



# INFORMATION REQUEST TO DEPARTMENT OF ENVIRONMENT AND HERITAGE PROTECTION

*New Acland Coal Mine  
Stage 3 Project*

**JUNE 2015**



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## 1. Introduction

The purpose of this Report is to provide the Department of Environment and Heritage Protection (EHP) with information as outlined in correspondence dated 27 May 2015 to the New Acland Coal Pty Ltd (NAC).

The specific information requested by EHP pursuant to section 140 of the *Environmental Protection Act 1994* (EP Act) is outlined below and detailed in the following sections of this Report.

- a) The additional information required by the Coordinator General's Report (December 2014), as follows:
  - Revised Environmental Management Plan (EM Plan);
  - Revised Environmental Offset Strategy (EOS); and
  - Groundwater Monitoring and Impact Management Plan (GMIMP).
- b) Clarification of the environmentally relevant activities (ERAs) proposed to be undertaken as part of the revised Project.
- c) A description of the activities proposed to be conducted with regard to ERA 16 extractive and screening activities.

## 2. Additional Information for the Coordinator General's Report

### 2.1. Revised Environmental Management Plan

The revised EM Plan is located in **Appendix A**. The amendments to the EM Plan include additional information about ERA 16 - Extractive and screening activities and updates to the groundwater management information consistent with the GMIMP.

### 2.2. Revised Environmental Offset Strategy

The revised EOS is located in **Appendix B**. There will be no additional offset requirement as a result of conducting ERA 16 as the basalt will only be extracted as a consequence of coal mining and within the footprint of the mining lease and blocks disturbed for coal mining. The amendments to the revised EOS are summarised below.

- The document has been re-named 'Environmental Offset Strategy' to reflect the nomenclature of the Coordinator General's Evaluation Report.
- A short overview of the document's history to-date has been added to the Introduction, including a reference to the Coordinator General's Evaluation Report.
- Chapters on the Coordinator General Conditions and the future EPBC Approval have been added for context within the document.
- Chapter 8 and 9 of the document have been updated to reflect the further work completed by the New Hope Group to address the State's and Commonwealth's offset requirements, respectively.
- Chapter 10 on the delivery of the offsets has been generalised to more reflect the process.
- Chapter 11 on the Offset Management Plans commits to their delivery as specified by Condition 4 of Appendix 3 of the Coordinator General's Report (and includes specific details from the Condition).

### 2.3. Groundwater Monitoring and Impact Management Plan

The updated GMIMP is located in **Appendix C**. There will be no impact on the groundwater as a result of conducting ERA 16 as the basalt is capping above the coal and is removed as part of the overburden removal. No excavation below the bottom of coal will be conducted for basalt sourcing. The amendments to the GMIMP are summarised below.

- Updated revised Project's monitoring bore locations (tables and figures in Section 3 of the GMIMP), based on the GMIMP drilling results to date:
  - Updated GMIMP bore naming convention to align with the standard NAC monitoring bore nomenclature.
  - Some small modifications to some bore locations based on on-ground land access constraints.
  - Removal of two bores accessing basalt aquifers close to the western boundary of the Project area, where the GMIMP drilling results at those sites indicated that the basalt aquifer was not present.
  - Addition of four new bores further west of the Project area, to replace those bores closer to the western boundary of the Project area where drilling results indicated that the basalt aquifer was not present.

- Removal of a Walloon Coal Measures monitoring bore to the north of the Project area, and replacement with a Marburg Sandstone monitoring bore at that location, where the GMIMP drilling results indicated that the Walloon Coal Measures aquifer was not present.
- Updated descriptions of the extent of impacts to the aquifers in and surrounding the Project area, based on the latest AEIS modelling results (Section 2.4 of the GMIMP).



### 3. Environmentally Relevant Activities for the Revised Project

The ERAs to be undertaken as part of the revised Project are outlined below.

- Schedule 2A, Item 13 of the *Environmental Protection Regulation 2008* (EP Reg) - **mining black coal.**
- Schedule 2, Part 2 of the EP Reg – **ERA 8 Chemical Storage**, (1) Chemical storage (the relevant activity) consists of storing — (c) more than 500m<sup>3</sup> of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3.

The threshold as it relates to ERA 8 Chemical Storage for the revised Project is: 3 storing more than 500m<sup>3</sup> of chemicals of class C1 or C2 combustible liquids under the AS 1940 or dangerous goods class 3 under subsection (1)(c).

- Schedule 2, Part 4 of the EP Reg – **ERA 16 Extractive and screening activities**, (1) Extractive and screening activities (the relevant activity) consists of:
  - (b) extracting, other than by dredging, a total of 5,000t or more material, in a year, from an area; and
  - (c) screening 5,000t or more material, in a year.

The thresholds as they relate to ERA 16 Extractive and Screening activities for the revised Project are: 2 (b) more than 100,000t but not more than 1,000,000t and 3 (b) more than 100,000t but not more than 1,000,000t.

- Schedule 2, Part 7 of the EP Reg – **ERA 31 Mineral processing**, (1) Mineral processing (the relevant activity) consists of processing, in a year, a total of 1,000t or more of coke or mineral products.

The threshold as it relates to ERA 31 Mineral processing for the revised Project is: 2 processing, in a year, the following quantities of mineral products, other than coke (b) more than 100,000t.

- Schedule 2, Part 11 of the EP Reg – **ERA 50 Bulk material handling**, (1) Bulk material handling (the relevant activity) consists of:
  - (a) loading or unloading minerals at a rate of 100t or more a day; and
  - (b) stockpiling 50,000t or more of minerals.

The threshold as it relates to ERA 50 Bulk material handling for the revised Project is: 1 loading or unloading 100t or more of minerals in a day or stockpiling 50,000t or more of minerals (b) at another place.

## 4. Description of Activities for ERA 16

Basalt processing for internal NAC utilisation is currently being conducted within the mining lease boundaries and has been for a number of years. The purpose of this basalt crushing and sizing processing has been for the following products:

- Stemming for blast hole loading on overburden and interburden blasting within the Acland mining areas currently being the active mining pits - South Pit and Centre pit on the Stage 2 mining leases;
- Road base (Class 2.4) for stockpile pad repairs and mine roadways;
- Gravels of various grading's for work pads, stabilisation of work areas and dirt roadway sheeting;
- Rip-Rap for erosion control bunding, dam inlets and spillways and by-wash areas;
- Sized material for erosion control within gabion baskets and rock matting;
- Building and structure support pads; and
- Fine basalt for pipeline and other bedding products.

NAC use has been less than 50,000 tonnes per annum (tpa) for all products including the raw unprocessed basalt product. Current processing has only been conducted on day shift operations and predominantly on a Monday to Friday basis. The proposal for future operations with an approved ERA 16 is still for day shift only operations which may need to span 7 days for a short period with peak construction demand for basalt products.

Environmental factors have been minimal and controlled at the basalt processing area source such as dust control with spray water application to work areas. Noise generation is minimal with the fixed plant crushing and screening equipment and smaller size earth moving equipment being utilised such as excavators, front end loaders, dozers, water truck, and road registered product trucks.

Fixed plant equipment includes various types of crushing equipment being hammer mills, jaw crushers and cone crushers or similar crushing equipment, static scalping screens, vibrating sizing screens and small transfer conveyors. All of these classes of equipment are currently utilised to process the basalt.

The proposed operation is to continue on a regular basis for extended operating hours overall on a day shift only basis and with similar equipment to currently utilised on the basalt stockpile and processing area. Different sites within the mining lease may be utilised to process the basalt close to the source in each pit. These additional areas would be controlled for noise, dust and environmental contaminants (e.g. oil leak if any from equipment) as per the existing basalt stockpile area which is in the now mined North Pit area. The basalt processing operations and offsite transport would only be a day shift activity within the hours nominally 7am to 6pm.

The initial proposal would be to continue producing the existing products as above in addition to a variety of products to be utilised on and offsite for the revised Project's construction phase. During the revised Project's construction phase the majority of the product would be used for construction purposes within the existing mining leases or within the new mining leases (MLA's 700002 and 50232).

Offsite sales and utilising of basalt products would also be conducted as markets and demand was available and production and transport costs could make the products competitive with dedicated quarry products. This is likely to be very minimal during the construction phase and likely to ramp up after construction depending on marketability of the various basalt products.

These products would include:

- Current products as produced with some in increased quantities for construction areas;
- Roadbase Class 2.1 product for road finishing and high load pad areas;
- Roadbase Class 2.3 product for road subgrade and lower load area pads;
- Roadbase Class 2.4 product for road subgrade, stockpile bases, general work pads and areas and building foundations;
- Sized Gravel products – 10mm, 20mm and other grades in smaller quantities as required for concrete, road way 2 pack dressings and bedding gravel;
- Rail ballast for railway line track foundation support and for other construction load rated fill product;
- Coarse Trip Rap of various sizes for dam inlet and spillway erosion control;
- Bedding basalt for pipeline and other bedding and top dressing works; and
- Other sized basalt products in smaller quantities for specific works.

The product tonnage for the construction period would be greater than 200,000 tpa for a two year construction phase.

Off-site potential after the revised Project's construction phase would be variable dependant on local construction projects and basalt products demand. For the purpose of consideration, the offsite products could be considered to be of the order of 100,000 tpa to 200,000 tpa.

All of the basalt feedstock that has been mined to date and stockpiled or intended to be mined is as a consequence of overburden removal to access coal reserves. No additional disturbance will be generated by the mining of the basalt other than product lay down and processing pads with surface topsoil disturbance only. This top soil would be stockpiled and the areas immediately rehabilitated as processing ceased. These stockpile areas may be located on already disturbed surface areas as is the case with an existing basalt stockpile located in the current North Pit.

Basalt capping's that exist within the current pit limits for the coal mine, are predominant in the uppermost layers and are mined as part of the overburden removal. Some of this basalt is of good quality, and as such the proposal is to stockpile this resource separately to the typical overburden material for future processing and on-selling.

Some of the basalt material mined to date, predominantly from the North Pit, along with a small amount sourced from the South Pit, has been stored within the North Pit basalt stockpile and is of nominally 4 million tonne of basalt capacity. This stockpiled basalt will be the prime supply of basalt feedstock and the current area of set up of the basalt crushing and sizing processing plant. The basalt feedstock tonnage will be added to as more of this material is encountered within the existing mining limits.

Significant tonnage of basalt products would continue to be utilised on site and transported within the existing mining leases. This product would involve no offsite transport to reach the utilisation destination.

Product for much of the revised Project's construction activities will require transport around the mining lease in road registered body trucks, 'B' Double trucks or Truck and Trailer configurations. These trucks would vary in load capacity with the maximum at approximately 40t for 'B' doubles to approximately 25t for body tip trucks. At a conservative estimate trucks would average 35t per load for truck movements.



The route selected from the main basalt stockpile area would be from the mining lease via the now closed Lange's Road to the Peachey-Maclagan roadway section of the Oakey-Cooyer Roadway. This intersection with bitumen sealing is still in place with approximately 75 m of off road access to the mining lease property fencing to allow for easy access onto and off the Peachey-Maclagan roadway. Clear vision is available in both directions from the Lange Road access with a 90 degree intersection at the intersection. Access control will be incorporated into this route at the mining lease boundary.

Other trucks would also be utilised through the existing mining lease and exit via the mine front boom gate access area as per other medium vehicle access to the site.

- At 2,000 t per week for 100,000 tpa rate - this average would be less than 60 truckloads per week or 10 truckloads per day over a 6 day week.
- At 4,000 t per week for 200,000 tpa rate - this average would be less than 120 truckloads per week or 20 truckloads per day over a 6 day week (Typical estimate).
- At 10,000 t per week for 500,000 tpa A rate - this average would be less than 300 truckloads per week or 50 truckloads per day over a 6 day week (Construction peak periods with 5 trucks per hour).

Even the peak truck movements would be a very low percentage of vehicle movements on the main access roadway being the Peachey-Maclagan designated section of the Oakey- Cooyer Roadway.

A full risk assessment of the processing and transportation of product would be conducted to determine activity and route hazards. Controls would then be put in place to manage and mitigate these identified hazards. All personnel and equipment will be mine site inspected, approved and authorised as per the requirements within the NAC site as per the NAC Safety and Health Management System.

## **APPENDIX A – REVISED ENVIRONMENTAL MANAGEMENT PLAN**

# ENVIRONMENTAL MANAGEMENT PLAN

*New Acland Coal Mine  
Stage 3 Project*

**June 2015**





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# 1. Introduction

## 1.1. Purpose of the Environmental Management Plan

The Environmental Management Plan (EM Plan) has been prepared to address the Terms of Reference for the New Acland Coal Mine Stage 3 Project (the revised Project). The purpose of the EM Plan is to propose environmental protection commitments to assist the Administering Authority prepare the Environmental Authority (EA) for the application. The EM Plan for the revised Project contains:

- A description of the revised Project;
- Environmental values likely to be affected by mining activities;
- Potential adverse and beneficial impacts of the mining activities on the environmental values;
- Environmental protection objectives; and
- Control strategies adopted to achieve the environmental protection objectives and the proposed EA conditions.

The structure of this EM Plan is outlined below:

- **Section 1** – Introduction provides background on the proponent, describes each of the relevant mining leases and land tenure, and identifies the relevant stakeholders.
- **Section 2** – Revised Project description describes the relevant mining activities and the land on which the mining activities are to be carried out.
- **Section 3** – Environmental Values, Impacts, Commitments, and Draft Conditions describes:
  - Environmental values likely to be affected by mining activities;
  - Potential adverse and beneficial impacts of the mining activities on the environmental values;
  - Environmental protection objectives;
  - Control strategies adopted to achieve the environmental protection objectives; and
  - Proposed EA conditions (including transitional arrangements).
- **Section 4** – Environmental Management describes details of the revised Project's systems for monitoring, reporting, research, training and auditing.
- **Section 5** – References used throughout this document.

## 1.2. The Revised Project

New Acland Coal Pty Ltd (NAC) currently operates the Mine at approximately 5 million tonne (product coal) per annum (Mtpa) as an open cut coal mine on Mining Lease (ML) 50170 and ML 50216, adjacent to Mineral Development Licence (MDL) 244, under the approval of EA EPML00335713. The Mine reserve is forecast to be depleted by 2017. The revised Project involves the extension and operation of the Mine, while increasing production from approximately 5 Mtpa up to 7.5 Mtpa of thermal product coal.

The revised Project involves the extension of the Mine's operating life to approximately 2029 with the inclusion and progressive development of two new resource areas within the area covered by MLA 50232. These resource areas are identified as the Manning Vale and Willeroo resource areas. The revised Project will include mining in three new mine pits, namely Manning Vale West, Manning Vale East and Willeroo mine pits.

The key objectives of the revised Project are to:

- establish and operate a sustainable and profitable coal mine;
- construct and operate a mine that complies with all relevant statutory obligations and continues to improve operations to ensure best practice environmental management;
- construct, design and operate a mine that does not compromise environmental and social indicators and standards;
- make efficient use of current infrastructure, with upgrades and expansions for the required capacity increase;
- reduce the disturbance to environmental values by minimising the footprint requirements for road and rail construction and the use of areas already disturbed for laydown, storage and handling facilities; and
- use similar proven strategies to those adopted at the Mine, for example:
  - salvage and stockpiling of topsoil;
  - early and progressive rehabilitation of disturbed areas;
  - use of recycled water as the main water supply;
  - protection of water quality by appropriate management systems; and
  - adoption of appropriate landform designs to ensure sustainable final land use.

In addition, key features of the revised Project include the:

- development of a suitable 'environmental offset' strategy to satisfy State and Federal requirements for clearance of significant vegetation within new operational areas on MLA 50232;
- preservation of historical items within Acland;
- comprehensive and progressive rehabilitation program involving continuous monitoring and reporting in line with the agreed post mining land use; and
- amendment of NAC's existing EA commensurate to the revised Project's size and scope.

The revised Project will allow the parent company, the New Hope Group (NHG), to expand its production capacity at the Mine to meet current and future market demands for its thermal coal products. The revised Project is particularly important considering NHG's West Moreton Operations near Ipswich which will exhaust current coal reserves in the near future.

