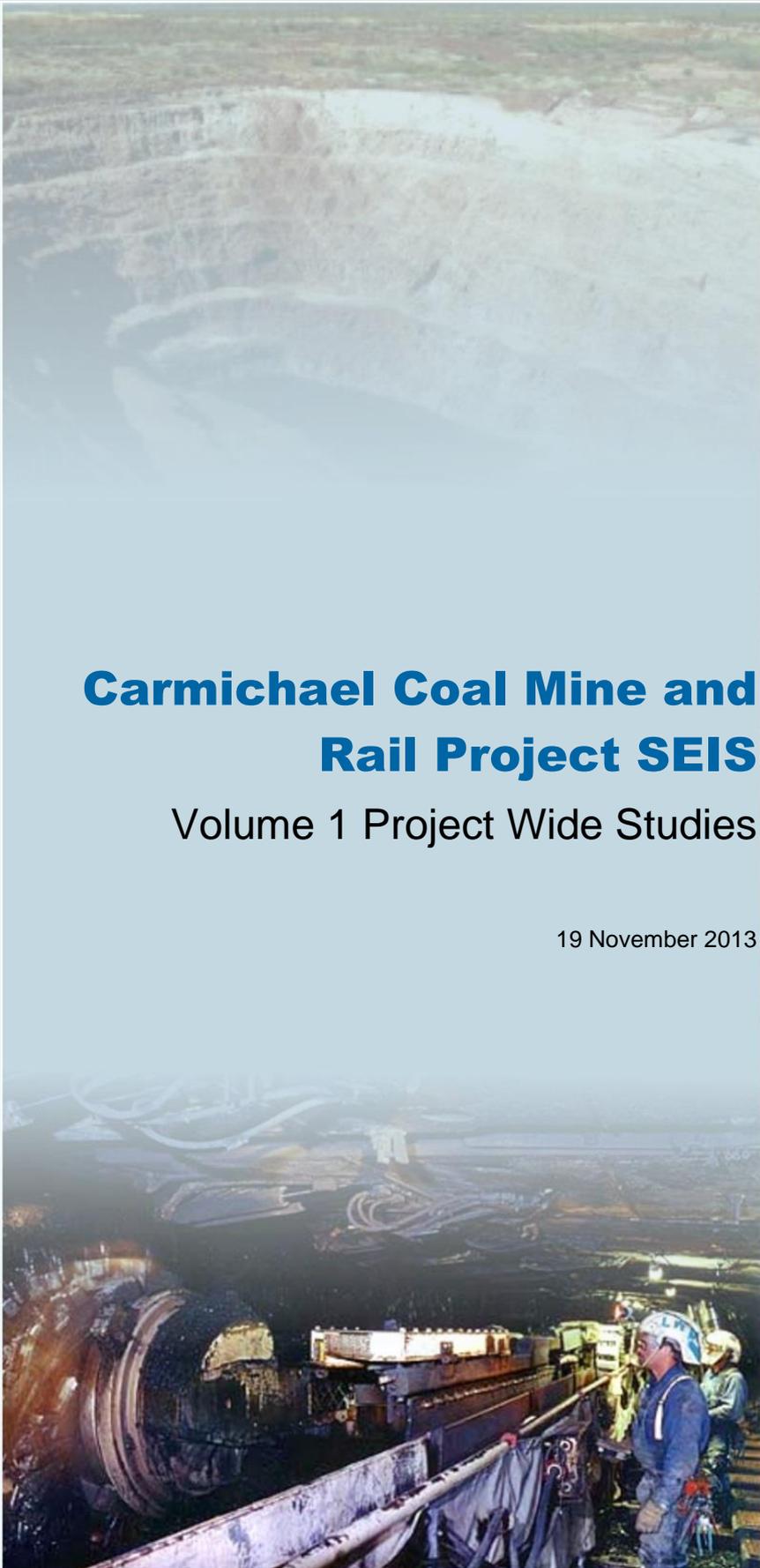
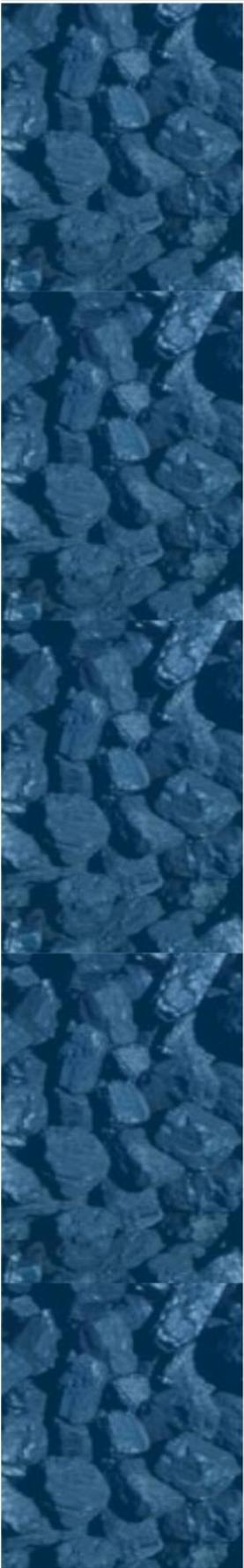




**Adani Mining Pty Ltd**

**adani**<sup>™</sup>



**Carmichael Coal Mine and  
Rail Project SEIS**

Volume 1 Project Wide Studies

19 November 2013





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# Abbreviations and glossary

## Project specific terminology

Abbreviation	Term
the SEIS	Carmichael Coal Mine and Rail Project Supplementary Environmental Impact Statement
the Proponent	Adani Mining Pty Ltd
the Project	Carmichael Coal Mine and Rail Project
the Project (Mine)	Carmichael Coal Mine and Rail Project: Mine Component
the Project (Rail)	Carmichael Coal Mine and Rail Project: Rail Component

## Symbols and units of measurement

Symbol / Unit	Definition
<	Less than
>	Greater than
100K	1:100,000 scale (in relation to geological mapping)
bcm	Bank Cubic Metres: a measure of volume representing a cubic metre of in-situ rock
bhp	Brake Horse Power
Bt	Billion tonnes
C	Carbon
CE	Control efficiency (%)
CEC	Cation Exchange Capacity
CH <sub>4</sub>	Methane
Cm	Centimetre(s)
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
CO <sub>2</sub> -e	Carbon dioxide equivalent emissions (emissions of other greenhouse gases are multiplied by their Global Warming Potential so that their effects can be compared to emissions of carbon dioxide)
CO <sub>2</sub> -e/y	CO <sub>2</sub> equivalent per year
0C	Degrees Celsius
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics.
dB(A)	Frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at very low and very high frequencies.
dS/m	Deci-Siemens per metre
EF <sub>i</sub>	Uncontrolled emissions factor for pollutant i (kg per activity)
E <sub>i</sub>	Emission rate of pollutant i (kg per activity)
EP	Equivalent persons
g/m <sup>3</sup>	Grams per cubic metre
GJ	Giga Joule
GJ/y	Giga Joules per year



Symbol / Unit	Definition
GL	Giga litre
GWh	Gigawatt hours
H	Horizontal
H <sub>2</sub>	Hydrogen
H <sub>2</sub> O	Water
H <sub>2</sub> S	Hydrogen sulphide
H <sub>2</sub> SO <sub>4</sub>	Sulphuric acid
ha	Hectare
HC	Hydrocarbon
HCl	Hydrochloric acid
HCO <sub>3</sub>	Bicarbonate
hrs	Hours
Hz	Hertz
K	Hydraulic Conductivity
kg	Kilogram
kg/ha	Kilogram per hectare
kL	Kilolitre
kL/day	Kilolitres per day
km	Kilometre
km/h	Kilometres per hour
km <sup>2</sup>	Square kilometre
Kph	Kilometres per hour
kVA	Kilovolt-ampere
L	Litre
L/s	Litres per second
L/sec	Litres per second
L/yr	Litres per year
LA <sub>1, 10, 90</sub>	A weighted noise levels exceeded 1%, 10% or 90% of the time
LA <sub>90</sub> (period)	The sound pressure level that is exceeded for 90 percent of the measurement period.
LA <sub>eq</sub> (period)	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
LA <sub>max</sub>	The maximum sound level recorded during the measurement period.
m	Metre
m AHD	Metres Australian Height Datum
m/d	Metres per day
m/s	Metres per second
m <sup>2</sup>	Square metres
m <sup>3</sup>	Cubic metres
mcg	Micrograms (10 <sup>-6</sup> grams)
Meq/100g	Milliequivalent per 100 grams
mg	Milligram
mg/kg	Milligrams per kilogram
mg/L	Milligrams per litre



Symbol / Unit	Definition
mg/m <sup>3</sup>	Micrograms per cubic metre
µg/L	Micrograms per litre
ML	Million litres or megalitre
ML/yr	Mega litre per year
mm	Micrometres
mm/day	Millimetres per day
Mm <sup>3</sup>	Million cubic metres
Mt	Million tonnes
Mtpa	Million tonnes per annum
µS/cm	Micro Siemens per centimetre (measure of electrical conductivity in water)
MW	Megawatt
MWh	Megawatt hour
Nm <sup>3</sup>	Normal Cubic Metre
NO <sub>2</sub>	Nitrogen dioxide
N <sub>2</sub> O	Nitrous Oxide
NO <sub>x</sub>	Oxides of nitrogen
O <sub>2</sub>	Oxygen
O <sub>3</sub>	Ozone
%	Percent
P	People
Peak particle velocity (PPV)	The maximum instantaneous particle velocity at a point during a given time interval in mm/s; A measure of the ground vibration magnitude
pH	Measure of acidity (<7) or alkalinity (>7) of a sample.
PM <sub>10</sub>	Particulate Matter less than 10 µm
PM <sub>2.5</sub>	Particulate Matter less than 2.5 µm
PM <sub>2.5</sub> and PM <sub>10</sub>	Particulate matter less than 2.5 or 10 microns
ROP	Resource operations plan
SF <sub>6</sub>	Sulphur hexafluoride
SO <sub>2</sub>	Sulphur dioxide
SO <sub>4</sub>	Sulphate
SWL	Standing water level
t	Tonne
TDS	Total dissolved solids (in relation to water quality)
TJ	Terajoules
tpa	Tonnes per annum
tph	Tonnes per hour
TSP	Total Suspended Particulates
U	Wind speed at the reference height of 10 m
UA	Unincorporated area
V	Speed of the train
V	Vertical when referring to slope angle or Volts when referring to power
yr	Year



## Acronyms

Acronym	Term
A	Activity data (units dependent on emission factors)
ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACH Act	Aboriginal Cultural Heritage Act 2003 (Qld)
AHD	Australian Height Datum
AMD	Acid and Metalliferous Drainage
ANFO	Ammonium nitrate fuel oil
ANRA	Australian Natural Resource Atlas
ANZECC	Australian and New Zealand Environment and Conservation Council
APCT	Abbot Point Coal Terminal
ARI	Average Recurrence Interval
AS/NZS	Australian Standards/New Zealand Standards
ASS	Acid Sulphate Soils
AusRivAS	Australian River Assessment System
AWS	Automatic Weather Station
BIBO	Bus-in/bus-out
BOM	Bureau of Meteorology
BPA	Biodiversity Planning Assessment
BPO	Barcaldine Post Office
BVC	Broad Vegetation Community
BVG	Broad Vegetation Group
CALMET	Atmospheric meteorological modelling system
CALPUFF	Gaussian puff modelling system for the simulation of atmospheric pollution dispersion distributed
CAMBA	Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment
CASA	Civil Aviation Safety Authority
CCD	Census Collection District
CEC	Cation Exchange Capacity
CEMP	Construction Environment Management Plan
CFI	Carbon Farming Initiative
CHMP	Cultural Heritage Management Plan
CHP	Coal Handling Plant
CHPP	Coal Handling Preparation Plan
CLR	Contaminated Land Register
CLU	Contaminated Land Unit
CN	Stony coal
CNG	Compressed natural gas
COD	Chemical oxygen demand
CoG	The Coordinator-General of the State of Queensland
CS	Claystone
CSIRO	Australian Government agency Commonwealth Scientific and Industrial Research Organisation



Acronym	Term
CTRC	Charters Towers Regional Council
DEM	Digital Elevation Model
DEU	Desert Uplands
DIDO	Drive-in/drive-out
DMC	Dense Medium Cyclone
DO	Dissolved oxygen
DEHP	Department of Environment and Heritage Protection
DNRM	Department of Natural Resource Management
DSDIP	Department of State Development, Infrastructure and Planning
DSEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
EA	Environmental Authority
EF	Emission factor
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMR	Environmental Management Register
EMS	Environmental Management System
EP Act	Environmental Protection Act 1994 (Qld)
EP Regulation	Environmental Protection Regulation 2008
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)
EPC	Exploration Permit for Coal
EPCA	Exploration Permit for Coal Application
EPP	Environment Protection Policy
ERA	Environmentally Relevant Activities
ESA	Environmentally Sensitive Area
ESCP	Erosion and Sediment Control Plan
ESP	Exchangeable Sodium Percentage
FIFO	Fly-in/fly-out
FullICAM	Full Carbon Accounting Model
GAB	Great Artesian Basin
GDP	Gross Domestic Product
GGE	Greenhouse Gas Emissions
GHG	Greenhouse gas
GHG Protocol	The Greenhouse Gas Protocol, A Corporate Accounting and Reporting Standard
GIS	Geographic Information Systems
GMA	Groundwater management area
GMU	Groundwater management unit
GPS	Global Positioning System
GPT	Gross Pollutant Trap
GQAL	Good Quality Agricultural Land
GRP	Gross Regional Product
GSP	Gross State Product



Acronym	Term
HES	High Ecological Significance
HIPAP	Hazardous Industry Planning Advisory Paper
IAP2	International Association of Public Participation
IAS	Initial Advice Statement
IECA	International Erosion Control Association
ILUA	Indigenous Land Use Agreements
IRC	Isaac Regional Council
IRR	Internal Rate of Return
ISO	International organisation for standardisation
IUCN	International Union for the Conservation of Nature
JORC	Joint Ore Reserves Committee
LGA	Local Government Area
MDL	Mining Development Licence
ML	Mining Lease
MLA	Mining Lease Application
Matters of NES	Matters of National Environmental Significance
NAF	Non Acid Forming
NATA	National Association of Testing Authorities
NPI	National Pollutant Inventory
NPR	Net Potential Ratio
NPV	Net Present Value
NRM	Natural Resource Management
NTA	Native Title Agreement
OCM	Open Cut Mine
OESR	Office of Economic and Statistical Research
OH&S	Occupation Health and Safety
PAF	Potentially Acid Forming
PAWC	Plant Available Water Capacity
PFCs	Perfluorocarbons
PFS	Pre-feasibility Study
PHA	Preliminary Hazard Analysis
PHIDU	Public Health Information Development Unit
PIFU	Planning, Information and Forecasting Unit
PM	Particulate matter (fine dust)
PMF	Probable Maximum Flood
PSU/NCAR	Pennsylvania State University/National Center for Atmospheric Research
QBOP	Queensland Biodiversity Offset Policy (QBOP)
QWQG	Queensland Water Quality Guidelines 2009
RE	Regional Ecosystem
REDD	Regional Ecosystem Description Database
REs	Regional Ecosystems
RESS	Rechargeable Energy Storage System
RL	Reduced Level
RLRPA	Regional Landscape and Rural Production Area



Acronym	Term
ROKAMBA	Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds
ROM	Run-Of-Mine
SCL	Strategic Cropping Land
SDPWO Act	State Development and Public Works Organisation Act 1971 (Qld)
SEIFA	Socio-Economic Index for Areas
SIA	Social Impact Assessment
SIAU	Social Impact Assessment Unit
SIMP	Social Impact Assessment Management Plan
SLA	Statistical Local Area
SPP	State Planning Policy
SRN	Stock Route Network
TAPM	The Air Pollution Model
TC	Tropical Cyclone
TCLP	Toxic Characteristic Leaching Potential
TEC	Threatened Ecological Community
TLO	Train Load-out
ToR	Terms of Reference
TSS	Total suspended solids
TSSC	Threatened Species Scientific Committee
VKT	Vehicle Kilometre Travelled
WHO	World Health Organisation
WONS	Weeds of National Significance
WQO	Water Quality Objectives
WRC	Whitsunday Regional Council
WRP	Water Resource Plan



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# 1. Introduction

## 1.1 Project overview

Adani Mining Pty Ltd (Adani, the Proponent), commenced an Environmental Impact Statement (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 (GBRMP) (sections 24B & 24C)
- Protection of water resources (sections 24D & 24E).

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* (SDPWO Act), which is administered by the Qld Government's Department of State Development, Infrastructure and Planning (DSDIP).

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.

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 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 from the Mine site running west to east to Diamond Creek.
  - Rail (east): a 69 km narrow gauge portion running east from Diamond Creek connecting to the Goonyella rail system south of Moranbah.
  - Quarries: The project will require a significant amount of quarry material and it is proposed to extract the material from five quarries in the region. The material will be used for upgrade and maintenance works on existing infrastructure and the construction of new infrastructure.

Figure 1 provides an overview of the project location.

The EIS was made available for public comment and review from 15 December 2012 through to 11 February 2013. In response, a total of 14,464 submissions were received on the EIS. These submissions comprised 68 unique submissions from advisory agencies, organisations, landholders (mine and rail) and private submitters. The additional 14,396 submissions were online facilitated submissions. A breakdown and analysis of the submissions is provided in Chapter 2 of the SEIS report.

