, even being as low as one-third below the peak at 30 mg/m²/day at 10 m from the tracks.

As such the air quality impact assessment of the Project (Rail) found that air quality objectives would be met within close proximity of the rail line and that a negligible change in ambient air quality is expected at the identified sensitive receptor locations. Refer to EIS Volume 4, Appendix AD Rail Air Quality Report for further information on the modelling and impact assessment.

Adani will develop and implement a Coal Dust Management Plan in accordance with QR National's Coast Dust Management Plan. The plan will include measures to mitigate the emission of dust from loaded and unloaded coal trains such as: wagon washing, dust suppression systems, periodic removal of dust from ballast and tracks. Adani will also consider treatment of coal surface (veneering) in wagons. Refer to section 6 in SEIS Volume 4, Appendix W of the Rail Environmental Management Plan for further information.

Increased fire risks

The Bushfire Risk Analysis map prepared in June 2008 for Isaac Regional Council by the Queensland Fire and Rescue Service (QFRS) indicated the Project (Rail) area was classified as having a low to medium bushfire hazard refer to (EIS Volume 3 Section 3 Hazard and Risk). Current grazing practices along the rail corridor and adjacent properties contribute to controlling vegetation growth in those areas thus decreasing risks of bushfire.

The increase in fire risks along the Project (Rail) corridor however is still considered as a potential impact on adjacent landholders, native vegetation and animals. In response to such impacts, Adani integrated the design of a fire station, fully equipped with fire truck and other fire fighting equipment to be constructed at the Mine. This station will be available to attend to emergencies within the Project (Rail). Where the fire is at a considerable distance from the Mine, Adani will consult and seek assistance from QFRS and other emergency services.

Adani developed Bushfire Management Plan (SEIS Volume 4, Appendix S2) and Emergency Management Plans (SEIS Volume 4, Appendix V) which will include emergency response. Other mitigation measures (SEIS Volume 4, Appendix W Rail Environmental Management Plan) include:

- Vegetation clearance in all working areas and growth management in other areas to prevent excessive fuel load accumulation.
- Maintaining fire breaks around areas identified as being potential sources of bushfire risk.
- Incorporation of bushfire response in the site incident management plan.

- Staff in education and training in relation to bushfire prevention.

4.3.9 Rail impact to resources such as MDLs and EPMs

Mineral Developmental Licence

DNRM has requested confirmation as to whether the MDL 391 (Diamond Creek) is traversed by the proposed rail line. If the MDL is traversed DNRM have requested that the tenure holder be consulted to ensure it will not impact on their future operations, and any requirements outlined in the *Mineral Resources Act 1989* regarding construction on a granted Mining Tenure will need to be adhered to.

The rail alignment will traverse a small section of the north eastern corner of MDL 391 and consultation between Adani, DNRM and the relevant tenure holder will be undertaken (refer to Figure 2 and Table 6). Adani will comply with the requirements outlined in the *Mineral Resources Act 1989* regarding construction on a granted Mining Tenure.

Exploration Permits for Minerals

DNRM have commented that there are an additional ten Exploration Permits for Minerals (EPM) that are not mentioned in the EIS and that the impact of the proposed rail line on these tenures should be considered by the proponent included in any table/figure that show the current tenures.

The mining and petroleum tenure figure and table have been updated to include the EPMs that will be traversed by the rail corridor (refer to Figure 2 and Table 6). Consultation between Adani, DNRM and the relevant tenure holder will be undertaken.

Current permit holder consultation

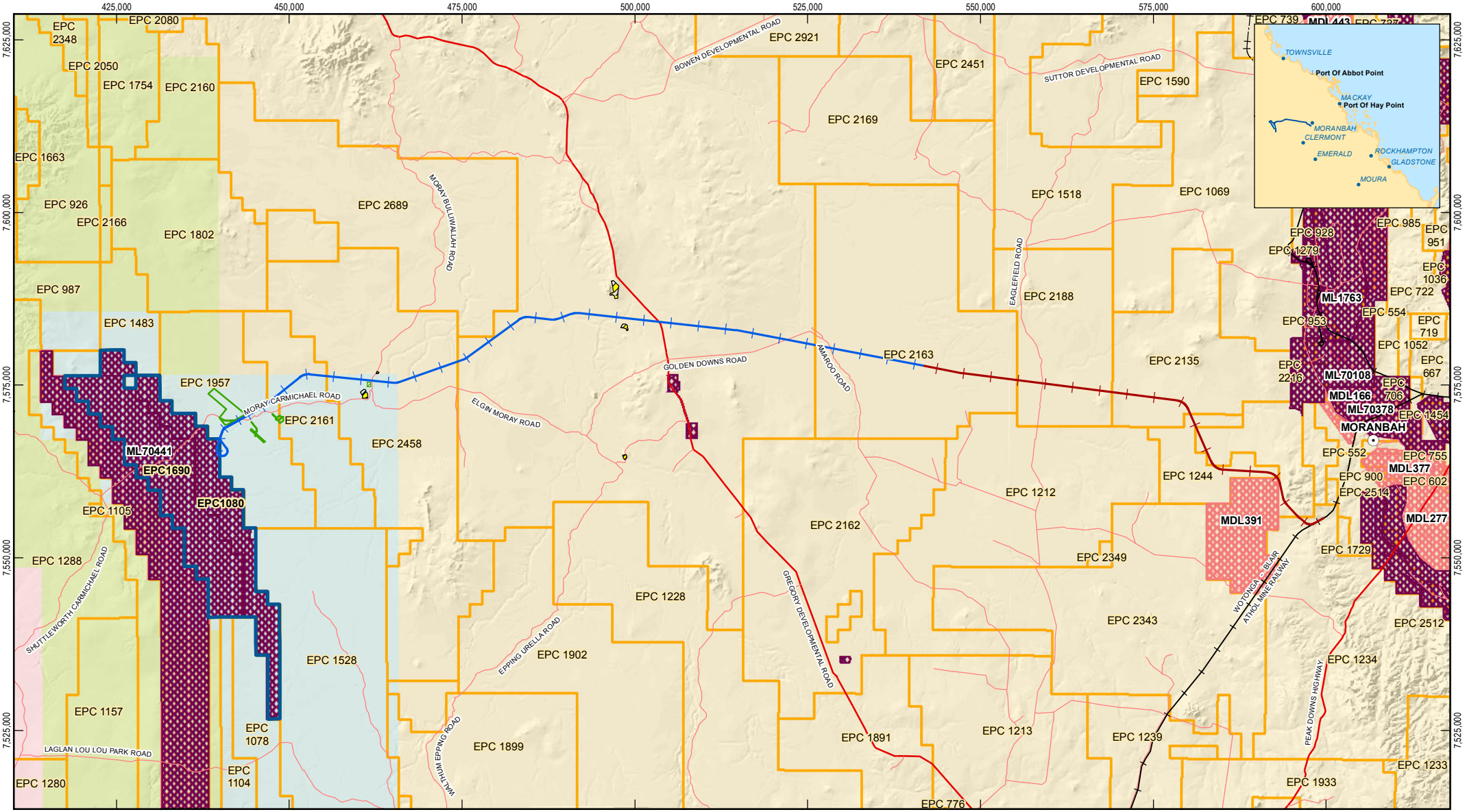
DNRM have requested that due to the high number of exploration permits in the area, as well as known mineral occurrences in close proximity to the proposal area, the holders of current permits should be consulted to ensure that any sterilisation of potential resources is minimised.

Consultation between Adani, DNRM and the relevant tenure holders will be undertaken.

Table 6 Updated mining and petroleum tenures near the Project (Rail)

Tenure	Holder	Status
EPC2163	Queensland Coal Investments Pty Ltd	Granted
EPC2135	Carabella Resources Limited	Application
EPC2458	Civil and Mining Resources Pty Ltd	Application
EPC2161	Rem Resources Pty Ltd	Application
EPC1957	Mining Investments One Pty Ltd	Application
EPC1069	Carabella Resources Limited	Granted
EPC2188	Carabella Resources Limited	Granted
EPC1080	Waratah Coal Pty Ltd	Granted
EPC1690	Adani Mining Pty Ltd	Granted
EPC1244	Energy Minerals Pty Ltd	Granted
EPC1234	Queensland Coking Coal Pty Ltd	Granted
EPP1044	Queensland Energy Resources Limited	Granted
EPP793	Diamond Creek Coal Pty Ltd	Granted

EPP814	Eureka Petroleum Pty Ltd	Granted
EPM 19716	Mining Investments Three Pty	Application
EPM 16527	Drummond West Pty Ltd	Application
EPM 17703	Zamia Resources Pty Ltd	Granted
EPM 16527	Drummond West Pty Ltd	Granted
EPM 17641	Zamia Resources Pty Ltd	Granted
EPM 14934	Drummond West Pty Ltd	Granted
EPM 14928	Drummond West Pty Ltd	Granted
EPM 19292	Gold Fields Australasia Pty Ltd	Granted
EPM 19193	GBM Resources Limited	Granted
EPM 18583	Zamia Resources Pty Ltd	Granted
EPM14933	Drummond West Pty Ltd	Granted
MDL 391	Diamond Creek Coal Pty Ltd	Granted



1:750,000 (at A4)

0 5 10 15 20 25

Kilometres

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

N

LEGEND

- Town
- State Road
- Local Road
- Other Rail Network
- Mining Lease
- Mineral Development License
- EPC Boundary
- Quarry
- EPP 744
- EPP 1015
- EPP 1044
- Mine (Onsite)
- Mine (Offsite)
- Rail (West)
- Rail (East)

Adani Mining Pty Ltd
Carmichael Coal Mine and Rail Project SEIS

Project (Rail)
Mining and Petroleum Tenure

Job Number 41-26422
Revision B
Date 15-10-2013

Figure 2

G:\41\26422\GIS\Maps\MXD\0000_Overview\41_26422_0029_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: DNRM: DEM (2008), DCDB (2010); DME: EPC1690 (2013), EPC1080 (2013), Mining Leases, Mineral Development Licences, EPC, EPP (2013); © Commonwealth of Australia (Geoscience Australia): Localities, Railways, Roads (2007); Adani: Alignment, Offsite, Quarry (2013). Created by: AF, MS

4.4 Amendments to commitments

The following commitment has been made regarding mining tenure: ‘Adani will comply with the requirements outlined in the *Mineral Resources Act 1989* regarding construction on a granted Mining Tenure’.

Adani have provided ongoing environmental management and mitigation commitments within the approvals documentation (refer to SEIS Volume 4 Appendix C5) and Environmental Management Plan (refer to SEIS Volume 4 Appendix W). These environmental management commitments address construction and operational requirements under the *Environmental Protection Act 1994*, *Environmental Protection Regulation 2009* and subordinate legislation.

5. Nature conservation

5.1 Introduction

5.1.1 Amendments to project description

Overview

The changes to the Project (Rail) relevant to the nature conservation chapter include:

- a change in the location of the rail loop
- a minor change to the rail alignment
- the addition of five quarries

Rail loop and alignment

The proposed rail loop is to be relocated to the south east of the previous rail loop assessed in the EIS. In addition, the rail alignment consists of approximately 4.7 km of the dual gauge portion of the Rail (west) being realigned approximately 140 m further north of the rail corridor.

A detailed assessment of the nature conservation impacts of the Project (Rail) is included in the original EIS previously submitted. Nature conservation impacts on sensitive ecological receptors are considered to be marginally reduced as a result of these changes, where the rail loop location has been amended to be sited largely within non-remnant vegetation areas and the realignment has resulted in very minor changes to impacts to remnant vegetation. The alignment change and relocation of ancillary facilities have occurred in areas of introduced pasture and/or non-remnant vegetation. The alteration to impacts, overall, is assessed as being negligible and the findings of the original EIS submission are therefore still considered to be current and appropriate.

Quarries

Five quarries are now proposed as part of the Project (Rail). The proposed quarries were not included within the nature conservation assessment in the EIS. The quarries are required to provide the quarry material for the construction of infrastructure associated with the mine and rail including, but not limited to, roads, camps, pads, dams and mine civil works.

Development applications for the five quarries have been submitted with the SEIS for the Project (refer to SEIS Volume 4 Appendix C5 Quarry Applications). The quarry applications also provide an assessment of the nature conservation impacts of the quarries. Overall, the assessment concluded that the quarry activities will be acceptable and no major or high risk impacts are likely. A detailed description and impact assessment has been undertaken for each of the five quarries (refer to SEIS Volume 4 Appendix C5 Quarry Applications). An overview of the ecological values of each quarry is provided in Section 7.1.3.

5.1.2 Update to studies

As a result of the Project changes listed above, the following additional studies and reports have been undertaken for the Project (Rail):

- Quarry EPBC Act Referral Assessment (SEIS Volume 4, Appendix J9)

- Quarry Development Applications for each location (SEIS Volume 4 Appendix C5) including:
  - Back Creek South Quarry
  - Disney Quarry
  - Borrow 7 Quarry
  - North Creek Quarry
  - Moray Quarry
- Adani Quarries *Nature Conservation Act 1992* (NC Act) Clearing Permit (Protected Plants) (SEIS Volume 4 Appendix C5)
- Assessment of changed rail loop included in the Offsite Infrastructure Ecology Surveys (SEIS Volume 4 Appendix J5)
- Development of Rail Fauna Crossings report (SEIS Volume 4 Appendix U)
- Species Management Plan (Rail and Offsite Infrastructure) (SEIS Volume 4 Appendix C3)
- Threatened Species Management Plan (Rail and Offsite Infrastructure (SEIS Volume 4 Appendix C3)

5.1.3 Ecological assessment of quarries

Back Creek South Quarry

The Back Creek South quarry site is currently mapped as containing non-remnant vegetation. A portion of the site towards the northern boundary has been disturbed by previous extractive activities and the area is generally cleared of vegetation. RE mapping identifies the remainder of the site (outside of the proposed quarry footprint) as containing Least Concern RE. No threatened ecological communities (TECs) or threatened flora species were recorded on the site. The quarry will have a total operational footprint of 55 ha and a depth of between 15–16 metres below ground level.

A total of 81 fauna species were recorded in the broader area, largely along Back Creek, but fauna values within the quarry site area are generally more limited. Two MNES species listed as migratory (EPBC Act) were observed along Back Creek (but not on the site of the proposed quarry itself): rainbow bee-eater (*Merops ornatus*) and eastern great egret (*Ardea modesta*).The habitats along Back Creek hold some potential for other MNES species, such as black-throated finch, squatter pigeon, koala and ornamental snake, but these are not expected to be impacted by the quarry.

Disney Quarry

The Disney quarry site is dominated by a high rocky hillside running north-south, with lower rises adjacent to the east and west. The site is within an area primarily used for cattle grazing, but this is a large and topographically complex site that remains well vegetated over much of its extent. The vegetation is dominated by eucalypt woodland with some patches of Acacia forest. The site consists of a mixture of mapped Endangered and Least Concern RE and non-remnant vegetation. No TEC or threatened flora species was observed in the survey area. The quarry has a proposed operational footprint of 93 ha and a depth of five metres below ground level.

A total of 46 fauna species were recorded in the area and the site contains variable habitat values across its extent. The survey area provides potential habitat for Yakka Skink (*Egernia rugosa*) (Vulnerable - EPBC Act), not seen elsewhere in the broader quarries project area. There is limited habitat value for koala, squatter pigeon and black-throated finch on the site, with the dominant presence of buffel grass and/or lack of nearby permanent water likely to preclude these species from occurring on a regular basis.