The revised Project offers an opportunity for NHG to expand its business base, improve profitability and increase its return to shareholders. The revised Project's thermal coal products are a highly valued energy resource that possesses lower sulphur content, provides



higher energy output and produces less greenhouse emissions than many alternative thermal coal sources.

#### 1.2.1. Accommodation and Workforce

No construction or operational camps will be located on-site during the construction and operational phases of the revised Project. Construction and operational workforces will reside in nearby regional communities. Arrival and departure times for workers will be staggered by at least half-an-hour to minimise traffic and other interactions.

#### 1.3. Location

The revised Project site is located within southeast Queensland's Darling Downs region 12 km north-northwest of Oakey, 35 km northwest of Toowoomba and 177 km west of Brisbane.

The main access roads to the Mine site from Toowoomba are the Warrego Highway to Jondaryan and the Jondaryan-Muldu Road from Jondaryan to the revised Project site. Alternative light vehicle access to the Mine from the Warrego Highway is via Oakey using the Oakey-Cooyar Road.

For the purposes of the draft EIS, the 'revised Project site' is defined by the following areas depicted in **Figure 1-1**:

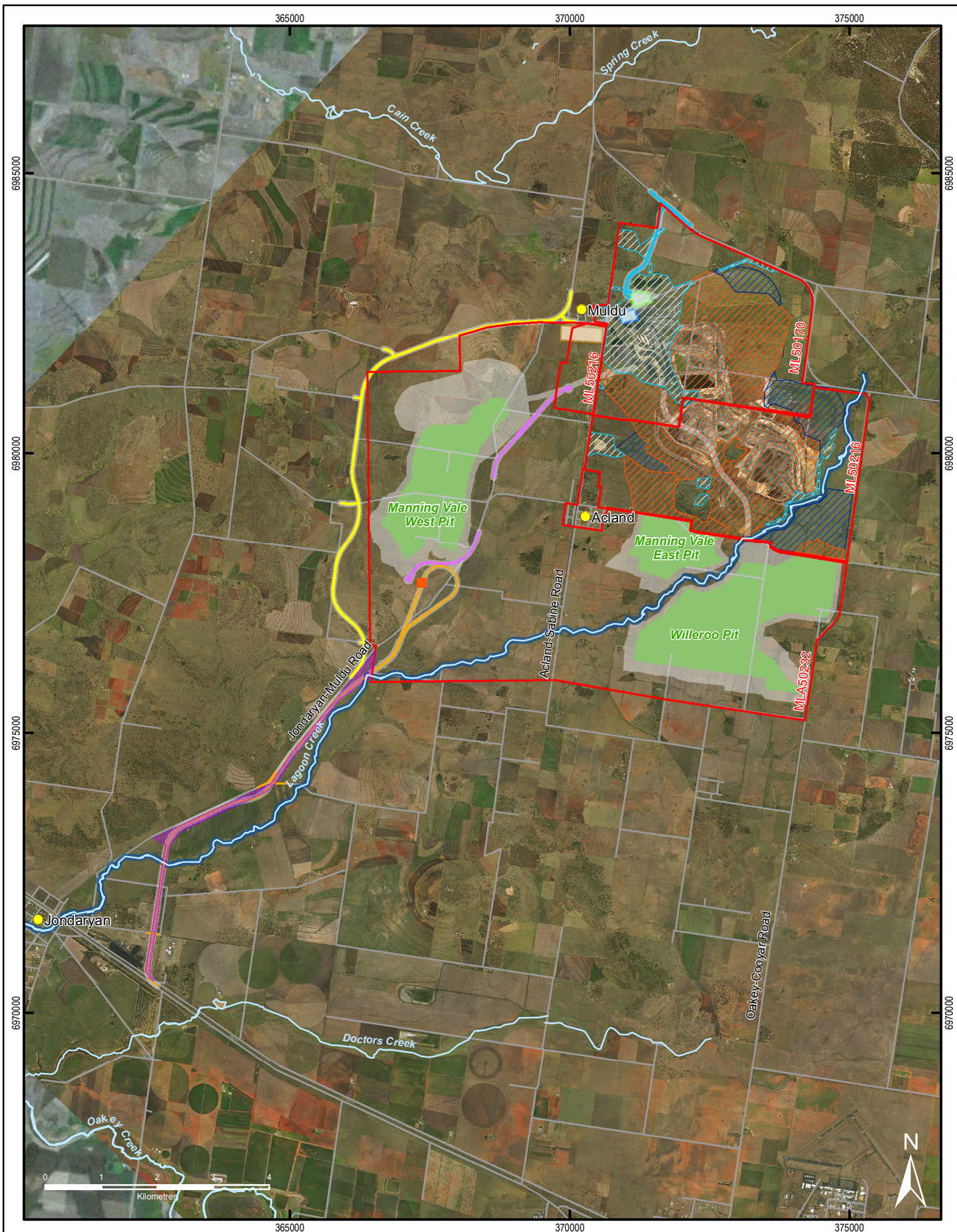
- the area of land within MLA 50232 that includes the new Manning Vale East, Manning Vale West and Willeroo mining areas;
- the existing mining and out-of pit-dumps areas located on MLs 50170 and 50216;
- the continued use of tailings disposal within In-Pit Tailings Storage Facilities (ITSFs) located in-pit on ML areas;
- the upgraded Mine Industrial Area (MIA) and Coal Handling and Preparation Plant (CHPP) Precinct on ML 50170;
- the new Materials Handling Facility (MHF) on ML 50216;
- the new rail spur line from the Western Rail Corridor at Jondaryan to the revised Project, and a new balloon loop and Train Loadout Facility (TLF) on MLA 50232; and
- the Jondaryan-Muldu Road diversion to the west of MLA 50232.

The 'Study area' is defined by the area outside of the 'revised Project site' that define the geographic limits of the environmental, social and economic impact assessment for the purposes of the EIS. The specific 'Study area' for each technical study is defined within the relevant Chapter of the draft EIS.

#### 1.4. Project Name

The name of the revised Project is the New Acland Coal Mine Stage 3 Project. NAC currently operates the Mine at approximately 5 Mtpa as an open cut coal mine on ML 50170 and ML 50216, adjacent to MDL 244, under the approval of EA EPML00335713. The existing EA covers mining activities for New Acland Coal Mine Stage 1 and 2, and is the subject of an amendment application under the *Environmental Protection Act 1994* (EP Act) to incorporate the revised Project.





#### LEGEND

- |   |  |   |
|---|--|---|
| <ul style="list-style-type: none"> <li>Towns and Localities</li> <li>Train Loadout Facility</li> </ul>  | <ul style="list-style-type: none"> <li>Roads</li> <li>Creeks</li> </ul>  | <b>Disturbance Areas - Stage 2</b> <ul style="list-style-type: none"> <li>Mining Areas</li> <li>Other Surface Infrastructure Areas</li> <li>Out of Pit Dumping Areas</li> </ul> |
| <b>Revised Rail &amp; Road Infrastructure</b> <ul style="list-style-type: none"> <li>Internal Haulage Road</li> <li>Revised Access to Mine</li> <li>Revised Jondaryan-Muldu Road Diversion</li> <li>Revised Rail Spur and Balloon Loop Alignment</li> </ul> | <ul style="list-style-type: none"> <li>Mining Tenements</li> <li>Disturbance Footprint Area</li> <li>Stage 3 Pit Areas</li> <li>Infrastructure Mining Lease</li> <li>Watercourse Buffer</li> </ul> |   |

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#### NEW ACLAND COAL MINE STAGE 3 PROJECT

#### Figure 1.1 - Revised Project Overview Indicative Only

Scale 1:90,000 on A4  
Projection: Australian Geodetic Datum – Zone 56 (AGD84)



## 1.5. Project Proponent

The revised Project Proponent is NAC, which is a wholly owned subsidiary of the NHG. NHG is an independent Australian company, publicly listed on the Australian Stock Exchange.

## 1.6. Land Use and Tenures

As discussed in **Section 5.1.4** of the AEIS, NAC has given notice in writing to the Chief Executive under Section 307 of the *Mineral Resources Act 1989* (MR Act) to partially abandon MLA 50232. Due to the legislative requirement under Section 232 of the MR Act, the partial abandonment covers an area shown in **Figure 1-2** along with the existing MLA 50232 boundaries. In line with previous commitments, the Acland town area has been excluded from MLA 50232.

All NAC's property descriptions are within the Parish of Watts, County of Aubigny. The current land uses on MLs 50170 and 50216 and MLA 50232 are mining and grazing. The Mine is located within granted MLs 50170 and 50216, which are the combined New Acland Coal Mine Stage 1 and 2 areas, respectively. The mining tenures and areas under each growth stage held by NAC are depicted in **Figure 1-2**. These mining tenures were all originally contained within NAC's MDL 244.

NAC applied for the existing MLA 50232 over the Manning Vale, Willeroo and Sabine Reserve areas on 24 April 2007. Tenements area information is provided in **Table 1-1** and their location shown in **Figure 1-2**.

**Table 1-1 Mining Tenure Areas**

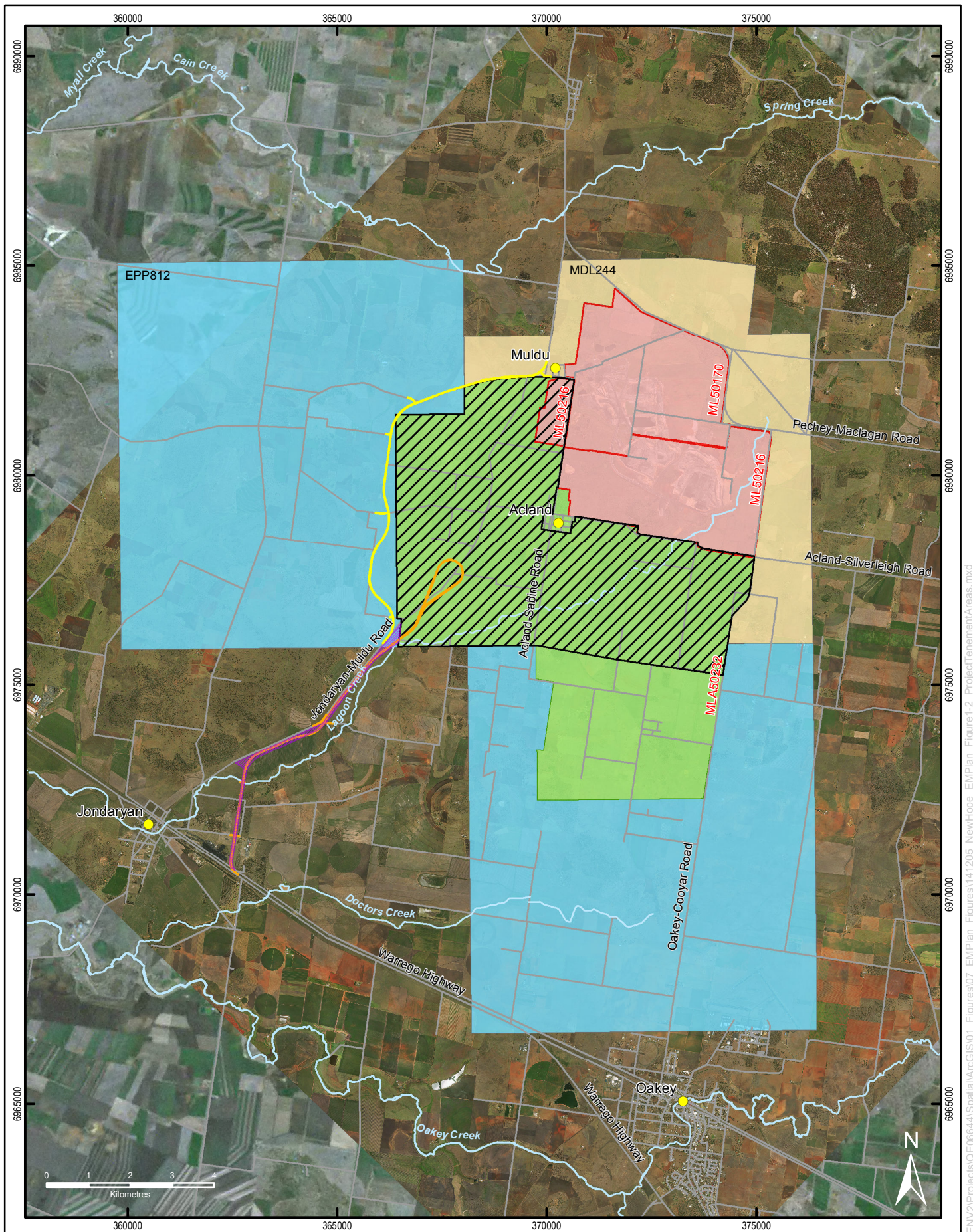
Mining Tenure	Stage	Area
ML 50170	1 (current)	1,103 ha
ML 50216	2 (current)	1,175 ha
	Current Mine Total:	2,278 ha
MLA 50232	3 (existing proposed area)	5,069 ha
	(revised proposal area – partial abandonment)	3,668 ha
	area reduction	1,401 ha

**Table 1-2 Tenements for the revised Project**

<b>Tenement Number</b>	<b>Description</b>	<b>Date of Granting/ Submission</b>	<b>Current Lease Expiration</b>	<b>Lease/ Licence/ Permit Holder</b>	<b>Administering Authority</b>	<b>Purpose</b>
<b>Mining</b>						
ML 50170	Mining Lease: North Pit (Stage 1)	6/9/2001	30/9/2022	New Acland Coal Pty Ltd	Department of Mines and Energy Queensland	Coal Shale Clay Bentonite Kaolinite
ML 50216	Mining Lease: South & Centre Pit (Stage 2)	7/12/2006	31/12/2026	New Acland Coal Pty Ltd	Department of Mines and Energy Queensland	Coal
MLA 50232	Mining Lease Application: Manning Vale Willeroo Sabine (Stage 3)	Submitted 25/5/2007	Not applicable	New Acland Coal Pty Ltd	Department of Mines and Energy Queensland	Coal
MLA 700002	Mining Lease Application: (Infrastructure)	Submitted 16/1/2015	Not applicable	New Acland Coal Pty Ltd	Department of Mines and Energy Queensland	Infrastructure
<b>Exploration and Feasibility Studies</b>						
MDL 244	Mineral Development License	30/09/1998	30/9/2016	New Acland Coal Pty Ltd	Department of Mines and Energy Queensland	Coal

Note: EPP812 no longer exists





# LEGEND

- Towns and Localities
- Rail Spur
- Roads
- Creeks
- Jondaryan-Muldu Road Diversion
- Infrastructure Mining Lease

- Revised MLA Area
- Mining Leases
- MDL Area
- EPP Area
- MLA Area



## NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 1-2:  
Revised Project Tenement Areas**

Scale 1:120,000 on A4  
Projection: Australian Geodetic Datum – Zone 56 (AGD84)



## 1.7. Stakeholders

The following list outlines the stakeholders considered to be Tier One (Affected) Stakeholders, (**Appendix K.2** of the draft EIS for Tier Two (Interested) stakeholders and additional information):

- key local property owners and neighbours including NHG property lessees;
- current employees;
- traditional owners;
- Federal, State and local government authorities, agencies and local elected representatives;
- local utility and service providers;
- environmental organisations;
- local community organisations;
- local industry groups;
- indigenous groups/organisations; and
- the communities of Oakey, Jondaryan, Goombungee, Kulpi and the wider Toowoomba Regional Council local government area.

## 1.8. Environmental Relevant Activities

It is anticipated that the environmental relevant activities (ERAs) listed in **Table 1-3** will be required for the revised Project as part of the authorised mining activity under the MR Act.

**Table 1-3 Revised Project – ERAs to be conducted as part of the mining activity**

Approval type	ERA descriptions	Relevant legislation	Relevant agency
Amendment to existing EA	<p>Resource activities that will be the subject of the amendment application that would otherwise be ERAs may include:</p> <ul style="list-style-type: none"> <li>• ERA 8 Chemical storage</li> <li>• ERA 16 Extractive and screening activities</li> <li>• ERA 31 Mineral processing</li> <li>• ERA 50 Bulk material handling</li> <li>•</li> </ul>	<p><i>Environmental Protection Act 1994</i> (EP Act);</p> <p><i>Environmental Protection Regulation 2008</i> (EP Regulation);</p> <p>MR Act;</p> <p><i>Mineral Resources Regulation 2003</i> (MR Regulation)</p>	DEHP



## **1.9. Environmental Authority Conditions**

The mining activity will be subject to the conditions of the amended EA for MLs 50170, 50216 and 50232. This EM Plan provides proposed EA conditions based on discussions with the relevant regulatory bodies, the findings of the draft EIS and the current Department of Environment and Heritage Protection (DEHP) model mining conditions.