## 1.2 Purpose of the Supplementary EIS

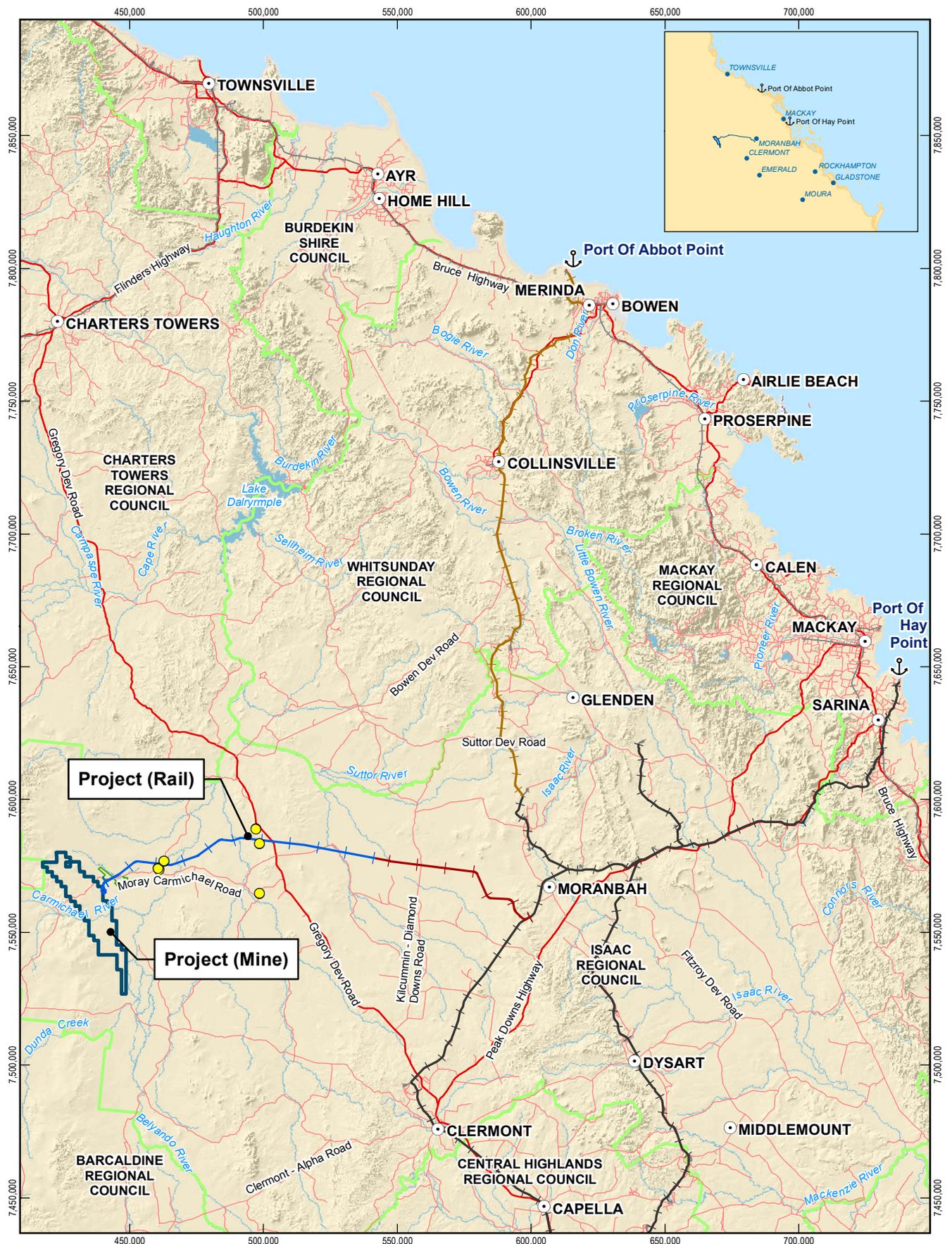
This Supplementary EIS (SEIS) report has been prepared in response to the submissions made on the EIS and includes additional information related to amendments made to the Project description since the release of the EIS. Additional studies were also undertaken as part of the SEIS in response to key submissions and are included in the SEIS as supporting information.

Updated Project projections are summarised in Table 1.

**Table 1 Updated project projections**

Project Overview	EIS	SEIS
Mine life	90 years	60 years
Capital Investment for the life of the Mine	21.5 billion Australian dollars	16.5 billion Australian dollars
Commencement dates	Construction: 2013 Operation: 2015	Construction: 2014 Operation: 2016
Jobs	3,700 peak (combined Mine and Rail), year 2015 Peak construction: 1,150 (Mine), 1,300 (Rail) Peak operation: 3,000 (Mine), 120 (Rail)	4,150 peak (combined Mine and Rail), year 2016 Peak construction: 1,075 (Mine), 1,400 (Rail and Quarries) Peak operation: 3,800 (Mine), 120 (Rail)

Further information on the Project description is provided in Section 3 of this document.



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

Based on or contains data provided by the State of QLD (DNRM) (2013). In consideration of the State permitting use of this data you acknowledge and agree that the State gives no warranty in relation to the data (including accuracy, reliability, completeness, currency or suitability) and accepts no liability (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for marketing or be used in breach of the privacy laws.



**Adani Mining Pty Ltd**  
Carmichael Coal Mine and Rail Project SEIS

Job Number | 41-26422  
Revision | 2  
Date | 14-10-2013

**Project Location**

**Figure 1**



### 1.3 Structure of the SEIS

The structure of this SEIS report consistent with the EIS outline as provided in Table 2.

**Table 2 Structure of the SEIS report**

Section	Section Title	Details
Volume 1	Project Wide	
1	Introduction (this section)	Provides an overview of the Project, the EIS and SEIS process and the purpose and structure of the SEIS report.
2	Overview of Submissions	Provides details and analysis of the submitters (advisory agencies, organisations, landholders and private submitters) and an outline of the key issues raised.
3	Project Description	Provides an overview of the Project and key amendments since the EIS report.
4	Approvals	Provides a description of the approvals framework and highlights changes to legislation since the lodgement of the EIS.
5	Social Impact Assessment and Social Impact Management Plan	Provides a response to the key issues raised on social matters and revised impact assessment. Highlights key amendments to the revised Social Impact Management Plan (SIMP) as response to submissions.
6	Indigenous and Non Indigenous Cultural Heritage	Provides a response to the issues raised on Indigenous and non-Indigenous cultural heritage matters.
7	Economics	Provides a response to the key issues raised on economic matters and highlights outcomes of the revised economic assessment.
8	Cumulative Impacts	Provides a response to the key issues raised on cumulative impact matters.
9	Offsets Strategy	Provides an overview of key issues raised on offsets and additional information through the revised Offsets Strategy Report.
10	Project Commitments	Provides an overview of Project Commitments and highlights changes to the Revised Project Commitments Report.
11	Matters of National Environmental Significance	Provides an overview of key issues raised on Matters of National Environmental Significance (MNES), and additional information from studies undertaken at the SEIS.
Volumes 2 and 3	Mine and Rail	Both volumes reflect the outline provided below
1	Introduction	Provides a synopsis of Volume layout.
2	Project Description	Highlights key amendments to the Project Description since the EIS report.
3	Climate, Natural Hazards and Climate Change	Provides a response to the key issues raised on climate, natural hazard and climate change.
4	Land	Provides a response to the key issues raised on land matters and additional work undertaken post EIS for the rail.
5	Nature Conservation	Provides an overview and response to key issues raised on nature conservation in addition to findings of additional ecological studies undertaken post EIS.



Section	Section Title	Details
6	Water Resources	Provides an overview of key issues and response to key issues raised on water resources in addition to findings of additional water studies undertaken post EIS for both mine and rail.
7	Air Quality	Provides a response to the key issues raised on air quality and an overview of the revised air quality modelling.
8	Greenhouse Gas Emissions	Provides a response to the key issues raised on greenhouse gas matters and highlights outcomes of the greenhouse gas emissions assessment for the mine.
9	Noise and Vibration	Provides a response to the key issues raised on noise and an overview of the revised noise modelling and the new noise modelling for the airport.
10	Waste	Provides a response to the key issues raised on mine, general and hazardous waste and an overview of the additional mine waste studies undertaken post EIS.
11	Transport	Provides a response to the key issues raised on transport and highlights additional work undertaken on transport impact assessment.
12	Hazard and Risk	Provides a response to key issues raised on hazard and risk.
13	Environmental Management Plans	Provides an overview of key issues raised on the Environmental Management Plans (EMPs) and response to the key issues through the revised EMPs (mine, offsite and rail).
Volume 4	Appendices	
A	Submissions Register	Complete register of submissions including responses to individual items and cross references to sections of the SEIS.
B	Updated Mine Project Description	Revised version of the EIS Volume 2 – Section 2 Project Description (Mine).
C1	Project Approvals Report	Revised version of the EIS Volume 4 – Appendix D Project Approvals and Planning Assessment Report.
C2	Mine Applications	Documentation to support mine approvals.
C3	Rail Applications	Documentation to support rail approvals.
C4	Offsite Applications	Documentation to support offsite infrastructure approvals.
C5	Quarry Applications	Documentation to support offsite infrastructure approvals.
C6	Proposed Draft Approvals Report	Draft Model Conditions Report for the Project.
D1	Revised Social Impact Assessment Report	Revised version of the EIS Volume 4 – Appendix F Social Impact Assessment Report.
D2	Draft Social Impact Management Plan	Revised version of the EIS Volume 4 – Appendix G Social Impact Management Plan.
E	Economic Assessment Report	Revised version of the EIS Volume 4 – Appendix H Economic Assessment Report.
F	Environmental Offset Strategy Report	Revised version of the EIS Volume 4 – Appendix AH Environmental Offsets Strategy Report.
G	Project Commitments	Revised version of the EIS Volume 1 – Section 10 Project Commitments
H	Matters of National Environmental	Revised version of the EIS Volume 4 – Appendix J Matters of National Environmental Significance report



Section	Section Title	Details
	Significance Report	
I1	Revised Subsidence Assessment Report	Report identifying results of subsidence levels from the underground mining activities.
I2	Draft Subsidence Management Plan	Management plan identifying key impacts from subsidence and measures for control and mitigation.
J1	Updated Mine Ecology Report	Revised impact assessment and mitigation measures relevant to impacts on ecological values.
J2	Black-Throated Finch On-Site Monitoring Survey Report	Report highlighting results of the Black-Throated Finch (BTF) surveys undertaken post EIS and the plans to manage the BTF populations during the construction and operation of the Project (Mine).
J3	Doongmabulla and Mellaluka Springs Report	Report highlighting results of the additional ecological surveys undertaken at the Doongmabulla and Mellaluka springs.
J4	Population Survey of the Waxy Cabbage Palm Report	Report highlighting results of the targeted Waxy Cabbage Palm survey.
J5	Offsite Infrastructure Ecological Assessment Report	Report highlighting results of the ecological surveys undertaken on the Project (Offsite).
J6	Offsite Infrastructure BioCondition Assessment Report	Report highlighting results of the BioCondition assessment on the Project (Offsite) to support Offsets Strategy Report.
J7a	Offsite Infrastructure PMAV Report	Property PMAV detailing outcomes of field verification at the Project (Offsite).
J7b	Offsite Infrastructure PVMP Report	Property Vegetation Management Plan to support clearing at the Project (Offsite).
J8	Great Barrier Reef Wetland Protection Areas Report	Report highlighting results of the ecological assessment undertaken at the three Wetland Protection Areas within the Project.
J9	Adani Quarries Environmental Impact Review	Review to identify and assess the potential environmental impacts of the construction and operation of the five project quarries upon MNES.
K1	Mine Hydrogeology Report	Report highlighting outcomes of the revised groundwater modelling based on the amended mine plan. Includes comments provided by peer reviewer.
K2	Water Balance Report	Report highlighting outcomes of the GoldSim water balance modelling and includes comments provided by peer reviewer.
K3	Mine Water Quality Report	Report highlighting results of surface water quality monitoring.
K4	Flood Mitigation and Creek Diversion Design Report	Report highlighting outcomes of mine flood modelling.
K5	Updated Mine Hydrology Report	Report highlighting revised impact assessment and mitigation measures for flood related impacts.
K6	Mine Hydrogeology Report Addendum	Report providing supporting information for Appendix K1 on sensitivity analysis, connectivity to the Greater Artesian Basin, groundwater flow direction and other matters.
K7	Numerical Groundwater Model	Peer review undertaken by URS Pty Ltd of the numerical groundwater model.



Section	Section Title	Details
	Peer Review	
K8	Groundwater Model Peer Review Comments	Response to URS groundwater model peer review.
L	Revised Mine Air Quality Assessment Report	Revised version of the EIS Volume 4 – Appendix S Air Quality Assessment Report, highlighting outcomes of the revised air quality modelling based on the amended mine plan and rail.
M	Greenhouse Gas Emissions Report	Revised version of the EIS Volume 4 – Appendix T Greenhouse Gas Emissions Report.
N	Updated Noise and Vibration Assessment Report	Revised version of the EIS Volume 4 – Appendix U Noise and Vibration Report highlighting outcomes of the revised noise and vibration modelling based on the amended mine plan and rail. It also incorporates the airport noise and vibration assessment.
O1	Mine Waste Characterisation Report	Report highlighting results of the additional mine waste characterisation studies post EIS.
O2	Mine Waste Management Strategy	Report considering options for managing tailings and mine waste during operation of the Mine.
O3	Landform Design Study Report	Report assesses the potential stability of proposed waste landforms.
P	Traffic Impact Assessment Report	Transport Impact Assessment taking into consideration the refined mine plan and changes to the project description.
Q1	Environmental Management Plan - Mine	Revised version of the EIS Volume 2 – Section 13 Environmental Management Plan – Mine.
Q2	Environmental Management Plan - Offsite	Revised version of the EIS Volume 2 – Section 14 Environmental Management Plan – Offsite.
R1	Mine Closure and Rehabilitation Strategy	Draft Closure and Rehabilitation Strategy for the Project (Mine).
R2	Offsite Closure and Rehabilitation Strategy	Draft Closure and Rehabilitation Strategy for the Project (Offsite).
S1	Rail Hydrology Report	Report highlighting outcomes of the flooding along the Project (Rail).
S2	Bushfire Management Plan	Procedure highlighting management measures in the event of a bushfire along the Project (Rail).
T1	Strategic Cropping Land Assessment Report	Report highlighting results of the historical strategic cropping land assessment along the Project (Rail) corridor.
T2	Rail Soil Survey Methodology	Methodology for conducting soil surveys along the Project (Rail) corridor.
U	Fauna Crossing Strategy	Report highlighting strategy for fauna crossings along the Project (Rail).
V	Emergency Management Plan	Procedure highlighting management measures in the event of emergencies associated with the Project (Rail).
W	Environmental Management Plan -	Revised version of the Volume 3 – Section 13 Environmental Management Plan – Rail.



Section	Section Title	Details
	Rail	
X1	Preliminary Closure and Rehabilitation Strategy – Rail	Draft Closure and Rehabilitation Strategy for the Project (Rail)
X2	Preliminary Closure and Rehabilitation Strategy – Quarries	Draft Closure and Rehabilitation Strategy for the Project (Quarries)

#### **1.4 Note to reader**

To review responses against submissions, the reader is directed to the Submissions Register in Volume 4, Appendix A, which will either provide a direct response or will guide the reader to the relevant sections of the SEIS for the response.



## 2. Overview of submissions

### 2.1 Summary of submission process

This section of the SEIS provides an overview of the submissions received on the EIS with regards to category of respondent, format of submissions and key issues raised.

A total of 68 unique submissions and 14,396 online facilitated submissions were received on the EIS during the public notification period (December 2012 – February 2013). Submissions were sorted into four categories: advisory agency, organisation, landholder and private. Each submission was reviewed to identify the nature of comments made and categorised according to the relevant EIS section, appendix or a technical area (e.g. groundwater, ecology, air quality).

The Office of the Coordinator-General provided direction to Adani on response to individual issues raised in the submissions. Due to the recurrence of issues, Adani and the OCG agreed to address these recurring key issues within the SEIS report. Responses to individual matters were still provided within the Submissions Register (Volume 4 Appendix A). Details of respondents are provided in the sections that follow.

### 2.2 Summary of submitters

#### 2.2.1 Advisory agency submissions

A total of 30 submissions were received from 19 different advisory agencies, including one Commonwealth government department, 15 Queensland government departments and three local governments. Table 3 lists the advisory agency respondents who provided submissions on the EIS in alphabetical order by agency name.

Advisory agency submissions were received in a number of formats including letters, submission forms and emails or a combination of formats. Submissions using the submission form format were most common, with 48 percent of advisory agency respondents solely using this format. An additional 31 percent used the submission form in combination with other formats.

**Table 3** Details of advisory agencies respondents

Advisory agency	Representative Details		Format
	Surname	First name	
Department of Agriculture, Fisheries and Forestry (DAFF)- Forestry	Letts	Malcolm	Letter and submission form (table)
DAFF- Industry and Planning Services	Letts	Malcolm	Letter and submission form
DAFF- Biosecurity Qld	Letts	Malcolm	Letter and submission form
DAFF- Fisheries	Letts	Malcolm	Letter and submission form
Department of Aboriginal and Torres Strait Islander and Multicultural Affairs (DATSIMA)	Best	Debbie	Letter and submission form
Department of Communities, Child Safety and Disability Services (DCCSDS)	Quirk	Judith	Email



Advisory agency	Representative Details		Format
	Surname	First name	
Department of Community Safety (DCS)- Corporate Service- Policy	Sinnemann	Christina	Submission form
DCS- Queensland Ambulance Service (QAS)	Cunington	James	Submission form
DCS- Queensland Fire and Rescue Service (QFRS)- Central Region	Macrae	Ross	Submission form
DCS- QFRS- Major Development Unit	Kahler	Mark	Submission form
Department of Environment and Heritage Protection (DEHP)	Delzoppo	Lindsay	Letter and submission form
Department of Education, Training and Employment (DETE)- Skills and Employment	NA	NA	Memorandum
Department of Energy and Water Supply (DEWS)	Sheraton	Mardi	Letter and submission form
Department of Housing and Public Works (DHPW)	Allen	Mark	Submission form
Department of Natural Resources and Mines (DNRM)	Wirth	Jacki	Letter, submissions form and supporting documentation
Department of State Development, Infrastructure and Planning (DSDIP)- Regional	Hoban	Michelle	Submission form
DSDIP- Industry Development Unit	Adams	Geoff	Submission form
Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC)	Cully	Emma	Letter
Department of Transport and Main Roads (DTMR)- Freight, Ports and Governance	Colclough	Damian	Submission form
DTMR- Planning Management	Moffat	Anne	Letter
DTMR- Program Delivery and Operations Division- Barcaldine	Pfingst	John	Submission form
DTMR- Program Delivery and Operations Division- Mackay	Pinkney	Daniel	Submission form
DTMR- Program Delivery and Operations Division- Townsville	Turner	Gina	Submission form
Isaac Regional Council (IRC)	Dodds	Terry	Letter
Mackay Regional Council (MRC)	Ackerman	Jaco	Letter
Qld Health (QH)	Dwyer	Sophie	Letter and submission form
Qld Police Service (QPS)	Hutchison	Ian	Submission form
Qld Treasury and Trade (QTT)	Thompson	James	Email
Skills Queensland (SQ)	Miller	Neil	Submission form
Whitsundays Regional Council (WRC)	Nant	Jane	Submission form



### 2.2.2 Organisation submissions

Sixteen submissions were received from organisations on the EIS. Table 4 lists the organisation respondents who provided submissions on the EIS in alphabetical order by organisation name.