Borrow 7 Quarry

The Borrow 7 quarry site consists of approximately 30 ha of mapped endangered remnant vegetation and 7 ha of mapped non-remnant vegetation (proposed operational quarry area of 37 ha); however, upon field verification, very little extant woody vegetation now remains on the site. Scattered eucalypts and brigalow are present; however, in general, the site provides little value for conservation significant flora. No TECs or threatened flora species were identified within or adjacent to the proposed quarry.

A total of 26 fauna species were detected on the quarry site and surrounds. In general, the site provides little value for fauna apart from for widespread and common species that utilise grasslands. One ornamental snake was found within a well-vegetated drainage line in the south-east of the survey area, approximately 1.5 km south of the proposed quarry site. No other MNES fauna species were detected and the habitat is unlikely to support other MNES species.

North Creek Quarry

RE mapping for the North Creek Quarry site indicates the presence of non-remnant vegetation in the form of open, disturbed grasslands. A portion of the site towards the southern boundary has been disturbed by previous extractive activities and the area is cleared of vegetation. A small amount of regrowth vegetation was also observed on the site. No TEC or listed threatened flora species were identified during the surveys. The quarry has a proposed operational footprint of 8 ha and a depth of approximately 10 m below ground level.

A total of 18 fauna species were recorded although the majority of these were observed in vegetation adjacent to the southern boundary of the site and not on the site itself. There is little habitat value for fauna on the quarry site beyond species common to disturbed grassy habitats. However, several burrows were observed in an artificial soil mound (resulting from quarry activities) that are likely to be that of rainbow bee-eater (listed as migratory under the EPBC Act), which were common in the wider area during the survey.

Moray Quarry

The site is within the Moray lease held by Adani and is an existing quarry site with some cattle grazing. The southern area of the site is sparsely vegetated, with RE mapping indicating the presence of remnant vegetation on the south-east portion of the site. The site has been identified as containing a composite RE community, comprising 80 percent Least Concern RE, 10 percent Of Concern RE and 10 percent Endangered RE. No evidence of species consistent with Endangered RE was observed during field surveys. No TECs or listed threatened flora species were identified during surveys. The quarry has a proposed operational footprint of 91 ha and a depth of 8 m below ground level.

A total of 55 fauna species were recorded on the quarry site. The majority of these were observed in or near the remnant vegetation located in the southern portion of the site. Whilst no listed threatened species other than squatter pigeon (southern) (EPBC Act listed vulnerable)

were observed to be present during the surveys, the site is also believed to be potentially suitable for koala and ornamental snake.

Offsite infrastructure ecological surveys

Following the finalisation of the Mine Plan in relation to the proposed location of offsite infrastructure (including the Rail Loop), further surveys were carried out within the Mine (Offsite) Area in April/May 2013. These surveys assisted in responding to comments received in submissions about the EIS. The work included bio-condition assessments (for use within the Project Offsets Strategy), and the production of a Property Map of Assessable Vegetation and Property Vegetation Management Plan, as well as targeted flora and fauna assessments.

The additional work carried out revealed that the survey area is a predominantly cleared agricultural landscape and that remnant vegetation only occurred over approximately 4.5 percent of that area, primarily in association with two creek lines and their adjacent floodplain areas. The remnant vegetation present included approximately 10 ha of (constituent endangered REs of) Brigalow TEC. While no threatened flora or aquatic species were recorded during the survey, three EPBC Act listed fauna species were confirmed present: black-throated finch, squatter pigeon and ornamental snake, as well as the NC Act listed black-necked stork and cotton pygmy-goose.

The full results of these surveys are reported in SEIS Volume 4 Appendix J5, J6, J7a and J7b.

Rail fauna crossing strategy

A rail fauna crossing strategy has been developed as part of the SEIS documentation and describes the strategy employed within the rail design to manage potential linkage and movement impacts on fauna due to the construction and operation of the Project (Rail). While all relevant environmental elements were considered and, where possible, negative impacts were avoided or minimised, the key environmental features that influence the engineering design are landform and hydrological conditions.

Of prime importance to the design process and this rail fauna crossing strategy are the flood plains, especially those associated with the Belyando River, Mistake Creek, Logan Creek and Diamond Creek. These vegetated corridors form networks across the study site and are areas with the greatest opportunity to cater for fauna movement within the greater landscape. Crossing designs in these areas require formation levels that minimise the fill material required while satisfying hydrological requirements. These factors combined largely determine the fauna crossing potential.

It is important to note that almost all crossings along the Project (Rail) alignment will remain predominantly dry due to broader landscape topography and the prevailing regional climate, which will permit almost continual fauna passage unobstructed by water bodies. Infrequent wet periods usually result in localised and regional flooding at which time fauna dispersal through water crossings along the alignment seems unlikely as escape paths lead to higher ground.

The strategy concludes:

- where possible, the rail design has attempted to avoid landscape corridors and important habitat areas

- where fauna connectivity is impacted, a range of mitigation measures have been identified and incorporated into the rail design, such as the appropriate selection of bridge structures within major corridors
- in most instances the alignment design has the potential to cater for fauna dispersal requirements, either through the current design or via a series of embellishments which will assist in promoting fauna passage
- where there are degraded and isolated areas of fauna habitat, no crossing structures are proposed

The full strategy is included in SEIS Volume 4 Appendix U.

5.2 Summary of comments

Submissions relating to nature conservation for the Project (Rail) were raised by advisory agencies, organisations, private submitters, and landholders.

Comments raised in these submissions included:

- level of flora and fauna survey effort at the western extent of the corridor
- level of survey effort for black-throated finch (southern)
- impacts to important habitat for black-throated finch (southern)
- habitat loss and degradation along the proposed rail corridor for koala
- the prevention of the spread of priority weed species across the Project (Rail) area
- the active management of weed species along the proposed rail corridor

5.3 Response to comments

5.3.1 Adequacy of survey effort

A submission on the EIS commented on an insufficient level of survey effort for the offsite infrastructure areas, which correspond to the western extent of the Project (Rail) area. Additional survey work has since been carried out within the offsite infrastructure areas and the results of these surveys have been reported in the Offsite Infrastructure Ecology Assessment Report (SEIS Volume 4, Appendix I5). Construction impacts associated with development of the offsite infrastructure have been recalculated based on the revised Project Description (SEIS Volume 4, Appendix B).

The offsite areas, which contain the proposed rail loop and western extent of the rail line, are largely cleared and comprise only small patches of remnant vegetation, which themselves are largely avoided by the proposed infrastructure.

The surveys carried out were undertaken over a period of 9 days in April-May 2013. The level of flora and fauna survey effort incorporated 10 comprehensive and 49 rapid flora assessment sites, two comprehensive and 38 rapid terrestrial fauna assessment sites, 12 rapid aquatic (flora and fauna) assessment sites, and additional targeted survey for threatened species including 23 hours of dam watches and 2,000 hours of remote camera footage, 320 km of driving transects and 21 hours of diurnal and 24 hours of nocturnal active searching for targeted threatened species.

5.3.2 Black-throated finch

A prominent issue raised in the submissions on the EIS for the Project focused on the level of survey effort for and the magnitude of predicted impact on the black-throated finch (southern), which is listed as endangered under the EPBC Act and the NC Act.

Since the time of the EIS submission, consultation meetings have been held with the Black-throated Finch Recovery Team (3 May 2013) and DSEWPaC (7 June 2013) and a four part monitoring program has been developed, comprising of:

- Regional distribution (species distribution modelling)
- Regional distribution (surveys)
- Local monitoring (observational) on the Mine Area
- Local monitoring (detailed) on the Mine Area

Although 64 ha of important habitat will be lost within the Project (Rail) area, this is not contiguous habitat, and much of it occurs is small, narrow portions along an extensive linear corridor and across suboptimal regional habitat (i.e. largely cleared land in the Northern Brigalow Belt). Evidence from surveys on the Mine Area suggest that the best black-throated finch habitat occurs in the mosaics of *Eucalyptus melanophloia*, *E. brownii/populnea*, *E. similis* vegetation that is intact and lightly grazed and within the Desert Uplands bioregion.

Furthermore, despite some information in the Significant Impact Guidelines, surveys on the Mine Area indicate that black-throated finch are not affected by narrow linear clearings or larger paddock clearings; black-throated finch were recorded drinking at troughs and dams more than 1 km from remnant vegetation, and therefore traverse wide areas of non-remnant vegetation. As such impacts associated with the Project (Rail) are considered less significant.

Therefore, although the relative level of survey effort for this linear corridor seems low, the extent of habitat is small, and the potential impacts low, in comparison, and thus the survey effort has been concentrated in the more intact habitat on and adjacent to the Mine Area, where management and mitigation of threats to the species are a higher priority.

5.3.3 Potential habitat for koala

A small number of submissions were received with respect to the surveys carried out and predicted losses of potential habitat for certain threatened species, primarily the koala, and the consequent potential impacts to these species.

While no targeted koala surveys were carried out for the EIS, a substantial amount of active searching has been undertaken for threatened fauna species within habitat types that may be occupied by them. The koala has been located and the EIS has taken a conservative approach to the definition of potential habitat for this species and has assessed against this. Where impacts have been deemed to be unavoidable, potential habitat has been offset (as reported within the Project Offset Strategy), following the appropriate policies and guidelines.

In assessing the potential value of habitats, the definition of 'habitat critical to the survival of' koalas was taken from the Commonwealth's 'Interim Koala Referral Advice for Proponents' (June 2012) and its application to the EIS is considered to be appropriate. Furthermore, the extent of potential habitat for these species that has been assessed against is very likely to be a considerable over-estimation of the actual occurrence of these species on the ground. For

example, koalas are known to occur in low-density, scattered populations across suitable habitats throughout central Queensland, with a particular affiliation to tree-lined creek systems (for movement and dispersal through the landscape). Therefore, the predicted impact of clearance of potential habitat is very likely to be an over-estimation of the actual impact to localised koala populations, where present.

The revised MNES chapter (SEIS Volume 1, Section 12) has also included further detail on the description of potential impacts upon these species and mitigation proposals with respect to fauna crossings and corridors, in order to counter isolation effects.

Adani has prepared a Species Management Plan (Least Concern, Special Least Concern and Colonial Breeders) (SEIS Volume 4 Appendix C3) to facilitate appropriate management of the special least concern species such as the koala during construction and operation of the Carmichael Coal Rail Project.

5.3.4 Management of weed and pest species

A number of submissions were received with respect to the level of detail of proposed management and mitigation measures provided within the EIS to address the potential introduction and/or spread of invasive weed and pest species as a result of the construction and operation of the Project (Rail) and Project (Mine) areas.

As a result, a number of updates have been made to the Project's Environmental Management Plan (SEIS Volume 4, Section W (Rail)). Specifically, these have included:

- management measures to prevent the introduction of species not currently present in the project area and to prevent weed incursion and spread to surrounding properties and environments
- the active control of weed presence on site
- best practice compliance with the requirements of the *Plant Protection Act 1989* and the alignment of Project plans with the priority weed species targeted by local government action
- the management and mitigation of the invasion of buffel grass and other exotic pasture grass species, as a potential threat to key fauna species, notably the black-throated finch
- the potential presence and need for the control of locust species
- the prevention of the attraction of pest species to construction sites and the waste minimisation and control processes to be implemented
- Biosecurity management
- the potential introduction of aquatic weed species and how these will be managed and controlled

5.4 Amendment to commitments

The Project (Rail) EMP (refer SEIS Volume 4, Appendix W) has been developed to provide a comprehensive framework for environmental management goals and activities within the Project (Rail) area. This plan details the Environmental Management Framework for the Project (Rail), and the monitoring, reporting and reviewing requirements and processes. The Environmental

Management Plan details the specific legislative framework, environmental values and management processes (including potential impacts and prevention measures) of ecological values pertinent to:

- Surface water
- Groundwater
- General and hazardous waste management
- Flora and fauna management
- Emergency management and response

For surface water, the overall performance outcome of the EMP will be to maintain the environmental values relating to aquatic ecosystems, and ensure that water quality downstream of the off-site infrastructure area meets specific requirements so that there is no unacceptable degradation of water quality downstream relative to upstream values.

For groundwater, the overall performance outcome of the EMP will be that groundwater users are not adversely impacted in terms of availability of water for stock and domestic use, and that impacts on groundwater dependent ecosystems do not cause loss of biodiversity values.

For general and hazardous waste management, the overall performance outcome of the EMP will be to minimise generation of waste in accordance with the waste management hierarchy, and avoid adverse impacts of waste on land contamination, surface and groundwater quality and visual amenity.

For flora and fauna management, the overall performance outcome of the EMP will be:

- No unapproved loss in biodiversity values over and above those impacts permitted through project approvals and implementation of Offset requirements
- No vegetation clearing outside the specified, pre-approved boundaries, where practicable, and in allowance for safe construction working
- Vegetation clearance to be preceded by final searches for specially protected species and their relocation as appropriate
- No injury or death of wildlife
- Appropriate signage to keep construction workers outside retained habitat areas
- No increase in level of weed and pest infestation as a result of construction and operational activities for the Project (Rail)
- Downstream habitats are not degraded by sediment deposition, scouring or water quality degradation
- Downstream flow changes remain within natural fluctuations

An emergency management and response plan will be developed and relevant sub-plans for environmental incidents and emergencies and requirements for prevention will be included within the overarching EMP. Specific requirements for incident reporting and notification will be developed in the emergency response plan. Incident investigation requirements are defined in the Adani Compliance Guideline CG-006 - Incident Investigation and Reporting. Environmental incident investigations and reports will include full details and descriptions of incidents (including

legislative and approvals requirements), reviews of causes and recommendations (to be included in the corrective action register).

6. Water resources

6.1 Introduction

6.1.1 Amendments to project description

Overview

The changes to the Project (Rail) relevant to the water resources chapter include:

- a change in the location of the rail loop
- a minor change to the rail alignment
- the addition of five quarries

Rail

The proposed rail loop is to be relocated to the south east of the previous rail loop assessed in the EIS. In addition the rail alignment consists of approximately 4.7 km of the dual gauge portion of the Rail (west) has been realigned approximately 140 m north of the corridor. The relocation of this rail loop does not affect any new landholders nor does it contribute to any additional water related impacts.

A detailed impact assessment of the water related impacts of the Project (Rail) is included in the original EIS previously submitted. Water related impacts have also been considered through an updated Rail Flooding Report (refer to Volume 4 Appendix S1). The realignment does not present additional impacts to existing waterways.

Quarries

Five quarries are now proposed as part of the Project (Rail). The proposed quarries were not included within the water resources assessment in the EIS. The quarries are required to provide the quarry material for the construction of infrastructure associated with the mine and rail including, but not limited to, roads, camps, pads, dams and mine civil works.

Development applications for the five quarries have been submitted with the SEIS for the Project (refer to SEIS Volume 4 Appendix C5 Quarry Applications). The land use and planning assessment for the quarries are provided within the applications. The land use assessments established that the quarries are generally consistent with the requirements of the *Belyando Shire Planning Scheme 2009* and State Planning instruments.