An EA under the EP Act is required for undertaking a resource activity, which includes a mining activity authorised under a ML. A single EA is required for all resource activities that are carried out as a single integrated operation. An application to amend EA EPML00335713 (to include MLA 50232) has been made for the revised Project.

The EM Plan has been prepared for the revised Project including the proposed EA conditions. Some of the proposed EA conditions for the revised conditions are stricter than the EA for operations at the Mine. The EM Plan has proposed transitional conditions that will take effect within 2 years of the commencement of construction activities to allow the Proponent to implement the proposed mitigation measures outlined in the draft EIS.

## 2. Description of the Revised Project

The revised Project constitutes a ‘mining activity’ as defined in the EP Act. The key elements of the revised Project are outlined below.

### 2.1. Mine Development

The mine will consist of the following key components:

- continuation of existing mining activities to progressively extend to parts of the Manning Vale and Willeroo resource areas within MLA 50232, located to the south and west of current MLs 50170 and 50216;
- production of up to 7.5 Mtpa of product coal equating to approximately 14 Mtpa Run-of-Mine (RoM) coal;
- production of up to 80.4 Mt of product coal over the life of the revised Project;
- maintenance of the existing thin seam coal mining equipment, continuation of the current open cut mining techniques and expansion of the truck and loader mining fleet;
- progressive disposal of coarse rejects to cells within the overburden dumps, along with fine tailings being disposed of in ITSFs;
- emplacement of two out-of-pit spoil dumps associated with the Manning Vale and Willeroo mine pits; and
- generation of three depressed landforms at the end of mining by backfilling and re-profiling final mine pits.

### 2.2. Associated Infrastructure

The key infrastructure requirements for the revised Project are outlined below:

- upgrade of the existing CHPP complex, RoM and product coal stockpile areas and supporting infrastructure on ML 50170;
- continued use of tailings disposal within ITSFs located in-pit on ML areas;
- continued use of recycled water from the Wetalla Wastewater Reclamation Facility (WWRF) supplied from Toowoomba via an approved 45 km pipeline that is currently fully operational;
- continued use of a mine surface water management system involving various water management structures staged to accommodate the progressive development of the Mine and based on the principles of diverting clean water and capturing and reusing water from disturbed areas;
- upgrades to the existing administration and heavy vehicle maintenance area on ML 50170;
- relocation and potential upgrade of the current power supply for the mine operation and the local 11kV distribution system;
- diversion of the Jondaryan-Muldu Road around the Manning Vale resource area;

- decommissioning of the Jondaryan Rail Loadout Facility (JRLF);
- construction of a new 8 km rail spur line and balloon loop from Jondaryan onto MLA 50232;
- construction of the TLF within MLA 50232; and
- relocation and potential upgrade of the existing local telecommunication network.

It is anticipated the construction period for associated infrastructure will occur from 2015 to 2017.

### **2.3. Description of the Mine**

The term “mining activities” is defined under the EP Act and the revised Project will, in summary, involve the following types of mining activities.

- processing raw materials;
- a number of activities directly associated with, or facilitating or supporting, the mining and processing activities; and
- rehabilitation/remediation.

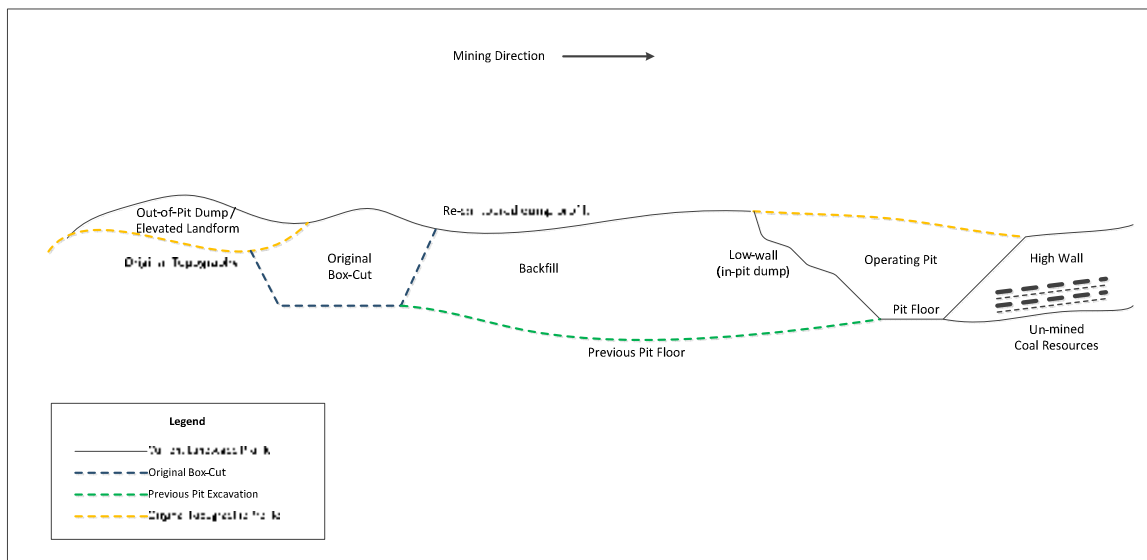
#### **2.3.1. Mining Method and Process**

The mining method utilised for the revised Project is truck and excavator/loader, which is currently employed at the Mine. This has been a proven mining method that operates efficiently with the current resource geometry while offering a significant level of flexibility.

Initially, all topsoil is stripped using bulldozers, and relocated using front end loaders and trucks and is directly respread on current progressive rehabilitation areas behind the active mine pit or stockpiled for future rehabilitation purposes. Direct respread is the preferred method to minimise topsoil handling, which reduces loss of viability from damage to soil structure and propagules. Topsoil is removed primarily for the purposes of rehabilitation followed by overburden drilling and blasting. Once the topsoil removal is completed, the following activities are undertaken:

- A new box-cut is initially developed with the overburden removed and dumped within an out-of-pit spoil dump or used to backfill other existing voids.
- Coal mining commences once sufficient overburden is removed to expose the coal seams. This involves working a number of blocks in conjunction with one another to develop a staggered pattern in relation to the vertical coal seam horizons. The overburden and thick partings (>1.5 m) are typically mined through the use of large excavators. Thin partings (<1.5 m) and coal seams are mined by loaders with assistance from dozers to rip and stack the material in windrows which increase loader productivity.
- Once the box-cut is completed, successive strips are opened to maintain consistent coal flow to the CHPP. The number of strips and blocks opened at any given time depends on the coal production schedule and equipment productivity requirements for that particular mine pit. Once enough floor area is available in the mine pit, spoil dumping then commences in-pit allowing progressive backfilling of the void as mining traverses across the resource area.

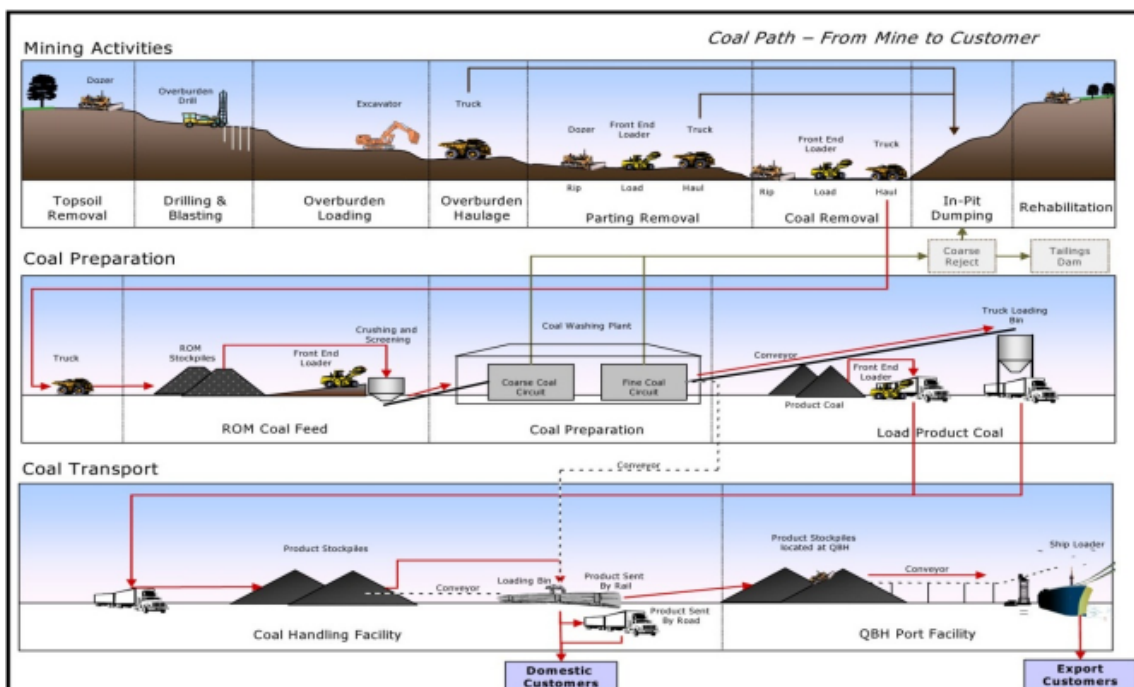
A typical cross section of an operating mine pit is shown in **Figure 2-1**.



**Figure 2-1 Mining Method Cross Section**

A generalised representation of the mining process (from mine to customer) is presented in **Figure 2-2**.

Once the raw coal has been extracted from the active mine pit it is transported to the RoM pad for delivery via conveyor to the CHPP where it is processed. Coarse rejects from the CHPP are disposed of through in-pit dumping or comingled with overburden for out-of-pit dump development while fine tailings are directed to ITSFs. The product coal is then stockpiled via conveyor and transported to the TLF for distribution to various markets.



**Figure 2-2 Mining Process Overview**

### 2.3.2. *Extractive and Screening Activities*

Basalt processing for internal NAC utilisation is currently being conducted within the mining lease boundaries and has been for a number of years. The purpose of this basalt crushing and sizing processing has been for the following products:

- Stemming for blast hole loading on overburden and interburden blasting within the Acland mining areas currently being the active mining pits - South Pit and Centre pit on the Stage 2 mining leases;
- Road base (Class 2.4) for stockpile pad repairs and mine roadways;
- Gravels of various grading's for work pads, stabilisation of work areas and dirt roadway sheeting;
- Rip-Rap for erosion control bunding, dam inlets and spillways and by-wash areas;
- Sized material for erosion control within gabion baskets and rock matting;
- Building and structure support pads; and
- Fine basalt for pipeline and other bedding products.

NAC use has been less than 50,000 tonnes per annum (tpa) for all products including the raw unprocessed basalt product. Current processing has only been conducted on day shift operations and predominantly on a Monday to Friday basis. The proposal for future operations with an approved ERA 16 is still for day shift only operations which may need to span 7 days for a short period with peak construction demand for basalt products.

Environmental factors have been minimal and controlled at the basalt processing area source such as dust control with spray water application to work areas. Noise generation is minimal with the fixed plant crushing and screening equipment and smaller size earth moving equipment being utilised such as excavators, front end loaders, dozers, water truck, and road registered product trucks.

Fixed plant equipment includes various types of crushing equipment being hammer mills, jaw crushers and cone crushers or similar crushing equipment, static scalping screens, vibrating sizing screens and small transfer conveyors. All of these classes of equipment are currently utilised to process the basalt.

The proposed operation is to continue on a regular basis for extended operating hours overall on a day shift only basis and with similar equipment to currently utilised on the basalt stockpile and processing area. Different sites within the mining lease may be utilised to process the basalt close to the source in each pit. These additional areas would be controlled for noise, dust and environmental contaminants (e.g. oil leak if any from equipment) as per the existing basalt stockpile area which is in the now mined North Pit area. The basalt processing operations and offsite transport would only be a day shift activity within the hours nominally 7am to 6pm.

The initial proposal would be to continue producing the existing products as above in addition to a variety of products to be utilised on and offsite for the revised Project's construction phase. During the revised Project's construction phase the majority of the product would be used for construction purposes within the existing mining leases or within the new mining leases (MLA's 700002 and 50232).

Offsite sales and utilising of basalt products would also be conducted as markets and demand was available and production and transport costs could make the products competitive with dedicated quarry products. This is likely to be very minimal during the construction phase and likely to ramp up after construction depending on marketability of the various basalt products.

These products would include:

- Current products as produced with some in increased quantities for construction areas;
- Roadbase Class 2.1 product for road finishing and high load pad areas;
- Roadbase Class 2.3 product for road subgrade and lower load area pads;
- Roadbase Class 2.4 product for road subgrade, stockpile bases, general work pads and areas and building foundations;
- Sized Gravel products – 10mm, 20mm and other grades in smaller quantities as required for concrete, road way 2 pack dressings and bedding gravel;
- Rail ballast for railway line track foundation support and for other construction load rated fill product;
- Coarse Trip Rap of various sizes for dam inlet and spillway erosion control;
- Bedding basalt for pipeline and other bedding and top dressing works; and
- Other sized basalt products in smaller quantities for specific works.

The product tonnage for the construction period would be greater than 200,000 tpa for a two year construction phase.

Off-site potential after the revised Project's construction phase would be variable dependant on local construction projects and basalt products demand. For the purpose of consideration, the offsite products could be considered to be of the order of 100,000 tpa to 200,000 tpa.

All of the basalt feedstock that has been mined to date and stockpiled or intended to be mined is as a consequence of overburden removal to access coal reserves. No additional disturbance will be generated by the mining of the basalt other than product lay down and processing pads with surface topsoil disturbance only. This top soil would be stockpiled and the areas immediately rehabilitated as processing ceased. These stockpile areas may be located on already disturbed surface areas as is the case with an existing basalt stockpile located in the current North Pit.

Basalt capping's that exist within the current pit limits for the coal mine, are predominant in the uppermost layers and are mined as part of the overburden removal. Some of this basalt is of good quality, and as such the proposal is to stockpile this resource separately to the typical overburden material for future processing and on-selling.

Some of the basalt material mined to date, predominantly from the North Pit, along with a small amount sourced from the South Pit, has been stored within the North Pit basalt stockpile and is of nominally 4 million tonne of basalt capacity. This stockpiled basalt will be the prime supply of basalt feedstock and the current area of set up of the basalt crushing and sizing processing plant. The basalt feedstock tonnage will be added to as more of this material is encountered within the existing mining limits.

Significant tonnage of basalt products would continue to be utilised on site and transported within the existing mining leases. This product would involve no offsite transport to reach the utilisation destination.

Product for much of the revised Project's construction activities will require transport around the mining lease in road registered body trucks, 'B' Double trucks or Truck and Trailer configurations. These trucks would vary in load capacity with the maximum at approximately 40t for 'B' doubles to approximately 25t for body tip trucks. At a conservative estimate trucks would average 35t per load for truck movements.

The route selected from the main basalt stockpile area would be from the mining lease via the now closed Lange's Road to the Peachey-Maclagan roadway section of the Oakey-Cooyer



Roadway. This intersection with bitumen sealing is still in place with approximately 75 m of off road access to the mining lease property fencing to allow for easy access onto and off the Peachey-Maclagan roadway. Clear vision is available in both directions from the Lange Road access with a 90 degree intersection at the intersection. Access control will be incorporated into this route at the mining lease boundary.

Other trucks would also be utilised through the existing mining lease and exit via the mine front boom gate access area as per other medium vehicle access to the site.

- At 2,000 t per week for 100,000 tpa rate - this average would be less than 60 truckloads per week or 10 truckloads per day over a 6 day week.
- At 4,000 t per week for 200,000 tpa rate - this average would be less than 120 truckloads per week or 20 truckloads per day over a 6 day week (Typical estimate).
- At 10,000 t per week for 500,000 tpa A rate - this average would be less than 300 truckloads per week or 50 truckloads per day over a 6 day week (Construction peak periods with 5 trucks per hour).