Submissions received from organisations consisted of letters, memorandums, reports or submission forms. Nine submissions were received in the submission form (~ 50 percent) either with or without supporting documentation. Additionally, four memorandums (25 percent), three letters (19 percent) and one report (6 percent) were also received.

**Table 4 Details of organisation respondents**

Organisation	Representative Details		Format
	Surname	First name	
Asia Pacific Strategy (APS)	Koerner	R.J.	Letter with supporting documentation
Aurizon Operations Limited (AOL)	Moutafis	James	Submission form
Birdlife Southern Qld (BLSQ)	Gillman	Sheena	Letter
Black-throated Finch Recovery Team (BTFRT)	Grice	A.C.	Memorandum and submission form
Chalk and Fitzgerald Lawyers and Consultants	Chalk	Andrew	Letter, submission form and supporting documentation
Coast and Country Association of Qld Inc (CCA)	Davies	Derec	Letter, submission form and supporting documentation
Doctors for the Environment Australia (DEA)	Shearman	David	Submission form and report
Economists at Large (EAL)	Campbell	R	Report
Greenpeace (GP)	Woods	Georgina	Memorandum
Hoch and Wilkinson Livestock and Property Pty Ltd (CM)	Moriarty	Carolyn	Submission form
Lock the Gate Alliance (LTGA)	Smith	Eleanor	Memorandum
Mackay Conservation Group (MCG)	Julien	Patricia	Memorandum
Macmines Austasia Pty Ltd (MAPL)	Phillips	Russell	Letter, submission form and supporting documentation
North Queensland Conservation Council (NQCC)	Tubman	Wendy	Memorandum
Powerlink Qld (PQ)	Mulherin	Garry	Letter
Townsville Enterprise Limited (TE)	Morris	Matt	Submission form

### 2.2.3 Landholder (Mine and Rail) submissions

A total of 17 submissions were received from landholders (within the mine or rail alignment) on the EIS, three within the mine and 15 along the rail alignment) who provided submissions on the EIS. Emanate Legal made submissions on behalf of 12 landholders along the rail corridor.

The 17 submissions received from landholders were in letter or submission form format. The letters from Emanate Legal, which were submitted on behalf of 12 landholders, had several supporting documents attached including a report, a privacy act authority and maps of the rail corridor and property. Submissions in letter format with supporting documentation were the most common with 13 landholders (76 percent) choosing this format.



### 2.2.4 Private submissions

Fourteen submissions were received from private respondents on the EIS. The majority of these submissions were in the submission form format, however, letter, email and memorandum style formats were also used with supporting documentation.

### 2.2.5 Online Facilitated Submissions

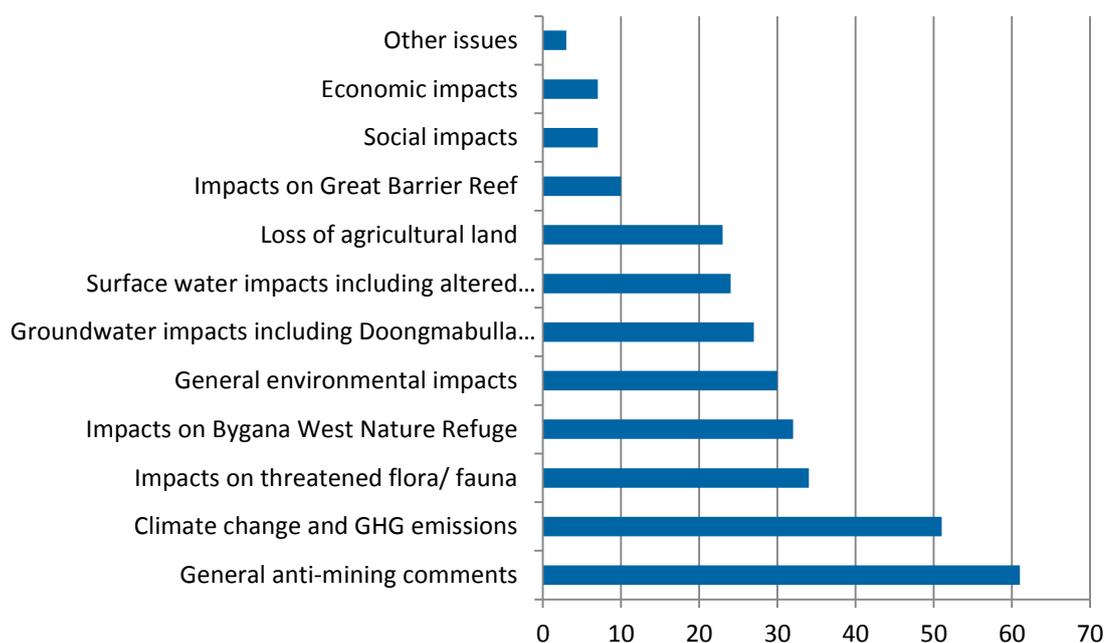
A total of 14,396 online facilitated submissions were received on the Project EIS. These submissions were coordinated and compiled by activist websites such as Get Up! Australia. Several thousands of the online facilitated submissions were identical, with submitters encouraged to share the 'make a submission' page of the website via social media outlets including Facebook and Twitter. An additional 584 online facilitated submissions were received after the submission period formally closed (5pm, 11 February 2013). These submissions were considered to raise the same issues as the online facilitated submissions received within the submission period and were therefore not included.

#### *Analysis of online facilitated submissions by issue*

The 14,396 online facilitated submissions were reviewed and categorised according to the issues raised. General anti-mining comments consisted of the key issue raised (20 percent), followed closely by climate change and greenhouse gas emissions (17 percent), impacts to threatened flora/fauna such as BTF, waxy cabbage palm and koala (11 percent) and impacts to the Bygana West Nature Refuge and other general environmental impacts (10 percent). The online facilitated submissions also touched on impacts to groundwater (9 percent), surface water (8 percent), loss of agricultural land (7 percent), impacts to the Great Barrier Reef, social and economic impacts.

Figure 2 provides a breakdown of the issues raised in the online facilitated submissions.

**Figure 2 Breakdown of comments in online submissions**



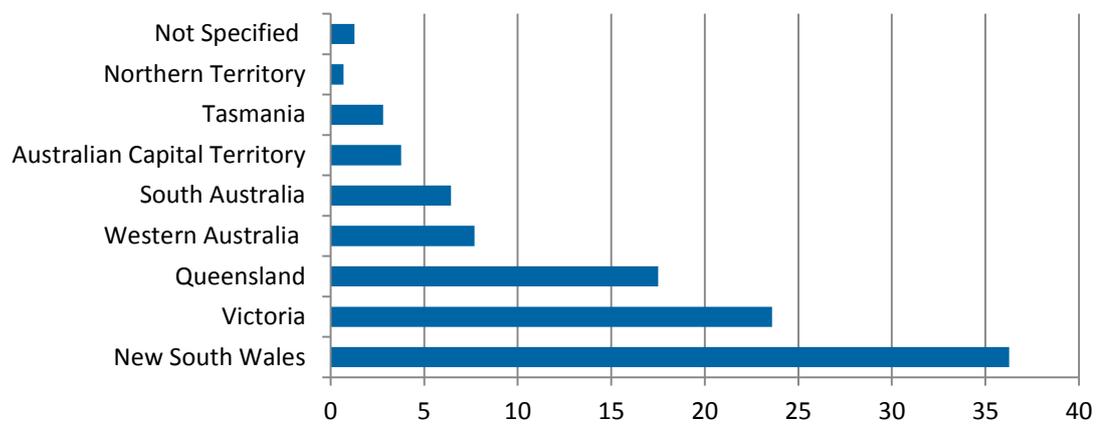


### Analysis of online facilitated submissions by geography

The majority of online facilitated submissions provided details of the state and postcode of the submitter. It is interesting to note that the main submitters were from New South Wales (36 percent), while submitters from Victoria occupied the next group (24 percent) and submitters from Queensland were third (17 percent).

Figure 3 provides a breakdown of the submissions received from each state and territory.

**Figure 3 Breakdown of on line submissions by State or Territory**



### 2.3 Key comments in submissions

The key comments identified in the submissions are categorised accordingly:

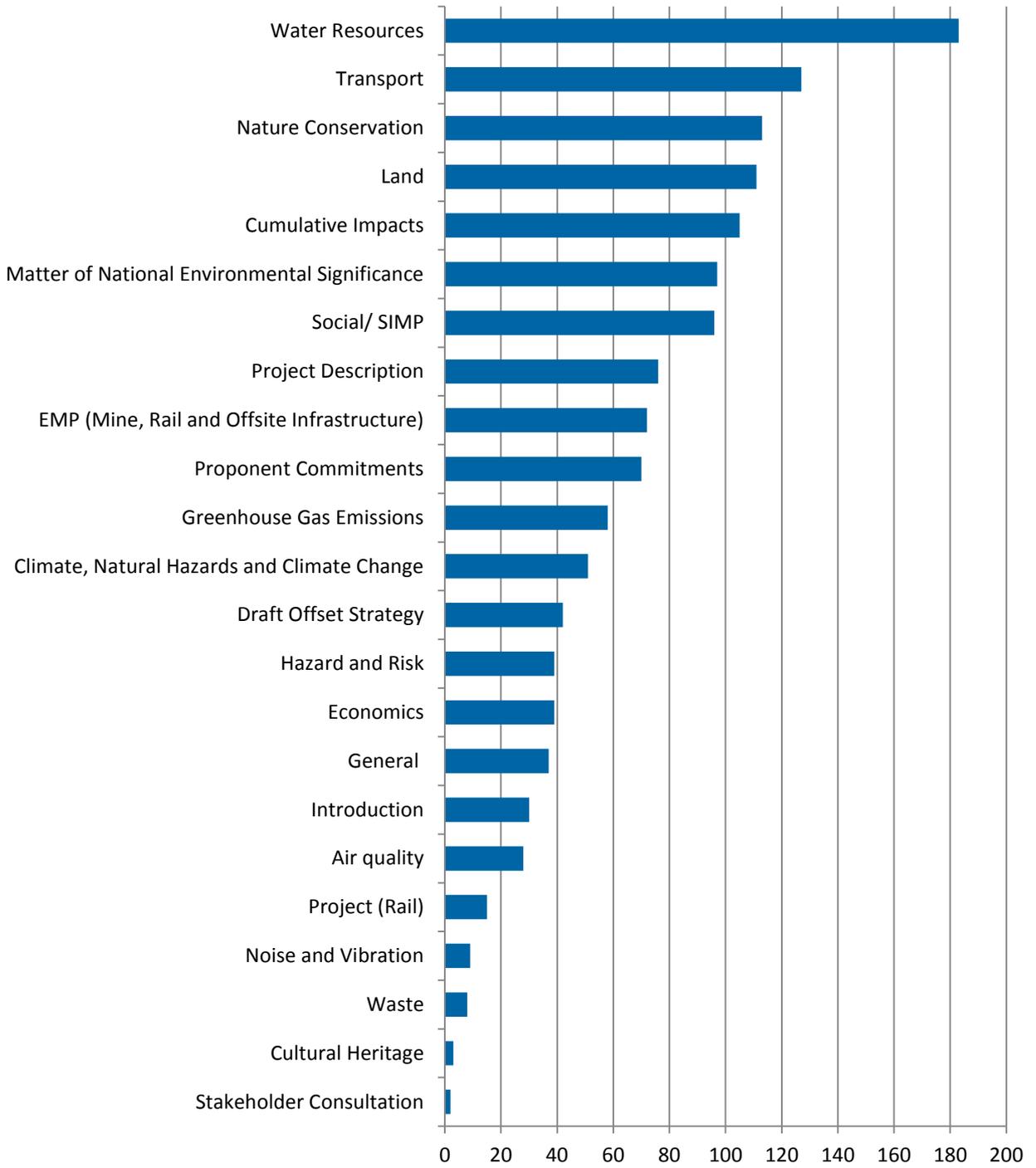
- Impacts on water resources including groundwater, surface water and water balance (13 percent)
- Impacts on transport (9 percent)
- Impacts on nature conservation and land (8 percent each)
- Impacts on MNES, social impacts and cumulative impacts (7 percent each)
- Environmental Management Plans, Project Commitments and Project Description (5 percent each)
- Remaining issues related to greenhouse gas emissions, climate related issues, offsets, hazard and risk, economics, air, noise, waste, cultural heritage and stakeholder consultation (26 percent total).

Figure 4 provides a breakdown of the submissions by categories.

Table 5 provides a breakdown of the key themes across all submission received and a cross reference to sections within the SEIS where these comments have been addressed.



**Figure 4 Breakdown of comments from submissions**





**Table 5 Key theme breakdown and cross-reference to section in the SEIS**

Key themes raised	Percent (%)	Cross Reference to section in the SEIS		
		Project Wide	Mine	Rail and Quarries
Water resources (groundwater, surface water and water balance)	13		Volume 2 Section 6 Volume 4 Appendices K1, K2, K3, K4, K5 & K6	Volume 3 Section 6 Volume 4 Appendix S1
Transport	9		Volume 2 Section 11 Volume 4 Appendix P	Volume 3 Section 11 Volume 4 Appendix P
Nature Conservation	8		Volume 2 Section 5 Volume 4 Appendices J1, J2, J3, J4, J5, J6, J7 & J8	Volume 3 Section 5 Volume 4 Appendix J9 & U
Land	8		Volume 2 Section 4 Volume 4 Appendices I1, I2, O1, O2, O3	Volume 3 Section 4 Volume 4 Appendices T1 & T2
MNES	7	Volume 1 Section 11 Volume 4 Appendix H		
Social Impacts	7	Volume 1 Section 6 Volume 4 Appendix D1 & D2		
Cumulative impacts	7	Volume 1 Section 8		
Environmental Management Plans	5		Volume 2 Section 13 Volume 4 Appendices Q1, Q2, R1 & R2	Volume 3 Section 13 Volume 4 Appendix W, X1 & X2
Project Commitments	5	Volume 1 Section 10 Volume 4 Appendix G		
Project Description	5	Volume Section 3	Volume 2 Section 2 Volume 4 Appendix B	Volume 3 Section 2
Greenhouse Gas Emissions	4		Volume 2 Section 8 Volume 4 Appendix M	Volume 3 Section 8
Climate, Natural Hazards and Climate Change	4		Volume 2 Section 3 Volume 4 Appendix K4	Volume 3 Section 3 Volume 4 Appendices S1, S2 & V
Offsets	3	Volume 1 Section 9 Volume 4 Appendix F		
Hazard and risk	3		Volume 2 Section 12	Volume 3 Section 12 Volume 4 Appendix S2 & W
Economics	3	Volume 1 Section 7 Volume 4 Appendix E		
General	3	Across all volumes	Across all volumes	Across all volumes
Air	2		Volume 2 Section 7 Volume 4 Appendix L	Volume 3 Section 7 Volume 4 Appendix C5
Introduction	2	Volume 1 Section 1	Volume 2 Section 1	Volume 3 Section 1
Noise	0.5		Volume 2 Section 9 Volume 4 Appendix N	Volume 3 Section 9 Volume 4 Appendix C5



Key themes raised	Percent (%)	Cross Reference to section in the SEIS		
		Project Wide	Mine	Rail and Quarries
Project (Rail)	0.5			Volume 3 Section 2 Volume 4 Appendix C3
Waste	0.5		Volume 2 Section 10 Volume 4 Appendices O1, O2 & O3	Volume 3 Section 10
Cultural heritage	0.25	Volume 1 Section 6		
Stakeholder consultation	0.25	Volume 1 Section 5 Volume 4 Appendices D1 & D2		



## 3. Project description

### 3.1 Introduction

Adani Mining Pty Ltd (Adani, the Proponent), commenced an Environmental Impact Statement (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 (GBRMP) (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* (SDPWO Act), which is administered by the Qld Government's Department of State Development, Infrastructure and Planning (DSDIP).

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.

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 (5) local quarries to extract quarry materials for construction and operational purposes.

### **3.2 Amendments to project description**

Amendments to project description (Mine, Offsite and Rail) are listed below and discussed individually in more detail in Volume 2 Section 2 (Mine and Offsite), Volume 4 (Appendix B Mine) and Volume 3 Section 2 (Rail).

Mine:

- Revision of mine stage planning
- Consolidation of open cut pits from 16 pits (Pit A through Pit P) to 6 pits (Pit B through Pit G)
- Revision of underground mining and increase to five underground areas
- Separation and distribution of central MIA into five multiple, smaller MIAs

Offsite infrastructure:

- Adjustment of accommodation camp aspect
- Relocation of the airport south of Moray Carmichael Road
- Consolidation of two raw water supply pipelines (Belyando River and Obungeena Creek)
- Realignment of consolidated water supply pipeline to Project (Rail) corridor
- Removal of in-stream storages on North and Obungeena Creeks
- Removal of offsite bore fields and associated pipelines.