The applications provide supporting documentation in regards to the assessment and management of water related impacts associated with the quarries. Overall the assessment that the quarry activities will be acceptable and no major or high risk impacts are likely. A detailed description and impact assessment has been undertaken for each of the five quarries (refer to SEIS Volume 4 Appendix C5 Quarry Applications). An overview of each quarry is provided Section 7.1.3.

6.1.2 Update to studies

As a result of Project changes, the following additional studies and reports relevant to water resources have been undertaken for the Project (Rail):

- Quarry Approvals Documentation (refer to SEIS Volume 4 Appendix C5 Quarry Applications) including:
  - Back Creek South Quarry (Aquatic Ecology, Surface Water and Hydrology Assessment)
  - Disney Quarry (Aquatic Ecology, Surface Water and Hydrology Assessment)
  - Borrow 7 Quarry (Aquatic Ecology, Surface Water and Hydrology Assessment)
  - North Creek Quarry(Aquatic Ecology, Surface Water and Hydrology Assessment)
  - Moray Quarry (Aquatic Ecology, Surface Water and Hydrology Assessment)
- Rail Flood Modelling Report (refer to SEIS Volume 4 Appendix S1).

6.1.3 Water resource assessment of quarries

Development applications for the five quarries are included with the SEIS for the Project (refer to SEIS Volume 4 Appendix C5 Quarry Applications). Surface water and groundwater assessments for each of the quarries are provided within the approvals documents and are summarised in this section.

The surface water assessment found that no major watercourses exist within the five quarry sites however mapped wetlands and watercourses occur within proximity to the quarry sites as described for each quarry below. At all five quarries there is the potential for some localised impacts to surface water and hydrology by altering the surface water runoff flows around the quarry workings, with the water from operational areas diverted into retention dams for reuse on site. The diversion of surface water flows may cause some erosion and sediment movement and possible scouring during large rain events. Management measures will be implemented that prevent sediment runoff into these watercourses and maintain the existing environmental conditions.

In order to ensure the appropriate protection of downstream surface waters, measures will be implemented at each quarry site to ensure:

- Conceptual Erosion and Sediment Control Plans have been implemented for each construction activity
- Disturbance areas will be minimised to reduce the volume of disturbed sediment that may potentially effect downstream water bodies
- Native vegetation clearance will only be undertaken in accordance with relevant permits and approval conditions
- Vegetation clearance will consider constraints such as slope and proximity to drainage lines.
- Based on the preliminary risk assessment, a number of potential impacts to groundwater due to proposed works were identified and are described for each quarry below. The main objectives of groundwater management include:

- Prevention of the degradation of groundwater quality in the area within and surrounding the development
- Protection and maintenance of integrity of surrounding bores
- Protecting the quality of existing groundwater resources
- Ensuring the development does not impact values associated with groundwater dependent ecosystems.

In order to minimise adverse impacts to groundwater, the following management methods will be undertaken:

- Laydown areas for vehicles and machinery and storage areas for chemicals, oils and fuels will be contained in appropriately designed facilities
- Spill kits will be available to all personnel in the event of a spill or leak.
- Potential contaminants will be stored and handled in a controlled manner to prevent impacts to creeks, rivers, bores or groundwater dependent ecosystems.
- Visual inspections of any groundwater seepage during extraction activities. If the water table is intersected during construction, the rate of groundwater seepage is likely to be low due to the assumed low permeability of the bedrock. It is assumed that groundwater seepage could be managed by in-pit sump pumping to facilitate dry construction.
- A number of groundwater monitoring bores would be installed and tested prior to construction to assess baseline groundwater conditions including depth to water, groundwater flow direction, indicative aquifer permeability and groundwater quality.
- Prior to blasting a census of all groundwater bores and spring complexes within a 1 km radius will be undertaken. Groundwater data collected prior to construction will be used to reassess the risk associated with the potential impacts of blasting. Blasting activities are only expected to occur at Borrow 7 and Back Creek South Quarries.

Back Creek South Quarry

No major watercourses exist within the Back Creek South Quarry site, however Back Creek is located to the south and west of the development and the Belyando River to the south (1 km). The nearest mapped wetlands is the riverine system of Back Creek itself.

Five registered bores were identified within a 10 km buffer surrounding the Back Creek South Quarry site and five abandoned bores within 5 km to the south-east of the site. No Groundwater Dependent Ecosystems (GDEs) have been identified in the Back Creek South Quarry area through field or desktop investigations; however, zones of high potential to support groundwater dependent vegetation have been identified in a low lying area approximately 300 m to the east of the quarry and to the south along Mistake Creek.

Based on the preliminary risk assessment, potential groundwater impacts due to the quarry include:

- Drawdown of the water table due to quarry excavation and associated dewatering activities. The extent of this impact is largely dependent on the potential for the base of the quarry to intersect the water table and hydrogeological properties of the aquifer surrounding the quarry. Site specific data obtained in June 2013 indicated that no groundwater would be intercepted by the quarry activities, with no groundwater being

encountered in any of the 30 m geotechnical holes drilled across the site. As the water table is not expected to be encountered this is a very low risk not likely to occur.

- Drawdown of the water table due to pumping from groundwater supply bores.
- Very low risk of alteration of the local groundwater flow regime during construction through blasting activities and associated changes in the hydrogeological properties of the surrounding formations. This has the potential to enhance hydraulic connection between the quarry and areas of potential GDEs.
- Damage to the integrity of the existing registered bore RN 12030156, located within 100 m of the quarry boundary, due to construction activities.
- Localised recharge to the water table from quarry operations and associated salinisation and mounding of the water table. This may arise if the water table is not intersected by the quarry and stormwater at the site is not properly managed. The mounding of the water table may facilitate lateral transport of dissolved salts and contaminants if present within the saturated zone.
- Localised degradation of groundwater quality due to accidental leaks or spills of on-site chemicals during construction and subsequent lateral migration of contaminants within the saturated zone.

Disney Quarry

No major watercourses currently exist within the proposed quarrying area. There are two mapped wetlands located close to the quarry area: a lacustrine wetland (i.e. farm dam) 6 km to the west; and riverine wetland associated with Mistake Creek 7 km to the west. Drainage lines within the Disney Quarry site and in the surrounding area primarily feed into Mistake Creek. Despite the Clermont region having received a total of 144.8 mm of rainfall in the previous month (BOMa, 2013) there was no flowing water in any of the sites drainage lines during inspections undertaken in February 2013. Due to the absence of any water bodies, it is not anticipated that the quarry will have any major impacts on surface water values directly within the quarry area.

Eight registered bores were identified within a 10 km buffer surrounding the quarry site, five of which are active or existing. No GDEs were identified in the Disney Quarry area through field investigations however vegetation within the riparian zone of Mistake Creek (8 km west of Disney Quarry) is likely to be groundwater dependent to some degree. Groundwater quality near to Disney Quarry is indicated to be of brackish quality. Based on the preliminary risk assessment, a number of potential impacts to groundwater due to proposed works were identified, which are primarily related to the existing registered bores at and within the vicinity of the quarry area.

Potential groundwater impacts due to the quarry include:

- Drawdown of the water table due to quarry excavation and associated dewatering activities. The extent of the impact will largely depend on the potential for the base of the quarry to intersect the water table and hydrogeological properties of the aquifer surrounding the quarry. The potential drawdown impacts include the lowering of the water table at the location of potentially groundwater dependent vegetation and lowering of water levels at registered and unregistered bores. It is understood that the proposed quarry depths are 5 and 15 m below pre-construction ground elevation of 220 to 255 m

AHD. This gives a lowest anticipated quarry elevation of 205 m AHD which is above the groundwater elevation of 189 m AHD recorded at RN 62587. On this basis, the likelihood of intersecting the water table during construction is considered low.

- Drawdown of the water table due to pumping from groundwater supply bores. The likelihood of impact is considered low due to the anticipated low bore yield and supplementary water demand. The risk is conservatively assessed as moderate due to the presence of registered bores and current uncertainty about their uses. However, there are no current plans to source water from bores and any impacts will be assessed in the approvals required for a water bore.
- Alteration of the local groundwater flow regime during construction and associated changes in the hydrogeological properties of the surrounding formations are likely to be low risk with potential minor changes to localised groundwater flow regime.
- Damage to the integrity of the existing registered bores RN 84363, located within the quarry area and RN 62587, located within 500 m of the quarry boundary, due to construction activities carries a medium risk. This can be mitigated through undertaking baseline bore assessments prior to quarry development.
- Localised recharge to the water table from quarry operations and associated salinisation and mounding of the water table is considered a low risk. This may arise if the water table is not intersected by the quarry and stormwater at the site is not properly managed. The mounding of the water table may facilitate lateral transport of dissolved salts or contaminants within the saturated zone. Appropriate management of water in the pit, particularly if dewatering is required, would minimise recharge induced impacts.
- The risk of localised degradation of groundwater quality due to accidental leaks or spills of chemicals during construction and subsequent lateral migration of contaminants if present within the saturated zone is considered low as the risk of groundwater contamination can be minimised through appropriate management of on-site chemicals.

Borrow 7 Quarry

No major watercourses currently exist within the proposed quarrying area. The nearest mapped wetland areas to the site are two lacustrine wetlands (i.e. farm dams) located 3.1 km and 3.8 km to the south and wetlands along Mistake Creek 6.7 km to the west. On-site studies identified the presence of a minor drainage line running east-west (with pools) 2.1 km south of the proposed quarry area. Little standing water was observed in the drainage area south of the quarry site despite 144.8 mm of rainfall being received in the Clermont region in the month prior to undertaking fieldwork in February 2013 (BOMa, 2013).

Eight registered bores were identified within a 10 km buffer surrounding the quarry site. All bores are registered as active, with four unknown uses, one water resources investigation bore, one water supply bore and two mineral or coal exploration holes. No GDEs were identified in the Borrow 7 area through field investigations however vegetation within the riparian zone of Mistake Creek (3.5 km west of Borrow 7) is likely to be groundwater dependent to some degree. Groundwater quality near to Borrow 7 is indicated to be of brackish quality.

The potential groundwater impacts due to the quarry include:

- Drawdown of the water table due to quarry excavation and associated dewatering activities. The extent of the impact will largely depend on the potential for the base of the

quarry to intersect the water table and hydrogeological properties of the aquifer surrounding the quarry. The potential drawdown impacts include the lowering of the water table at the location of potentially groundwater dependent vegetation along Mistake Creek to the west and lowering of water levels at registered and unregistered bores. The planned elevation of the quarry base is 190 m AHD, approximately 30 m below the peak pre-construction elevation of 220 m AHD. A depth to water measurement of 27.4 m below ground level (bgl) at RN 62536 is within this range albeit at a lower ground elevation of approximately 202 m AHD. Therefore, the water table beneath Borrow 7 may be below the proposed quarry base.

- Drawdown of the water table due to pumping from groundwater supply bores. The likelihood of impact is considered low due to the anticipated low bore yield and supplementary water demand. The risk is conservatively assessed as moderate due to the presence of registered bores and current uncertainty about their uses. However, there are no current plans to source water from bores and any impacts will be assessed in the approvals required for a water bore.
- Alteration of the local groundwater flow regime during construction through blasting activities and associated changes in the hydrogeological properties of the surrounding formations.
- Localised recharge to the water table from quarry operations and associated salinisation and mounding of the water table is considered a low risk. This may arise if the water table is not intersected by the quarry and stormwater at the site is not properly managed. The mounding of the water table may facilitate lateral transport of dissolved salts and contaminants if present within the saturated zone. Appropriate management of water in the pit, particularly if dewatering is required, would minimise recharge induced impacts.
- The risk of localised degradation of groundwater quality due to accidental leaks or spills of chemicals during construction and subsequent lateral migration of contaminants within the saturated zone is considered low as the risk of groundwater contamination can be minimised through appropriate management of on-site chemicals.

Based on the preliminary risk assessment, works associated with the development will not be expected to significantly impact groundwater.

North Creek Quarry

No major watercourses currently exist within the proposed North Creek Quarry area, however North Creek is located to the south of the site and the Belyando River to the east (1.5 km). Two mapped wetlands are located close to the quarry area: a lacustrine wetland (farm dam) associated with North Creek and riverine wetland associated with the Belyando River.

Six registered bores within a 10 km buffer surrounding the quarry site, of which five are abandoned and one is an active water resources investigation bore located 6.2 km to the south-east of the site. No GDEs have been identified in the quarry area through field investigations however areas along North Creek and the Belyando River to the east have been identified as areas with high potential to support groundwater dependent vegetation (BOMb, 2013).

The potential groundwater impacts due to the quarry include:

- Drawdown of the water table due to quarry excavation and associated dewatering activities. The extent of the impact will largely depend on the potential for the base of the

quarry to intersect the water table and hydrogeological properties of the aquifer surrounding the quarry. The potential drawdown impacts include the lowering of the water table at the location of potentially groundwater dependent vegetation to the south and east of the quarry and along Belyando River and lowering of water levels at registered and unregistered bores. It is understood that the proposed quarry depth is approximately 10 mbgl, which gives quarry base elevations of 193 to 197 m AHD. The available depth-to-water data from the Groundwater Database indicates that the water table may occur around 11 to 15 m bgl in the alluvium near creeks. Given the proposed depth of quarry and its proximity to the creeks and Belyando River, the likelihood of intersecting the water table is considered moderate.

- Drawdown of the water table due to pumping from groundwater supply bores. The likelihood of impact is considered low due to the anticipated low bore yield and supplementary water demand. The risk is conservatively assessed as moderate due to the presence of registered bores and current uncertainty about their uses. However, there are no current plans to source water from bores and any impacts will be assessed in the approvals required for a water bore.
- Localised recharge to the water table from quarry operations and associated salinisation and mounding of the water table. This may arise if the water table is not intersected by the quarry and stormwater at the site is not properly managed. The mounding of the water table may facilitate lateral transport of dissolved salts or contaminants if present within the saturated zone.
- Localised degradation of groundwater quality due to accidental leaks or spills of chemicals during construction and subsequent lateral migration of contaminants within the saturated zone.

Moray Quarry

No major watercourses currently exist within the proposed quarry area. Two mapped wetlands are located close to the quarry area: a lacustrine wetland (farm dam) associated with North Creek directly to the north; and riverine wetland associated with the Belyando River directly to the east. The Moray Quarry site is within the Belyando floodplain and is located within the extent of 100 yr ARI flood extent predicted by the Queensland Reconstruction Authority – known as the Queensland Interim Floodplain Assessment Overlay (QIFAO). The proposed quarry is on topography that varies between 202 m and 212 m AHD. While the quarry is shown to be covered by the QIFAO flood extent, the flood extent at that location on the Belyando River intersects the 202 m AHD contour on the east and west banks. The location of the quarry should in theory be represented as a ‘dry island’ in the flood extent of both datasets having correct elevations.

Six registered bores were identified within a 10 km buffer surrounding the quarry site, of which five are abandoned and one is an unknown water bore located 7 to 8 km south-east of the site. No GDEs have been identified in the quarry area through previous field or desktop investigations; however, the southern portion of the quarry area and Belyando River to the east have been identified as areas with high potential to support groundwater dependent vegetation. No groundwater quality data within the quarry area are available.