Even the peak truck movements would be a very low percentage of vehicle movements on the main access roadway being the Peachey-Maclagan designated section of the Oakey- Cooyer Roadway.

A full risk assessment of the processing and transportation of product would be conducted to determine activity and route hazards. Controls would then be put in place to manage and mitigate these identified hazards. All personnel and equipment will be mine site inspected, approved and authorised as per the requirements within the NAC site as per the NAC Safety and Health Management System.

### 2.3.3. Mine Plan Schedule

The revised Project involves the continued development of the Mine by the progressive commissioning of two additional resource areas within MLA 50232. The two resource areas will be developed sequentially and combined with the current operations to supply up to 7.5 Mtpa of saleable product coal for export and domestic markets until approximately 2029.

#### Overview of Mining Related Activities

Following the successful grant of MLA 50232 in (approximately) 2015, NAC estimates that approximately 2.5 years will be required to complete design, construction and other related activities that facilitate the continuation of mining. The proposed length of the construction period is governed by external rail developments which influence the rate of product coal transportation off-site. **Table 2-1** outlines an indicative schedule for mining related activities on MLA 50232. The construction phase for the revised Project involves the increase in the mining fleet and workforce, construction of supporting infrastructure and development of the new resource areas.

**Table 2-1 Indicative Schedule for Mining related activities on MLA 50232**

Year	Activity
2015	Environmental and mining approvals (Federal & State)
2015-2017	Cultural Heritage clearance Road closure applications Construction of the rail spur from Jondaryan and a balloon loop within the mining lease

Year	Activity
	Construction of site access and roads (including re-alignments) Construction of water management structures Construction of the additional supporting infrastructure Gradual employment of additional workers
2016	Mining commences within the Manning Vale reserve area (box-cut and out-of-pit dump construction)
2016	Mining commences within the Willeroo reserve area (box-cut and out-of-pit dump construction)

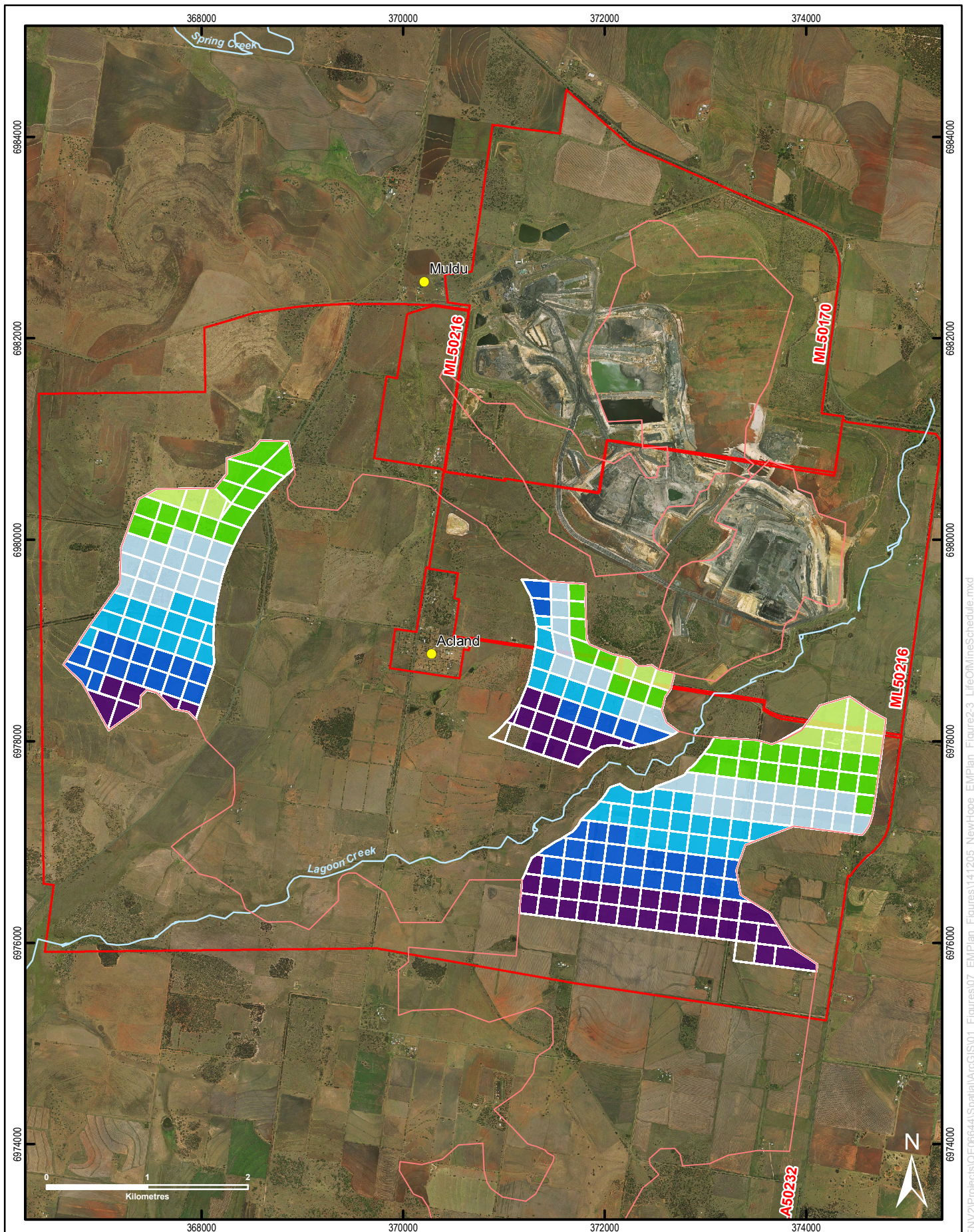
NAC will be responsible for all mining activities within the revised Project site. The transportation of plant and equipment (including the additional mining fleet) to the revised Project site is expected to take the full construction period. NAC will ensure that local government services (i.e. emergency services and police) are appropriately advised of the revised Project activities and timing.

No significant quantities of additional construction materials are required for the revised Project. Sufficient basaltic materials are available from existing and new areas on-site for the construction of haul roads and other related infrastructure such as water management structures. Some minor quantities of specialist materials may be required for construction and operational purposes and would be sourced off-site on an as required basis and delivered under the appropriate transport arrangements.

### **Life of Mine Schedule**

The life of mine schedule has been modified to allow an exclusion zone around Acland, increase the buffer distance from Oakey and to avoid disturbance of Lagoon Creek (**Figure 2-3**).





#### LEGEND

- |                        |             |           |
|------------------------|-------------|-----------|
| ● Towns and Localities | <b>Year</b> |           |
| — Creeks               | FY2017-18   | FY2023-24 |
| — Coal Resource Area   | FY2019-20   | FY2025-26 |
| — Mining Tenements     | FY2021-22   | FY2027-29 |

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#### NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 2-3: Life of Mine Schedule**

Scale 1:50,000 on A4  
Projection: Australian Geodetic Datum - Zone 56 (AGD84)



### 2.3.4. Target Production Rate

Current production at the Mine is approximately 5 Mtpa of product coal for the granted MLs. This production rate utilises NAC's current available CHPP capacity (up to 5.2 Mtpa of product coal) and transport capacity of product coal off-site to the various market locations. This production rate is dependent on geological, technical, financial, statutory approvals and market factors and may vary throughout the remaining mine life.

The maximum production rate of 7.5 Mtpa is targeted to be reached after 2017. This mine plan allows sufficient time for the mining lease to be granted and the upgrades to the CHPP to be completed. More importantly, it also coincides with the depletion of the Glen Roslyn mining reserves.

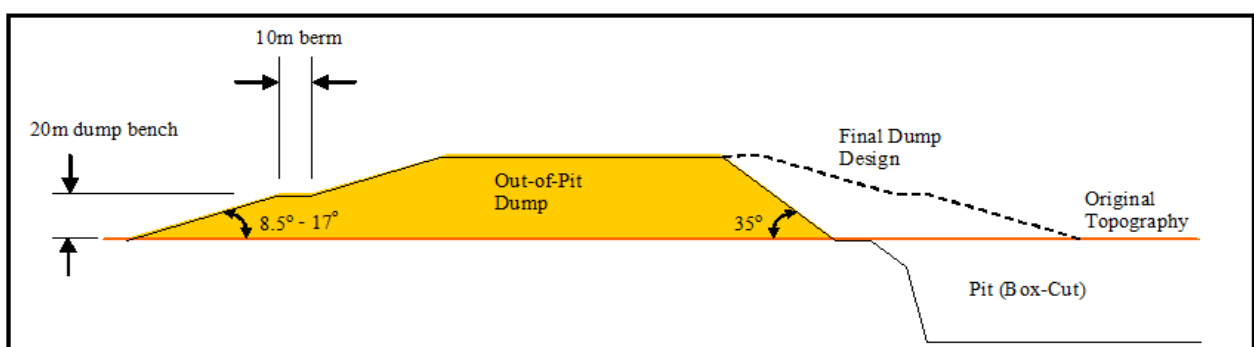
### 2.3.5. Out-of-pit Spoil Dumps (Future Elevated Landforms)

The primary objective of the dumping strategy for the revised Project is to backfill voids where practical to reduce the void space remaining at end of the revised Project's life. In general, dumping is carried out in-pit. Out-of-pit dumping is kept to a practical minimum and generally only carried out when a box-cut is being developed, or when ITSFs have displaced in-pit dumping volume.

The revised Project's two out-of-pit spoil dumps will be designed based on the following criteria:

- the final spoil dump slopes are battered to between 8.5 and 17 degrees slope angle based on geotechnical and final land use considerations, with a target of 8.5 degrees;
- a 10 m berm will be included at least every 20 m in dump height; and
- water management structures such as contour banks and rock-lined water ways will be constructed as required with respect to the slope length and catchment area of each spoil dump face to be treated.

**Figure 2-4** represents a schematic diagram demonstrating the conceptual engineering design parameters for the out-of-pit spoil dumps or elevated landforms.



**Figure 2-4 Spoil Dump Conceptual Design Plan**

### 2.3.6. Void Design and Depressed Landforms

The revised Project's final landform design comprises a two staged approach initially involving the completion of mining activities which will result in a void being created in each

of the three mine pits. The second stage involves the backfilling and re-shaping of the voids to create depressed landforms.

### Void Design

The objective of the dumping and in-pit tailings management strategies are to limit the area and quantity of voids that remain once mining has been completed. Based on the current mine design, three voids are planned to remain at the completion of mining, which correspond to the three mine pits that will be operating throughout the life of the revised Project.

### Depressed Landforms

To facilitate the rehabilitation of the residual voids, the highwalls and low walls of these voids will be battered down to develop safe, stable and sustainable 'depressed landforms'. The angles for the depressed landforms will be in the order of 8.5 to 17 degrees and match the rehabilitation design angle of the out-of-pit dumps (elevated landforms).

Recent updated groundwater modelling has been completed (refer to **Appendix F** of the AEIS) including long term post-mining modelling (modelled as 300 years post-mining). Permanent lakes are predicted to form in all three depressed landforms. The maximum depths of the lakes that are predicted to form are around 33 m in the Manningvale West depressed landform, 18 m in the Manning Vale East depressed landform, and 22 m in the Willeroo depressed landform.

### Final Landform

The final landform based on the development of elevated and depressed landforms as at 2029 is presented in **Figure 2-5**.

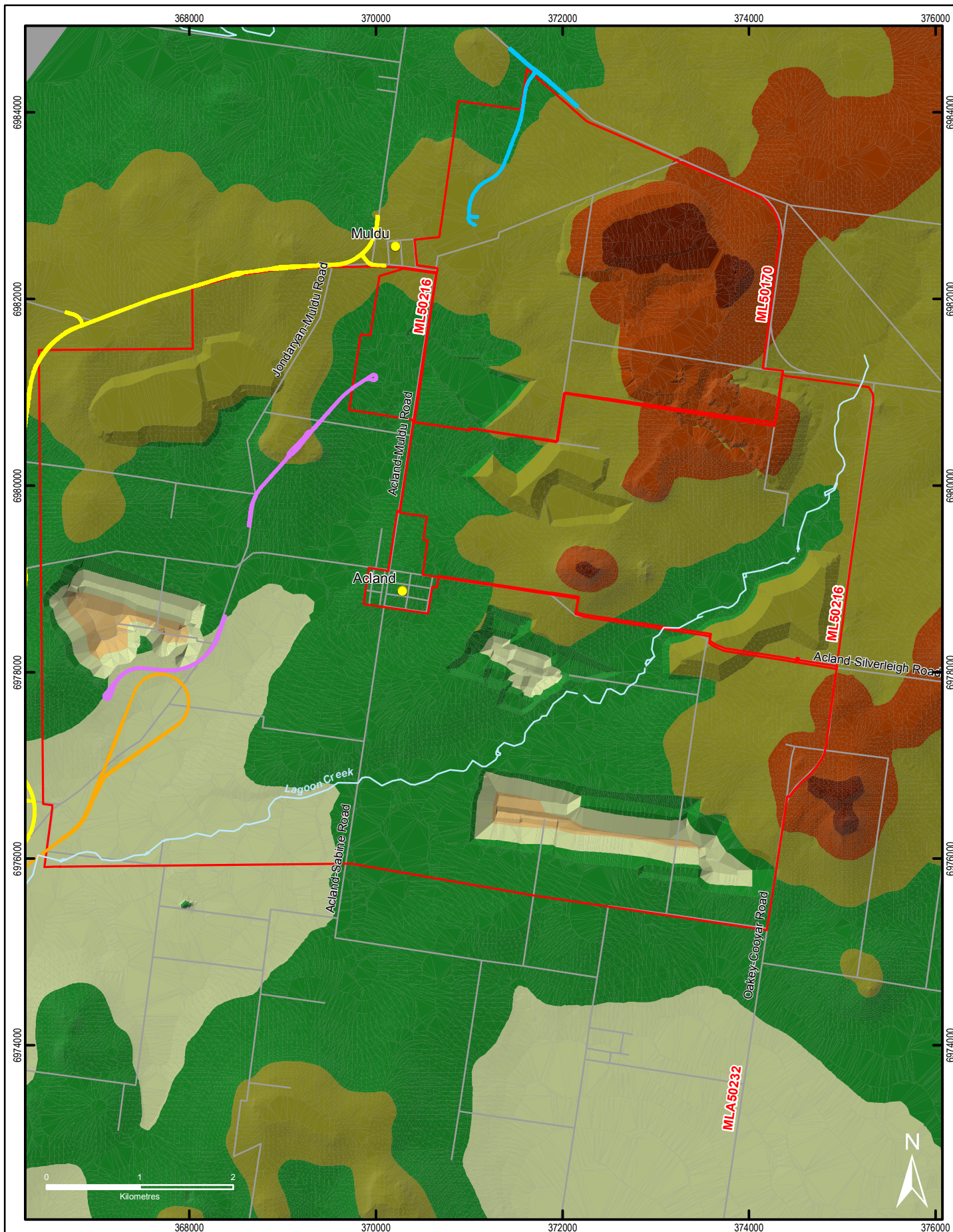
### Ground Disturbance

The revised Project draft EIS reported a total disturbance footprint of 2,030 ha. This disturbance footprint also includes disturbance on existing ML areas and off-lease areas (example rail infrastructure off-lease) that is required for the revised Project. It has been identified that the Depressed Landform reported as 621 ha, includes a duplication of the pit footprint already reported under the ML areas as 921 ha. This is illustrated in **Table 2-2**. The decommissioning and rehabilitation to manage this disturbance area is discussed in **Section 3.9**. A detailed breakdown of the disturbance footprint of the revised Project is presented in **Table 5.1.2-B** of the AEIS.