Rail:

- Rail balloon realignment
- Relocation of construction camps
- Amendments in laydown areas
- Location of Construction Depot
- Realignment of Rail Line on Goodoowada and Elgin Downs Property
- Quarries

### **3.3 Updates to studies**

A number of studies have been undertaken since the release of the EIS. These are listed and addressed in relevant sections of the SEIS.



### 3.4 Updates on consultation since the EIS

Adani has continued consultation with agencies following submission of the EIS as indicated in Table 6 below. An update on social consultation is provided separately in the revised SIA (SEIS Volume 4, Appendix D1).

**Table 6 Consultation summary since the EIS**

Agency	Date	Attendees	Purpose
QPS	23 March 2013	QPS and Adani	Discuss agency submissions and key issues and actions: resourcing, mine site facilities, wide load escort vehicles and communications
DEHP	27 March 2013	DEHP, OCG and Adani	General discuss submissions on the EIS
DTMR	8 April 2013	DTRM, OCG and Adani	Discuss submissions on the EIS
IRC working group	9 April 2013	IRC, OCG, Adani	Discuss mine worker accommodation village and other matters raised in the submission (power, dust, flooding, waste disposal, traffic, disaster management, weeds)
DATSIMA	22 April 2013	DATSIMA and Adani	Discuss agency submissions and key issues and actions: initiatives and partnerships, performance indicators, Traditional Owners and ILUA, Workforce Management and Training
DNRM	26 July 2013	DNRM, OCG, GHD, Adani	Discuss DNRM submissions to EIS Present Groundwater and Surface water analysis for the SEIS.
Various	18 September 2013	DEHP, DNRM, DotE, OCG, GHD and Adani	Discuss groundwater specific issues
IRC working group	14 October 2013	IRC, DSDIP and Adani	Discussion on quarries (applications and landholder agreements), and local roads (surveying and road upgrade material)
DotE	7 February 2013 30 April 2013 07 June 2013 03 July 2013 17 July 2013 24 July 2013 25 September 2013	DotE, OCG, GHD and Adani	Discussions on: SEIS process Project Description Groundwater and Surface water impacts MNES impact discussion Black-throated Finch impacts Cumulative Impacts



## 4. Approvals

### 4.1 Introduction

Adani has identified the relevant approvals for all components and phases of the Project. This section and SEIS Volume 4, Appendix C1 Project approvals intends to provide a clear understanding of approval requirements. These documents also update the EIS Volume 4, Appendix D Project Approvals and Planning Assessment from December 2012 and should be read in conjunction with that document.

The updated information in this chapter and Volume 4, Appendix C1 Project approvals is based on:

- responding to submissions made about project approvals in the EIS during the public consultation period from 15 December 2012 to 11 February 2013
- updated information about the project that impacts on approvals
- requests for information from the Coordinator-General under section 35(2) of the *State Development and Public Works Organisation Act 1971* (SDPWO Act)
- changes to legislation following submission of the EIS that impact on the project, such as the *Environmental Protection (Greentape Reduction) and Other Legislation Amendment Act 2012*.

This section is also supported by the following appendices:

- SEIS Volume 4, Appendix C2
- SEIS Volume 4, Appendix C3 that includes applications to construct and operate a railway, and supporting activities
- SEIS Volume 4, Appendix C4 that includes applications for offsite infrastructure activities such as worker accommodation and industrial precincts
- SEIS Volume 4, Appendix C5 that includes applications for the five (5) quarries required to support the Project

In addition to the applications, Adani has drafted suggested conditions in SEIS Volume 4, Appendix C6 Draft Model Conditions Report which are based on current best practice environmental management.

### 4.2 Amendments to the project

Since the EIS was released for public consultation in December 2012, parts of the Project have changed as a result of several factors, including responding to feedback from landholders and other stakeholders and additional data from exploration activities. Broad amendments to the Project that impact on project approvals are outlined in Table 7. Detailed amendments to the Project are included in SEIS Volume 4, Appendix B and Volume 3, Section 2.



**Table 7 Project changes relevant to approvals**

Change	Rationale
Updated Mine Plans	Additional data from the exploration programs on EPC 1690 and the eastern and northern portions of EPC 1080. The changes also respond to feedback about the EIS made by the Department of Natural Resources and Mines (DNRM) and other submitters about the Project (Mine) plans included in the EIS.
Reduced Project (Mine) life from 90 years to 60 years	Additional data from the exploration programs on EPC 1690 and the eastern and northern portions of EPC 1080.
Removal of offsite bore fields and associated pipelines and removal of in-stream storages within North and Obungeena creeks	Additional understanding of water requirement and supply strategy.
The stock route that crosses the northern part of the Project (Mine) site is proposed to be moved, rather than closed.	The Project (Mine) plan changes mean the realignment to the stock route, as opposed to the previously proposed closure.
Change of rail balloon loop location where it intersects with the boundary of the Project (Mine)	Consequential impact from infrastructure layout changes to the Project (Mine) plans.
Relocation of a rail construction depot – approximately 9 km east of previous location	Depot has been moved closer to quarries to reduce traffic impacts. New location is also more flood resilient.
Relocation of two (2) rail laydown areas	Minimise impacts to landholders.
Increased workforce accommodation requirements	Consequential changes due to the updated Mine Plan for the Project (Mine).
The location of the airport moved from the north of the rail line, to the south of the rail line	Responding to submissions made about traffic and other environmental impacts.
Further detailed design of industrial area	Improved Project (Offsite Infrastructure) design
Inclusion of five (5) quarries in project approvals and assessment	Improved geotechnical information about the optimum quarry locations to provide material for the Project.

### 4.3 Summary of comments

Submissions about the EIS, Volume 4, Appendix D (Project approvals and planning assessment) were made by a range of submitters including the Qld Government, organisations and individuals. Comments in submissions and responses are detailed in Volume 4, Appendix C1 Project Approvals.

Key comments in the submissions relating to the Project's approvals included requests for more information about the following:

- Approvals under the *Fisheries Act 1994*, including operational works approvals for the construction and / or raising of waterway barrier works
- Approvals required for use of forest products and quarry materials under the *Forestry Act 1959* (Forestry Act)



- Whether commercial quantities privately owned (freehold) forests will be interfered with and how timber salvage will be facilitated
- How state owned forestry products administered under the Forestry Act will be interfered
- All relevant approvals, permits, licences and authority that need to be obtained for the Project
- Approvals required to clear vegetation for the offsite infrastructure area
- Project requirements for development approvals and licences in accordance with the *Water Act 2000*
- Where rail corridor transverses ten Exploration Permits for Minerals (EPM) and land subject to mining lease of Mineral Development Licence (MDL)
- Quarry resources.

#### 4.4 Response to comments

To address these comments, responses to the following general approvals and land use issues have been provided:

- Waterway barrier works: Adani will consult with relevant agencies during the detailed design stage for all waterway diversions, levee designs, culvert or bed level crossings, rock armouring, and for all and any other works within a waterway as defined under the Fisheries Act for both permanent and temporary works. The Fisheries Act approvals are discussed in SEIS Volume 4, Appendix C1, sections 2, 3 and 4. Also, applications for approvals under the Fisheries Act are included in Appendices C3 and C4.
- Forest products: There are no commercial quantities of privately owned (freehold) forests interfered with due to the Project. No state owned forestry products, administered under the Forestry Act, will be interfered with due to the Project.
- Quarry products: quarry materials will be required for to the Project. Approval requirements are outlined in SEIS Volume 4, Appendix C1, section 5, and approval applications for five (5) quarries are included in SEIS Volume 4, Appendix C5. Adani does not propose to take quarry material from watercourses in the location of the five (5) quarries. Hence the requirement for a Quarry Material Allocation Notice under the Water Act is not triggered.
- Project requirements and approvals in accordance with *Water Act 2000*: Further information about the Project and approvals required under the Water Act are discussed in sections 2 to 6 of SEIS Volume 4, Appendix C1. Also, applications for approvals under the Water Act are included in Appendices C3 and C4 application approvals.
- Approvals for offsite infrastructure vegetation clearing: The EIS acknowledged clearing approvals would be required for the Project (Offsite Infrastructure). In particular, the EIS, Volume 2, Chapter 5, section 5.3.2 discussed anticipated clearing required for the offsite infrastructure area, and Volume 4, Appendix D sections 5.6 and 5.7 discussed approval requirements. Further information about approvals required about vegetation for the Project (Offsite Infrastructure) is included in SEIS Volume 4, Appendix C1, section 5. Applications for approvals required under the VM Act and Nature Conservation Act 1992 about vegetation impacts are included in SEIS Appendix C4.



- Project (Rail) intersection of MDL and EPMs: The ten EPMs have been incorporated into the Land – Rail Chapter (SEIS, Volume 3, Section 4). Adani will undertake further consultation in 2013 with the tenure holders along the Project (Rail) corridor to understand the resource potential further.

#### 4.5 Summary of Project approval requirements

The Project is a ‘coordinated project’ under the SDPWO Act. The EIS from December 2012 and this SEIS responds to the Terms of Reference and a request for further information from the Coordinator-General in March 2013.

The Project is a controlled action for matters of national environmental significance under the *Environment Protection and Biodiversity Protection Act 1999* (EPBC Act). Mining lease applications under the *Mineral Resources Act 1989* (MR Act) have been made over areas under exploration for coal, namely EPC 1690 and the eastern and northern portions of EPC 1080. An environmental authority application has also been made under the *Environmental Protection Act 1994* (EP Act) seeking conditions for the carrying out of the activities on the Project (Mine) site, where possible.

Adani is in discussions with the Office of the Coordinator-General regarding a declaration of land relating to the Project (Rail) as a State Development Area (SDA) under the SDPWO Act. It is proposed the SDA include construction of rail and other facilities such as maintenance areas. It is also proposed that an SDA include the Project (Offsite Infrastructure), such as incorporating the mine worker accommodation village, airport, quarries and the industrial area.

Adani is actively working to reduce the complexity associated with the large number of approvals which are relevant to large projects. Adani is seeking grant of approvals and conditions through the CG’s report evaluating this SEIS for individual permits, authorisations and approvals, as summarised in the following tables.

**Table 8 Overarching legislation**

Activity	Approval	Legislation	Status
Whole of project	Approval for taking of a controlled action	EPBC Act	The Project will be assessed in accordance with the bilateral agreement between the Commonwealth and Qld Governments.
Indigenous cultural heritage	Cultural Heritage Management Plans	Aboriginal Cultural Heritage Act 2003	The Cultural Heritage Management Plans are being pursued outside the EIS process.
Whole of project	Report evaluating the EIS	SDPWO Act	This SEIS has been submitted to the Coordinator-General for evaluation.



**Table 9 Project (Mine) approvals**

Project (Mine) Activity	Approval	Legislation	Status
Mining activities, including the following ERAs: <ul style="list-style-type: none"> <li>• Chemical storage</li> <li>• Sewage treatment</li> <li>• Water treatment</li> <li>• Regulated waste storage</li> <li>• Regulated waste transport</li> <li>• Waste disposal</li> <li>• Extractive and screening activities</li> </ul>	Mining Lease	MR Act	Applications for MLs were made in July 2013.
	Environmental authority (EA)	EP Act	EA application made July 2013.
Taking of overland flow for the operation of the mine	Water licences	<i>Water Act 2000</i>	Applications to be made after the CG's Report.
Taking and / or diverting overland flow harvesting from within the mining lease	Water licences	<i>Water Act 2000</i>	Applications to be made after the CG's Report.
Construction of Project (Mine) dams	Failure impact assessment, to be authorised and managed under the EA	<i>Water Supply (Safety and Reliability) Act 2008 (WSSR Act)</i>	Applications to be made after the CG's Report.
Dewatering of open cut pits and underground mine workings	Water licences, to be authorised and managed under the EA	<i>Water Act 2000</i>	Applications to be made after the CG's Report.
Changing the stock route on the northern part of the Project (Mine) site	Agreement from DNRM and IRC for changes to stock routes	<i>Land Protection (Pest and Stock Route Management) Act 2002</i>	A formal agreement to move the stock route is estimated to be complete by early 2014.
Clearing in the Bygana West Nature Refuge	Undermine a protected area	<i>Nature Conservation Act 1992 (NC Act)</i>	Applications to be made after the CG's Report.



**Table 10 Project (Rail) approvals**

Project (Rail) Activity	Approval	Legislation	Status
Planning approval for the Project (Rail)	Possible SDA, or change to IRC planning scheme	SDPWO Act or <i>Sustainable Planning Act 2009</i> (SP Act)	Adani is in discussions with the Coordinator-General about the possible declaration of an SDA over the Project (Offsite Infrastructure) and associated facilities. Another planning mechanism for infrastructure is amendment to the local government planning scheme.
Construction of the Project (Rail) itself	Operational works (excavation and fill)	SP Act or SDPWO Act, depending if SDA is declared	Applications to be made after the CG's Report.
Clearing native vegetation for the Project (Rail)	Clearing native vegetation	VM Act	Applications to be made after the CG's Report.
Sourcing water for the Project (Rail) construction	Water licence for the taking or interfering with water	<i>Water Act 2000</i>	Applications to be made after the CG's Report.
Sourcing water for the Project (Rail) construction	Water licence for the taking of artesian and sub artesian water	<i>Water Act 2000</i>	Applications to be made after the CG's Report.
Construction of bridge works across creeks	Constructing waterway barrier works	<i>Fisheries Act 1994</i> (Fisheries Act)	Applications to be made after the CG's Report.
Changes to stock routes due to the Project (Rail)	Agreement from DNRM and IRC for changes to stock routes	<i>Land Protection (Pest and Stock Route Management) Act 2002</i>	Formal agreement with the Queensland Government is estimated to be complete by early 2014.
Storage of chemicals under ERA 8 for the maintenance facility and construction depot	EA	EP Act	Applications included in Volume 4, Appendix C3 (Rail approval applications)
Sewage Treatment Plant under ERA 63 for the construction depot	EA	EP Act	Applications included in Volume 4, Appendix C3 (Rail approval applications)
Impacts to protected plants and animals	Permit to take protected plants	NC Act	Applications to be made after the CG's Report.



Project (Rail) Activity	Approval	Legislation	Status
Possible damage to protected wildlife habitat	Species Management Plan / Threatened Species Management Plan	NC Act	Applications to be made after the CG's Report.
Activities in strategic cropping land area	Impacts to strategic cropping land	<i>Strategic Cropping Land Act 2011</i>	History assessment and deed of agreement to be made after CG's Report.

**Table 11 Project (Offsite infrastructure) approvals**

Project (Offsite Infrastructure) Activity	Approval	Legislation	Status
Planning scheme allowing: <ul style="list-style-type: none"> <li>Workers accommodation village</li> <li>Industrial area</li> <li>Airport</li> <li>Water infrastructure</li> </ul>	Possible SDA, or change to IRC planning scheme	SDPWO Act or SP Act	Adani is in discussions with the Coordinator-General about the possible declaration of an SDA over the Project (Offsite Infrastructure) and associated facilities. Application has been included in Appendix C4 about the local government planning scheme.
Clearing native vegetation for the Project (Offsite Infrastructure)	Clearing native vegetation	VM Act	Applications to be made after the CG's Report.
Impacts to protected plants and animals	Permit to take protected plants	NC Act	Applications to be made after the CG's Report.
Possible damage to protected wildlife habitat	Species Management Plan / Threatened Species Management Plan	NC Act	Applications to be made after the CG's Report.
<b>Mine worker accommodation village</b>			
Bulk earthworks for the construction of the Workers accommodation village	Operational works for bulk earthworks	SDPWO Act or SP Act	Applications to be made after the CG's Report.
Construction of the Workers accommodation village involving vegetation clearing	Operational works for vegetation clearing	VM Act	Applications to be made after the CG's Report.



Project (Offsite Infrastructure) Activity	Approval	Legislation	Status
Material change of use for <ul style="list-style-type: none"> <li>accommodation buildings</li> <li>Workers accommodation village wet mess</li> <li>ERA 63 (sewage treatment).</li> </ul>	Development approval and EA	SP and EP Acts	Applications in this SEIS, Appendix C4 (Offsite infrastructure applications).
<b>Rail Camps 1 to 3</b>			
Construction of Rail Camps 1 to 3 involving vegetation clearing	Operational works for vegetation clearing	VM Act	Applications to be made after the CG's Report.
Material change of use for <ul style="list-style-type: none"> <li>ERA 8 (Chemical storage)</li> <li>ERA 63 (sewage treatment).</li> </ul>	Development approval and EA	SP and EP Acts	Applications in this SEIS, Appendix C4 (Offsite infrastructure applications)
Construction of Rail Camps 1 to 3	Operational work (excavation or filling) – construction of Rail Camps 1 to 3	SDPWO Act or SP Act	Applications to be made after the CG's Report.
<b>Industrial Precinct</b>			
Subdivision of Industrial Precinct	Reconfiguration of a Lot: Community Title Subdivision	SDPWO Act or SP Act	Applications in this SEIS, Appendix C4 (Offsite infrastructure applications)
Material change of use for industrial activities <ul style="list-style-type: none"> <li>ERA 8 (chemical storage)</li> <li>ERA 63 (sewage treatment)</li> </ul>	Development approval and EA	SP and EP Acts	Applications in this SEIS, Appendix C4 (Offsite infrastructure applications)
Bulk earthworks for the construction of the industrial precinct	Operational works for bulk earthworks	SDPWO Act or SP Act	Applications to be made after the CG's Report.
Construction of the industrial precinct involving vegetation clearing	Operational works for vegetation clearing	VM Act	Applications to be made after the CG's Report.
<b>Airport</b>			
Airport	Aerodrome certification	<i>Civil Aviation Safety Regulations 1998</i>	Applications to be made after the CG's Report.