A number of potential impacts to groundwater due to proposed works were identified as follows:

The potential groundwater impacts due to the quarry include:

- Drawdown of the water table due to quarry excavation and associated dewatering activities. The extent of the impact will largely depend on the potential for the base of the quarry to intersect the water table and hydrogeological properties of the aquifer surrounding the quarry. The potential drawdown impacts include the lowering of the water table at the location of potentially groundwater dependent vegetation to the south and east of the quarry and along Belyando River and lowering of water levels at registered and unregistered bores. The available depth-to-water data from the Groundwater Database indicates that the water table may occur around 11 to 15 m bgl in the alluvium near creeks. Given the proposed depth of quarry and its proximity to the creeks and Belyando River, the likelihood of intersecting the water table is considered moderate.
- Drawdown of the water table due to pumping from groundwater supply bores. The likelihood of impact is considered low due to the anticipated low bore yield and supplementary water demand. The risk is conservatively assessed as moderate due to the presence of registered bores and current uncertainty about their uses. However, there are no current plans to source water from bores and any impacts will be assessed in the approvals required for a water bore.
- Localised recharge to the water table from quarry operations and associated salinisation and mounding of the water table. This may arise if the water table is not intersected by the quarry and stormwater at the site is not properly managed. The mounding of the water table may facilitate lateral transport of dissolved salts or contaminants if present within the saturated zone.
- Localised degradation of groundwater quality due to accidental leaks or spills of chemicals during construction and subsequent lateral migration of contaminants within the saturated zone.

6.2 Summary of comments

Comments raised in the submissions included:

- Inadequate consideration of hydrology and flooding impacts that will result from the Project (Rail)
- Water supply, sewerage and waste disposal methods for temporary rail camps.

6.3 Response to comments

6.3.1 Flooding

Comments were received in regard to the adequacy of flood modelling and the assessment of the Project (Rail) flooding impacts. Flooding impacts for the Project (Rail) have been assessed in accordance with the ToR which includes predicted afflux levels and flooding durations. A revised Rail Flood Modelling Report is provided in the SEIS Volume 4 Appendix S1. This report has been prepared to assess any potential flood impacts on properties and was based on the following:

- Before and after rail development scenarios;
- Ground truthing of major watercourses and catchments; and

- Consideration of anecdotal evidence of historic flood levels and stream gauge data (where available).

Flood level and flow limits for approved railway projects in Central Queensland, such as the Alpha Coal Project have been used to determine acceptable impact criteria for the Project (Rail). The results of this assessment indicate that any flood impacts from the proposed rail design are within these criteria.

With regard to indundation duration, Section 2.4 of Volume 4, Appendix S1 stipulates that any increase in duration (modelled) of flooding inundation is not to exceed an average across the modelled extent of 72 hours or 20% (whichever is greater) of existing inundation durations during the 50 year ARI event. This is unless specific circumstances where inundation durations post-development can be tolerated in conjunction with landholder agreement. Inundation durations shall be measured from when the water depth is greater than 300mm on the rising limb of the hydrograph to when the water depth is equal to 300mm on the falling limb of the hydrograph. Adani will undertake the flood inundation duration modelling at the detailed design phase.

Flooding impacts are consistent with those described in the EIS and avoidance, mitigation and design measures have been identified and presented to prevent or minimise flooding impacts associated with the Rail. Residual flooding impacts have also been assessed and presented and ongoing consultation with landholders will continue in regards to specific impacts and specific mitigation measures required for each affected property.

6.3.2 Water supply, sewerage and waste disposal methods for temporary rail camps

Operational aspects in regards to water supply and sewage disposal for temporary rail camps are detailed in Volume 4 Appendix C3 Project (Rail) approval applications.

6.4 Amendments to commitments

Adani have provided ongoing environmental management and mitigation commitments within the approvals documentation (refer to SEIS Volume 4 Appendix C5 Quarry Approvals). These environmental management commitments address construction and operational requirements under the *Environmental Protection Act 1994*, *Environmental Protection Regulation 2009* and subordinate legislation.

7. Air quality

7.1 Introduction

This section of the SEIS provides an overview of the amendments to the Project (Rail) and additional work undertaken in relation to air quality since the EIS was made available for public comment in December 2012. A summary of key submissions is provided with response to these key matters. Response to individual submissions is provided in Volume 4 Appendix A.

7.1.1 Amendments to project description

Overview

The changes to the Project (Rail) relevant to the air quality chapter include:

- a change in the location of the rail loop
- a minor change to the rail alignment
- the addition of five quarries

Rail

The proposed rail loop is to be relocated to the south east of the previous rail loop assessed in the EIS. In addition, the rail alignment requires approximately 4.7 km of the dual gauge portion of the Rail (west) being to be realigned approximately 140 m north.

A detailed impact assessment of the air quality impacts of the Project (Rail) is included in the original EIS previously submitted (Volume 4, Appendix AD). In regards to the rail realignment, air quality impacts on the defined sensitive receptors are considered to be reduced. This is because there is now an increased distance between the rail and the sensitive receptors as the rail has been realigned to the north by 140 m with the nearest closest receptor being to the south of the rail alignment. The alteration in the rail loop is considered negligible in terms of air quality impacts and findings in the original EIS assessment are still current given distances to sensitive receivers have only marginally changed and the rail loop's vertical elevation is similar.

Quarries

Five quarries are now proposed as part of the Project (Rail). The proposed quarries were not included within the air quality assessment in the EIS. The quarries are required to provide the quarry material for the construction of infrastructure associated with the mine and rail including, but not limited to, roads, camps, pads, dams and mine civil works.

Development applications for the five quarries have been submitted with the SEIS for the Project (refer to SEIS Volume 4 Appendix C5 Quarry Applications). The land use and planning assessment for the quarries are provided within the applications. The land use assessments established that the quarries are generally consistent with the requirements of the *Belyando Shire Planning Scheme 2009* and State Planning instruments.

The quarry applications also provide an assessment of the air quality impacts of the quarries. Overall, the assessment concluded that the quarry activities will be acceptable and no major or high risk air quality impacts are likely. A detailed description and impact assessment has been

undertaken for each of the five quarries (refer to SEIS Volume 4 Appendix C5 Quarry Applications). An overview of each quarry is provided Section 7.1.3.

7.1.2 Update to studies

As a result of the Project changes listed above, the following additional studies and reports have been undertaken for the Project (Rail):

- Quarry Approvals Documentation (refer to SEIS Volume 4 Appendix C5 Quarry Applications) including:
  - Back Creek South Quarry Air Quality Assessment
  - Disney Quarry Air Quality Assessment
  - Borrow 7 Quarry Air Quality Assessment
  - North Creek Quarry Air Quality Assessment
  - Moray Quarry Air Quality Assessment
- Mine Air Quality Assessment for those elements of the Rail Loop located within the mining lease boundary (refer to Volume 4 Appendix L)

7.1.3 Air quality assessment of quarries

Modelling and assessment of the potential impact of each of the quarry operations was undertaken using the 3-dimensional dispersion wind field model, CALPUFF and The Air Pollution Model, which is a 3-dimensional prognostic model developed and verified for air pollution studies by the CSIRO to simulate the impacts from the quarry.

For all five quarries the *Environmental Protection (Air) Policy 2008* (EPP Air) air quality goals was used as the EPP Air prescribes ambient air quality goals relevant to this Project, particularly criteria for PM_{10} and $PM_{2.5}$. The most critical of these is the PM_{10} criterion as the fraction of $PM_{2.5}$ against PM_{10} emissions from extractive operations is small (typically less the 10 percent).

Deposited dust is commonly used as a measure of the potential for dust nuisance; high levels can reduce the amenity of an area. No formal criteria for dust deposition exist within Queensland; however the EHP has recommended a nuisance guideline of 120 mg/m²/day. From all of the regulations, the strictest applicable criteria have been selected for this assessment and are presented in Table 7. Particulate emissions from the surrounding environment include contributors from farming activities (i.e. dust from cultivated areas and roads/tracks) and smoke from activities associated with burning off.

Table 7 Quarry air quality goals

Pollutant	Basis	Criteria	Averaging Time	Exceedances *
TSP	Human Health	90 µg/m^3	1-year	-
PM_{10}	Human Health	50 µg/m^3	24-hour	Five days per year
$PM_{2.5}$	Human Health	25 µg/m^3	24-hour	-
Dust deposition	Amenity	120 mg/m^2/day	30 days	-

* Allowance intended for natural events such as dust storms or bushfires

Back Creek South quarry

An Air Quality Impact Assessment report for the Back Creek South Quarry has been prepared and is provided as Appendix H in the Back Creek South Quarry Approvals Documentation (refer to SEIS Volume 4 Appendix C5).

Modelling was based on the peak production month of August 2014 with 224,444 t of material extracted. This rate was modelled for a one year duration and as such the modelling results show the worst case scenario with minimal controls in place (dust suppression with a water truck). The actual impacts of the quarry are likely to be significantly less than the predictions and modelling of the worst case scenario.

The nearest sensitive receptors to the proposed quarry are:

- Elgin Downs receptor (6.6 km from the quarry)
- Laurel Hills receptor (6.8 km from the quarry)
- Urella (6.7 km from the quarry)
- Middle Creek (7 km from the quarry)

The TSP, PM_{10}, $PM_{2.5}$ and dust deposition results for the Elgin Downs and Laurel Hills receptors are detailed in Table 4-8 and Table 4-9 in the Back Creek South Approvals Documentation (refer to SEIS Volume 4 Appendix C5).

Monitoring and modelling of air quality indicates that even in the worst case scenario peak production the operations will be compliant with required air quality standards. It was noted that the highest contributor to all pollutants is from haul truck movements.

Disney Quarry

An Air Quality Assessment report for the Disney Quarry has been prepared and is provided as Appendix H in the Disney Quarry Approvals Documentation (refer to SEIS Volume 4 Appendix C5).

Modelling was based on the peak production month of May 2015 when 1.51 Mt will be extracted. This rate was modelled for a one year duration and as such the modelling results show the worst case scenario with minimal controls in place (dust suppression with a water truck). The actual impacts of the quarry are likely to be significantly less than the predictions and modelling of the worst case scenario.

The nearest sensitive receptors to the proposed quarry are the Gregory Developmental Road which lays 720 m to the east and a homestead approximately 2.1 km to the west. The residence will be screened from the quarry operations (230 m AHD) by a hill that rises to 290 m AHD and runs in a general north-south direction. In addition, the proposed operation will be screened from the Gregory Developmental Road by two vegetated hills that rise to approximately 258 m AHD.

The TSP, PM_{10}, $PM_{2.5}$ and dust deposition results for the Disney Homestead are detailed in Table 4-10 in the Disney Quarry Approvals Documentation (refer to SEIS Volume 4 Appendix C5). Monitoring and modelling of air quality indicates that even in the worst case scenario peak production the operations will be compliant with required air quality standards. It was noted that highest contributor to all pollutants is from haul truck movements.

The distances between the other four quarries and the Disney Quarry are so great, that cumulative impacts of dust will not occur at the closest receptor to the Disney Quarry, the Disney Homestead. For this reason, cumulative impacts of these other quarries upon the Disney Homestead have not been predicted.

Borrow 7 Quarry

An Air Quality Assessment report for Borrow 7 has been prepared and is provided as Attachment K in the Borrow 7 Quarry Approvals Documentation (refer to SEIS Volume 4 Appendix C5).

Modelling was based on the peak production month of November 2015 when 209,906 t will be extracted. This rate was modelled for the duration of one year and as such the modelling results show the worst case scenario with minimal controls in place (dust suppression with a water truck). The actual impacts of the quarry are likely to be significantly less than the predictions and modelling of the worst case scenario.

The nearest sensitive receptors to the proposed quarry are Old Twin Hills Homestead (approximately 6.7 km south-west) and Disney Homestead (approximately 6.7 km) north-west of Borrow 7.

The TSP, PM_{10}, $PM_{2.5}$ and dust deposition results for the Old Twin Hills and the Disney Homestead are detailed in Table 4-9 and Table 4-10 respectively in Borrow 7 Quarry Approvals Documentation. Monitoring and modelling of air quality indicates that even in the worst case scenario peak production the operations will be compliant with required air quality standards. It was noted that highest contributor to all pollutants is from haul truck movements.

Due to the distances between Borrow 7 and the other four quarries, cumulative dust impacts will not occur at the closest receptors (Disney Homestead and Old Twin Hills).

North Creek Quarry

An Air Quality Impact Assessment report for the North Creek Quarry has been prepared and is provided in Attachment H of the North Creek Quarry Approvals Documentation (refer to SEIS Volume 4 Appendix C5).

Modelling was based on the peak production month of September 2014 when 61,391 t will be extracted. This rate was modelled for one year duration and as such the modelling results show the worst case scenario with minimal controls in place (dust suppression with a water truck). The actual impacts of the quarry are likely to be significantly less than the predictions and modelling of the worst case scenario.

The nearest sensitive receptors to the proposed quarry are Moray Downs Homestead approximately 4 km to the south and Beenboona Homestead 8.8 km to the north-east. The Moray Downs homestead is likely to be screened from the quarry operations by vegetation corridors lining North Creek and an anabranch of the Belyando River lying between the two areas.

The modelled TSP, PM_{10}, $PM_{2.5}$ and dust deposition results for the Moray Downs Homestead and Beenboona Homestead are detailed in Table 4-8 and Table 4-9 respectively in the North Creek Quarry Approvals Documentation (refer to SEIS Volume 4 Appendix C5). Monitoring and modelling of air quality indicates that even in the worst case scenario during peak production the operations will be compliant with required air quality standards. It was noted that the highest

contributor to emissions is from pit activities. Emissions from the haul road are predicted to be minimal due to only one truck operating at a time.

This assessment is based on the worst case scenario which occurs for one month (September 2014). The following month will be similar although the scheduled extraction rate is slightly less (approximately 60,000 t in October 2014). It can therefore be concluded that the impacts predicted are conservative.

Moray Quarry

An Air Quality Impact Assessment report for the Moray Quarry has been prepared and is provided as Attachment H of Moray Quarry Approvals Documentation (refer to SEIS Volume 4 Appendix C5).

Modelling was based on the peak production month of September 2014 when 66,697 t will be extracted. This rate was modelled for one year duration and as such the modelling results show the worst case scenario with minimal controls in place (dust suppression with a water truck). The actual impacts of the quarry are likely to be significantly less than the predictions and modelling of the worst case scenario.

The nearest sensitive receptor to the proposed quarry is Moray Downs Homestead, approximately 900 m from the quarry. This residence is likely to be screened from the quarry operations by riparian vegetation lining the anabranch of the Belyando River that lies between the two areas. In addition, Moray Downs Homestead has been acquired by the proponent and is likely to be removed or minimally used during the operational period of Moray Quarry. Should the homestead be occupied during construction, Adani will liaise with the occupiers to minimise air quality impacts from the operation of the quarry. A second homestead (Beenboona) is located approximately 12 km from the site.

The TSP, PM_{10}, $PM_{2.5}$ and dust deposition results for the Moray Downs Homestead are detailed in Table 4-8 in Moray Quarry Approvals Documentation. Monitoring and modelling of air quality indicates that even in the worst case scenario during peak production the operations will be compliant with required air quality standards. The impacts on the Beenboona receptor during the life of the quarry are minimal with TSP, PM_{10}, $PM_{2.5}$ concentration as dust deposition is only slightly above background levels. Monitoring and modelling of air quality indicates that even in the worst case scenario peak production the operations will be compliant with required air quality standards. It was noted that highest contributor to all pollutants is from haul truck movements.