**Table 2-2 Estimated ground disturbance**

Domain	2014 EIS – Table 4-35 area (ha)	2014 EIS – Disturbance duplication removed
Mining Areas	921	1201
Elevated Landforms	314	311
Depressed Landforms	621	Included in Mining Areas
Rehabilitated batter of slopes	0	128
Mine infrastructure	174	175
<b>TOTAL</b>	<b>2,030</b>	<b>1,815</b>





## LEGEND

- Towns and Localities
- Roads
- Creeks
- Mining Tenements

## Revised Rail & Road Infrastructure

- Internal Haulage Road
- Revised Access to Mine
- Revised Jondaryan-Muldu Road Diversion
- Revised Rail Spur and Balloon Loop Alignment

## Elevation

- |           |           |
|-----------|-----------|
| 604 - 636 | 480 - 511 |
| 573 - 604 | 449 - 480 |
| 542 - 573 | 417 - 449 |
| 511 - 542 | 386 - 417 |
|           | 355       |



## NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 2-5: Conceptual Final Landform**

Scale 1:54,000 on A4  
Projection: Australian Geodetic Datum – Zone 56 (AGD84)



## **2.4. Water Management**

### **2.4.1. Water Management Principles**

As a minimum, the surface water management philosophy for the revised Project will involve the:

- diversion of clean water away from disturbed areas;
- capture and adequate treatment of water that may be potentially discharged off site to ensure it complies with the water discharge limits;
- minimal disturbance of Lagoon Creek;
- protection of infrastructure and mining areas from flooding using flood bunding;
- design and construction of all water management structures using practical hydraulic parameters based on an appropriate risk based rainfall event, catchment size, slopes, discharge design and soil types;
- preferential use of water stored in onsite storages as a supplemental water source for coal washing and other activities, to minimise the likelihood of offsite water discharges;
- beneficial recycling of water for activities, such as dust suppression;
- recycling of water from the ITSFs to reduce water consumption for coal washing purposes;
- temporary or permanent bunding of all significant quantities of hydrocarbon and chemical products stored on site;
- use of spill capture and retention devices for refuelling and similar areas;
- treatment of oily water areas using an oil-water separator;
- minimisation of disturbance to an operational minimum for safe operation;
- revegetation of disturbed areas no longer required for operational use, to promote progressive rehabilitation; and
- sealing of high use traffic areas to reduce degradation.

### **2.4.2. Water Supply**

Water supply for the revised Project will primarily be sourced from onsite storages. In the instance that onsite storages are not able to meet the revised Projects water demands, external water supply sources will be used.

A maximum external water supply allocation to the Mine of 5,650 ML/per annum (MLpa) is available from offsite sources. The major source is via a long term contract to the year 2055 with the TRC to purchase up to 5,500 ML per annum of Class A+ recycled water from the WWRF.

A second water source is minor and involves an agreement to receive 150 ML per annum (MLpa) from the Oakey Reverse Osmosis Plant. This water is received under a beneficial re-use of a waste product approval and is taken to assist the TRC with water management at its Oakey Reverse Osmosis Plant.

In addition to the water sources noted, an additional 1,321 MLpa of licensed capacity is available from the Helidon (Precipice) and Marburg (Hutton) aquifers via a series of groundwater bores. Current allocation from the Helidon aquifer is 710 MLpa, and from the

Marburg aquifer the allocation is 271 MLpa. This capacity is available as an emergency supply of process water, subject to successful future renewal of licenses.

### Potable Water

Potable water originates from basalt aquifers and is sourced from licensed groundwater bores on-site and treated by a Reverse Osmosis Treatment Plant on-site. Current average consumption of potable water on site is approximately 16 kL/day, which equates to 6 MLpa. Current maximum treatment plant capacity is 22 kL/day, or 7 MLpa. Future use is projected to increase to a maximum of 50 MLpa.

### Mine Water Use

The Mine's current process water demand and the revised Project's future process water demand at a production rate of 7.5 Mtpa are outlined in **Table 2-3**. The process water demand varies depending on a range of factors including rainfall/runoff and groundwater inflow within the active mine pits.

**Table 2-3 Current Mine and Future Project Raw Water Demands**

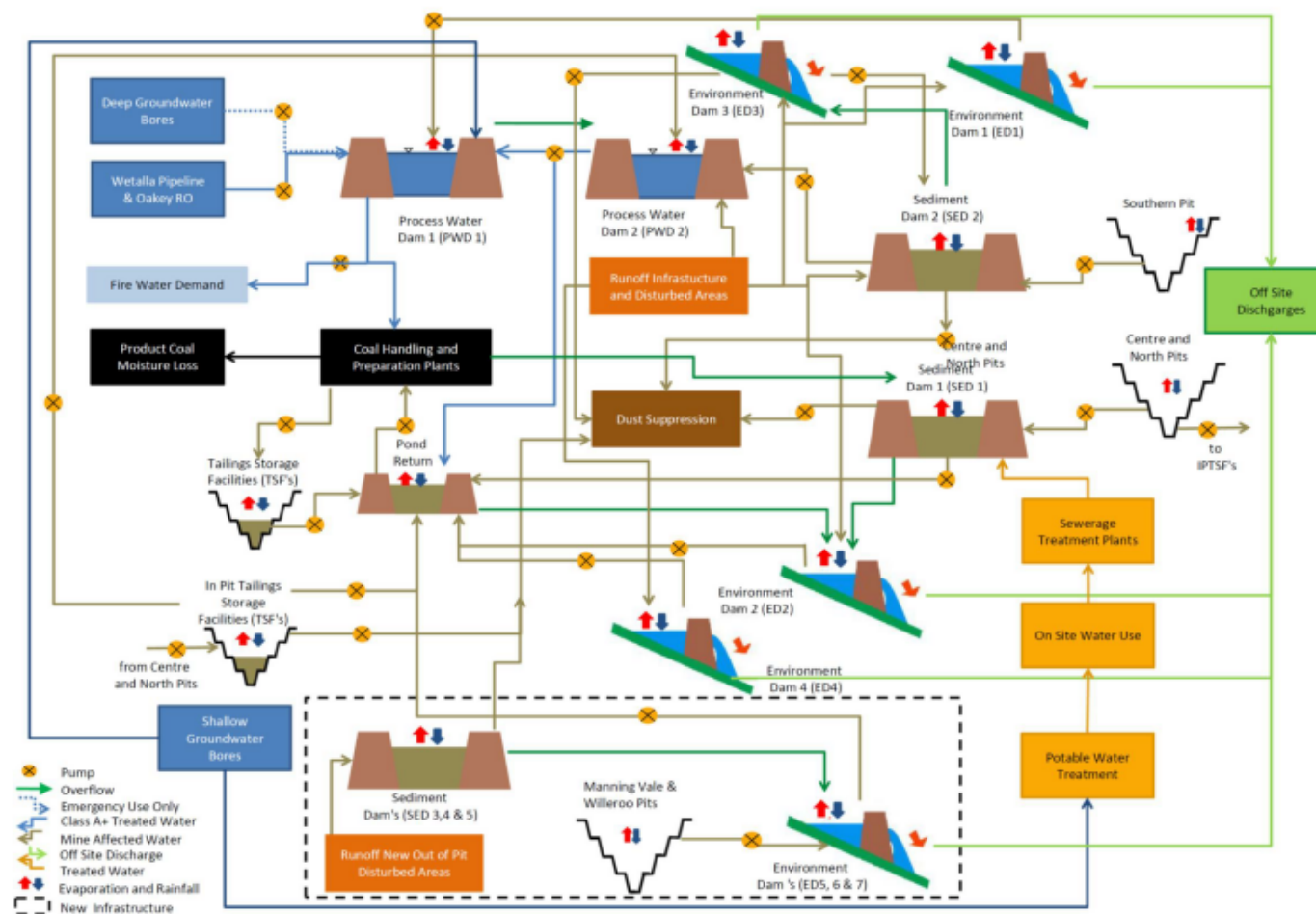
Water Supply Activity		Current Usage (approx) (ML/ year)	Future Usage (2021) (approx) (ML/ year)
Operation of the CHPPs	(~550 L/RoM tonne)	5,280	8,250
Wash down of machinery			
Fire suppression			
Shower and ablution use			
Dust suppression (~ 45 L/RoM tonne)		432	675
TOTAL USAGE		5,712	8,925
Estimated recovery Tailings Storage Facilities (50%)		2,860	4,460
Estimated water collected at site (rainfall runoff & groundwater inflows)		740	1,170
TOTAL NET WATER USAGE (~220 L/RoM tonne)		2,545	3,295

### Water Management Infrastructure

The current and future water management infrastructure is summarised in **Table 2-4** with a schematic of the mine water management system presented in **Figure 2-6**.

**Table 2-4 Water Management Infrastructure**

Structure	Size/Volume	Location
Existing Water Management Infrastructure		
Environmental Dam 1	126 ML	Northwest mining lease boundary area (ML 50170).
Environmental Dam 2	232 ML	Downstream of the tailings dam, southwest mining lease boundary area (ML 50170).
Environmental Dam 3	45 ML	Southern mining lease boundary (ML 50216).
Environment Dam 4	110ML	Southwest section of mining lease (ML 50216).
Sediment Dam 1	97 ML (including 16 ML of sediment)	Near the product coal haul road exit, western mining lease boundary area (ML 50170).
Sediment Dam 2	62 ML	Near the South Pit's out-of-pit dump (ML 50216).
Process Water Dam 1	136 ML	North of the main administration area, adjacent the main access to the current Mine (ML 50170).
Process Water Dam 2	175 ML	Immediately east of Raw Water Dam 1 (ML 50170).
Tailings Dam (Out-of-pit) TSF 1 – Stage 1 & 2	2,550 ML (of tailings)	Western mining lease boundary area (south of the RoM stockpile area) (ML 50170). – Stage 1 is under rehabilitation.
Tailings Dam (In-pit) ITSF 1	2,800 ML (of tailings)	Within the North Pit (ML 50170).
Tailings Dam (In-pit) ITSF 2-1	3,320 ML (of tailings)	Within the North Pit (ML 50170).
Tailings Dam (In-pit) ITSF 2-2	3,400 ML (of tailings)	Within the North Pit (ML 50170).
Return Water Dam	300 ML	Upstream of Environmental Dam 2, western mining lease boundary area (ML50170)
Lagoon Creek Flood Bund	1:1,000 yr AEP flood protection (approx. 3.5 m high and 3 km in length)	Between Lagoon Creek and the South Pit area (ML50216).
Additional Water Management Infrastructure		
Process Water Dam3	100 ML	TBA
Sediment Dam 3	160 ML	North of Manning Vale East Pit.
Sediment Dam 4		North of Willaroo Pit.
Environment Dam 5	150 ML	Near the Southwest mining lease boundary (MLA 50232) north east of the rail loop and spur.
Environment Dam 6		South of Manning Vale East final pit extent.
Environment Dam 7		Southeast of Willaroo final pit extent.
Tailings Dam (In-Pit) ITSF 4	7.9 Mm <sup>3</sup>	Within the Centre Pit (ML 50216).
Tailings Dam (In-Pit) ITSF5	8.6 Mm <sup>3</sup>	Within the Centre Pit (ML 50216).
Lagoon Creek Flood Levee 2	Approximately 3.5 m high and 1.5 km in length	Between Lagoon Creek and the Manning Vale East Pit area.
Additional Water Management Infrastructure (cont.)		
Lagoon Creek Flood Levee 3	Approximately 3.5 m high and 2 km in length	Between Lagoon Creek and the Willeroo Pit area.

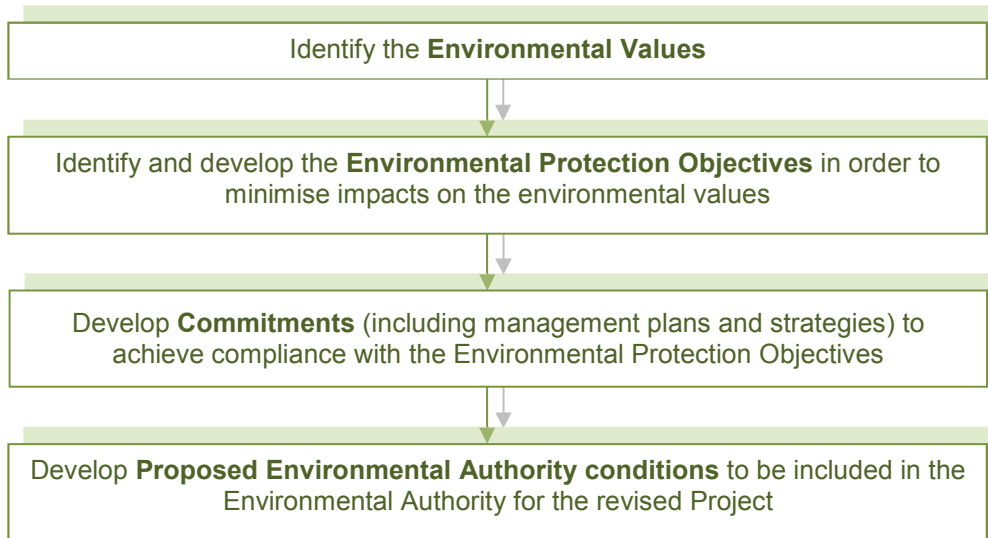


**Figure 2-6 Water Management System Schematic**

### 3. Environmental Values, Impacts, Commitments and Draft Conditions

#### 3.1. Content of the Section

This EM Plan was compiled by following the requirements of the EP Act. This process is shown below.



The guiding definitions for the terms that are used throughout the EM Plan are:

**Background:** information to provide context of the environmental value being considered.

**Environmental Values:** Environmental values are those qualities or physical characteristics of the environment that are conducive to ecological health, public amenity or safety.

Section 9 of the EP Act describes an Environmental Value as:

- a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety; or
- another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation.

**Environmental Protection Objectives:** Describes the key elements of the environment and the outcomes to be protected in order to minimise impacts on the environmental values.

**Performance Criteria:** These are the indicators by which the level of achievement of the environmental protection objectives can be determined, in a measurable and auditable way.

**Control Strategies:** These are the methods for achieving the environmental protection objectives.

**Monitoring:** This describes how the success of the control strategies is measured and the monitoring frequency.

**Commitments:** Describes the technological and design elements together with management plans and strategies proposed to be taken to meet the environmental protection objectives and achieve the standards.

**Proposed Environmental Authority Conditions:** These are draft conditions containing measurable indicators and standards that are proposed to be included in the EA to protect identified environmental values that may be impacted by the revised Project.

### 3.2. General Conditions

There are a number of general issues that do not relate to environmental values or control strategies, but are to be included in the EA. Conditions of the EA are proposed here for '*Schedule A – General Conditions*'.

#### 3.2.1. Proposed Environmental Authority Conditions: Schedule A – General Conditions

##### Schedule A - General

- A1** This environmental authority authorises environmental harm referred to in the conditions. Where there is no condition or this environmental authority is silent on a matter, the lack of a condition or silence does not authorise environmental harm.
- A2** In carrying out the mining activity authorised by this environmental authority, the holder of this environmental authority must comply with Figure 1 (Revised Project Overview – Mine Area).
- A3** The holder of this environmental authority must:
  - a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority
  - b) maintain such measures, plant and equipment in a proper and efficient condition
  - c) operate such measures, plant and equipment in a proper and efficient manner
  - d) ensure all instruments and devices used for the measurement or monitoring of any parameter under any condition of this environmental authority are properly calibrated.

##### Monitoring

- A4** Except where specified otherwise in another condition of this environmental authority, all monitoring records or reports required by this environmental authority must be kept for a period of not less than 5 years.
- A5** Upon request from the administering authority, copies of monitoring records and reports will be made available and provided to the administering authority's nominated office within 10 business days or an alternative timeframe agreed between the administering authority and the holder.
- A6** Any management or monitoring plans, systems or programs required to be developed and implemented by a condition of this environmental authority should be reviewed for effectiveness in minimising the likelihood of environmental harm on

an annual basis, and amended promptly if required, unless a particular review date and amendment program is specified in the plan, system or program.

### **Financial assurance**

- A7** The activity must not be carried out until the environmental authority holder has given financial assurance to the administering authority as security for compliance with this environmental authority and any costs or expenses, or likely costs or expenses, mentioned in section 298 of the Act.
- A8** The amount of financial assurance must be reviewed by the holder of this environmental authority when a plan of operations is amended or replaced or the authority is amended.

### **Risk management**

- A9** The holder of this environmental authority must develop and implement a risk management system for mining activities which mirrors the content requirement of the Standards Australia Risk management – Principles and guidelines (AS/NZS ISO 31000:2009), or the latest edition of a Standards Australia for risk management, to the extent relevant to environmental management, prior to the commencement of mining activities.