Project (Offsite Infrastructure) Activity	Approval	Legislation	Status
Bulk earthworks for the construction of the airport	Operational works for bulk earthworks	SDPWO Act or SP Act	Applications to be made after the CG's Report.
Construction of the airport involving vegetation clearing	Operational works for vegetation clearing	VM Act	Applications to be made after the CG's Report.
Material change of use for: <ul style="list-style-type: none"> <li>an airport</li> <li>ERA 63 (sewage treatment)</li> </ul>	Development approval and EA	SDPWO Act, SP Act and EP Act	Applications in this SEIS, Appendix C4 (Offsite infrastructure applications)
<b>Water infrastructure</b>			
Pipeline in the Project (Rail) corridor.	Water licences and development approvals	<i>Water Act 2000</i> and SP Act	Applications to be made after the CG's Report.
Taking flood water from the Belyando River	Water licence	<i>Water Act 2000</i>	Applications to be made after the CG's Report.
Construction of dam to store water from the Belyando River	Operational works, dam assessment	SP Act and WSSR Act	Applications to be made after the CG's Report.
<b>Roads</b>			
Open / Close Local Government Roads	Upgrade, and realign parts of, the Moray-Carmichael Road to support the Project (Mine) production and the Project (Offsite Infrastructure) construction and operation	SP Act and <i>Transport Infrastructure Act 1994</i> (TI Act)	Applications to be made after the CG's Report.
Roadworks – State Controlled Roads	Approval to undertake works and ancillary works to a state-controlled road	TI Act	Applications to be made after the CG's Report.
Roadworks – Local Roads	Approval to make an alteration or improvement to a local government road	<i>Local Government Act 2009</i>	Applications to be made after the CG's Report.
Operational work that is undertaking road works on a local government road	Road crossings will be required for the Project (Rail)	SP Act & <i>Local Government Act 2009</i>	Applications to be made after the CG's Report.



Project (Offsite Infrastructure) Activity	Approval	Legislation	Status
Construction of Project (Rail) involves undertaking works with SCRs	Ancillary works and encroachment	TI Act	Applications to be made after the CG's Report.
	Declaration of common areas	TI Act	Applications to be made after the CG's Report.
	Approval for construction and maintenance access to SCRs	TI Act	Applications to be made after the CG's Report.
	Approval for alteration or improvement to local government controlled roads and approval for carrying out works on a road	<i>Local Government Act 2009</i>	Applications to be made after the CG's Report.
The use quarry materials belonging to the State	Quarry sales permit	<i>Forestry Act 1959</i>	Applications to be made after the CG's Report.
Forest products and quarry materials	Interfering or use of quarry materials on State lands	<i>Forestry Act 1959</i>	Applications to be made after the CG's Report.
The use quarry materials belonging to the State	Quarry sales permit	<i>Forestry Act 1959</i>	Applications to be made after the CG's Report.
Quarrying activities	Development approval for a material change of use and ERA 16	SDPWO Act, SP Act and EP Act	Applications in this SEIS, Appendix C5 (Quarry approval applications)



## 5. Social impact assessment and social impact management plan

### 5.1 Introduction

#### 5.1.1 Amendments to project description

Amendments to the Project (Mine) are detailed in SEIS Volume 4 Appendix B, and amendments to the Project (Rail) are detailed in SEIS Volume 3 Section 2. Those amendments that apply to the social impact assessment (SIA) are:

- Project life – The project life of the Mine has been amended to 60 years in the SEIS from 90 years as stated in the EIS
- Workforce profile – The workforce requirements have been amended to meet the revised Mine plan. Total workforce requirements to full production for the revised Mine plan are illustrated in Figure 5, compared to total workforce requirements for the EIS restated in Figure 6.

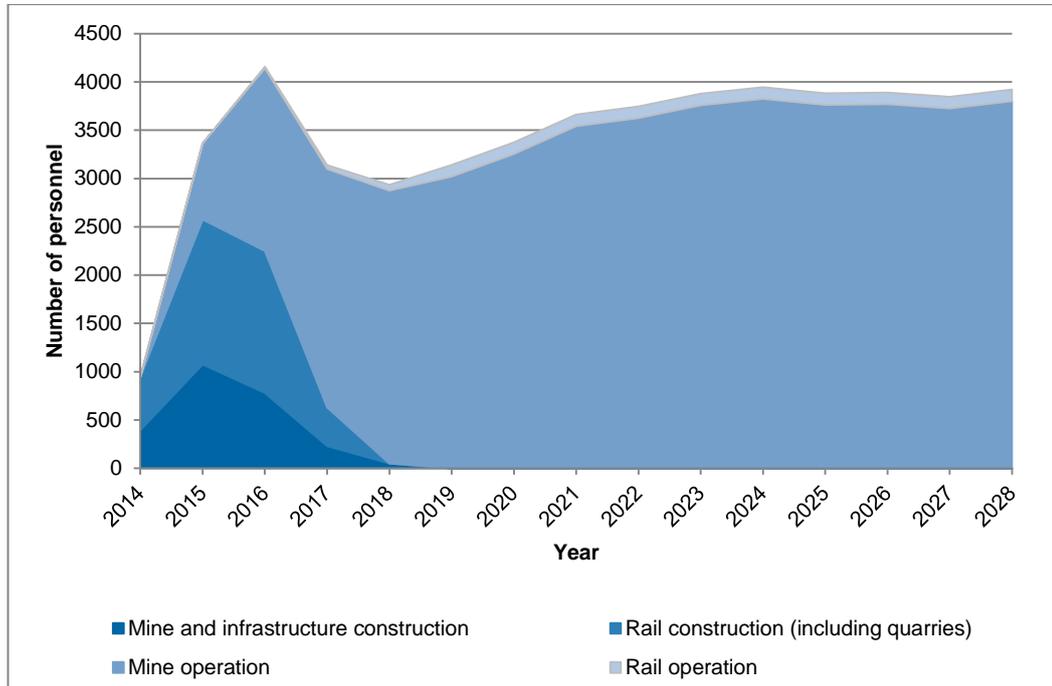
#### 5.1.2 Update to studies

The following updates have been included in the SIA (refer to SEIS Volume 4, Appendix D1) and Social Impact Management Plan (SIMP) (refer to SEIS Volume 4, Appendix D2)

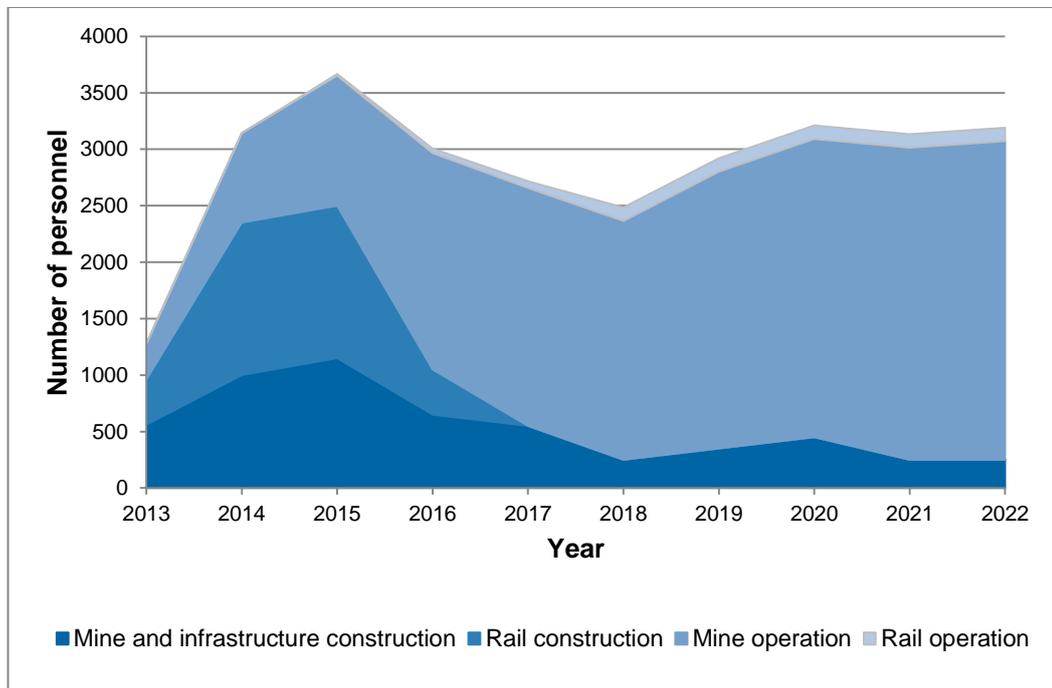
- Updated social baseline with inclusion of latest available census data
- Updated consultations with relevant stakeholders to discuss submissions to the EIS
- Re-assessment of social impacts arising from the Project in relation to updated project description. The re-assessment indicated that the type and significance rating of potential social impacts remained the same from EIS to SEIS due to the remote location of the Project site and Project design mitigation measures Updated SIMP to address submissions and updates to social impact assessment
- Updated Integrated Housing Strategy



**Figure 5 SEIS Total anticipated project workforce to full production**



**Figure 6 EIS Total anticipated project workforce to full production**





## 5.2 Summary of comments

Matters raised in submissions to the EIS can be summarised into the following key themes:

- Social baseline and census, a request to use the 2011 Census data
- Out of date unemployment and housing availability figures used
- Local industry and employment opportunities and business development issues:
  - Opportunities for local and regional business development to cater to the Project
  - Encouragement of local employment
  - Insufficient consideration of implications of a 100 per cent FIFO workforce model
  - Insufficient consideration of DIDO and BIBO options, from locations such as Clermont, to build the skill base of the region
  - Use of regional centres including Townsville and Clermont as service and employment hubs
  - Opportunity for local businesses to tender for the provision of goods and services
- Use of regional centres as FIFO hubs
- Workforce management
  - Skills requirements
  - Workforce wellbeing
  - Indigenous participation
  - Inclusion of employment opportunities for traditionally underrepresented groups
  - Culturally appropriate workplace
  - Housing, social infrastructure and emergency services
  - Potential cumulative impact on housing in regional centres
  - Design and operation of the accommodation village
  - Provision of facilities and telecommunications for police services,
  - Impact on community health and infrastructure
- Land use
  - Impacts on amenity and grazing activities from the rail alignment
  - Impacts associated with the increased number of people traveling through the area including perceived decrease in security for landholder and decreased road safety
  - Disruption to cattle operations including paddock gates bring left open or damage to infrastructure

## 5.3 Response to comments

Detailed responses to individual comments are provided in the Submissions Register in SEIS Volume 4 Appendix A, In addition, the issues and associated management strategies are discussed in detail in SEIS Volume 4 Appendix D1 and D2. A summary of responses to the themes stated in Section 5.2 are provided in this section.



### **5.3.1 Social baseline**

The entire social baseline has been updated with Census 2011 data and is presented in Section 3 and 4 of the SIA Volume 4 Appendix D1.

### **5.3.2 Local employment and business development opportunities**

Due to the remoteness of the Project site and short term nature of most construction work, opportunities for local recruitment during the construction phase will be limited. Further, as the distance from Clermont to the proposed mine by road is approximately 200 km, DIDO or BIBO on a shift basis (that is, where workers return to their usual place of residence after each shift) is unlikely to be feasible as the travel times would exacerbate risk of fatigue and accidents. Adani will continue to engage with relevant state and local government stakeholders to identify possible opportunities for Clermont residents.

As addressed in the SIA, Adani proposes to utilise a FIFO operations workforce due to its remote location and to minimise the potential impact of the Project on regional communities (such as increased housing and rental prices). FIFO operations will fly between nominated collection points along the east coast to the private airstrip located within the offsite infrastructure area.

Optimal collection points will be determined after full consideration to skilled workforce availability in the immediate vicinity of airports, airport capacity and flight schedule performance, surrounding infrastructure such as public transport, parking and training facilities to ensure long term efficient and reliable transit for workers.

Adani is committed to considering DIDO or BIBO arrangements out of regional centres including Clermont, Emerald and Charters Towers once road infrastructure is improved. Considering the potential traffic volumes, reliable all-weather access roads are required, including between the Gregory Developmental Road and the Project (Mine) site. Any DIDO or BIBO arrangements would require workers to stay at the accommodation village during their rosters due to the remote location of the mine.

Details on local industry and employment opportunities are discussed in Sections 8.6 and 8.7 in the SIA (SEIS Volume 4 Appendix D1) and Sections 3.5 and 3.6 in the SIMP (SEIS Volume 4 Appendix D2).

### **5.3.3 Workforce management**

Adani will prepare a Workforce Management Plan with a three-pronged approach:

- Behaviour of the workforce in the accommodation facilities, while travelling between the point of origin and the workplace and when in local and regional communities will be managed through a code of conduct and ongoing awareness raising activities
- A recruitment, education and training plan will be developed and implemented to maximise training and development opportunities and provide a sustainable skilled workforce
- Worker health, safety and wellbeing will be addressed in the Workplace Health and Safety Plan

Construction contractors and subcontractors will be required to put in place equivalent programs in relation to worker behaviour and management.



Given the rapidly changing nature of the labour force and market, and lag between this SIA and commencement of construction and operations, it is not appropriate to set employment and training related targets at this time. Adani will continue to work with key government agencies, DETE in particular and training providers in the development of its workforce education and training program. By the time of a Financial Investment Decision being made and the awarding of contracts, Adani will have in place revised workforce data and specific targets and timeframes in place for skills development through its traineeship and apprenticeship programs. Targets will be set for both contractors and Adani workforce.

Adani's approach to employment, recruitment and training will focus on the following programs currently under development:

- Programs for recruitment of existing skilled workers from throughout Queensland and Australia. Should there be a need to source skilled workforce from overseas Adani will work with Skills Queensland to provide information on the type of skills, numbers and migration program under which they will be sourced.
- A New Entrant Program, specifically designed for those with no prior experience in the mining industry
- A structured apprentice and trainee program to work with existing training providers to employ and train apprentices and trainees. The first stage of that plan has been implemented with Adani having made a commitment to commence with a total of 6 apprentices by early 2013 through programs such as the "Unified to Qualified" program based in the Whitsunday region.

Given the remoteness of the site from training providers, there may also be potential to establish a training facility at the proposed mine, or in the vicinity, and discussions have taken place with a number of agencies that could contribute to such a facility. Some general strategies that Adani is developing to assist with retention of those new to mining and from traditionally under-represented in mining workforces may include:

- Mentoring programs to provide workplace support
- Enforcement of the code of conduct to create a culture of tolerance, fairness and equity at work and in the workers accommodation village
- Links with existing training providers and recruitment programs, including those with an indigenous focus
- Ongoing programs of on-the job training, skills development, graduate development program and career path development within the workforce.

Adani will continue to work collaboratively with government agencies and training organisations such as Skills Queensland, DETE, Whitsunday Marketing and Development Ltd, Clermont Preferred Futures and engage with FIFO Coordinators at the councils at Cairns, Gold Coast and Wide Bay to develop and finalise the recruitment, education and training component of the Workforce Management Plan. This will include consideration of maximising employment opportunities and improving skill levels in the community. In the final Workforce Management Plan, Adani will develop measurable targets for its training programs.



In terms of workforce health and wellbeing the workforce management plan will include:

- Requirements in relation to safe work practices and fitness for work (fatigue, drugs and alcohol)
- Induction, other training and awareness programs to maintain a strong focus on health and safety and a high level of awareness of responsibilities for health and safety
- Programs in relation to individual health and wellbeing including management of medical conditions when away from home, maintenance of physical fitness, management of stress and isolation, healthy eating and alcohol consumption
- Programs in relation to financial planning.

Details on workforce management are discussed in Section 8.6 in the SIA (SEIS Volume 4 Appendix D1) and Section 3.5 in the SIMP (SEIS Volume 4 Appendix D2).

### **5.3.4 Housing, social infrastructure and emergency services**

Overall, the Project is not expected to significantly increase the population of the communities located closest to the Project site as all construction workers will be housed in purpose built accommodation villages. Although some population growth may occur in Clermont as a result of the increased economic activity that the Project will bring, it is anticipated that this will be in line with OESR population projections. As a result the construction and operation activities of the Project are not expected to exacerbate existing issues in relation to social services and infrastructure, particularly housing. Adani understands that should the population increase significantly, there could be impacts on the local housing market and possible local services. Therefore Adani is committed to continuing to work with the IRC, service providers and the Clermont Preferred Futures Group to monitor population and demographic changes in Clermont and the former Belyando Shire area and develop responses, as required, to address any emerging social issues.

Further details on addressing housing issues are provided in SIMP Section 3.4, SEIS Volume 4 Appendix D2 and updated information on the mine workers accommodation village is provided in the Integrated Housing Strategy (Appendix B of the SIMP).

Although Adani will develop an emergency management plan for all components of the project, which will include responses to injuries and medical evacuations as well as fire response and response to road accidents, it is likely that local fire, police and ambulance services may also be required to respond, particularly to accidents on access roads, large fires or in the event of a suspected crime, Adani will continue to consult with emergency service providers during the pre-construction, construction and operation phases to ensure that responses can be coordinated and impacts on emergency service providers minimised.

To manage potential impacts on emergency services Adani will further investigate resourcing requirements, including vehicles and staff, through liaising with Queensland Police Services (QPS) at a State and local level. This process will be supported through the formation of an Emergency Services Consultative Committee. Adani is has further committed to the provision of infrastructure facilities to QPS:

- 1 x office
- 2 x workstations



- Access to a meeting room
- 1 x vehicle
- Accommodation at the village
- Upgrade to existing communication towers for secure network. This would also be extended to service Queensland Fire and Rescue Services and Queensland Ambulance Services.

Details on management of housing and social infrastructure impacts are discussed in Sections 8.5 and 8.9 in the SIA (SEIS Volume 4 Appendix D1) and Sections 3.4 and 3.8 in the SIMP (SEIS Volume 4 Appendix D2).

### **5.3.5 Landholder issues**

To address impacts on landholders and landholder issues raised in submissions a number of Project (Rail) design measures will be put in place such as:

- Fencing of the alignment
- Installation of stock and occupational crossings
- Consistency with the approaches to rail dust issues set out in the Aurizon Coal Dust Management Plan

Land access protocols are also a critical aspect of minimising impacts on landholders and maintaining good ongoing relationships. The Land Access Protocols will include but not limited to:

- Protocols for communication and permissions to access the property
- Driving speed limits while on property
- Protocol for opening and closing of fence gates
- Vehicle wash down

In addition the landholders will have an ongoing opportunity to provide feedback through the stakeholder engagement strategy.