During the excavation of the Moray Quarry, activities associated with the North Creek Quarry will also be occurring. The assessments for both quarries were based on peak output, with these peak outputs occurring in September 2014. The modelling indicates that operations will be compliant when production output schedules are taken into account.

7.2 Summary of comments

Comments raised in the submissions included:

- Dust affecting grass growth, dust settling on grass and the associated implications to livestock health.
- Dispersal of dust and its destructive effects on marine organisms from accumulating in creeks and river systems.

7.3 Response to comments

7.3.1 Dust impacts to grazing

Comments regarding coal dust impacts on grazing activities have been noted. The air quality assessment conducted during the EIS concluded that air quality objectives of the EPP(Air) will be met. Further, a study undertaken at the University of Western Sydney on dairy cows (Andrews et al., 1992) found that: *Cattle did not find feed unpalatable if coal mine dust was present at a level equivalent to a dust; The presence of coal mine dust in feed did not affect the amount of feed that the cattle ate or the amount of milk that the cattle produced at a level equivalent to a dust deposition rate of 4,000 mg/m^3/day and Cattle did not preferentially eat feed that did not contain coal mine dust. The cattle were able to choose between feed that was free of coal mine dust, feed that contained 4,000 mg/m^2/day of coal mine dust and feed that contained 8,000 mg/m^2/day of coal mine dust*.

There is no evidence to support a claim that cattle will not feed on pastures affected by airborne particles, and further to this, there are a number of existing sources of airborne dust such as unsealed roads and tracks coexisting with cattle grazing land uses within the Galilee Basin.

7.3.2 Dust management

Comments were received with regard to the need for dust management. Adani will prepare a Coal Dust Management Plan identifying control measures to mitigate the emission of dust from loaded and unloaded coal trains. When operating on any Aurizon railway line, Adani will comply with the recommendations stated in the Aurizon (2010) Coal Dust Management Plan. Please refer to SEIS Volume 4, Appendix W for the Rail EMP, section 6.5.3 for rail operations related to coal dust.

7.4 Amendments to commitments

Adani have provided ongoing environmental management and mitigation commitments within the approvals documentation (refer to SEIS Volume 4 Appendix C5 Quarry Approvals). These environmental management commitments address construction and operational requirements under the *Environmental Protection Act 1994*, *Environmental Protection Regulation 2009* and subordinate legislation.

8. Greenhouse gas emissions

8.1 Introduction

This section of the SEIS provides an overview of the amendments to the Project (Rail) and additional work undertaken in relation to greenhouse gas emissions since the EIS was made available for public comment in December 2012. A summary of key submissions is provided with response to these key matters. Response to individual submissions is provided in Volume 4 Appendix A.

8.1.1 Amendments to project description

Overview

The changes to the Project (Rail) relevant to the greenhouse gas chapter include:

- a change in the location of the rail loop
- a minor change to the rail alignment
- the addition of five quarries

Rail

The proposed rail loop is to be relocated to the south east of the previous rail loop assessed in the EIS. Another change to the rail alignment consists of approximately 4.7 km of the dual gauge portion of the Rail (west) being aligned approximately 140 m north of the rail alignment proposed in the EIS.

The results of the EIS in relation to greenhouse gas will not change significantly as the proposed alignment changes are minor and will not change those impacts predicted in the EIS, with the area of vegetation clearing remaining the same.

Quarries

Five quarries are now proposed as part of the Project (Rail). The quarries are required to provide the quarry material for the construction of infrastructure associated with the mine and rail including, but not limited to, roads, camps, pads, dams and mine civil works. Vehicle haulage associated with the quarries was included in the calculation of emissions for the EIS and are unchanged based on the project updates.

Development applications for the five quarries are included as part of the SEIS for the Project (refer to SEIS Volume 4 Appendix C5 Quarry Applications).

Four of the five quarries will operate during the construction period only. Borrow 7 will operate for the life of the Mine. Due to the temporary nature of the quarries it is not expected to generate significant amounts of scope 2 greenhouse gas emissions. A detailed description and impact assessment has been undertaken for each of the five quarries (refer to SEIS Volume 4 Appendix C5 Quarry Applications).

Adani have committed to ensuring all vehicles are suitably fitted with exhaust systems that minimise gaseous and particulate emissions to meet vehicle design standards.

Adani have provided ongoing environmental management and mitigation commitments within the approvals documentation. These environmental management commitments address construction and operational requirements under the *Environmental Protection Act 1994*, Environmental Protection Regulation 2008 and subordinate legislation.

8.1.2 Update to studies

Due to the changes in the Project (Rail), quarry applications have been prepared (refer to SEIS Volume 4 Appendix C5 Quarry Applications).

A revised Traffic Impact Assessment has also been undertaken (SEIS Volume 4 Appendix P). This shows a significant reduction in traffic numbers.

8.2 Summary of comments

The majority of the issues raised for the rail greenhouse gas chapter were related to scope 3 emissions and how the EIS had not adequately addressed scope 3 greenhouse gas emissions.

A table that provides responses or cross references to the responses to individual comments is provided in SEIS Volume 4, Appendix A.

8.3 Response to comments

As identified above, the majority of the issues raised for the rail greenhouse gas chapter were related to scope 3 emissions and how the EIS had not adequately addressed scope 3 greenhouse gas emissions.

Comments regarding scope 3 emissions have been noted. As specified in the Project ToR scope 3 greenhouse gas emissions are not a requirement of the Project, as such they are not included as part of the EIS.

8.4 Amendments to commitments

Adani have committed to ensuring that all quarry related vehicles will be suitably fitted with exhaust systems that minimise gaseous and particulate emissions to meet vehicle design standards.

9. Noise and vibration

9.1 Introduction

This section of the SEIS provides an overview of the amendments to the Project (Rail) and additional work undertaken in relation to noise and vibration since the EIS was made available for public comment in December 2012. A summary of key submissions is provided with response to these key matters. Response to individual submissions is provided in Volume 4 Appendix A.

9.1.1 Amendments to project description

Overview

The changes to the Project (Rail) relevant to the noise and vibration chapter include:

- a change in the location of the rail loop
- a minor change to the rail alignment
- the addition of five quarries

Rail

The proposed rail loop is to be relocated to the south east of the previous rail loop assessed in the EIS. In addition, the rail alignment requires approximately 4.7 km of the dual gauge portion of the Rail (west) being to be realigned approximately 140 m north of the rail corridor.

A detailed impact assessment of the noise and vibration impacts of the Project (Rail) is included in the original EIS previously submitted (Volume 4, Appendix AF). In regards to the rail realignment, noise and vibration impacts on defined sensitive receptors are considered to be reduced. This is because there is now an increased distance between the rail and the sensitive receptors as the rail has been realigned to the north by 140 m with the nearest closest receptor being to the south of the rail alignment. The alteration in the rail loop is considered negligible in terms of noise and vibration impacts and findings in the original EIS assessment are still current given distances to sensitive receivers have only marginally changed and the rail loop's vertical elevation is similar.

Quarries

Five quarries are now proposed as part of the Project (Rail). The proposed quarries were not included within the noise and vibration assessment in the EIS. The quarries are required to provide the quarry material for the construction of infrastructure associated with the mine and rail including, but not limited to, roads, camps, pads, dams and mine civil works.

Development applications for the five quarries have been submitted with the SEIS for the Project (refer to SEIS Volume 4 Appendix C5 Quarry Applications). The land use and planning assessment for the quarries are provided within the applications. The land use assessments established that the quarries are generally consistent with the requirements of the *Belyando Shire Planning Scheme 2009* and State Planning instruments.

The quarry applications also provide an assessment of the noise and vibration impacts of the quarries. Overall, the assessment identified that the quarry activities will be acceptable and no

major or high risk noise and vibration impacts are likely. A detailed description and impact assessment has been undertaken for each of the five quarries (refer to SEIS Volume 4 Appendix C5 Quarry Applications). An overview of each quarry is provided Section 7.1.3.

9.1.2 Update to studies

As a result of the Project changes listed above the following additional studies and reports have been undertaken for the Project (Rail):

- Quarry Approvals Documentation (refer to SEIS Volume 4 Appendix 2 Quarry Applications) including:
  - Back Creek South Quarry noise and vibration Assessment
  - Disney Quarry noise and vibration Assessment
  - Borrow 7 Quarry noise and vibration Assessment
  - North Creek Quarry noise and vibration Assessment
  - Moray Quarry noise and vibration Assessment
- Mine Noise and Vibration Assessment for those elements of the Rail Loop located within the mining lease boundary (refer to SEIS Volume 4 Appendix N)

9.1.3 Noise and vibration assessment of quarries

For each of the five quarries the Environmental Protection (Noise) Policy 2008 acoustic quality objective for dwellings was used as the EPP (Noise) is designed to protect the acoustic environment for health and well-being. These objectives are considered most applicable to the Project given they are the statutory levels applicable to land uses in Queensland. Section 8 and Schedule 1 of the EPP (Noise) outlines these acoustic quality objectives as shown in Table 8.

The Acoustic Quality Objective applicable to this Project is the dwelling (indoors) night time criteria of 30 dB $L_{Aeq,adj,1hr}$. This noise level is an indoor level. In order to predict the external levels, a façade transmission loss of 7 dB has been applied. As such, the adjusted external night time criteria of 37 dB $L_{Aeq,adj,1hr}$ is adopted as the relevant acoustic criteria for permissible impact on sensitive receivers.

Table 8 EPP (Noise) acoustic quality objectives for dwellings

Sensitive Receptor	Time of Day	Acoustic Quality Objectives (measured at receptor) dB(A)			Environmental Value
		$LA_{eq,adj,1hr}$	$LA_{10,adj,hr}$	$LA_{1,adj,1hr}$	
Dwelling (outdoors)	Daytime & evening	50	55	65	Health & Wellbeing
Dwelling (indoors)	Daytime & evening	35	40	45	Health & Wellbeing
	Night-time	30	35	40	Sleeping

The prediction of noise has been undertaken using SoundPLAN noise modelling software with the CONCAWE prediction methodology to take into consideration the weather conditions at the site. The significant construction and operational noise sources used for this assessment have been obtained from VIPAC's database of noise emissions. The noise modelling has assessed

both the onsite operations and the haulage of material along the site access road for all quarries. Results for acoustic modelling undertaken for each quarry are detailed below.

Back Creek South Quarry

The worst-case scenario of 224,444 t extracted and hauled in one month is expected to comply with the external night time noise criteria of 37 dB(A) during stable and adverse weather conditions, from South Back Creek Quarry. The highest noise level is predicted to be 35 dB(A) at the Elgin Downs receptor for August 2014.

An assessment of blast activities concluded that ground vibration and airblast overpressure from blasting can be controlled to acceptable levels at the currently identified residential receptor locations using standard blasting practices.

Figure 4-8 in the South Back Creek Quarry Development Application (refer SEIS Volume 4 Appendix C5) shows the noise impact profile for the combined quarry and haulage activities at the South Back Creek Quarry site during night time at peak production. This impact and modelling is based on no noise mitigation measures in place. A number of noise mitigations will be installed to ensure noise impacts are reduced and limits not exceeded (refer to section 4.8.4 of the South Back Creek Quarry Development Application included in the SEIS Volume 4 Appendix C5).

Disney Quarry

The worst-case scenario of 1.51 Mt extracted and hauled from the site is expected to comply with the external night time noise criteria of 37 dB(A) during stable weather conditions. The highest noise level is predicted to be a maximum of 37 dB(A) at the Disney receptor for May 2015 when the extraction rate is 1.51 Mt. This represents the peak production which will only occur for 4.86 percent of the quarry life, approximately 1 Mt will be extracted for 24 percent of the time and remaining time will be less than 800,000 tonnes a month which is half of the modelled noise impact.

The modelling shows the predicted night time noise levels for the combined extraction activities and haulage during the peak production rate month will be 37(dB $L_{Aeq,\ 1hour}$) at the Disney homestead and 36(dB $L_{Aeq,\ 1hour}$) at the Old Twin Hills homestead. This is in compliance with the proposed external noise criteria of 37 (dB $L_{Aeq,\ 1hour}$).

Figure 4-8 in the Disney Quarry Development Application (refer SEIS Volume 4 Appendix C5) shows the noise impact profile for the combined quarry and haulage activities at the Disney site during night time at peak production. The combined noise levels show that noise levels are driven by the extraction activities, primarily from the dozer and excavator. The results have shown that compliance with the acoustic objectives for the night-time period has been achieved at all receptors during peak output in stable conditions. During unstable weather conditions the noise level may increase up to 3 dB(A) at the Disney receptor.

This impact and modelling is based on no noise mitigation measures in place. A number of noise mitigations will be installed to ensure noise impacts are reduced and limits not exceeded (refer to section 4.8.4 of the Disney Quarry Development Application included in the SEIS Volume 4 Appendix C5).

Borrow 7 Quarry

The majority of noise sources will remain constant throughout the life of the quarry. These sources will be around the quarry and generally be operating for 100 percent of the time. As such, the noise from these activities has been predicted separately to provide a worst-case scenario for the extraction activities.

The modelling shows the predicted night time noise levels for the extraction activities during the peak production rate month will be 30(dB $L_{Aeq, 1hour}$) at the Disney Homestead and 30 (dB $L_{Aeq, 1hour}$) at the Old Twin Hills Homestead. This is in compliance with the proposed external noise criteria of 37 (dB $L_{Aeq, 1hour}$). Figure 4-8 of the Borrow 7 Development Application (refer SEIS Volume 4 Appendix C5) shows the noise impact profile for the combined quarry activities at Borrow 7 site during night time.

The combined noise levels show that noise levels are driven by the extraction activities, primarily from the dump truck and excavator. The results have shown that compliance with the acoustic objectives for the night-time period will be achieved at all receptors during peak output in stable conditions. Noise predictions were also conducted for adverse weather. Results indicate that during adverse weather conditions the night-time $L_{Aeq,adj,1hr}$ noise criteria would not be exceeded.

This impact and modelling is based on no noise mitigation measures in place at the quarry. A number of noise mitigations will be installed to further reduce noise impacts.

Blasting activities will release around 60,000-80,000 t of material and occur approximately once or twice a month in high production months. Blasting will be undertaken to ensure ground vibration and airblast overpressure from blasting can be controlled to acceptable levels using standard blasting practices.

North Creek Quarry

The worst-case scenario, or maximum monthly output of 61,391 t extracted and hauled from the site is expected to comply with the external night time noise criteria of 37 dB(A) during stable weather conditions. The highest noise level is predicted to be 22 dB(A) at the Moray Downs receptor for September 2014 when the extraction rate is scheduled to be at 61,391 t. Extraction rates in October 2014 are scheduled to be slightly less (approximately 60,000 t). This represents the peak production which will occur for 9.52 percent of the quarry life. Approximately 230,000 t will be extracted over the first four months of operation (19 percent of the overall operating time). The remaining time scheduled production will be less than 41,000 t per month which is considerably less than the modelled noise impact.

The modelling shows the predicted night time noise levels for the combined extraction activities and haulage during the peak production rate month will be 22(dB $L_{Aeq, 1hour}$) at the Moray Downs Homestead. This is in compliance with the proposed external noise criteria of 37 (dB $L_{Aeq, 1hour}$). Figure 4-8 of the North Creek Quarry Development Application (refer SEIS Volume 4 Appendix C5) shows the noise impact profile for the combined quarry and haulage activities at the North Creek Quarry during night time at peak production.