### **Notification of emergencies, incidents and exceptions**

- A10** The holder of this environmental authority must notify the administering authority by written notification within 24 hours after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with, the conditions of this environmental authority.
- A11** Within 10 business days following the initial notification of an emergency or incident, or receipt of monitoring results, whichever is the latter, further written advice must be provided to the administering authority, including the following:
  - a) results and interpretation of any samples taken and analysed
  - b) outcomes of actions taken at the time to prevent or minimise unlawful environmental harm
  - c) proposed actions to prevent a recurrence of the emergency or incident.

### **Complaints**

- A12** The holder of this environmental authority must record all environmental complaints received about the mining activities including:
  - a) name, address and contact number for of the complainant
  - b) time and date of complaint
  - c) reasons for the complaint



- d) investigations undertaken
- e) conclusions formed
- f) actions taken to resolve the complaint
- g) any abatement measures implemented
- h) person responsible for resolving the complaint.

**A13** The holder of this environmental authority must, when requested by the administering authority, undertake relevant specified monitoring within a reasonable timeframe nominated or agreed to by the administering authority to investigate any complaint of environmental harm. The results of the investigation (including an analysis and interpretation of the monitoring results) and abatement measures, where implemented, must be provided to the administering authority within 10 business days of completion of the investigation, or no later than 10 business days after the end of the timeframe nominated by the administering authority to undertake the investigation.

### **Third-party reporting**

**A14** The holder of this environmental authority must:

- a) within 1 year of the commencement of this environmental authority, obtain from an appropriately qualified person a report on compliance with the conditions of this environmental authority
- b) obtain further such reports at regular intervals, not exceeding 3 yearly intervals, from the completion of the report referred to above; and
- c) provide each report to the administering authority within 90 days of its completion.

**A15** Where a condition of this environmental authority requires compliance with a standard, policy or guideline and the standard is amended or changed subsequent to the issue of this environmental authority, the holder of this environmental authority must:

- a) comply with the amended or changed standard, policy or guideline within 2 years of the amendment or change being made, unless a different period is specified in the amended standard or relevant legislation, or where the amendment or change relates specifically to regulated structures referred to conditions H3 to H36, the time specified in that condition
- b) until compliance with the amended or changed standard, policy or guideline is achieved, continue to remain in compliance with the corresponding provision that was current immediately prior to the relevant amendment or change.

END OF CONDITIONS FOR SCHEDULE A

### 3.3. Air Quality

#### 3.3.1. Background

Dust and greenhouse gas emissions are potential air contaminants. In general, gaseous emissions such as SO<sub>x</sub> and NO<sub>x</sub> are potential air contaminants from mining activities but are not significant owing to their very low levels of emission. Short term rapid emissions of NO<sub>x</sub> and SO<sub>x</sub> may be periodically associated with blast plumes.

The following existing sources contribute to particulate emissions in the vicinity of the revised Project site.

- dust generated from agricultural activities;
- motor vehicle exhaust and dust emissions from roads;
- smoke from bushfires and controlled burns; and
- operation of the Mine.

The adopted background air quality concentrations are shown in **Table 3-1**.

**Table 3-1 Adopted background concentrations for the revised Project**

Pollutant	Averaging period	Background concentration	Units
Total Suspended Particulates (TSP)	Annual	28	µg/m <sup>3</sup>
Particulates as PM <sub>10</sub>	24 hours	14	µg/m <sup>3</sup>
Particulates as PM <sub>2.5</sub>	24 hours	5	µg/m <sup>3</sup>
	Annual	2.8	µg/m <sup>3</sup>
Dust deposition	1 month	63	mg/m <sup>2</sup> /day

#### 3.3.2. Environmental Value

The environmental values of the air environment to be enhanced or protected under this EM Plan are the qualities of the air environment that are conducive to suitability for people's amenity and health.

#### 3.3.3. Potential Impacts on the Environmental Value

##### Dust

The potential sources of dust emissions from construction activities, including construction/upgrade of the existing CHPP precinct, the MHF and the MIA, the rail spur and balloon loop and TLF, water infrastructure and the Jondaryan-Muldu Road realignment include:

- wind erosion from exposed areas after vegetation clearing;
- dust from operation of earthmoving equipment;
- emissions from fixed and mobile equipment;

- topsoil disturbance and removal; and
- wheel generated dust from vehicle movements.

The same sources will apply in the future during the project decommissioning phase.

## Operation

During operations, the main emissions to air are particulate matter generated by the onsite mining activities which primarily occur as a result of the following activities:

- excavation of coal and overburden;
- bulldozer and grader operations;
- loading/unloading of haul trucks;
- wheel generated dust from haul trucks and other vehicles;
- drilling and blasting activities;
- wind erosion from disturbed areas and stockpiles;
- operation of the conveyors/ transfer points at CHPP;
- stacking and reclaiming at the MHF; and
- operation of the TLF.

Dust emissions will vary according to the following factors:

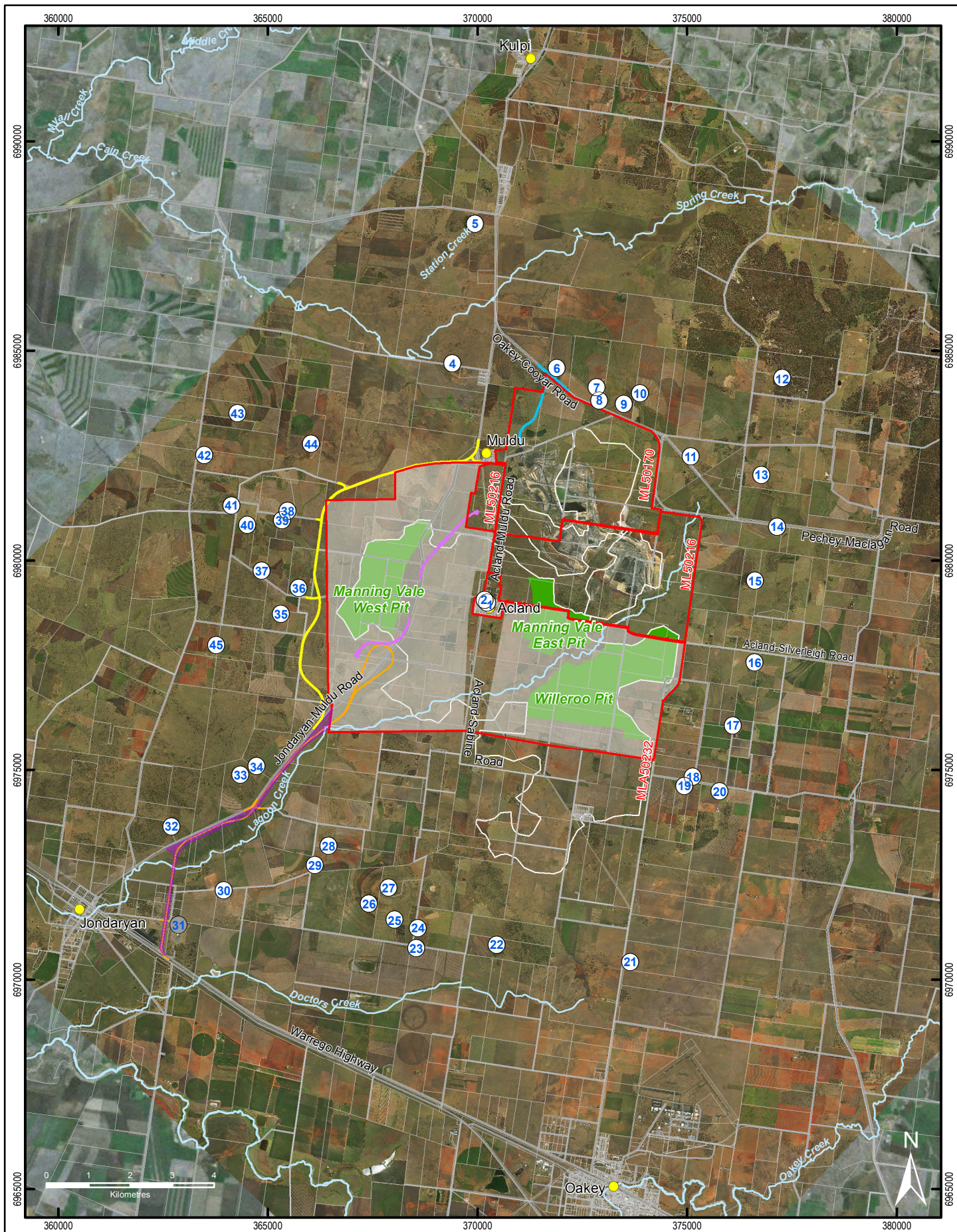
- coal seam, overburden and interburden properties;
- prevailing meteorological conditions;
- the mining activities occurring, such as vegetation clearing, topsoil stripping, overburden removal or coal extraction;
- location, condition (e.g. moisture content) and extent of stockpiles; and
- length of time that cleared areas remain unvegetated.

Product coal will be transported from the CHPP precinct to the TLF via an internal sealed haul road. The existing Jondaryan – Muldu Road that traverses to the east of the Manning Vale West resource area will be closed to the public. Wheel generated dust from sealed roads is considered to be negligible has not been modelled as part of this air quality assessment.

Nearest sensitive receptors for dust are all near neighbours immediately surrounding the revised Project site as shown in **Figure 3-1**. The nearest sensitive receptors to the proposed private haul road are all located at least 500 m from the private haul road.

Dust monitoring undertaken by NAC has indicated that actual dust levels are significantly lower than the predicted/modelled dust levels for current operations, and this situation is expected to be the case for the revised Project.





# LEGEND

- |                                    |  |  |
|------------------------------------|--|--|
| ● Towns and Localities             | ▭ Mining Tenements                       | — Revised Rail & Road Infrastructure           |
| ○ Sensitive Receptor - Residential | ▨ Infrastructure Mining Lease            | — Internal Haulage Road                        |
| ● Sensitive Receptor - Commercial  | ▭ Proposed Extent of Surface Rights Area | — Revised Access to Mine                       |
| — Creeks                           | ▭ Stage 3 Pit Areas                      | — Revised Jondaryan-Muldu Road Diversion       |
|                                    |  | — Revised Rail Spur and Balloon Loop Alignment |

NEW HOPE GROUP

SINCLAIR KNIGHT MERZ  
**SKM**

## NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 3-1: Sensitive Receptors**

Scale 1:120,000 on A4  
Projection: Australian Geodetic Datum - Zone 56 (AGD84)



## Greenhouse Gases

NAC is acutely aware of its corporate responsibilities in relation to greenhouse gas emissions and is clearly focussed on minimising its carbon footprint.

The main greenhouse gas emissions from the revised Project are generated from diesel use, which is also the main operational cost. Therefore, NAC possesses strong social, economic and ecological imperatives to reduce its diesel usage, and therefore, improve its greenhouse gas emissions. NAC is looking to accomplish this goal through a range of new and existing reduction strategies.

The main sources of Scope 1 and Scope 2 greenhouse gas emissions for the revised Project are:

- direct CO<sub>2</sub> emissions from combustion of diesel in mining equipment and trucks;
- indirect CO<sub>2</sub> emissions due to consumption of electricity; and
- fugitive emissions from construction, open cut coal mining and decommissioning.

Greenhouse gas emissions were estimated based on published emissions factors. The operation of the revised Project is estimated to result in approximately 0.18 Mt CO<sub>2</sub>-e on an annual basis. These emissions represent an increase of 0.055 Mt CO<sub>2</sub>-e in greenhouse gas emissions when compared to current operations of the Mine. The increase in greenhouse gas emissions above current operations of the Mine represents 0.01 per cent of Australia's annual greenhouse gas emissions.

The revised Project is considered to have a low vulnerability to climate change.

### 3.3.4. *Environmental Protection Objective*

The revised Project's environmental protection objectives for air quality are:

- to minimise the impacts of mine-derived dust on sensitive receptors beyond the revised Project's boundaries; and
- to implement reasonable energy minimisation initiatives.

### 3.3.5. *Performance Criteria*

The performance criteria for air quality are:

- compliance with the requirements of the revised Project's EA;
- rail activities will comply with South West System Coal Dust Management Plan and other future related requirements;
- compliance with the Queensland Rail Code of Practice – Railway Noise Management;
- dust and particulate monitoring in accordance with the control strategies outline below;
- no substantiated dust and fume (NO<sub>x</sub> or SO<sub>x</sub>) complaints from the community;
- the airborne dust deposition rate as a result of mining activities will not exceed an average annual 120 mg/m<sup>2</sup>/day at nearby sensitive receptors; and

- adherence to the air quality objectives in the EPP (Air) that are considered relevant to the operation of the Mine and the revised Project (**Table 3-2**).

**Table 3-2 Air quality objectives in the EPP (Air) relevant to the revised Project**

Pollutant	Air Quality Objective	Averaging Period	Allowable Exceedances
Total Suspended Particulates (TSP)	90 µg/m <sup>3</sup>	Annual	-
Particulates as PM <sub>10</sub> (<10 µm)	50 µg/m <sup>3</sup>	24 hours	5 per year
Particulates as PM <sub>2.5</sub> (<2.5 µm)	25 µg/m <sup>3</sup>	24 hours	
	8 µg/m <sup>3</sup>	Annual	-
Nitrogen dioxide (NO <sub>2</sub> )	250 µg/m <sup>3</sup>	1 hour	
Carbon monoxide (CO)	11,000 µg/m <sup>3</sup>	8 hours	
Sulphur dioxide SO <sub>2</sub>	570	1 hour	1 day each year
	230	1 day	1 day each year

### 3.3.6. Control Strategies

Air quality and specifically dust, fumes and greenhouse gas emissions will be managed by NAC's EMS based on the Air Quality Management Plan (AQMP) in the draft EIS, Appendix J.10.

#### Dust Control

NAC currently manages its operations to minimise the potential to generate dust impacts at nearest sensitive receptors. Dust control measures for the revised Project are presented in **Table 3-3**.