Details on management of landholder impacts are discussed in Section 4.3.8 of Volume 3 (Rail), Sections 8.3 and 8.8 in the SIA (SEIS Volume 4 Appendix D1) and Sections 3.3, 3.7 and 4 in the SIMP (SEIS Volume 4 Appendix D2).

## **5.4 Amendments to commitments**

The Project Commitments Register (SEIS, Volume 4, Appendix G) has been updated with social commitments reflective of the SIMP. The SIMP has been revised and includes updated and additional commitments (refer SEIS Volume 4 Appendix D2).



## 6. Indigenous and non-Indigenous cultural heritage

### 6.1 Introduction

#### 6.1.1 Amendments to project description

Amendments to project description (Mine, Offsite and Rail) have not incurred additional impacts on the Indigenous and Non-Indigenous Cultural Heritage to those identified in EIS Volume 1, Chapter 5. Consultation and negotiations with Native Title/Aboriginal parties has included the five quarries within the SEIS in the relevant agreements.

#### 6.1.2 Updates

Following submission of the EIS, Adani has continued to progress consultation with the four Native Title/Aboriginal parties. Updates are as follows:

##### **Wangan and Jagalingou People**

There are no changes to the consultation information supplied for the EIS.

Adani has completed cultural heritage assessments for the entire Rail corridor within the Wangan and Jagalingou Aboriginal party areas. Cultural heritage assessments of the Carmichael mine site are ongoing.

Ongoing field work programs are now being conducted by teams consisting of Wangan and Jagalingou Traditional Owner Field Officers and their nominated archaeologists within the Wangan and Jagalingou Aboriginal party area. Adani is progressing native title negotiations with relevant parties. Adani is in discussions with the Wangan and Jagalingou People in order to address their native title issues.

##### **Jangga People**

An Indigenous Land Use Agreement (ILUA) has been agreed for that part of the project within the Jangga native title determination area, is expected to be certified in August 2013 and will be subsequently lodged with the National Native Title Tribunal (NNTT) for registration.

Adani has completed cultural heritage assessments for the entire Rail corridor within the Jangga Aboriginal party area. Ongoing field work programs are now being conducted by teams consisting of Jangga Traditional Owner Field Officers and their nominated archaeologist within the Jangga Aboriginal party area.

An Indigenous Land Use Agreement (ILUA) with the Jangga People has been agreed for that part of the project within the Jangga native title determination area, is expected to be certified in August 2013 and will be subsequently lodged with the National Native Title Tribunal (NNTT) for registration.

##### **Barna Kabalbara & Yetimarla (BBKY) #4 People**

A Cultural Heritage Management Plan (CHMP) for the life of the Project was established and approved by the Chief Executive of the Department of Aboriginal and Torres Strait Islander and Multicultural Affairs (DATISMA) in November 2012.



Adani has completed preliminary cultural heritage assessments within the BBKY#4 Aboriginal party areas. Full cultural heritage surveys with the BBKY #4 People Aboriginal party will be undertaken at a subsequent stage.

### **Barada Barna People**

There are no changes to the consultation information supplied for the EIS. Adani has completed preliminary cultural heritage assessments within the Barada Barna Aboriginal party areas.

Full cultural heritage surveys with the Barada Barna People Aboriginal party will be undertaken at a subsequent stage.

## **6.2 Summary of comments**

Comments raised in submissions to the EIS included:

- Implications on native title from use of Moray Downs for environmental offsets
- Implications on native title from use of Moray Downs for quarrying activities

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

## **6.3 Response to comments**

Whilst Adani had identified in the EIS the use of Moray Downs for Environmental Offsets, further assessment for the SEIS has considered other opportunities for Offsets within the broader Galilee Basin in accordance with the Galilee Basin Offsets Strategy (GBOS). Under the GBOS, properties are excluded where tenure precludes the securing of Offsets. Whilst a change in tenure or terms of an existing lease may, in certain circumstances, require consideration of and compliance with the Native Title Act 1993's 'future act' provisions, the establishment of nature refuge, voluntary declaration or statutory covenant cannot effect a change in underlying tenure or change in lease conditions and therefore no Native Title Act 1993 'future act' provisions. For further detail, refer to Volume 4 Appendix F (Offsets Strategy)

With regards to quarrying on the Wangan and Jagalingou Aboriginal Area, the applicants were formally notified of Adani's application for grant of ML 70441 on 23 November 2011 the notification day for the commencement of the Native Title Act 1993's 'right to negotiate' process. The RTN process for ML 70441 concluded on 7 May 2013 when the National Native Title Tribunal determined that ML 70441 could be granted without condition. Grant of ML 70441 will permit quarrying within the ML 70441 area for purposes associated with the Project.

Indigenous cultural heritage surveys are being undertaken as part of the Cultural Heritage Management Plan (CHMP) established for the Project and approved by DATSIMA. The outcomes of those surveys are the subject of further discussion between the parties and agreement on the terms of any mitigation within the agreed CHMP consultation processes. If the parties are unable to reach agreement in relation to mitigation of any particular cultural heritage values, dispute resolution processes set out in the CHMPs, including the involvement of independent experts, may be utilised to assist with finalisation of mitigation arrangements.



## 6.4 Amendments to commitments

Proposed additional commitments:

- Adani will continue to carry out full cultural heritage surveys of all Project areas with relevant Aboriginal Parties in accordance with the provision of approved CHMPs.
- Adani will maintain communication with the Wangan and Jagalingou and Jangga Peoples through the established CHMP implementation committees, and other relevant Aboriginal parties through the establishment of implementation committees made up of representatives of both Adani and relevant Aboriginal parties.
- Ongoing cultural awareness training will continue to be provided to personnel with the intention of training people involved in the Project in avoidance and protection of known cultural heritage sites and management procedures in the event of a cultural heritage find not previously identified during the cultural heritage surveys



## 7. Economics

### 7.1 Introduction

#### 7.1.1 Amendments to project description

The change to the Project that will affect the economic assessment in the Environmental Impact Statement (EIS) is the revised mine plan. The principal differences influencing the economic assessment are the change in overall mining duration from 90 to 60 years and consequential changes to construction and operation capital investment.

#### 7.1.2 Update to studies

As a result of the Project changes listed above a revised Economic Assessment Report (refer to SEIS Volume 4 Appendix E) has been undertaken for the SEIS:

### 7.2 Summary of comments

Comments in the submissions relating to the economic assessment included:

- Use of Input/ Output Analysis versus Cost –Benefit Analysis
- Local procurement and effect on local businesses
- FIFO impacts on local economy

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

### 7.3 Response to comments

#### 7.3.1 Use of Input/ Output Analysis versus Cost –Benefit Analysis

Several comments were received regarding the use of cost-benefit analysis versus the use of input-output analysis in the EIS economic assessment.

In summary, the input-output method is an economic impact assessment method, whereas cost-benefit analysis is an economic evaluation method. The objective of the economic assessment required by the Project ToR is to identify the potential economic impacts of the project, including the direct and indirect impacts. The input-output methodology is one method of estimating such impacts as it focuses on economic activity impacts and enables direct and indirect contributions to output and employment to be estimated from inputs in the form of spending during both the construction and operational periods. This method, therefore, is consistent with the outputs sought from the ToR.

In contrast, cost-benefit analysis estimates cost and benefits (monetised and non-monetised) of a project using discounted cash flow analysis. Unlike the input-output method, the outputs from a cost-benefit analysis would be the net present value (NPV), internal rate of return (IRR) and benefit-cost ratio (BCR). These indicators are decision making indicators to determine whether a project should go ahead or not go ahead (e.g. if NPV is greater than zero, then it is prudent to invest) and to prioritise investment options. The cost-benefit analysis method essentially measures the net worth of a project, not its economic impacts. Cost benefit analysis is data



intensive, requires forecast of revenues and benefits, and is generally done internally before the proponents of a project decide to proceed or not proceed.

### **7.3.2 Local procurement and effect on local businesses**

A comment was received regarding how Adani will ensure that local procurement remains a priority for the company over time and how this will affect local businesses.

Adani has provided a commitment in the Social Impact Management Plan (SIMP) (Volume 4 Appendix D2) for the development and implementation of local procurement policies.

### **7.3.3 FIFO impacts on local economy**

Concern has been raised regarding the proponents use of self-contained accommodation camps and FIFO workforce and how this will significantly limit the likely benefits to the local economy.

Comments regarding FIFO arrangements limiting the economic benefits to the local economy have been noted. The potential of the Project to produce significant positive impacts on the local economy is substantial. In order to ensure the range and extent of positive impacts can be achieved, a number of measures to mitigate possible negative impacts have been or will be put in place. This includes the use of self-contained accommodation camps and FIFO workforce to avoid rental and housing impacts to local and regional communities. This measure does not however prevent opportunities for local employment. In addition and strategies such as an increase in local participation of regional and Queensland based industry as well as encouraging the participation and up-skilling of disadvantaged groups such as Indigenous communities has been identified in the revised economic report (refer to SEIS Volume 4 Appendices E Revised Economic Assessment Report).

## **7.4 Amendments to commitments**

The Project commitments have been identified as part of the Revised Economic Assessment Report.

- Adani has purchased the leasehold for the Moray Downs property and a package of compensation will be provided for impacts to the properties affected by the Mining Lease.
- Adani will work with landowners to agree 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.
- 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.
- Adani will work with both Councils, Clermont Preferred Futures Group, and local businesses in conjunction with government agencies (Office of Advanced Manufacturing) and the Industry Capability Network (ICN) in developing a plan to provide robust, integrated and sustainable local business participation opportunities.
- Whilst there will predominantly be a FIFO workforce, Adani will identify opportunities for Drive in Drive Out and Bus in Bus Out employment options.



## 8. Cumulative impacts

### 8.1 Introduction

This section of the SEIS provides an overview of the amendments to the Cumulative Impact Assessment work undertaken 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.

### 8.2 Amendments to the project

Amendments to the Project description listed below have facilitated a revision of the cumulative impact assessment in regards to Matters of National Environmental Significance (Volume 4 Appendix H):

- Mine (onlease):
  - Updated Mine plan (including mine and water infrastructure): six open cut pits and five underground mines
- Mine (offlease):
  - The location of the airport moved from the north of the rail line, to the south of the rail line
  - Relocation of the water pipeline within the rail corridor
- Rail:
  - Realignment of the balloon loop approximately 2 km south east, necessitating
  - 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
  - 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

### 8.3 Summary of comments

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

Comment raised in these submissions included:

- Cumulative impacts on biodiversity, particularly MNES fauna species including black-throated finch (southern), squatter pigeon (southern) and koala
- Credibility of cumulative impact ratings assigned in EIS, particularly for greenhouse gas emissions
- Cumulative impacts of existing and proposed infrastructure and projects in the surrounding region/ Galilee Basin
- Need for basin wide assessment of cumulative impacts



- Adequacy of cumulative impact assessment presented in EIS, in particular failure to access all relevant projects
- Cumulative impact of climate change on species range and ecology
- Cumulative impacts on groundwater resources, including impacts on existing users and groundwater dependant ecosystems
- Cumulative impacts of the project on the Great Barrier Reef
- Cumulative impact assessment of water consumption and waste water
- Failure to assess of consequential and synergistic impacts
- Cumulative impacts of air quality/ noise and vibration along rail
- Cumulative impacts of coal volume along the existing transport corridor
- Cumulative impacts on domestic and regional airports
- Cumulative impact on services and infrastructure
- Cumulative impacts on housing
- Cumulative impact of FIFO workforce
- Cumulative impacts on transport
- Cumulative impacts on water quality

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

## **8.4 Response to comments**

### **8.4.1 Methodology**

Subsequent to the EIS, Adani has undertaken additional ecological investigations to inform the SEIS. This has strengthened the cumulative impact assessment undertaken for the EIS. Volume 4 Appendix H Report for Matters of National Environmental Significance includes an updated cumulative impact assessment.

The updated cumulative impact assessment considered impacts to:

- Threatened ecology communities listed under the EPBC Act
  - Brigalow (*Acacia harpophylla* dominant and co-dominant)
  - The community of native species dependant on natural discharge of groundwater from the Great Artesian Basin (GAB)
- Threatened fauna (confirmed present) listed under the EPBC Act
  - Black-throated finch
  - Squatter pigeon
  - Koala
  - Ornamental snake
- Migratory birds, listed under the EPBC Act
- Aquatic ecology, as relevant to matters of national environmental significance



- Water resources (surface water and groundwater)

Editorial errors in the EIS led to submissions regarding a table in the cumulative impact assessment detailing clearing of regional ecosystems (REs). This table was incorrectly referenced as Table 8-8 in the text. The correct table (Table 8-5) can be viewed in EIS Volume 1 Chapter 8 Cumulative Impacts.

A number of submissions questioned the relevance factors applied to the selection of projects in the EIS cumulative impact assessment. The revised cumulative impact assessment is less dependent on the use of relevance factors and focuses on those cumulative impacts for which there is sufficient information to quantify impacts.

Submissions were received on the consideration of economic impacts in the cumulative impact assessment. A revised economic assessment was prepared and is included as SEIS Volume 4 Appendix E Revised Economic Assessment Report.

#### **8.4.2 Selection of projects and actions for inclusion in the cumulative impact assessment**

A revised cumulative impact assessment is presented in Volume 4 Appendix H Reports for Matters of National Environmental Significance. The revised cumulative impact assessment, including selection of projects at an appropriate scale, was done in consultation with the Office of the Coordinator-General.

#### **8.4.3 Regional hydrology impacts**

Subsequent to the EIS, Adani has undertaken a revised assessment of regional (cumulative) surface water impacts. The revised assessment is detailed in Volume 4 Appendix K5 Mine Hydrology Report. Hydrology impacts at a regional scale are also discussed in the revised cumulative impact assessment in Volume 4 Appendix H Report for Matters of National Environmental Significance.

Total impacts through a combination of reduced base flow upstream and increased base flow losses in the Carmichael River across the Mine Area are predicted to be around 1000 m<sup>3</sup>/d (33 percent of the pre-development base flow) at the end of the Mine life and 950 m<sup>3</sup>/d (31 percent of the pre-development base flow) post closure. No significant impacts on flows and/or levels are expected in any other local water courses, including the Cabbage Tree Creek, since these creeks are ephemeral in nature and not thought to currently receive any substantial discharges from groundwater.

The Project (Mine) and a number of other projects are part of the larger Burdekin Catchment, and its sub catchment for the Belyando River. No other projects with available public information on impacts are within the Carmichael River Catchment. Potential cumulative impacts arise predominantly from surface water flow impacts within the common catchment areas of the Belyando River.

In regards to water extraction from the Belyando Catchment, the Project will seek approval through the Regional Water Plan to provide a flood harvesting allocation under that State approved and assessed management framework.

A comprehensive monitoring program will be developed as part of the site water management plan. The site water management plan will include the following monitoring measures as outlined in SEIS Volume 4 Appendix Q1 Environmental Management Plan for the Mine:



- Surface flows will be monitored on an ongoing basis prior to construction, during operation and post operation upstream, downstream and within the Study Area to measure changes

#### **8.4.4 Regional groundwater impacts**

Subsequent to the EIS, Adani has undertaken a revised assessment of regional (cumulative) groundwater impacts. This updated report was prepared in accordance with the Terms of Reference for the Project, and in consultation with the Office of the Coordinator-General. The revised assessment is detailed in Volume 4 Appendix K1 Mine Hydrogeology Report and Appendix K6 Addendum to the Mine Hydrogeology Report.

The operational water requirement for the Project (Mine) will be met from a combination of dewatering, stored surface water and water imported from offsite. Further information on mine water management, treatment and discharge is provided in SEIS Volume 2 Chapter 5. The revised assessment of groundwater impacts includes a numerical groundwater, which has been used to

- Assess potential drawdown as a result of the water requirement of the Project
- Assess regional groundwater impacts at a regional scale

The revised groundwater model predicts drawdown of less than 1 m along most of the Carmichael River, and up to 4 m at select points of the river closest to open cut pits. No significant impacts to flows or levels are expected at other local watercourses. No regional groundwater aquifer connectivity is predicted, therefore depressurisation is not expected to propagate to the Great Artesian Basin.

Groundwater impacts at a regional scale are also discussed in the revised cumulative impact assessment in Volume 4 Appendix H Report for Matters of National Environmental Significance.

#### **8.4.5 Cumulative impacts on threatened species and ecological communities**

Subsequent to the EIS, Adani has undertaken additional ecological investigations to inform the SEIS. This additional work is detailed in the following reports.

- Volume 4 Appendix H Report for Matters of National Environmental Significance
- Volume 4 Appendix J1 Updated Mine Ecology
- Volume 4 Appendix J5 Report for Offsite Infrastructure Assessment

Volume 4 Appendix H Report for Matters of National Environmental Significance includes an updated cumulative impact assessment of other coal projects in the Galilee Basin, including:

- Alpha Coal Project
- Kevin's Corner Project
- China First Coal Project; Galilee Coal Project (Northern Export Facility)
- South Galilee Coal Project

A number of other projects relevant to a cumulative impact assessment were identified, however publicly available information on these projects was insufficient to properly assess the cumulative impact.



The updated cumulative impact assessment considered impacts to:

- Threatened ecology communities listed under the EPBC Act
  - Brigalow (*Acacia harpophylla* dominant and co-dominant)
  - The community of native species dependant on natural discharge of groundwater from the Great Artesian Basin (GAB)
- Threatened fauna (confirmed present) listed under the EPBC Act
  - Black-throated finch
  - Squatter pigeon
  - Koala
  - Ornamental snake
- Migratory birds, listed under the EPBC Act

The cumulative impact assessment concludes that there is a high risk of cumulative impacts on terrestrial ecology. Volume 4 Appendix F Revised Offset Strategy Report details revised offset commitments for the SEIS. The offset strategy includes offsets calculated under the EPBC Act Environmental Offsets Policy and EPBC Act Offsets Assessment Guide. The conservation status of EPBC listed species or ecological communities was a factor in the calculation of the offset requirement. Offsets for the Project consider cumulative impact to EPBC listed species or ecological communities to the extent that their conservation status reflects broad scale pressures.