The combined noise levels show that these are driven by the extraction activities, primarily from the dozer and excavator. The results have shown that compliance with the acoustic objectives for the night-time period has been achieved at all receptors during peak output in stable conditions. During unstable weather conditions the noise level is predicted to increase up to 30

db(A) at the Moray Downs receptor, which remains in compliance with the proposed noise criteria.

This impact and modelling is based on no noise mitigation measures in place. A number of noise mitigations will be installed to ensure noise impacts are reduced and limits not exceeded (refer to section 4.8.4 of the North Creek Quarry Development Application included in the SEIS Volume 4 Appendix C5).

Moray Quarry

The worst-case scenario of 66,697 t extracted and hauled from the site is expected to be maximum of 44 dB(A), which exceeds the external day time criteria of 42 dB(A) and the external night time noise criteria of 37 dB(A) during stable weather conditions.

The combined noise levels for extraction activities and haul road movements during maximum output are expected to exceed outdoor day-time and night-time criteria by 2 dB(A) and 7 dB(A), respectively, under stable weather conditions. Figure 4-8 in the Moray Quarry Development Application (refer SEIS Volume 4 Appendix C5) shows the noise impact profile for the combined quarry and haulage activities at the Moray site during night time at peak production.

The combined noise levels show that noise levels are driven by the extraction activities, primarily from the dozer and excavator. The results have shown that compliance with the acoustic objectives for the night-time period has not been achieved at all receptors during peak output in stable and adverse conditions, with exceedances of greater than 3dB(A) expected.

This impact and modelling is based on no noise mitigation measures in place. A number of noise mitigations will be installed to ensure noise impacts are reduced and limits not exceeded (refer to section 4.8.4 of the Moray Quarry Development Application included in the SEIS Volume 4 Appendix C5 Quarry Applications). In addition, the nearest sensitive receptor (Moray Downs Homestead) has been acquired by the proponent and is likely to be removed or minimally used during the operational period of Moray Quarry and the nearby North Creek Quarry. Should the homestead be occupied during construction, Adani will liaise with the occupiers to minimise noise and vibration impacts from the operation of the quarry.

Cumulative Impacts

At the Elgin Downs receptor, cumulative noise assessment indicated that when other surrounding proposed quarries are also under operation, the day-time noise criteria may be exceeded by up to 3 dB(A) and the night-time noise criteria may be exceeded by up to 8 dB(A), under neutral weather conditions, and by up to 10 dB(A) in adverse weather conditions. The exceedances are caused by extraction activities at the proposed Moray Quarry which were modelled without noise mitigations in place, that is, worst case scenario, not by the South Back Creek Quarry. A number of noise mitigations will be installed to ensure noise impacts are reduced and limits not exceeded (refer to the Back Creek South Quarry Development Application included in the SEIS Volume 4 Appendix C5 Quarry Applications)At the Disney receptor, cumulative noise assessment indicated that when Borrow 7 and Disney Quarry are operational (with peak production occurring concurrently), the night-time $L_{Aeq,Adj,1hr}$ noise criteria may be marginally exceeded by 1 dB(A), under neutral weather conditions. While Borrow 7 does contribute, the exceedance is primarily due to extraction activities at the Disney Quarry. A number of noise mitigations will be installed to ensure noise impacts are reduced and limits not

exceeded (refer to Borrow 7 Quarry Development Application included in the SEIS Volume 4 Appendix C5 Quarry Applications).

9.2 Summary of comments

Comments raised in the submissions included:

- Recommended that the noise criteria specified within the World Health Organisation's Guidelines for Community Noise and the enHealth Council's document *The health effects of environmental noise - other than hearing loss* be adopted. These identify a level of 45 dB(A) L_{AMax} as the recommended sleep disturbance criteria.
- Method of noise monitoring for establishing background noise levels.

9.3 Response to comments

9.3.1 Noise criteria

The World Health Organisation's discusses the effects of environmental noise in non-industrial environments in its Guideline for Community Noise (1999). This guideline examines aspects such as sleep disturbance, annoyance, and speech intelligibility and provides guidance for protecting people from adverse effects induced by excessive noise. The guideline is also referred to in the PNC Guideline's section on sleep disturbance criteria. While the World Health Organisation's Night Noise Guidelines For Europe (2009) provides a revised approach, the World Health Organisation's 1999 Guideline is considered relevant and complementary.

Most people are likely to experience a high level of annoyance should daytime sound pressure levels at outdoor living areas exceed 55 dB(A)L_{eq} for a steady, continuous noise. Moderate annoyance may be felt should daytime outdoor sound pressure level exceed 50 dB(A)L_{eq}. Sound pressure levels during the evening and night should be 5 to 10 dB lower than the level during the day.

When the noise comprises of a large low frequency component, lower guideline values are recommended as Low Frequency Noise (LFN) can disturb sleep at lower sound pressure levels. The recommendation of lower noise levels for LFN also applies for outdoor living areas. For intermittent noise, it is necessary to take into account the maximum sound pressure level as well as the number of noise events. Interference to speech intelligibility may be prevented by maintaining background noise to levels of about 35 dB(A) to 45 dB(A). Table 9 summarises the World Health Organisation's 1999 Guideline values.

Table 9 Summary of World Health Organisation's guidelines for community noise, 1999

Descriptor	Indoor Guideline Value	Outdoor Guideline Value
Speech intelligibility (dwellings indoors)	35 dB(A) Leq (steady noise)	Not applicable.
Sleep disturbance (Bedrooms)	30 dB(A) Leq (steady noise) 45 dB(A) Lmax (intermittent noise)	45 dB(A) Leq (steady noise) 60 dB(A) Lmax (intermittent noise)
Annoyance (daytime and evening)	35 dB(A) Leq	50 dB(A) Leq

While the WHO 1999 Guidelines provide values for sleep disturbance, external amenity and speech intelligibility, these values are less stringent than the PNC Guideline goals outlined previously. The above 30 dB(A) L_{eq} guideline value shown in Table 9 equates to 40 dB(A) L_{eq} external (based on typical 10 dB(A) façade reduction – as per Australian Standard AS3671 and indeed WHO recommends 15 dB(A) façade reduction). Given the PNC Guideline criterion is 28 dB(A) $L_{eq, 1hour}$ outdoor at night-time, it is considered that the adoption of the PNC Guideline criteria for this Project (Mine) will also ensure compliance with the WHO 1999 guidelines.

9.3.2 Background noise monitoring

Attended measurements were undertaken at unattended monitoring locations during the daytime to supplement logger data. The monitoring was conducted with consideration to land access timeframes, safety and security requirements. Unattended noise logging includes night-time data. The most stringent night-time criteria possible under the Eco-access Planning for Noise Control Guideline has been used in the assessment, which is based on the minimum night-time background noise level. Therefore, attended monitoring during night-time would not change the assessment outcomes.

9.4 Amendments to commitments

Adani have provided ongoing environmental management and mitigation commitments within the approvals documentation (refer to SEIS Volume 4 Appendix C5 Quarry Applications). These environmental management commitments address construction and operational requirements under the *Environmental Protection Act 1994*, *Environmental Protection Regulation 2009* and subordinate legislation.

10. Waste

10.1 Introduction

This section of the SEIS provides an overview of the amendments to the Project (Rail) and additional work undertaken in relation to waste since the EIS was made available for public comment in December 2012. A summary of key submissions is provided with response to these key matters. Response to individual submissions is provided in Volume 4 Appendix A.

10.1.1 Amendments to project description

The change to the Project (Rail) relevant to waste is the addition of five quarries.

The quarries are required to provide the quarry material for the construction of infrastructure associated with the mine and rail including, but not limited to, roads, camps, pads, dams and mine civil works.

10.1.2 Update to studies

Development applications for the five quarries are included as part of the SEIS for the Project (refer to SEIS Volume 4 Appendix C5 Quarry Applications).

10.1.3 Waste assessment of quarries

Four of the five quarries will operate during the construction period only. Borrow 7 will operate for the life of the Mine. Due to the operating principles and temporary nature of four of the quarries, significant quantities of waste materials are not expected to be generated. Waste generated during construction will be managed as outlined in the Environmental Management Plan (Rail) (SEIS, Volume 4 Appendix W). Any waste generated through the operation of Borrow 7 will be managed in accordance the mine general waste measures as detailed in SEIS Volume 4 Appendix Q1 (EMP – Mine). A detailed description and impact assessment has been undertaken for each of the five quarries (refer to SEIS Volume 4 Appendix C5 Quarry Applications).

10.2 Summary of comments

There were no comments raised in the EIS Submissions relevant to waste management associated with the Project (Rail).

11. Transport

11.1 Introduction

11.1.1 Amendments to project description

Overview

The changes to the Project (Rail) relevant to the transport chapter include:

- a change in the location of the rail loop
- a minor change to the rail alignment
- the addition of five quarries

Rail

The proposed rail loop is to be relocated to the south east of the previous rail loop assessed in the EIS. The rail alignment will also consist of approximately 4.7 km of the dual gauge portion of the Rail (west) being aligned approximately 140 m north of the rail alignment proposed in the EIS. No changes are proposed in relation to construction/operation access or the location of road crossings.

The results of the EIS in relation to transport have not changed due to these realignments. The predicted impacts have however reduced due to revised logistics assessments and the movement of haul trucks being predominantly in the rail corridor, rather than the road network as predicted in the EIS.

Quarries

Five quarries are now proposed as part of the Project (Rail). The proposed quarries were not included within the transport assessment in the EIS, however haul truck movements were included to provide materials to the construction of the rail corridor. The quarries are required to provide the quarry material for the construction of infrastructure associated with the mine and rail including, but not limited to, roads, camps, pads, dams and mine civil works. The only quarry that will remain in use post-construction will be the Borrow 7 Quarry.

Development applications for the five quarries have been submitted with the SEIS for the Project (refer to SEIS Volume 4 Appendix C5 Quarry Applications). Transport assessments for each quarry are provided within the approval documents. The quarries have also been assessed within the revised Transport Impact Assessment Report (TIA) (refer to SEIS Volume 4 Appendix P).

11.1.2 Update to studies

As a result of the Project changes listed above, the following additional studies and reports have been undertaken for the Project (Rail):

- Transport Impact Assessment Report (TIA) (refer to SEIS Volume 4 Appendix P TIA)
- Quarry Approvals Documentation and associated Traffic and Transport Impact Assessments (refer to SEIS Vol 4 C5 Quarry Applications)

11.1.3 Findings of transport assessment of quarries

The traffic and transport arrangements for each of the five quarries are discussed in the traffic assessment report prepared for each quarry (refer to SEIS Volume 4 Appendix C5 Quarry Applications). Transport impacts are to be managed in accordance with the management and mitigation measures outlined in the quarry approval documentation (refer to SEIS Volume 4 Appendix C5 Quarry Applications).

Back Creek South Quarry

The proposed Back Creek South Quarry will maintain an all weather access. The track will directly access Elgin Road which connects to Moray Carmichael Road approximately 4 km west of the quarry. A detailed estimate of the likely development traffic generation and distribution has been undertaken for the quarry, with the site predicted to generate maximum truck movements of 172 (in/out) during the peak extraction and haulage month. Back Creek South Quarry is expected to increase traffic on the roads in the study area by no more than 172 trucks per day during peak operations and as such the current Service Level 'A' is expected to be retained on all roads.

Cumulative development traffic will be highest on Elgin Road and Doongmabulla Road with an average of 320 extra vehicles per day. As a result, Level of Service 'A' is expected to be retained however some sections along this route may experience Level of Service 'B' roadway capacities in peak periods.

A summary of the impacts as assessed in the traffic assessment undertaken for the quarry report are:

- A detailed assessment of the development traffic impacts in accordance with the GARID guidelines has established that Back Creek South Quarry and surrounding quarries will not have a significant or assessable pavement impact on the state controlled road network.
- No school route, pedestrian or cyclist impacts associated with the development proposal.
- There are no traffic planning or engineering reasons why the proposed development should not proceed as planned.
- All intersections within the study area will operate under uninterrupted flow conditions.
- Impacts to the local road network will be restricted to the Elgin and Moray Carmichael Roads which is the subject of a road upgrade.

Disney Quarry

Two main access roads to the Disney Quarry are proposed as part of the quarry development:

- Northern access - an access off the Gregory Developmental Road is proposed for the northern entrance to the quarry.
- Southern access – the primary access is proposed approximately 2.4 km south of the Northern access. This road will link to the extraction area and the propose rail haul road. This road will directly link to the Carmichael Coal Mine and Rail Project corridor in the south and detour the Gregory Developmental Road. This access will be used for haulage of quarry material.

Site access roads will be constructed with a gravel pavement with a minimum of 9 m width. An internal haul road will be developed down the centre of the extraction area to transport material to the processing area. This internal haul road will be relocated as the linear cell extraction is moved onto the second row of cells to be extracted.

Traffic will be generated by the Disney Quarry development through construction and site set up, employees, service vehicles and the haulage of quarry material. A detailed estimate of the likely development traffic generation and distribution has been undertaken for the quarry, with the site predicted to generate a maximum monthly traffic volume (on and off road) of 1,342 vehicles (in/out) during the peak production month.

Disney Quarry traffic is expected to increase traffic on the public roads in the study area by no more than 10 vehicles per day during peak operations and as such the current service level 'A' is expected to be retained on all roads.

A summary of the impacts as assessed in the traffic assessment undertaken for the quarry report are:

- Assessment in accordance with the GARID guidelines found that Disney Quarry and associated quarries will not have a significant or assessable pavement impact on the state controlled road network.
- No school route, pedestrian or cyclist will be impacted with the development proposal.
- There are no traffic planning or engineering reasons why the proposed development should not proceed as planned.
- All intersections within the study area will operate under uninterrupted flow conditions.

Borrow 7 Quarry

Borrow 7 will maintain one all weather site access from Twin Hills Road in the south and a dedicated haul route to the north. The northern access will be the primary haul route and will connect Borrow 7 to the Carmichael Coal Mine and Rail corridor located 900 m to the north of the quarry. This will generally be an all weather access and will not cross main surface water runoff channels. A haul route will be constructed along the rail corridor and will provide an access along this route to the Gregory Developmental Road. Site access roads will be constructed with a gravel pavement with a minimum of 9 m width.

Traffic will be generated by Borrow 7 development through construction and site set up, employees service vehicles and the haulage of quarry material. A detailed estimate of the likely development traffic generation and distribution has been undertaken, with the site predicted to generate a maximum daily traffic generation of 310 vehicles (in / out).

Borrow 7 traffic is expected to increase traffic on the roads in the study area by no more than 200 vehicles per day during peak operations and as such the Level of Service 'A' is expected to be retained on all roads. The highest volume road within the study area is Gregory Developmental Road which carries 450 vehicles per day. This volume is significantly less than the AADT threshold for a Level of Service 'A'.