**Table 3-3 Dust control measures for the revised Project**

Mining Activity	Dust Control Measures
Material extraction and handling	<p>Loading/dumping overburden</p> <p>The drop height of material from excavators will be minimised when loading trucks.</p> <p>Modification of operations will occur during adverse weather conditions (e.g. dust storms, gale force winds and storm conditions).</p> <p>Water carts will be employed to keep mine roads and work areas in a moist condition.</p> <p>Dozer operations on overburden dumps will be modified or suspended if dust generation is excessive.</p>
Drilling and Blasting	<p>Dust curtains will be installed on drill rigs (i.e. under the drill deck with fabric filters to collect dust).</p> <p>Water injector will be used on drill rigs to minimise dust emission.</p> <p>Local residents (neighbours) will be advised of blasting events (date and time).</p> <p>Blasting operations will be modified during adverse weather conditions (e.g. dust storms, gale force winds and storm conditions).</p> <p>Blasts will occur during daytime hours only and not on weekends or public holidays.</p> <p>Gravel/basalt stemming will be used in blast holes.</p> <p>Blasts will be monitored for effectiveness, e.g. plume, gas emissions and stemming.</p> <p>Specific procedures for blast fume management will continue as standard practice and will be updated as required to ensure continuous improvement.</p>

Mining Activity	Dust Control Measures
Haul roads	<p>Water carts will maintain moisture conditions on haul roads.</p> <p>Road grading and maintenance will be undertaken on a regular basis. Key actions include:</p> <ul style="list-style-type: none"> <li>- Application of coarse rejects on haul roads to reduce dust generation.</li> <li>- Grading procedures to achieve constant spread of fines and coarser material.</li> </ul> <p>Speed on haul roads will be limited to 60km/h (20 km/h on selected corners).</p> <p>Where feasible, the volumes of trays on haul trucks will be maximised to increase carrying capacity and to reduce vehicle kilometres travelled on haul roads.</p> <p>Visual monitoring of haul roads and major work areas will be undertaken to identify noticeable dust generation for corrective actioning.</p> <p>Certain site roads will be sealed (near administration area – site access and employee car park).</p> <p>Efficient watering will be conducted during peak periods of activity and within areas of concentrated activity.</p> <p>Well defined and planned haul routes and internal roads will be developed to maximise efficiency of travel.</p> <p>Obsolete mine roads will be rehabilitated.</p> <p>The private haulage route from the Materials Handling Facility to Train Loading Facility will be a sealed road.</p>
Exposed areas	<p>The pre-strip areas will be planned to minimise the time of exposure following clearing in advance of mine development.</p> <p>Exposed areas/active areas will be watered if dust generation is observed.</p> <p>Where possible, topsoil will be stripped when its moisture content is elevated but not sodden.</p> <p>A vegetative cover will be established as soon as feasible on areas prepared for rehabilitation.</p> <p>Progressive rehabilitation will be conducted behind the active pit areas to minimise exposed areas.</p> <p>Unauthorised clearing of non-mine areas will be prevented using a 'permit to disturb' system.</p>
RoM Pad	<p>Water will be applied on a regular basis by a water cart on trafficked areas within the RoM Pad's operational area.</p> <p>Visual monitoring of RoM coal stockpiles will be undertaken to identify noticeable dust generation for corrective action.</p> <p>Water will be applied on the RoM coal stockpiles if significant dust levels are being generated.</p>
CHPP and RoM Bin	<p>RoM Bin</p> <p>Automatic water sprays will be installed at the RoM hopper bin to produce a fine mist to suppress dust generated when sensors are triggered.</p> <p>Surge Bin</p> <p>Dust curtains will be installed.</p> <p>Waters sprays will be used.</p> <p>Crushing</p> <p>Wet crushing will be employed.</p> <p>This activity will be fully enclosed.</p> <p>Conveyors</p> <p>Water sprays will be used on transfer points.</p>
MHF	<p>An automatic sprinkler system will be employed to moisten product coal stockpiles.</p> <p>Water sprays will operate at transfer points on conveyors.</p> <p>Coal spills will be removed regularly to minimise the potential for dust generation.</p> <p>A vacuum sweeper will operate on roads near the MHF.</p> <p>The washed coal will normally retain a moisture level of approximately 10%.</p>



Mining Activity	Dust Control Measures
TLF	No coal will be stored in open/exposed stockpiles. An enclosed overhead bin will deliver the coal to each rail wagon as part of the train loadout system. Coal will be loaded by side tipper into a hopper as part of the train loadout system. Veneering and profiling of the loaded coal will be conducted to minimise dust emissions during transport.
Mine and Mine Infrastructure Construction	The size of cleared areas will be kept to an operational minimum to limit exposed areas available for dust emissions by wind erosion. The speed of light vehicles on-site will be limited to reduce wheel-generated dust. A watering truck will be employed to control dust in dry and/or windy conditions. Cease works if excessive dust generation from construction activities occurs
Rail Spur and Balloon Loop Construction	The size of cleared areas will be kept to an operational minimum to limit exposed areas available for dust emissions by wind erosion. The speed of light vehicles on-site will be limited to reduce wheel-generated dust. A watering truck will be employed to control dust in dry and/or windy conditions. Cease works if excessive dust generation from construction activities occurs.

### Adaptive Air Quality Management

In addition to the dust controls identified in **Table 3-3**, a series of adaptive management measures for the revised Project include the suspension or modification of operations in response to the following triggers:

- potential dust risk predictions from the dust forecasting system;
- warning or exceedance alarms from the strategic real time air quality monitoring system; and
- observation(s) of significant dust generation during visual monitoring of mining activities.

An indicative hierarchy of controls in response to potential dust risk predictions from the dust forecasting system is presented in **Table 3-4**. Successful implementation of adaptive air quality management will significantly reduce potential for air quality impacts from the revised Project.

**Table 3-4 Hierarchy of Dust Controls Actions**

Trigger	Possible Dust Control Actions
Dust risk predicted from the Manning Vale East Pit	<ol style="list-style-type: none"> <li>1. Increase watering rate applied to haul roads in the Manning Vale East Pit</li> <li>2. Suspension of overburden/interburden blasting if meteorological conditions are unfavourable</li> <li>3. Suspension or modification of dozer operations on overburden dumps</li> <li>4. Suspension of night-time operations (6am - 6pm) in the Manning Vale East Pit (If required)</li> <li>5. Suspension or modification of all or selected overburden and/or coal handling activities (including excavation, loading, dumping and hauling)</li> </ol>
Dust risk predicted from the Manning Vale West Pit	<ol style="list-style-type: none"> <li>1. Increase watering rate applied to haul roads in the Manning Vale West Pit</li> <li>2. Suspension of overburden/interburden blasting if meteorological conditions are unfavourable</li> <li>3. Suspension or modification of dozer operations on overburden dumps</li> <li>4. Suspension or modification of all or selected overburden and/or coal handling activities (including excavation, loading, dumping and hauling)</li> </ol>

Trigger	Possible Dust Control Actions
Dust risk predicted from the Willeroo Pit	<ol style="list-style-type: none"> <li>1. Increase watering rate applied to haul roads in the Willeroo Pit</li> <li>2. Suspension of overburden/interburden blasting if meteorological conditions are unfavourable</li> <li>3. Suspension or modification of dozer operations on overburden dumps</li> <li>4. Suspension or modification of all or selected overburden and/or coal handling activities (including excavation, loading, dumping and hauling)</li> </ol>

With the cooperation of landholders, NAC has been monitoring for PM<sub>10</sub> concentrations and dust deposition rates at a number of sensitive receptors to determine if mining operations are generating air quality impacts at nearest sensitive receptors. To detect if mine operations are generating potential nuisance impacts, air quality monitoring will continue to be undertaken and expanded to accommodate the revised Project. Consultation with the landholders and implementing dust mitigation measures should assist in reducing the potential for dust nuisance.

### Fume Management

NAC have developed fume management procedures at the Mine which will be adopted for the revised Project. The fume management procedures form part of the AQMP (**Appendix J.8** of the draft EIS). Key actions include:

- Review weather forecast;
- Establish 300 m and 500 m minimum machine and personnel exclusion zones;
- Establish Fume Management Zone based on expected meteorological conditions;
- Notify neighbours on blast contact list of time and date of blast, and whether their residence is in the fume management zone;
- Set up portable weather station to monitor field meteorological conditions;
- Blast when meteorological conditions favourable; and
- Capture and record relevant blast data.

In addition to general fume management practices, NAC continues to work closely with its explosive suppliers to minimise the potential for post blast fume. Recent developments to minimise potential impacts include innovation blasting methods and explosive products. These developments are likely to benefit the broader mining industry, particularly those mining operations operating in a fume sensitive environment.

### Greenhouse Gases

There are a range of mitigation and management measures for greenhouse gas emissions, which will be implemented or continued by the revised Project. These management measures are aligned with other operators in the black coal industry. The measures can be broadly categorised as:

- **reduce fuel usage from operations** (improving operational efficiency). NAC is continuously evaluating methods to reduce fuel usage and are committed to undertaking the following actions to reduce fuel usage from mining operations for the revised Project:
  - mine planning to reduce haulage distances

- improving efficiency of payload management (e.g. run-of-mine coal haulage);
- considering fuel efficiency of mining equipment and haul trucks during procurement;
- maintaining mining equipment and haul trucks in good working order so fuel efficiency of equipment is maximised;
- modifying operational procedures to improve the fuel use of selected machines (for example, minimising unnecessary idling of mobile equipment); and
- implementing an operator education program to promote more fuel efficient operation of machines.
- reduce electricity usage from operations through:
  - using power factor correction equipment at the CHPP to improve electricity consumption efficiency; and
  - using LED lighting where practical for general access and safety lighting, e.g. around personnel access walkways and doors and conveyor walkways, which can result in a reduction of electricity consumption.
- **use of alternate fuels** such as compressed natural gas (CNG) and liquefied natural gas (LNG) for its on-site mining fleet, and in consultation with its trucking contractor, for the haulage of product.
- **capturing or flaring coal seam gas.** Gas content analysis undertaken has determined the Mine is in a low gas domain. The revised Project site is expected to have similar gas content to the Mine. Fugitive emissions represent approximately 1 per cent of greenhouse gas emissions from the revised Project. Capturing or combusting coal seam methane is not considered a feasible option for achieving significant reductions in greenhouse gas emissions from the revised Project.
- **reporting and analysis.** Based on the revised Project's estimated annual greenhouse gas emissions the following actions will be undertaken to fulfil legislative requirements:
  - report annual greenhouse gas emissions under the National Greenhouse and Energy Reporting System under the NGER Act (facility threshold is 25,000 t CO<sub>2</sub>-e / year); and
  - identify, evaluate and publicly report cost effective energy savings opportunities under the EEO Act (facility threshold is 0.5 PJ energy consumed / year).
- Under the EEO Act, NAC are committed to investigating energy efficiency and other opportunities with a view to reducing its carbon footprint. Initiatives such as a solar power and tree screening and planting are examples of options currently being considered.
- **carbon sequestration.** A carbon sequestration program near the revised Project site is considered to have a relatively low potential to offset greenhouse gas emissions. The reduction in greenhouse gas emissions provided by a carbon sequestration program is not expected to outweigh the costs of implementing the program.
- **carbon trading.** Under the *Clean Energy Act 2011* (CE Act), NHG are required to pay a carbon price for Scope 1 greenhouse gas emissions from their operations that exceed 25,000 kt CO<sub>2</sub>-e. The carbon price is currently fixed but will transition to a fully flexible price under an emissions trading scheme market.

- The transition to an emissions trading scheme will provide opportunities to offset emissions through carbon trading. NHG will investigate opportunities to offset greenhouse gas emissions from the revised Project through the trading scheme under the CE Act.
- **research and contributions to industry bodies.** NAC are also a foundation member of the COAL 21 fund, a voluntary industry fund dedicated to greenhouse abatement measures in the Black Coal industry. As of April 2013, approximately \$250 million has been committed to demonstration projects as well as a national research program managed by Australian National Low Emissions Coal Research (ANLEC) Ltd.

The proposed management measures to reduce greenhouse gas emissions from the revised Project are consistent with other mining operations in Queensland.

### 3.3.7. Monitoring

The air quality monitoring requirements for the revised Project are presented in **Table 3-5** and locations of air quality monitoring equipment for the revised Project are presented in **Figure 3-2**.

**Table 3-5 Summary of air quality monitoring requirements for the revised Project**

Instrument	Air Quality Indicator	Frequency	Air Quality Objective	Nuisance Goal	Methodology
TEOM	PM <sub>10</sub>	Real-time	50 µg/m <sup>3</sup> (24 h avg)	-	AS/NZS 3580.9.8:2008
	TSP <sup>#</sup>	Real-time	90 µg/m <sup>3</sup> (annual)	80 µg/m <sup>3</sup> (24 h avg)	AS/NZS 3580.9.8:2008/ AS 3580.9.11:2009
High Volume Samplers	PM <sub>10</sub>	Quarterly	50 µg/m <sup>3</sup> (24 h avg)	-	AS/NZS 3580.9.6:2003
Dust Deposition gauges	Insoluble solids	Monthly	-	120 mg/m <sup>2</sup> /day (monthly average)	AS/NZS 3580.10.1:2003
Meteorological Station	-	Hourly	-	-	AS 3580.14:2011

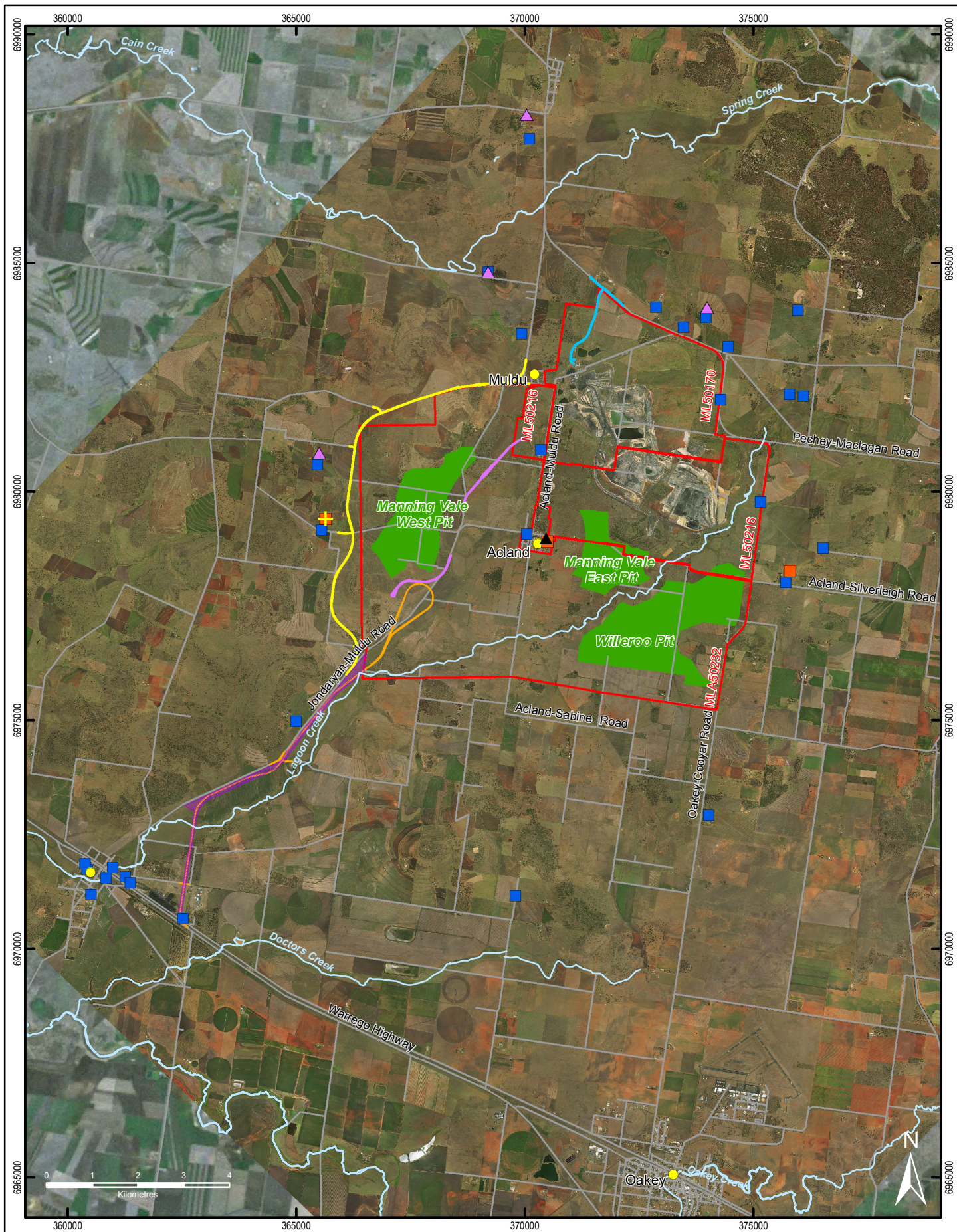
<sup>#</sup> there are no specific standards for measurement of real time TSP. The TEOM/BAM requires a suitable size-selective inlet to monitor TSP.

The rationale for each component of the air quality monitoring program is:

- Meteorological Station – analysis of data to will provide supporting data Real time PM<sub>10</sub> – determine compliance with EPP (Air) objective of 50 µg/m<sup>3</sup> and facilitate adaptive air quality management;
- Real time TSP – determine potential nuisance impacts to west of Manning Vale West Pit and determine compliance with EPP (Air) objective of 90 µg/m<sup>3</sup>;
- Quarterly PM<sub>10</sub> monitoring - continue historical monitoring and determine compliance with EPP (Air) objective of 50 µg/m<sup>3</sup>;
- Dust deposition gauges – determine potential nuisance impacts and to continue historical monitoring; and

- to assess potential for air quality impacts following any investigations of dust concerns raised.