The revised impact assessment considered both direct (e.g. clearing) and indirect (e.g. dust) impacts on threatened fauna. These impacts will be considered in the procurement of offsets for the Project. Under the EPBC Act Environmental Offsets Policy, the scale and nature of direct and indirect impacts must be considered in determining any significant residual impacts to be offset. Offsets, as a mitigation measure, are considered to mitigate any potential synergies between direct and indirect impacts.

Adani has been in consultation with Black-throated Finch Recovery team and DSEWPaC. A four part monitoring program was developed comprising of (i) Regional distribution (species distribution modelling); (ii) Regional distribution (surveys); (iii) Local monitoring (observational) on the Mine Area; and (iv) Local Monitoring (detailed) on the Mine Area. A detailed plan was prepared for the Local monitoring) on the Mine Area and the first survey was conducted in May 2013. The results are presented in the SEIS Volume 4, Appendix J2. This monitoring will continue during construction and operation of the mine, and the focus and intent of the monitoring will be guided by, and contribute to, the Black-throated Finch Species management Plan following the principled of adaptive monitoring and management.

#### **8.4.6 Cumulative impacts of road traffic**

A revised road impact assessment is provided as Volume 4 Appendix P Traffic Impact Assessment Report. The revised assessment considers and documents the impacts of the Project on road and rail infrastructure. Impacts resulting from Port infrastructure were not within the scope of the EIS. The cumulative assessment prepared for the SEIS has been undertaken in consultation with the OCG and DTMR. Capacity of trunk based infrastructure is further discussed in the SIA material undertaken for the SEIS (refer to SEIS Volume 4 Appendix D1 Revised Social Impact Assessment Report and D2 Revised Social Impact Management Plan).



#### **8.4.7 Cumulative impacts of FIFO workforces on regional housing stocks**

Volume 4 Appendix D1 Revised Social Impact Assessment report includes a consideration of cumulative impacts, notably FIFO workforces. Due to travel distances, it is not proposed to accommodate FIFO workers in Clermont or other regional centres. As workers will be required to stay at the workers accommodation village while on roster and will not be permitted to travel home during shifts, it is unlikely there will be an incentive for workers to relocate their families to towns such as Clermont.

#### **8.4.8 Cumulative impacts on species resilience from climate change**

A revised impact assessment is presented in Volume 4 Appendix H Reports for Matters of National Environmental Significance. This report considered climate change and drought as influences on the decline of particular species. The report recommends that the offset package for the Project considers the value of offsets as habitat in assisting species in adapting climate change.

#### **8.4.9 Cumulative impacts with future actions**

A revised cumulative impact assessment is presented in Volume 4 Appendix H Reports for Matters of National Environmental Significance. The revised cumulative impact assessment, including selection of projects at an appropriate scale, was done in consultation with the Office of the Coordinator-General.

Adani is aware of the following proposals within the region, three of which had been identified prior to the EIS submission; however, insufficient information is available at the time of writing (July 2013) to enable inclusion in the cumulative assessment:

- China Stone Coal Project (MacMines): development of two open cut and two underground mines with ultimate production for export of 30 Mtpa via a rail spur line linking into the proposed Project (Rail) corridor to export coal through the Port of Abbot Point. The EIS for this project is currently under preparation; however, no publicly available information is currently available to support understanding of potential cumulative impacts.
- Alpha West Coal Project (GVK Hancock Coal Pty Ltd): a proposed 24 Mtpa capacity underground mine located immediately to the west of the Alpha Coal Project. A concept study has been completed for this Project; however, no publicly available information is currently available to support understanding of potential cumulative impacts.
- Alpha North Coal Project (Waratah Coal): proposed coal mines located north of the proposed Alpha West Coal Project. Feasibility studies have commenced for the project; however; no publicly available information is currently available to support understanding of potential cumulative impacts.
- Carmichael East Coal Project (Waratah Coal): located to the north of the Alpha North Coal Project within the western portion of EPC 1080, which is immediately adjacent to the western boundary of the Mine Project Area. No publicly available information is currently available for this project to support understanding of potential cumulative impacts.

The revised cumulative impact assessment includes a consideration of consequential development that provides necessary supporting infrastructure for the export of coal. The projects considered were



- Abbot Point Terminal 0 Project
- Port of Hay Point (Dudgeon Point Expansion)

The revised cumulative impact assessment concludes that adequate controls would be in place for identify and manage impacts from these consequential developments.



## 9. Offsets strategy

### 9.1 Introduction

This section of the SEIS provides an overview of the amendments to the Project (Mine) and additional work undertaken in relation to offsets 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 the Project

Amendments to the Project description (Mine, Offsite and Rail), listed below, have triggered the recalculation of the vegetation clearing and impacted areas for the purposes of the offsets strategy.

Mine (onlease):

- Updated Mine plan (including mine and water infrastructure): six open cut pits and five underground mines
- Reduced Project (Mine) life from 90 years to 60 years

Mine (offlease):

- The location of the airport moved from the north of the rail line, to the south of the rail line
- Removal of instream water harvesting as a water supply option
- Relocation of the water pipeline within the rail corridor

Rail:

- 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)

### **9.1.2 Updates to studies**

To support inputs to the Environmental Offset Strategy report, a number of additional studies have been undertaken including:

- Revised Offsets Strategy (SEIS, Volume 4, Appendix F)
- Offsite Infrastructure BioCondition (SEIS, Volume 4, Appendix J6)
- Offsite Ecology Surveys (SEIS, Volume 4, Appendix J5)
- Doongmabulla and Mellaluka Springs Report (SEIS, Volume 4, Appendix J3)
- Black-throated Finch Monitoring Report (SEIS, Volume 4, Appendix J2)
- Revised Mine Ecology Report (SEIS, Volume 4, Appendix J1)
- GBR Wetland Protection Areas Report (SEIS, Volume 4, Appendix J8)
- Quarries Environmental Impact Review (SEIS, Volume 4, Appendix J9)

Adani has commissioned an Ecological Equivalent Assessment for the exploration areas over EPC1690 as a requirement for offsetting those related impacts. Additionally, a consultant has been commissioned to complete Ecological Equivalence assessments across the balance of the Mine site.

## **9.2 Summary of comments**

Summary of key comments raised on the EIS relevant to offsets included:

- Requirement for more detail in the Environmental Offset Strategy that is consistent with current offset policy requirements
- Requirement for ecological equivalence assessments for inclusion in the Environmental Offset Strategy
- Overlap of the proposed biodiversity offset area (Moray Downs) with the China Stone Project
- Inadequacy of offsets currently proposed

## **9.3 Response to comments**

### **9.3.1 Revised Offsets Strategy**

The Environmental Offset Strategy Report has been revised to address all comments and incorporate additional information to support the proposed strategy. The revised Offsets Strategy is consistent with current State and Federal Offset policies and takes account of the Galilee Basin Offsets Strategy. Additionally, all offset values have been reassessed and recalculated as a result of changes across the Project as detailed elsewhere in the SEIS



(Volume 2 Section 2 and Volume 3 Section 2). The revised strategy is provided in Volume 4, Appendix F of this SEIS.

### **9.3.2 Ecological Equivalence Assessment**

Ecological Equivalence Assessments have been undertaken for the Exploration Areas and for the Offsite Infrastructure Area (SEIS, Volume 4, Appendix J6). Adani will commission the Ecological Equivalence Assessments for the balance of the Project (Mine Area), the Project (Rail) and proposed offset areas to provide quantitative information on offset area requirements as part of the implementation of the offsets package.

### **9.3.3 Overlap of Moray Downs and China Stone Project**

The revised Offsets Strategy (SEIS, Volume 4, Appendix F) identifies suitable Offset properties within the Galilee Basin in accordance with the Galilee Basin Offsets Strategy (GBOS). These properties are prioritised within that strategy and the strategy excludes in compatible tenure such as Mining Leases. The China Stone Project does not currently have tenure excluding the GBOS, and therefore, does not preclude the securing of Offsets in the locations identified. Under State and Federal policies, future projects may have to provide additional Offsets where impacts occur at secured Offset areas.

Nevertheless, Adani will consult with Macmines Australia regarding the securing of offsets on Moray Downs and potential impacts on its proposed mining activities in order to achieve positive outcomes compatible with the GBOS.

### **9.3.4 Inadequacy of proposed offsets**

The revised Offsets Strategy (SEIS, Volume 4, Appendix F) identifies suitable properties more broadly within the Galilee Basin in accordance with the Galilee Basin Offsets Strategy (GBOS), QLD Offset policies, and the Commonwealth Offset policy. The EIS had only considered the use of the Moray Downs property.

The Offsets strategy has identified through desktop analysis, that there are suitable properties available to offsets all but one of the environmental values identified (98 percent of offsets). Field studies will be undertaken in accordance with those policies, in order to refine the suitability of those properties, and to assist in offset package finalisation.



## 10. Project commitments

### 10.1 Introduction

This section of the SEIS provides an overview of the additional work undertaken in relation to commitments 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 the Project

Amendments to the Project (Mine and Rail), as described in Section 2 of Mine and Rail Project Description Volumes 2 and 3, have not impacted on the commitments undertaken in the EIS. Additional commitments have been identified through the studies undertaken for the SEIS. These commitments are discussed in detail under Volume 4 Appendix G.

#### 10.1.2 Updates to studies

Commitments have been identified through the studies undertaken for the SEIS. In addition, the following management plans contain specific details on monitoring, management and mitigation measures that complement the project commitments listed under Volume 4 Appendix G.

- Rail site based management plans and species management plans (refer to Volume 4 Appendix C3)
- Offsite infrastructure site based management plans (refer to SEIS Volume 4 Appendix C4)
- Quarry site based management plans (refer to SEIS Volume 4 Appendix C5)
- Social Impact Management Plan (SEIS Volume 4 Appendix D2)
- Offsets Strategy (SEIS Volume 4 Appendix F)
- Draft Subsidence Management Plan (SEIS Volume 4 Appendix I2)
- Environmental Management Plan – Mine (SEIS Volume 4 Appendix Q1)
- Environmental Management Plan – Offsite (SEIS Volume 4 Appendix Q2)
- Closure and Rehabilitation Strategy – Mine (SEIS Volume 4 Appendix R1)
- Closure and Rehabilitation Strategy – Offsite (SEIS Volume 4 Appendix R2)
- Bushfire Management Plan (SEIS Volume 4 Appendix S2)
- Environmental Management Plan – Rail (SEIS Volume 4 Appendix V)
- Closure and Rehabilitation Strategy – Rail (SEIS Volume 4 Appendix X1)
- Closure and Rehabilitation Strategy – Quarries (SEIS Volume 4 Appendix X2)

### 10.2 Summary of comments

Summary of key comments raised on the EIS relevant to commitments included:

- No commitment to maintain roads or ensure money is put back into the community



- Mechanism for enforcing of Adani's commitments in collaboration with Council, the community and other key stakeholder to deliver best practice outcomes

### **10.3 Response to comments**

The Project Commitment Chapter of the EIS has been revised to include the EIS commitments and additional commitments made. The revised Project Register is provided in SEIS Volume 4 Appendix G. Social and economic commitments are presented in the Social Impact Management Plan (refer to Volume 4 Appendix D2). The mechanisms for enforcing commitments made under the EIS and SEIS will be through the Coordinator General's Evaluation Report, the EPBC Approval Report and numerous subsequent approvals, all of which are enforceable under the relevant legislation.



# 11. Matters of national environmental significance

## 11.1 Introduction

### 11.1.1 Amendments to Project description

The changes to the Project (Mine) relevant to matters of NES include:

- changes to the Mine plan and layout
- changes to the layout of the Offsite infrastructure area

The changes to the Project (Rail) relevant to matters of NES include:

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

### 11.1.2 Update to studies

The following additional studies have been undertaken in response to these amendments and to comments received during the EIS submission period.

These reports include:

- Revised MNES Report (refer to SEIS Volume 4 Appendix H)
- Revised Mine Ecology Report (refer SEIS Volume 4 Appendix J1)
- Black-throated Finch Monitoring Report (refer SEIS Volume 4 Appendix J2)
- Doongmabulla and Mellaluka Springs Report (refer SEIS Volume 4 Appendix J3)
- Population Survey of Waxy Cabbage Palm Report (refer SEIS Volume 4 Appendix J4)
- Offsite Infrastructure Ecological Assessment Report (refer SEIS Volume 4 Appendix J5)
- Offsite Infrastructure BioCondition Report (refer SEIS Volume 4 Appendix J6)
- Offsite PMAV Report (refer SEIS Volume 4 Appendix J7a)
- Offsite PVMP Report (refer SEIS Volume 4 Appendix J7b)
- GBR Wetland Protection Areas Report (refer SEIS Volume 4 Appendix J8)
- EPBC assessment of the five quarries (refer SEIS Volume 4 Appendix J9)

## 11.2 Summary of comments

Issues raised in these submissions included:

- Impacts to the Great Barrier Reef including changes to sediment loads and groundwater
- Potential impacts on the Tree of Knowledge resulting from groundwater drawdown
- Potential impacts to the Bowling Green Bay and Shoalwater and Corio Bays Ramsar sites



- Adequacy of surveys and level of survey effort, particularly in relation to rare and threatened species and offsite infrastructure areas
- Impacts on black-throated finch (southern), particularly through clearing of known habitat for the subspecies
- Impacts to the threatened fauna species, koala and squatter pigeon, through clearing of potential habitat for the species including clearing within Bygana West Nature Refuge
- Impacts on groundwater dependant ecosystems and species, such as impacts on riparian vegetation surrounding the Carmichael River, including waxy cabbage palm and *Eryngium fontanum*
- Impacts on the Great Artesian Basin, including Mellaluka Springs and Doongmabulla Springs and TECs and migratory species
- Impacts of subsidence on habitat for threatened species, in particular black-throated finch
- Cumulative impacts of threatened species, in particular black-throated finch (southern)
- Offset strategy

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 Great Barrier Reef

The Project will directly and indirectly affect the water quality and quantity of the Carmichael River catchment. Understanding the movement of water to the coast and the contribution of the Carmichael River catchment to the larger Burdekin River Basin is important for understanding potential for the Project to impact upon the Great Barrier Reef (GBR).

Kroon et al. (2012) identify that the Burdekin River Basin is the largest contributor of sediment to the GBR. The large contribution of total suspended sediment loads from the Burdekin River Basin to the GBR is derived from grazing lands.

The majority of the Burdekin River Basin runoff (over 80 percent), including the Carmichael River catchment is regulated by Lake Dalrymple and the Burdekin Falls Dam. The dam catchment captures inputs from the Belyando and Suttor Rivers associated with the Study Area as well as inputs from the Cape River and the upper Burdekin River catchments.

The Carmichael River catchment is part of the larger Belyando River catchment. In turn, the Belyando River catchment is part of the Burdekin River Basin, which discharges to the coast at Upstart Bay within the GBRWHA. The affected Mine catchment area makes up 1.4 percent of the Belyando River catchment and 0.44 percent of the Burdekin Basin catchment.

The Belyando River catchment, of which the Mine Area makes up 1.4 percent, contributes less than or equal to 11 percent of the sediment loads to the Burdekin Falls dam and sediment loads attributed to this river were less 1 percent in some years. Lewis et al. (2013) determined that sediment loads delivered to the Burdekin Falls Dam were predominantly sourced from the upper Burdekin River (70 – 94 percent).

The contributions of the catchment within which the Project is located to downstream flows to the GBR are markedly far less than other catchments and as the Project will affect a very minor



proportion of the catchment, it is unlikely that a material change in these flows will be detectable.

The design, engineering and understanding of onsite environmental conditions at the Mine Area have informed development of measures proposed to mitigate the potential impacts from sediment and Mine affected water from the Mine Area. Details are provided in Volume 4, Appendix K5 Revised Mine Hydrology Report. Measures principally relate to controlling movement of water around and across site, trapping and treating waters affected by site works and release of treated waters back into streams. To facilitate this, dedicated water management structures and systems will be established as a priority during construction works. These include diversion drains, sediment ponds, dams for storage of waters from site and scour protection measures for any surfaces that may be exposed to water runoff and have potential to mobilise sediments into the adjacent waterways (see SEIS Volume 4, Appendix K5 Revised Mine Hydrology Report).

The Mine catchment area is 0.44 percent of the Burdekin Falls Dam catchment and the majority of the sediment loads delivered to the Burdekin Falls Dam are predominantly sourced from the upper Burdekin River (70 – 94 percent) (Lewis et al., 2013). A number of hydrological barriers and catchment land uses exist between the Mine Area and the coast, these influence the quality and quantity of water that flows into Upstart Bay within the GBRWHA. Therefore, no onsite impacts are expected to detrimentally affect the values for which the GBR is recognised. No impacts associated with the Project are expected to result in a substantial and measurable change in the hydrological regime of the GBRWHA waters or systems that feed those waters and, therefore, no effects on the GBRMP are predicted either. The catchment within which the Project is sited provides little contribution to flows that influence the coast from this region and onsite controlling measures will manage potential for impacts offsite to be realised. Localised impacts within the immediate Project catchment are expected but these are not considered to have connectivity to coastal habitats. The distance from the protected area and barriers (dam etc.) would impede site conditions from having an influence, directly or indirectly, on the protected values of the GBRWHA or GBRMP.

Full details are presented in SEIS Volume 4, Appendix H Revised MNES report.

The hydrogeology report has not identified any connection between groundwater at the proposed mine site or along the proposed rail alignment and coastal areas or the GBRWHA or the GBRMP. See SEIS Volume 4, Appendix K1 Updated Mine Hydrogeology Report and Appendix K6 Addendum to K1 for further details regarding groundwater.

### **11.3.2 Tree of Knowledge**

The Tree of Knowledge and curtilage at Barcaldine is the closest National Heritage Place to the Study Area. It is located approximately 200 km south-west of the western extent of the Study Area. In April 2006, the Tree of Knowledge was poisoned and did not recover. It was felled on 29 July 2007 but the site remains an important place of National Heritage. No direct or indirect influences on this Place will occur as a consequence of the Project.