A summary of the impacts as assessed in the traffic assessment undertaken for the quarry report are:

- A detailed assessment of the development traffic impacts in accordance with the GARID guidelines has established that Borrow 7 and associated quarries will not have a significant or assessable pavement impact on the state controlled road network.
- There are no school route, pedestrian or cyclist impacts associated with the development proposal.
- There are no traffic planning or engineering reasons why the proposed development should not proceed as planned.
- All intersections within the study area will operate under uninterrupted flow conditions.
- Impacts to the local road network will be restricted to the Elgin Moray and Moray Carmichael Roads which are subject to a Road Agreement with IRC which includes upgrades by Adani of this road network.

North Creek Quarry

The proposed North Creek Quarry will maintain two all weather access points. The tracks will directly access Bulliwallah Road which connects to Moray Carmichael Road approximately 2.5 km south of the North Creek Quarry.

Site access roads will be constructed with a gravel pavement with a minimum of 9 m width. An internal haul road will be developed down the centre of the extraction area to transport material off the site. This internal haul road will be relocated as the linear cell extraction is moved onto the second row of cells to be extracted.

A detailed estimate of the likely development traffic generation and distribution has been undertaken for the quarry, with the site predicted to generate a maximum daily traffic generation 56 vehicles (in/ out). North Creek Quarry traffic is expected to increase traffic on the roads in the study area by no more than 56 vehicles per day (vpd) vehicles during peak operations and as such the Level of Service ‘A’ is expected to be retained on all roads.

Cumulative development traffic will be highest on Elgin Road and Doongmabulla Road with an average of 320 vehicles extra per day. As such, Level of Service ‘A’ is expected to be retained however some sections along this route may experience Level of Service ‘B’ roadway capacities in peak periods.

A summary of the impacts as assessed in the traffic assessment undertaken for the quarry report are:

- A detailed assessment of the development traffic impacts in accordance with the Guidelines for Assessment of Road Impacts of Development (GARID) guidelines has established that North Creek Quarry will not have a significant or assessable pavement impact on the SCR network.
- There will be no school route, pedestrian or cyclist impacts associated with the development proposal.
- There are no traffic planning or engineering reasons why the proposed development should not proceed as planned.
- All intersections within the study area will operate under uninterrupted flow conditions.

- Impacts to the local road network will be restricted to the Elgin Moray and Moray Carmichael Roads which are subject to a Road Agreement with IRC which includes upgrades by Adani of this road network.

Moray Quarry

The proposed Moray Quarry will maintain only two all weather access points. The track will directly access the realigned Moray Carmichael Road. Site access roads will be constructed with a gravel pavement with a minimum of 9 m width. An internal haul road will be developed along the edges of the rip areas to transport material off the site. The internal haul roads will be relocated as the linear cell extraction is moved onto the next row of cells to be extracted.

A detailed estimate of the likely development traffic generation and distribution has been undertaken, with the site predicted to generate a total daily traffic generation 60 vehicles (in/out).

Moray Quarry traffic is expected to increase traffic on the roads in the study area by no more than 69 vehicles per day during peak operations and as such the Level of Service 'A' is expected to be retained on all roads. Cumulative development traffic will be highest on Elgin Road and Doongmabulla Road with an average of 302 vehicles extra per day. As such, Level of Service 'A' is expected to be retained however some sections along this route may experience Level of Service 'B' roadway capacities in peak periods.

A summary of the impacts as assessed in the traffic assessment undertaken for the quarry report are:

- A detailed assessment of the development traffic impacts in accordance with the GARID guidelines has established that Moray Quarry will not have a significant or assessable pavement impact on the state controlled road network.
- No school route, pedestrian or cyclist impacts associated with the development proposal.
- There are no traffic planning or engineering reasons why the proposed development should not proceed as planned.
- All intersections within the study area will operate under uninterrupted flow conditions.
- Impacts to the local road network will be restricted to the Elgin and Moray Carmichael Roads which are subject to a Road Agreement with IRC which includes upgrades by Adani of this road network.

11.2 Summary of comments

A summary of issues raised in these submissions is provided below:

- Level of traffic assessment
  - Consultation with relevant transport authorities
  - EIS does not adequately address the requirements of section 1.9 and 3.9 of the ToR.
  - Transport assessment is not in accordance with the Department of Transport and Main Road's (DTMR) GARID and other relevant DTMR polies and guidelines.
  - Need for report to be relied upon by a third party
  - ALCAM assessment of all level crossings
  - Assessment of intersection performance

- Emergency/risk/safety management
  - Requirement for a preliminary risk assessment and risk management plan for aspects of the Project (Rail) associated with transport activities and infrastructure
  - Need for suitable evacuation strategies from camps
  - Location of flood warning stations in relation to rail
  - Road operational safety is inadequately addressed
  - Details of specific management measures regarding fatigue management and 'park up' rest areas
  - Fuel transport arrangements
- Level crossings details
- Impacts on the State Controlled Road Network
- Local road infrastructure impacts
- Access to project sites
- Consequential impacts existing rail infrastructure
- General Comments
  - Severance of the Whitsunday Regional Council local government area (LGA)
  - Impacts on school bus routes.
  - Road operational efficiency matters
  - Impacts on regional roads from the transport of rail construction supplies from Mackay to the construction supply depots
  - Haulage in urban areas

A table that provides responses or cross references to the responses to individual comments is provided in SEIS Volume 4, Appendix A.

11.3 Response to comments

11.3.1 Existing rail infrastructure

Comments regarding the consequential impacts of the Project on the Aurizon network and the capacity of the rail line to cope with the additional demand (across the Newlands and Goonyella Systems) are noted. Consequential impacts on the Aurizon network have been not included within the scope of work as set out in the Project ToR. Assessment of expansion of existing rail infrastructure capacity is outside scope of this EIS process.

As outlined in the EIS it is understood that the additional trains associated with the Mine's production can be accommodated on the existing rail network or on other rail lines proposed for development within the Galilee Basin. Any impact will be managed through the scheduling of trains which will be undertaken in consultation with Aurizon and third party operators.

11.3.2 Access locations

Comments have been received regarding access locations for mine construction works and camps. A comment was also received regarding the routes to be taken during construction.

Access points for construction camps including roads were provided in the EIS through the Material Change of Use application material under EIS Volume 4 Appendix D.

The comments have been noted and the requested information has been included within the revised TIA undertaken for the Project (Mine) (refer to SEIS Volume 4 Appendix P). As identified in the TIA, workforce access to each site will be via bus / coach for all locations. The primary route for the majority of local movements will be the Moray - Carmichael Road.

11.3.3 Level of traffic assessment

Several comments were received regarding the adequacy of the EIS traffic assessment to address the requirements of the ToR and DTMRs guidelines and policies. These comments specifically related to sections 1.9, 3.9 and 6.1 of the ToR. A revised TIA has been undertaken in response to these comments (refer to SEIS Volume 4 Appendix P) and has been prepared in accordance with the ToR and DTMRs guidelines and policies. In addition, specific traffic assessments have been undertaken for each quarry location, please refer to Volume 4 Appendix C5 for these reports.

Consultation

Comments regarding consultation with relevant transport authorities as identified in the ToR have been noted. The Traffic Management Plans for the Project (Rail) will be developed in consultation with the DTMR, Queensland Police Service (QPS) and local authorities. Further to this, there has been ongoing consultation with agencies and authorities throughout the SEISQPS development, including a meeting with DTMR on 8 April 2013 and QPS on 18 April 2013.

Third party advice

Comment regarding the need for the TIA to be relied upon by a third party is noted. Certification of the transport reports is not a requirement under the ToR. The updated TIA was prepared by a specialist transport consultant in accordance with DTMR requirements.

Data

Several comments were received regarding the EIS traffic data being insufficient and out of date, specifically, traffic volumes, peak hour traffic, supply vehicles, peak heavy vehicle estimates, crash information, population, and light vehicle trips.

The traffic count and crash data that is presented in the revised TIA prepared for the SEIS is the latest data (received July 2013) and it has been acquired from DTMR or from other reports as defined by each of the references.

Updated supply vehicle estimates are provided in the revised TIA undertaken for the Project. The revised TIA has been prepared in accordance with DTMR guidelines and policies and where relevant provides up to date data that is sufficient to meet the requirements of the ToR.

Assessment of intersection performance

Several comments were received regarding the lack of an intersection performance in the EIS. These comments have been noted and an intersection assessment has been included within the revised TIA undertaken for the Project.

ALCAM assessments

A comment was received regarding the provision of an ALCAM assessment for all level crossings on the project and all downstream level crossings impacted by trains servicing the project. The requested information has been included within the revised TIA.

11.3.4 Emergency/risk/safety management

Overview of comments received

Several comments were received regarding road operational safety, specifically, response times of emergency vehicles, mine camp evacuation strategies, location of flood warning stations, information on crash data, fatigue management, provision of 'park up' rest areas, and strategies for disaster management regarding the delivery of fuel and dangerous goods.

This is a very broad series of comments which have been responded to in a number of documents including the Rail Emergency Management Plan (Volume 4 Appendix V), Traffic Impact Assessment (volume 4 Appendix P), the Rail EMP (Volume 4 Appendix W) and will also be managed through ongoing project documentation such as Traffic Management Plans and through consultation with relevant agencies.

Emergency response

Comments regarding emergency response times have been noted. The updated TIA concluded that the construction of level crossings along the route could result in potential conflicts between rail and road traffic that will need to be managed by installing appropriate safety warning measures. Adani will consult with DTMR to establish how these impacts should be managed and to identify agreed mitigation measures.

Management and mitigation procedures outlining emergency response times for emergency vehicles will be included within the revised traffic management plan for the Project (Rail).

Risk assessment and management plans

Comments regarding hazard and risk associated with the Project (Rail) transport activities and infrastructure has been noted. The revised TIA assesses the potential hazards and risks arising from roads and traffic related to the projects construction and operational phases. Hazards and risks are further assessed for the Project (Rail) in the EIS, Volume 3, Chapter 12 – Hazard and Risk.

Flooding

Comments regarding the need for evacuation strategies are noted. The Hazard and Risk Assessments undertaken in the EIS consider the requirements for evacuations. In addition, the design criteria for roads and rail are consistent with the required engineering standards to ensure access during flooding events up to and include design criteria for roads and rail. Events over and above these agreed design criteria (approved by agencies including DTMR) will create regional access challenges. Evacuation procedures and plans will be implemented that accommodate a range of scenarios.

Road operational safety

The requested information regarding road operational safety has been included within the revised TIA undertaken for the Project. Comments regarding safe access for vehicles during

construction of level crossings have been noted. Mitigation and management measures that ensure adequate access for emergency vehicles and safe evacuation is provided for during construction and maintenance in the project area will be addressed within the construction and operation EMPs for the Mine and Rail, and in Traffic Management Plans.

Rest areas and fatigue management

Comments regarding 'park up' rest areas and road signage are noted. Adani will consult with DTMR and QPS regarding the need for additional 'park up' rest areas and road signage. Relevant management and mitigation measures regarding fatigue management will be identified from consultation and will be incorporated into the revised traffic management plan for the Project (Rail).

Haulage of dangerous goods

Haulage of dangerous goods has been included in the revised TIA prepared for the SEIS and included within the Hazard and Risk Assessment conducted for the EIS which considered road transport impacts and incident management.

Further, the EIS considered the use of alternative transport methodologies for fuels. Consultation with Aurizon regarding the use of the existing rail network for these purposes is ongoing. Adani will consider during the operational phase of the project the feasibility of using the Carmichael Coal Rail Line for fuel transport.

11.3.5 Level crossings

Trains speeds will be up to 80 km/hr when loaded and 100 km/hr when unloaded. Train speeds at each individual crossing will be finalised through a rail safety analysis and dependant on the crossing type. These speeds will vary between 60 km/hr and 100 km/hr.

The revised TIA concludes that the construction of level crossings along the route could result in potential conflicts between rail and road traffic that will need to be managed by installing appropriate safety warning measures. Adani will consult with Department of Transport and Main Roads (DTMR) to establish how these impacts should be managed and to identify agreed mitigation measures.

11.3.6 Oversized vehicles

Comments regarding details of likely heavy and oversized vehicles and impacts on local and SCR networks are noted. Requested information has been included within the revised TIA undertaken for the Project.

11.3.7 Impacts on the State Controlled Road Network (SCR)

Several comments were received regarding the impact analysis on the SCR network. An assessment of impacts on the SCR network within the limits of the ToR and Impact Assessment Boundary was undertaken for the EIS. Specifically, impacts to the Gregory Developmental Road were provided. Further information regarding impacts on the SCR network is included within the revised TIA undertaken for the Project (Rail) (refer to SEIS Volume 4 Appendix P).

Adani will continue consultation with IRC, QPS and DTMR in regards to impacts to road infrastructure on the local and SCR network.

A comment regarding the interruption of relatively well used State Controlled roads by increased frequency of trains from the Carmichael Coal Mine to Terminal 0 at Port of Abbot Point has been noted. The Project (Rail) included the proposed rail line joining into the existing Aurizon rail network south of Moranbah. The assessment did not include, and was not required to include impact assessment on the existing rail network. Impact assessment of proposed upgrades to the existing rail network are being undertaken by others and will included assessment and mitigation of impacts to road crossings associated with those parts of the network.

11.3.8 Local road infrastructure impacts

Several comments were received regarding the Project (Rail) impacts on local road infrastructure. In response to these comments an assessment of the traffic impacts to the local roads as a result of the Project (Rail) has been undertaken and included in SEIS Volume 4, Appendix P. Adani will continue consultation with and undertaken agreements with IRC, QPS and DTMR in regards to impacts to road infrastructure on the local and SCR network.

Details regarding local road upgrades and maintenance have been outlined in the revised TIA undertaken for the Project. Adani is currently in discussions with IRC to draft an agreement regarding the long term maintenance of impacted local roads.

11.3.9 General comments

Haulage in urban areas

A comment was received noting that an analysis of the impact of haulage in urban areas was not carried out.

The ToR required an impact assessment for the local and regional areas. There are no urban areas within the project area. Analysis of traffic impacts with the urban areas of regional towns was not specified in the ToR. Impacts to the main roads servicing regional towns has been included within the revised TIA undertaken for the Project (refer to SEIS Volume 4 P Transport Impact Assessment).

Transport of rail construction supplies

A comment regarding the impacts on regional roads from the transport of rail construction supplies from Mackay to the construction supply depots is noted. The feasibility of using the existing rail network for transport purposes was investigated. Without available rail network capacity and capability, transport of goods to construction depots identified in the EIS and SEIS is not possible. Transport of goods beyond the construction phase of the project is being investigated.

An assessment of the traffic impacts to the local roads as a result of the Project has been undertaken and included in SEIS Volume 4, Appendix P Transport Impact Assessment.

Severance of the local government area

A comment regarding the further severance of the Whitsunday Regional Council (WRC) LGA by using the existing and proposed rail lines in WRC LGA is noted.

The Project (Rail) included the proposed rail line joining into the existing Aurizon rail network south of Moranbah. The Assessment did not include, and was not required to include impact

assessment on the existing rail network. Impact assessment of proposed upgrades to the existing rail network is being undertaken by others and will include land severance impacts associated with those parts of the network.

School bus routes

Comments regarding impacts on school bus routes are noted. There is the potential for school bus routes and services to overlap and interact with the rail transport movements for the Project (Rail) during construction and operation. Given this, it is recommended that all road users relating to the project be made aware of the school bus routes as part of an operational plan (Road Use Management Plan (RUMP)) for both the construction and operational phases for the project.

Information regarding the impacts on school bus routes has been included within the revised TIA undertaken for the Project (Rail) (refer to SEIS Volume 4 Appendix P).

Road operational efficiency

The requested information regarding road operational efficiency has been included within the revised TIA undertaken for the Project (Rail) (refer to SEIS Volume 4 Appendix P).

11.4 Amendments to commitments

The following commitment has been made regarding transport:

- General
  - Adani will consult with DTMR and QPS regarding the need for additional 'park up' rest areas and road signage. Relevant management and mitigation measures regarding fatigue management will be identified from consultation and will be incorporated into the revised traffic management plan for the Project (Rail).
  - Adani will continue consultation with and undertaking agreements with IRC, QPS and DTMR in regards to impacts to road infrastructure on the local and SCR network.
  - Adani is currently in discussions with IRC to draft an agreement regarding the long term maintenance of impacted local roads.
- TIA report
  - Upgrade the existing Carmichael – Elgin Road to become a sealed, single lane carriageway so as to provide a trafficable road under most rain event conditions and minimise the risk of closure.
  - Upgrade the existing Carmichael – Elgin Road / Gregory Developmental Road intersection – as part of the upgrade works for the Carmichael – Elgin Road it is recommended that the existing intersection be upgraded to include protected right turn and left movements at this intersection.
  - Signage at the Gregory Developmental Road / Kilcummin Downs Road – it is recommended that during the course of the construction period (2014 and 2015), including the life of the Rail Camp 1, “Trucks Turning” signage be installed at the intersection so as to advise road users of the potential for heavy vehicles to be negotiating this intersection.

- Upgrade Kilcummin Downs Road / Rail Camp 1 Site access – it is recommended that the proposed site access location be upgraded to allow for a protected right turn into the site access.
- Signage located at the intersection of the Peak Downs Highway with the Gregory Developmental Road and also north of the proposed Disney Quarry along the Gregory Developmental Road to advise motorists of the construction activities along this road section.
- The Gregory Developmental Road and Peak Downs Highway are not approved for HML vehicles. Should these routes be required to be used by HML a separate application will be required for these routes. This will go through to DTMR for their review and is subject to their approval.

A bus fleet will be required to support both the construction and operational phases of the Project. The buses will primarily transport the workforce to / from the Airport(s) (FIFO) and each work site.

12. Hazard and risk

12.1 Introduction

This section of the SEIS provides an overview of the amendments to the Project (Rail) and additional work undertaken in relation to hazard and risk since the EIS was made available for public comment in December 2012. A summary of key submissions is provided with response to these key matters. Response to individual submissions is provided in Volume 4 – Appendix A.

12.1.1 Amendments to the Project

The minor amendments to the Project (Rail), as described in Section 2, do not present new impacts on hazard and risk impact values, as such, the impact assessment undertaken for the EIS remains unchanged.

12.1.2 Updates to studies

A number of studies have been undertaken since the release of the EIS, relevant to hazard and risk. In addition, Adani has developed standards and procedures for emergency and bushfire management. The list of studies and procedures undertaken as part of the SEIS includes:

- Rail flood modelling (Volume 4, Appendix S1)
- Traffic Impact Assessment (Volume 4, Appendix P)
- Emergency Management (Volume 4, Appendix V)
- Bushfire Management Plan (Volume 4, Appendix S1)
- Environmental Management Plan Rail (Volume 4, Appendix W)

12.2 Summary of comments

Key comments raised in the EIS submissions included:

- Emergency response planning and facilities
- Increased risk of flooding along rail line and impact on grazing vegetation
- Increased risk of bushfires
- Lack of weed and pest (biosecurity) management plan
- Specific measures to ensure the environment is not adversely affected by the detrimental impacts of floodwater on sewage waste have not been addressed.

12.3 Response to comments

12.3.1 Emergency response

Adani has developed a Rail Safety Standard – Emergency Management to address any Project (Rail) related emergency incidents during operations such as: collisions, derailment, person struck by train, medical emergency, bushfire, fire on board, explosion, bomb threat, suspicious package and natural disasters (refer to SEIS Volume 4 Appendix V).

The standard details the principles of prevention, preparation, response and recovery that will be applied to emergency management. It identifies the mechanisms for risk identification and management, training, integration with emergency services and communication plans.

Adani will develop an Emergency Management Plan and an Emergency Response Plan prior to start of construction works, in consultation with relevant emergency service providers such as QAS, Department of Community Safety and QPS. Adani will engage with these emergency service providers throughout the construction and operation phase of the Project (Rail).

12.3.2 Flooding along rail corridor

Further to the EIS Rail Hydrology assessment (EIS Volume 4, Appendix AB), additional Rail Hydrology modelling work was completed to inform recommendations of the cross drainage infrastructure required to minimise impacts to existing flow paths, infrastructure and properties, and to meet the conditions set in the EIS and project design criteria (refer SEIS Volume 4 Appendix S1). The design approach used in the analysis was based on best practice principles and experience gained from similar projects in the region.

Seventy one, one dimensional hydraulic models and six, two dimensional hydraulic models were run for the study. The six major floodplains modelled consisted of the following:

- North Creek
- Belyando River
- Mistake / Gowrie Creeks
- Logan Creek
- Diamond Creek
- Grosvenor Creek.

The models identified that with the recommended waterway drainage structures, afflux levels adjacent to the proposed railway generally meet the design criteria, with minor localised areas of inundation exceeding 0.5 m. These areas were found to be small in extent, localised to adjacent to the alignment and have minimal impact on existing infrastructure and velocities.

Consultation with landowners on flood related impacts has occurred with Rail (West) and Rail (East) landowners during 2012 / 2013. Adani will continue to liaise with impacted landholders prior to construction commencing. Further details on potential flood impacts are available in the SEIS Volume 4, Appendix S1.

12.3.3 Bushfire Management Plan

Adani has developed a Bushfire Management Plan for the Project (Rail) (refer SEIS Volume 4 Appendix S2). The Bushfire Management Plan identifies guiding principles to protect the rail corridor, rail operations and the surrounding area along the corridor from uncontrolled bush or grass fire. The Bushfire Management Plan provides for the effective prevention, response, management and control of the risk of bushfire.

A fire station, fully equipped with fire truck and other fire fighting equipment will be constructed at the mine site which will be available for use on the Project (Rail). An emergency response team will be established to ensure trained and equipped personnel are available in the event of an incident.

12.3.4 Weed and Pest (Biosecurity) Management Plan

The Environmental Management Plan (Rail) in the EIS (Volume 3, Section 13) provided a high level plan to identify, monitor, report, control and manage potential weed and pest infestations along the Project (Rail).

As part of the SEIS, the Environmental Management Plan (Rail) (refer SEIS Volume 4 Appendix W) has been further updated to include additional relevant mitigation measures and controls relevant to weed and pest management associated with the construction and operation of the Project (Section 12 – Flora and Fauna). The EMP provides details on how materials, equipment, structures and waste (including putrescibles) associated with the construction and operations of the Project (Rail), camps and other infrastructure will be managed to limit weed and pest species proliferation and aggregation in these areas.

Adani will prepare site specific weed management plans prior to construction commencing which will involve the identification of existing weeds, identification of appropriate site specific controls and the identification of temporary and permanent wheel wash locations across the project.

In addition, Adani will develop a pest control program for the management of feral animals such as cats, pigs and dogs in consultation.

Liaison with Biosecurity Queensland, Isaac Regional Council and local stakeholders on weed and pest management matters will occur prior to construction commencing and throughout the Project's life.

12.3.5 Wastewater Management

Adani will be constructing sewage treatment plants (STPs) with effluent irrigation at the construction camps, rail construction depot and maintenance facility (EIS Volume 4, Appendix D). Site Based Management Plans (EIS Volume 4, Appendix D and SEIS Volume 4 Appendix C3) have been prepared for the operation of the temporary and permanent STPs identifying appropriate control measures for the discharge of effluent to minimise impact on the adjacent environment, including during periods of high rainfall.

12.4 Amendment to project commitments

No changes to project commitments are proposed.

13. Environmental management plan

13.1 Introduction

This section of the SEIS provides an overview of the amendments to the Project (Rail) and additional work undertaken in relation to the Environmental Management Plan (Rail) since the EIS was submitted in December 2012.

A summary of key submissions is provided with response to individual submissions provided in Volume 4 Appendix A.

13.1.1 Amendments to the project

Amendments to the Project Description (Rail) subsequent to the EIS are located in the Project Description (Rail) (SEIS, Volume 3, Section 2). Project (Rail) changes include:

- Realignment of the balloon loop approximately 2 km south east, necessitating
  - Removal of the concrete batching plant at Chainage 182.500 km
  - Reorientation of the bridge laydown area at Chainage 175.500 km
  - Relocation of the turning circle at Chainage 176.000, 400 m east
  - Relocation of the turning circle at Chainage 175.400, 375 m south east
- Realignment of the rail corridor approximately 300 m north at Goodoowada and Elgin Downs properties, to sit on the boundary of Lot 637 PH1980, necessitating
  - Realignment of bridge laydown at Chainage 128.100
  - Relocation of track laydown at Chainage 126.000, 200 m north
  - Relocation of turning circle and Chainage 124.000, 200 m north
  - Relocation of bridge laydown at Chainage 123.000, 125 m north
- Relocation of Construction Camp 2 approximately 2.9 km west
- Relocation of Construction Camp 3 approximately 2 km west
- Relocation of various bridge and laydown areas to minimise impact to landholders and optimise construction of the Project (Rail)
- Relocation of the Construction Depot on Lot 4 SP116046 approximately 9 km west
- Inclusion of five quarries or borrows at:
  - Disney (Lot 4 SP116046)
  - Borrow 7 (Lot 3235 PH752)
  - North Creek (Lot 3235 PH752)
  - Moray (Lot 662 PH1491)
  - South Back Creek (Lot 656 PH138788)

13.1.2 Updates to studies

A number of studies have been undertaken since the release of the EIS, which have been used for informing the mitigation measures and controls identified in the Environmental Management Plan (Rail). These include:

- Rail:
  - Rail Flood Modelling Report (SEIS Volume 4, Appendix S1)
  - Rail Bushfire Management Plan (SEIS Volume 4, Appendix S2)
  - Soil Survey Methodology (SEIS Volume 4, Appendix T2)
  - Rail Fauna Crossing Strategy Report (SEIS Volume 4, Appendix U)
  - Rail Emergency Management Plan (SEIS Volume 4, Appendix V)
  - MEDLI Modelling assessments for the Construction Depot, Maintenance Facility, Construction Camps 1 – 3 (SEIS Volume 4, Appendix C3)
  - Species Management Program (Least Concern) (SEIS Volume 4, Appendix C3)
  - Threatened Species Management Plan (SEIS Volume 4, Appendix C3)
  - Watercourse Determination and Riverine Protection Permit Review (SEIS, Volume 4, Appendix C3)
  - Revised Property Map of Assessable Vegetation and Regional Vegetation Management Code Response (SEIS Volume 4, Appendix C3)
- Quarries:
  - EPBC Environmental Impact Assessment Review (SEIS, Volume 4, Appendix J9)
  - Draft Closure and Rehabilitation Strategy (SEIS, Volume 4, Appendix X2)
  - Vegetation Assessment including Property Map of Assessable Vegetation and Regional Vegetation Management Response Codes (where applicable) (SEIS, Volume 4, Appendix C5)
  - Traffic and Transport Impact Assessments (SEIS, Volume 4, Appendix C5)
  - Air Quality Impact Assessment (SEIS, Volume 4, Appendix C5)
  - Noise Assessment (SEIS, Volume 4, Appendix C5)
  - Conceptual Erosion and Sediment Control Plans (SEIS, Volume 4, Appendix C5)

13.2 Summary of comments

Key comments raised in the EIS submissions included:

- Recommended additional mitigation measures to ensure adequate access for emergency services and evacuation during construction and maintenance are included in the EMP (Rail)
- Rail EMP does not adequately address erodible soil management
- Potential impacts on grazing properties including flood and bushfire management
- Biosecurity (weed and pest) management including the introduction of weed species not present within the area.
- Potential impacts of coal dust on adjacent land owners.

A number of submissions received requested further assessment, avoidance and mitigation measures for the potential impact of rail construction and operation. These have incorrectly

been identified as being required to be addressed in the Environmental Management Plan Rail. These submissions include:

- Landowners require access over the rail corridor within the boundaries of the property to provide access to the severed parcel.
- Cumulative air emission impacts combined with existing train movements on the established rail network, particularly the Newlands and Goonyella systems.
- Rail crossings for cattle – further clarification required on what happens if despite trying to negotiate the best type of cattle crossing with Adani it doesn't work.
- The implications of the dust on the grass growth, and consequently to the cattle's health is not mentioned.
- It is recommended that the noise criteria specified within the Work Health Organisation's Guidelines for Community Noise be adopted.
- The construction of level crossings along the route may result in potential conflicts between rail and road traffic that will need to be managed by the installation of appropriate safety warning measures.
- More detail is required on the option of one or several of the temporary rail camps staying for maintenance purposes, given the likelihood of infrastructure loss over the life of mine and the need to repair / reinstate in unfavourable conditions.
- There should be more investigations and supervision carried out during construction to minimise impact. Koala corridors should be built along the rail corridor as the rail corridor will further isolate the colonies.

The EMP presented in the EIS is a proposed project implementation document providing a framework for the management, monitoring and mitigation of key project impacts arising from the EIS. The EMP is not the primary impact assessment document. Where there has been an amendment to impact assessment studies and findings, these have been reflected in the relevant section of the SEIS. Further details on how these submissions have been addressed are available in the Submissions Register (Volume 4, Appendix A).

13.3 Response to comments

The EMP (Rail) (SEIS, Volume 4, Appendix W) has been revised to respond to comments raised in the EIS on the EMPs, specifically:

- Section 6 – Air Quality identifies that appropriate control measures for the management of dust (including coal dust). This includes the preparation of an Adani Coal Dust Management Plan and compliance with Aurizon's Coal Dust Management Plan when utilising existing Aurizon rail networks.
- Section 9 – Surface water identifies appropriate control measures for the management of erosion and sediment control. The preparation of customised erosion and sediment control plans will be required for each work area prior to construction commencing in accordance with the International Erosion Control Association (Australasia), Best Practice Erosion and Sediment Control Guidelines (2008). Adani have prepared a Soil Survey Methodology (SEIS Volume 4, Appendix T2) detailing soil sampling methodologies for the Carmichael Rail corridor, ancillary

infrastructure and quarries. Information obtained from the soil surveys will be used to develop the site specific erosion and sediment control plans.

- Section 12 – Flora and Fauna Management identifies appropriate controls for weed and pest management. The EMP also identifies that Adani will prepare a site specific weed and pest management plan prior to construction commencing which will require the mapping of existing weeds along the alignment, identification of appropriate site specific controls and identification of locations for temporary / permanent wheel wash facilities.
- Section 18 – Emergency Management and Response addresses spill, flood and bushfire management issues. In addition, further information is available in in Adani's Rail Safety Standard – Emergency Management (SEIS Volume 4, Appendix U) and Adani's Rail Bushfire Management Plan (SEIS Volume 4, Appendix S2).

13.4 Amendment to commitments

The Rail EMP describes each of the management and mitigation commitments identified by Adani.

14. References

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