### **11.3.3 Ramsar sites**

The Project is not hydrologically or ecologically connected to any Ramsar wetland. The Study Area is connected aquatically to the Burdekin River but flood plumes from this system do not move northwards to influence Bowling Green Bay, instead they flow offshore. A number of



mitigation measures at the Mine site will control any sediment runoff, however, there may be flood events during which the sediment dams on site overflow. The impact from sediment plumes from recent flood events to the Ramsar wetlands was assessed. The sediment plume from the Burdekin River does not reach the Bowling Green Bay Ramsar site instead, it moves further out to sea. This provides further evidence that the sediment loads from the Burdekin Basin do not reach Bowling Green Bay or Shoalwater and Corio Bay Ramsar wetlands.

Accordingly, no areas of Ramsar wetland are predicted to be impacted by this Project. No areas of internationally important wetland will be lost, destroyed or substantially modified as a result of the Project nor will the hydrological regime of those distant wetlands be affected. None of the biodiversity for which the Ramsar wetlands are recognised will be impacted by Project activities as the Project will not affect the geography of any Ramsar protected wetlands nor will it act to introduce invasive species to any wetland sites. Accordingly, no impacts to Ramsar wetlands are predicted to occur as a result of this Project.

Full details are presented in Volume 4, Appendix H Revised MNES report.

#### **11.3.4 Adequacy of surveys and level of survey effort**

Several submissions on the EIS commented on an insufficient level of survey effort for the offsite infrastructure areas.

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 J5). A revised Mine Ecology Report (SEIS Volume 4, Appendix J1) provides an overall assessment of the mine and offsite infrastructure impacts, bringing together the consideration of these areas, as opposed to the separate reporting of these areas that featured within the EIS. Construction impacts associated with development of the offsite infrastructure have been recalculated based on the revised Project Description (SEIS Volume 4, Appendix B).

Whilst the survey work carried out at EPC 1080 was acknowledged as relatively lower than that carried out for 1690, it was considered to be sufficient to determine the principal vegetation communities present within the area and the condition of these communities. Given the extensive survey effort on the neighbouring 1690 lease area, as well as the comprehensive offsite surveys of adjacent areas since that time, it has been possible to extrapolate these findings and apply them to the 1080 area, in order to gain a broad understanding of the flora known and likely to be present, sufficient for the purposes of the EIS.

#### **11.3.5 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

Further information and detail of these tasks is presented in a draft Black-throated Finch Adaptive Monitoring Plan.

A detailed plan was prepared for the Local monitoring (observation) on the Mine Area task, with the aim of collecting comprehensive information on habitat use, distribution across the Mine Area, nest sites, variation in sites where black-throated finch were present and absent, types of water sources preferred for use, habitat condition, weed, fire and grazing effects and landscape use.

The first survey was conducted in May 2013. It established 80 monitoring sites: 52 x 2 ha woodland sites, 8 x water body count sites and 20 x camera trap sites. Detailed vegetation and habitat data was collected at the 2 ha sites. Survey methods follow those in the EPBC Significant Impact Guidelines.

Surveys were conducted over 8 days. A further 208 records of black-throated finch were recorded mainly from 2 ha counts in 12 locations, including 3 records of nesting. The camera traps recorded a further 6 locations and mainly utilising troughs and ephemeral water sources.

In terms of the evidence of nesting, at one site, an adult bird was observed transporting *Panicum sp.* stalks suggesting nesting activity nearby; however, the nests were not found. At another site, at least two active nests being used by black-throated finch were found in *Acacia coriacea*. At a third site, an active nest being used by black-throated finch was found in *Eucalyptus melanophloia*. No breeding activity was observed (this nest may have just have been used for roosting). The on-going monitoring will continue to survey nesting activity in these sites, and search for additional nest locations.

The cameras were set for between 22 and 42 days, recording data continuously, thus representing over 500 days of continuous monitoring. This level of effort is substantially greater than that recommended by the Significant Impact Guidelines and the new data is providing important information on water sources regularly used, and daily water use budgets. Further monitoring will identify if these water sources are regularly used, or if water sources use shifts seasonally. Furthermore, different water sources will be monitored over time, as others dry out.

The full results are presented in SEIS Volume 4, Appendix J2 Black-throated Finch Monitoring Survey Report.

The surveys will continue over time to provide data on temporal and spatial variation of habitat use of the Mine Area. Camera traps in particular will also provide significant secondary information on other key species, such as feral animals (pigs *Sus scrofa* and cats *Felis catus*), which may be used in feral pest management on the Mine Area, and the presence of other EPBC Act listed species such as the squatter pigeon (southern). This data will contribute significant information for incorporation into the Black-throated Finch Species Management Plan for the Mine Area, and will assist in species recovery and mitigation of impacts on the Mine Area, following the principles of adaptive monitoring and management.

The phased construction schedule will allow important population, movement and habitat information to be collected, particularly with respect to seasonal use, key areas, nest sites, important feeding areas, etc. The most up-to-date information will be used to formulate the optimal strategies to manipulate the distribution of black-throated finch on the Mine Area (e.g.



via use of water sources, fire, grazing removal), or the requirement for trapping or translocations. In the case of subsidence, which will occur gradually and in a complex and partly unpredictable manner, the data being collected will be used adaptively to focus on mitigating adverse effects should these occur and manage key resources for black-throated finch on the Mine Area.

### 11.3.6 Threatened fauna species

The potential to realise a significant impact upon the listed threatened species within the Study Area has been considered against criteria identified by DSEWPaC. Those threatened species that could be affected by the Project, as determined by site assessments and desktop studies include:

- Black-throated finch (southern) (*Poephila cincta cincta*) – endangered under the EPBC Act; confirmed present at Mine and likely to occur at Rail Study Area
- Squatter pigeon (southern) (*Geophaps scripta scripta*) – vulnerable under the EPBC Act; confirmed present across both Mine and Rail Study Areas
- Ornamental snake (*Denisonia maculata*) – vulnerable under the EPBC Act; confirmed present across both Mine and Rail Study Areas
- Yakka skink (*Egernia rugosa*) – vulnerable under the EPBC Act; likely to occur across Mine Study Area

Detailed assessment of potential to significantly impact upon any threatened fauna species noted above has occurred giving consideration to the DSEWPaC Significant Impact Guidelines (with the exception of the Koala, listed after the commencement of the EIS). That assessment is provided in EIS Volume 2, Section 5 Mine Nature Conservation, EIS Volume 3, Section 5 Rail Nature Conservation and SEIS Volume 4, Appendix J1 Revised Mine Ecology Report. In summary, assessment identifies that the Project is not expected to have a significant impact upon any of the identified threatened flora or fauna except the black-throated finch (southern).

For species, which are not considered to be significantly impacted, this finding is on the basis that:

- The Study Area does not support an important population of any of these species
- The species are well represented in landscapes that surround the Study Area, where suitable alternative habitat is prevalent and will persist
- The species are not considered to be dependent upon any habitat within the Study Area for survival

As such, while large tracts of habitat suitable for these matters of NES will be affected, alternative habitat suitable for these species exists adjacent to the Study Area and within the region.

### 11.3.7 Groundwater dependant ecosystems and species

#### *Springs*

Additional surveys of the Doongmabulla and Mellaluka Springs were carried out in March/April 2013, including migratory bird surveys. The additional work carried out revealed that, in general, the habitats present within the Doongmabulla Springs complex are intact and in good ecological



condition exhibiting only minor disturbance and that the greatest habitat values of the complex are the permanency of water and the connectivity of the wetland to the nearby waterways and the surrounding region. It also revealed a lesser complexity of habitat within the Mellaluka Springs complex than at Doongmabulla and that the value of this habitat may be more limited for some species.

During the 2013 survey, numerous bird species were observed within the Doongmabulla wetlands. Of particular note was the presence of the EPBC and NC Act listed squatter pigeon (*Geophaps scripta*). A total of 70 bird species were observed within the Doongmabulla wetlands.

Three observed birds are listed as migratory under the EPBC Act, brolga (*Grus rubicundus*), eastern great egret (*Ardea modesta*) and osprey (*Pandion haliaetus*). The observed birds can be generally categorised as common waterbirds, woodland and grassland birds. Woodland birds were most frequently observed. These birds include such species as the blue-faced honeyeater (*Entomyzon cyanotis*), the brown treecreeper (*Climacteris picumnus*) and double-barred finch (*Taeniopygia bichenovii*). The most common waterbirds included the white-faced heron (*Egretta novaehollandiae*), eastern great egret (*Ardea modesta*) and black-fronted dotterel (*Elseya melanops*).

During the 2013 survey, a total of 44 bird species were identified within the Mellaluka wetlands. Three observed birds are listed as migratory under the EPBC Act, brolga (*Grus rubicundus*), eastern great egret (*Ardea modesta*) and fork-tailed swift (*Apus pacificus*). A small flock of domesticated Guinea fowl (*Numida meleagris*) were also present at the Mellaluka Spring. Similarly to the Doongmabulla wetlands, typically birds were common waterbirds, woodland and grassland birds. Woodland birds were most frequently observed. These birds include such species as the double-barred finch (*Taeniopygia bichenovii*), pale-headed rosella (*Platycercus adscitus*) and black-faced cuckoo shrike (*Coracina novaehollandiae*). The most common waterbirds included the purple swamphen (*Porphyrio porphyrio*), eastern great egret (*Ardea modesta*) and black-tailed native hen (*Trypanox ventralis*).

The worst case predicted reduction in pressure in the aquifer at the Doongmabulla Springs varies, from less than 0.05 m at the Moses spring group to 0.19 m at the Joshua Spring. It is expected this reduction in pressure would represent a negligible impact on the ecology of the spring and the surrounding wetlands.

During the operational phase, the maximum predicted reduction in pressure is in the Permian-age strata aquifer, with up to 1.14 m predicted for at the Mellaluka spring, 8.22 m at Lignum Spring and 2.34 m at Stories Spring. It is predicted that post closure, the main Mellaluka Spring will see drawdowns of up to 9.07 m in Permian-age strata, with the northern springs (Stories and Lignum Springs) predicted to experience drawdowns of up to 13.4 and 25.6 m in Permian-age strata respectively post closure. This is well below ground level and only the most deep-rooted trees associated with the springs will still be able to access groundwater at this depth.

It is concluded that impacts to the Mellaluka spring group will be significant during operations for at least the Lignum and Stories Springs, and of significant magnitude post-closure for the entire spring group.

Groundwater modelling has identified only very minor drawdown in the vicinity of Doongmabulla Springs and hence, no impact on the migratory species utilising this habitat is expected. Refer



to SEIS Volume 4, Appendix K1 Updated Mine Hydrogeology Report and Appendix K6 Addendum to K1 for further details regarding groundwater.

The full results of this survey are reported in SEIS Volume 4, Appendix J3 Doongmabulla and Mellaluka Springs Report.

### *Waxy cabbage palm*

The 2013 survey found waxy cabbage palms growing primarily in sandy alluvial soil on channel benches, channel bars, and in the bed of the Carmichael River, in situations where groundwater is likely to be closest to the surface, and clustered along a 'gaining' section of the river. In 'losing' sections of the river, the palms were recorded in much lower densities.

The majority of waxy cabbage palms (including most of the adults) are located within the western half of the Mine Area, and in this section it is considered likely to persist despite the predicted changes, together with other species in the riparian zone.

While the dominant riparian vegetation in the Carmichael River is tolerant of extended zero/low flow events, a predicted reduction in base flow volume, and a predicted increase in zero flow periods is likely to stress palms in locations where groundwater is predicted to be drawn down by up to around 4 m in the near vicinity of the river. In the 800 m stretch where drawdown of between 1 and 4 m is predicted these changes are likely to result in the loss of some or all of the canopy trees (probably after a period of some years of slow decline). In particular, the waxy cabbage palm is unlikely to be able to tolerate such a combined reduction in access to base flow and groundwater, although the population survey counted only two juvenile palms in this section of the river.

The relatively low percentage of adults in this eastern section of the river is likely to be indicative of the existing difficulties seedlings and sub-adults experience to become established where groundwater is deep, base flow volume is low, and zero baseline flow events are more common than upstream. It is not clear how many of the large number of juveniles in this section of the river will survive under existing conditions – based on the low relative number of adults present, high mortality rates are expected. However, all waxy cabbage palms (juveniles, sub-adults and adults) are expected to be challenged by the likely groundwater changes predicted by the modelling.

The primary impacts (without mitigation measures) to the waxy cabbage palm are reduced base flow as the result of drawdown of the groundwater table, reductions in base flow from upstream, and increases in the frequency of zero base flow events. These impacts will result in a reduction in health, stress and probable mortality of waxy cabbage palm individuals (a vulnerable species under both the EPBC Act) located in the eastern half of the Mine Area, including 9 adults and 160 juveniles.

In summary, in the eastern section of the river the waxy cabbage palm will be significantly impacted by groundwater drawdown within the Carmichael River channel.

Further details of this assessment are provided in SEIS Volume 4 Appendix J1 Revised Mine Ecology Report.

### **11.3.8 Subsidence**

For four threatened species confirmed present or likely to occur (black-throated finch (southern), squatter pigeon (southern), yakka skink and little pied bat), the vast majority (80 – 91 percent) of



the overall area predicted to be subject to subsidence represents potentially suitable habitat. These species utilise a wide range of grassland and open woodland habitats.

Adani proposes to manage the subsidence areas to maximise retention of suitable habitat. This is described in SEIS Volume 4, Appendix I1 Subsidence Assessment Report. However, Adani recognises that it may not be possible maintain viable habitat over subsided areas and the Revised Offset Strategy (Appendix F) includes subsidence areas in calculations of offset obligations. The draft Subsidence Management Plan (refer to SEIS Volume 4, Appendix I2) proposes controls, mitigation and management measures for minimising impacts on existing habitat and dependent fauna.

Those species with a noted affiliation to water (squatter pigeon (southern), black-throated finch (southern) and ornamental snake in particular) may be able to take advantage of the creation of additional ponded surface water areas as a result of subsidence, even where this resource is temporary, though the destructive impact on surface habitat might negate this effect. Black-throated finch (southern) requires an abundance of reliable water sources within its localised habitat ranges. Furthermore, they have been observed (during survey work) to drink from water sources in areas of cleared land or non-wooded vegetation and therefore any localised changes in habitat structure around existing or new water sources may not affect the subspecies' ability to use these water sources, so long as the requisite grassland and woodland habitats remain present within the nearby surrounds. However as the subsidence will occur gradually and in a complex and partly unpredictable manner, the data being collected by this long term monitoring in the Mine Area will provide information regarding the best strategies over time to mitigate negative effects and manage key resources for black-throated finch (southern) on the Mine Area.

The approach to management of ponded water in subsidence areas is set out in SEIS Volume 4, Appendix K4 Flood Mitigation. Ponded water will be left in situ if water quality is acceptable (against WQOs) and there is no risk to underground mining and there is no erosion occurring. Otherwise, ponds will be drained.

Note that the underground mining area is not traversed by any significant streams, but only by a small number of ephemeral watercourses. Further, evaporation far exceeds rainfall in this location. Hence, the extent of ponding is expected to be minimal.

A draft Black-throated Finch Adaptive Monitoring Plan has been prepared for the black throated finch (southern) (SEIS Volume 4, Appendix J2). In addition, a Black throated Finch Threatened Species Management Plan will be prepared to facilitate appropriate management of the black throated finch during construction and operation of the Project (refer to SEIS Volume 4, Appendix C3 for Threatened Species Management Plan template). Ongoing monitoring will be important in the management of potentially delayed impacts such as those attributed to subsidence. Management and monitoring of impacts to the black-throated finch (southern) will contribute to the recovery of the subspecies, as per the objectives of the National Recovery Plan for the Black-throated Finch Southern Subspecies (Black-throated Finch Recovery Team, 2007). The onsite and offsite (offset areas) habitat management and complementary monitoring program, as described above, will be developed and implemented in consultation with relevant stakeholders (i.e. Black-throated Finch Recovery Team, Commonwealth and State governments).

Further details are provided in SEIS Volume 4, Appendix J1 Revise Mine Ecology Report.



### **11.3.9 Cumulative impacts of threatened species**

An evaluation of the potential cumulative impacts resulting from the Project including an estimation of the overall size, significance and likelihood of these impacts has been undertaken. Review of the relevant projects (that is, with publically available information) for threatened species and ecological communities listed under the EPBC Act that are predicted to occur in the Galilee Basin has been completed to understand whether there is potential to have cumulative loss of these communities.. The potential impact to each species from the direct (clearing for Mine and Rail Projects) and indirect (subsidence, where available) loss of habitat for the individual projects within the Galilee Basin was determined.

A significant impact to the black-throated finch (southern) is predicted to occur as a consequence of both this Project and as a result of cumulative loss of habitat across other known projects within the Galilee Basin. The cumulative loss of habitat across projects will increase pressure on black-throated finch habitat in the Galilee Basin, and is likely to exacerbate the potential significant impact resulting directly from the Project.

Each proponent will be required to provide offsets in accordance with Commonwealth and State policies for unavoidable impacts on potential habitat for each of the abovementioned species. These offsets should take account of the potential cumulative impacts that each project will realise, addressing indirect impacts, fragmentation and loss of habitat regionally instead of considering only localised direct impacts or habitat loss. This has been accounted for by this Project in designing and considering offset requirements in accordance with the Galilee Basin Offsets Strategy.

Full details are presented in Volume 4, Appendix H Revised MNES Report.

### **11.3.10 Offset strategy**

Adani has provided a Revised Offset Strategy in the SEIS (Volume 4 Appendix F). Offset acquisition will be in accordance with State and Commonwealth policy requirements and will consider land tenure and other legislative requirements also. Avoidance and mitigation measures are presented throughout the EIS and SEIS include ongoing commitments to seek reductions to predicted environmental impacts.

## **11.4 Amendment to commitments**

No specific additional commitments are relevant for matters of NES.



## 12. References

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