# LEGEND

- Towns and Localities
- Proposed real time TSP concentration
- Proposed Quarterly PM<sub>10</sub> Monitoring Locations
- Proposed Meteorological Station
- Proposed real time PM<sub>10</sub> concentration
- Proposed Dust Deposition gauges
- Roads
- Creeks

- Mining Tenements
- Infrastructure Mining Lease
- Stage 3 Pit Areas
- Revised Rail & Road Infrastructure
  - Internal Haulage Road
  - Revised Access to Mine
  - Revised Jondaryan-Muldu Road Diversion
  - Revised Rail Spur and Balloon Loop Alignment



## NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 3-2: Proposed Air Quality Monitoring Locations for the revised Project**

Scale 1:110,000 on A4  
Projection: Australian Geodetic Datum – Zone 56 (AGD84)



### 3.3.8. Commitments

- The Proponent will implement the AQMP for the site prior to the commencement of any vegetation clearing or construction activities.
- The Proponent will achieve and maintain the level of dust control outlined in the EA.
- The Proponent will investigate all substantiated dust related complaints and implement corrective actions resulting from substantiated complaint investigations as required.
- All monitoring and sampling techniques will be consistent with the Queensland Government's Air Quality Sampling Manual and applicable Australian Standards as outlined in **Section 3.3.7**.
- The revised Project will maintain plant and equipment in a proper condition.
- The revised Project will investigate energy efficiency ratings of plant and equipment for consideration in plant installations.
- A greenhouse gas inventory will be maintained and reported as required by the NGER legislation.
- The proponent will provide air quality monitoring results to the public as part of the monthly environmental monitoring report.

### 3.3.9. Proposed Environmental Authority Conditions: Schedule B – Air

#### Schedule B - Air

##### Dust and particulate matter monitoring

- B1** The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that the dust and particulate matter emissions generated by the mining activities do not cause exceedances of the following levels when measured at any sensitive or commercial place:
- a) Dust deposition of 120 milligrams per square metre per day, averaged over 1 month, when monitored in accordance with the most recent version of Standards Australia AS/NZS 3580.10.1 Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method.
  - b) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM<sub>10</sub>) suspended in the atmosphere of 50 micrograms per cubic metre over a 24-hour averaging time, for no more than 5 exceedances recorded each year, when monitored in accordance with the most recent version of either:
    1. Standards Australia AS/NZS 3580.9.6 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM<sub>10</sub> high volume sampler with size-selective inlet - Gravimetric method; or
    2. Standards Australia AS/NZS 3580.9.9 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM<sub>10</sub> low volume sampler - Gravimetric method

3. Standards Australia AS 3580.9.8 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM<sub>10</sub> continuous direct mass method using a tapered element oscillating microbalance analyser;
  - c) A concentration of particulate matter suspended in the atmosphere of 90 micrograms per cubic metre over a 1 year averaging time, when monitored in accordance with the most recent version of AS/NZS3580.9.3:2003 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - Total suspended particulate matter (TSP) - High volume sampler gravimetric method.
- B2** If monitoring indicates the potential for exceedance of the relevant limits in condition B1 then the environmental authority holder must immediately implement dust abatement measures to avoid exceeding the relevant limits.
- B3** An Air Emissions Management Plan must be developed by a suitably qualified person and implemented. The Air Emissions Management Plan must incorporate a program for continuous improvements for the management of dust resulting from mining operations with respect to, but not limited to:
- a) The collection of air quality and meteorological data in accordance with Table A: Air quality monitoring requirements;
  - b) A system to identify adverse meteorological conditions likely to produce elevated levels of dust including PM<sub>10</sub> at a sensitive or commercial place due to the mining conditions; and
  - c) A dust control strategy which activates a timely implementation of dust control management actions aimed to avoid elevated levels of dust including PM<sub>10</sub> at a sensitive or commercial place due to mining activities.
- B4** A copy of the Air Emissions Management Plan and any changes to the Air Emissions Management Plan must be provided to DEHP on request.

**Table A. Air quality monitoring requirements**

Monitoring location*	Air quality indicator	Instrument	Frequency	Air quality limit	Nuisance limit	Monitoring method
1,2 (Acland)	PM <sub>10</sub>	TEOM	Continuous	50µg/m <sup>3</sup> (24 hr avg)		AS 3580.9.8-2008
	TSP	Hi-Vol Sampler	24hr, 1 day in 6	90µg/m <sup>3</sup> (annual)	80µg/m <sup>3</sup> (24 hr avg)	AS/NZS 3580.9.3:2003
	TSP# <sup>1</sup>	Modified TEOM v	Continuous	90µg/m <sup>3</sup> (annual)	80µg/m <sup>3</sup> (24 hr avg)	Modified TEOM

	Insoluble solids	Dust gauge	Monthly		120mg/m <sup>2</sup> /day	AS/NZS 3850.10.1:2003
	Wind speed and direction		Hourly			AS 3580:14-2011
35,36 (west of mine site)	PM <sub>10</sub>	TEOM	Continuous	50µg/m <sup>3</sup> (24 hr avg)		AS/NZS 3580.9.8-2008
	TSP	Hi-Vol Sampler	24hr, 1 day in 6	90µg/m <sup>3</sup> (annual)	80µg/m <sup>3</sup> (24 hr avg)	AS/NZS 3580.9.3:2003
	Insoluble solids	Dust gauge	Monthly		120mg/m <sup>2</sup> /day	AS/NZS 3850.10.1:2003
Acland-Silverleigh Road (at site on Fig 3-2 where real time PM <sub>10</sub> and dust deposition is monitored.	PM <sub>10</sub>	TEOM	Continuous	50µg/m <sup>3</sup> (24 hr avg)		AS/NZS 3580.9.8-2008
	TSP	Hi-Vol Sampler	24hr, 1 day in 6	90µg/m <sup>3</sup> (annual)	80µg/m <sup>3</sup> (24 hr avg)	AS/NZS 3580.9.3:2003
	Insoluble solids	Dust gauge	Monthly		120mg/m <sup>2</sup> /day	AS/NZS 3850.10.1:2003
as per Figure 3-2.	Insoluble solids	Dust gauge	Monthly		120mg/m <sup>2</sup> /day	AS/NZS 3850.10.1:2003
Siting of monitoring equipment						AS/NZS 3580.1.1:2007

\*See Figures 3-1 and 3-2 Revised Environmental Management Plan (New Acland AEIS)

\*See Figures 3-1 and 3-2 Revised Environmental Management Plan (New Acland AEIS, August 2014)

#Data from the modified TEOM and Hi-Vol samplers to be used to calibrate the modified TEOM for monitoring TSP. Calibration results can be used at other sites to derive TSP. Once the TEOM has been calibrated (calibration undertaken over at least 6 months period from June to December), a modified TEOM can be used to measure TSP instead of Hi-Vol sampler.

1 The modified TEOM can be used to measure TSP at other sites.

**END OF CONDITIONS FOR SCHEDULE B**



### 3.4. Waste Management

#### 3.4.1. Background

The waste management strategies proposed for the revised Project will incorporate those already in use at the NAC Mine and will consider waste management from the concept and planning stages through design, construction, operation and decommissioning.

- The major sources of waste with the potential to cause impacts are:
- vegetation cleared from areas to be disturbed by the revised Project;
- regulated waste (hydrocarbon waste, detergents, solvents, batteries, tyres);
- general waste (food scraps, paper, rags, cans and glass);
- scrap metal and off cuts from maintenance activities and from the construction of the CHPP precinct, water supply pipeline and mine infrastructure areas; and
- sewage effluent and sludge.

The estimated volume and management methods are shown in **Table 3-6** for construction wastes and **Table 3-7** for wastes produced during operation. These are based on minimising the potential environmental impacts associated with waste generation at the revised Project.

**Table 3-6 Waste Management: Construction Phase**

Waste Type	Source(s)	Management Methods	Approximate Quantity
Cleared Vegetation	Site Infrastructure (rail loop and balloon loop, MHF and TLF)	Where possible use on re-vegetated areas. Reuse on-site as fauna habitat or dispose of in waste dump.	Small amounts of vegetation
Excavated Waste	Site Infrastructure (rail loop and balloon loop, MHF and TLF)	Refill any excavations and spread any excess over the nearby area and allow re-vegetating with appropriate sediment control if likely to be exposed to surface water. Waste materials will be reused as much as practicable to construct haul roads and pads.	All used as fill on-site
Concrete	Site Infrastructure area (MHF, TLF workshops and buildings)	Minimise waste by producing/procuring only the amount necessary. Disposal in waste rock dump. Pre fabrication if possible.	<10 t
Steel/ metal off cuts	Site Infrastructure area (MHF, TLF workshops and buildings)	Minimise waste by producing/procuring only the amount necessary. Segregation and collection on-site. Transportation off-site by a waste contractor for off-site recycling.	<20 t
Timber – pallets and off-cuts	Site Infrastructure area (MHF, TLF workshops and buildings)	Minimise waste by producing/procuring only the amount necessary. Good pallets returned to sender. Damaged pallets disposed of in waste dump, chip and reuse on site as mulch for landscaping and erosion control.	<2 t

Waste Type	Source(s)	Management Methods	Approximate Quantity
Paints and Resins	Site Infrastructure area (MHF, TLF workshops and buildings)	Minimise waste by producing/procuring only the amount necessary. Collection on-site and storage in a segregated area. Transportation off-site by licensed regulated waste transporter and disposal off-site by a regulated waste receiver.	Minor amounts (All available parts should be painted off-site before Installation on-site).
General wastes including putrescible & organic (food waste), some plastics and paper	Construction offices, workshop	General waste will be taken off-site for disposal at a nearby landfill.	<500 t
Recyclables - including paper, cardboard, plastics, glass, aluminium cans	Construction offices	Incorporate into existing waste management system - Collection on-site. Transportation by a waste contractor for off-site recycling.	<10 t
Grease trap wastes	Workshop	Incorporated into existing waste management system - Wastes will be collected and disposed of off-site by a licensed regulated waste transporter, to a licensed regulated waste receiver, for recycling and disposal.	< 3 t
Waste Oil and Containers	Workshop	Collected and stored on-site in a bunded facility (compound, temporary or pallet). Transported off site by a licensed regulated waste transporter, to a licensed regulated waste receiver for recycling.	45 t
Oily Water	Workshop	Oil will be separated from water. The resulting oil will be collected and transported off-site by a licensed regulated waste transporter to a licensed regulated waste receiver for recycling. The separated water is directed to a sediment dam for evaporation or possible reuse on-site for dust suppression activities.	4 t
Electrical Wastes	Contractor crib rooms, offices, facilities, CHPP precinct and infrastructure facilities	Collection and segregation on-site. Transportation by a waste contractor for off-site recycling.	< 10 t
Sewage Effluent	Construction and Administration Offices	Sewage will be pumped to the STP for treatment and disposal in accordance with the EA.	25 ML annum (based on 450 EP). Max construction volume assumed.

**Table 3-7 Waste Management: Operational Phase**

<b>Waste Type</b>	<b>Source(s)</b>	<b>Management Methods</b>	<b>Approximate Quantity</b>
Waste oil, oily waste and waste from oil separator	CHPP precinct, Workshops	Collected and stored in a bunded tank. Transported off site by a licensed regulated waste transporter, to a licensed regulated waste receiver, for recycling or treatment and disposal.	15 t per MT of ROM coal
Oily sludge, absorbent, degreaser, grease, oily rags, oil filters	CHPP precinct, Workshops	Collected on-site. Then transported off-site by a licensed regulated waste transporter, to a licensed regulated waste receiver, for recycling or treatment and disposal.	3 t per Mt of ROM coal (oily sludge, absorbent, greases) 25 000 L/a (rags) 0.75 t per Mt coal (filters)
Waste Oil containers	CHPP precinct, Workshops	Drained on site. Drums will be transported off-site by waste contractor for off-site reuse, recycling or disposal. Oil will be collected, then transported off-site by a licensed regulated waste transporter to a licensed regulated waste receiver, for recycling.	Approximately 150 units per year
Scrap metal	Mine plant, including administration, workshops	Minimise waste by producing/procuring only the amount necessary. Segregation and collection on-site. Transportation off-site by a waste contractor for off-site recycling.	30-50 t (inclusive of mine plant equipment)
General wastes including putrescible and organic (food waste), some plastics and paper not suitable for recycling	Workshop, offices	General waste will be taken off-site for disposal at Oakey landfill.	190 t per annum
Recyclables – including paper and cardboard, plastics, and glass.	Workshop, offices	Collection and segregation on-site. Transportation by a waste contractor for off-site recycling.	150 t per annum
Paints and resins	CHPP precinct, Workshops	Minimise waste by producing/procuring only the amount necessary. Collection on-site and storage in a segregated area. Transportation off-site by licensed regulated waste transporter and disposal off-site by a regulated waste receiver.	<2 t per annum
Timber pallets and off-cuts	CHPP precinct, Workshops	Minimise waste by producing/procuring only the amount necessary. Good pallets returned to sender. Damaged pallets disposed of in landfill.	<2 t per annum
Tyres	Workshops	Tyres will be stored and disposed of in the spoil dumps or transported off-site by a licensed regulated waste	750 t per annum

Waste Type	Source(s)	Management Methods	Approximate Quantity
		transporter to a licensed regulated waste receiver for recycling or disposal.	
Vehicle Batteries	Workshops	Collected on-site in a segregated area. Then transported off-site by a licensed regulated waste transporter to a licensed regulated waste receiver for recycling.	120 t per annum
Anti-corrosion Agents	Workshops	Collection and segregation on-site. Transportation by a waste contractor for off-site processing.	<50 t per annum
Regulated waste - sewage waste and residues (sewage sludge)	STP	Sewage sludge is treated on-site at the STP. The thickened sludge will be removed from site from a licensed contractor during the decommissioning phase.	<1 t per annum
Regulated waste – sewage wastewater discharged from the STP	STP	STP effluent will be discharged to a sediment dam for possible reuse on-site for dust suppression and/or evaporation, or discharged to the process water system in accordance with the EA.	18 ML per annum (based on 200 EP) Volume will vary depending on the number of personnel on site.

At the decommissioning phase of the revised Project, a comprehensive assessment of waste will be undertaken in line with the waste management hierarchy to identify the most appropriate measures to manage the remaining waste. Site infrastructure will generally be decommissioned and sold off, relocated to another NHG mine site, or demolished in line with the post mine land use. The estimated volumes of each waste type likely to be generated during the decommissioning phase of the revised Project and their management method are shown in **Table 3-8**.

**Table 3-8 Waste Management: CHPP & Infrastructure Decommissioning Phase**

Waste Type	Source(s)	Management Methods	Approximate Quantity
Waste oil, oily waste and waste from oil separator and electrical transformers	CHPP precinct, Workshops	Bunded tank and residue oils will be collected and removed from site by a licensed contractor for recycling or treatment and disposal.	10 t
Oily sludge, absorbent, degreaser, grease, oily rags, oil filters	CHPP precinct, Workshops	Collected on-site. Then transported off-site by a licensed regulated waste transporter, to a licensed regulated waste receiver, for recycling or treatment and disposal.	2 t
Waste Oil containers	CHPP precinct, Workshops	Drained on-site. Drums will be transported off-site by waste contractor for off-site reuse, recycling or disposal. Oil will be collected, then transported off-site by a licensed regulated waste transporter to a licensed regulated	50 drums



Waste Type	Source(s)	Management Methods	Approximate Quantity
		waste receiver, for recycling.	
Scrap metal	Mine plant, including Administration, Workshops	Segregated and collection on-site. All scrap metal to be removed for recycling. All re-usable steel and functioning equipment will be sold and removed from site.	2,000 t
Electrical Waste	CHPP precinct, Workshops, Administration	Collection and segregation on-site. Transportation by a licensed waste contractor for off-site recycling.	600 t
Rubber (such as conveyor belts, linings)	CHPP precinct	Collection and segregation on-site. Transportation by a licensed waste contractor for off-site recycling.	<5 km of belt
Radioactive sources (density gauges)	CHPP precinct	Removed and transported off-site by a licensed contractor	3 sources
General wastes including putrescible and organic (food waste), some plastics and paper not suitable for recycling	Workshop, offices	General waste will be taken off-site for disposal at Oakey or nearby landfill.	<500 t
Recyclables - including paper, cardboard, plastics, glass, aluminium cans	Workshop, offices	Collection and segregation on-site. Transportation by a waste contractor for off-site recycling.	<10 t
Concrete	Site Infrastructure area (CHPP precinct, Workshops & Buildings)	Removed and segregation on site. Transportation by a licensed waste contractor for off-site recycling or disposal.	< 5, 000 t
Regulated waste - sewage waste and residues (sewage sludge)	STP	The residual sewerage sludge is recovered by a licensed STP contractor for appropriate disposal off-site in compliance with regulated waste requirements.	<20 t

### 3.4.2. Environmental Values

The environmental values to be protected through the management of waste are the:

- health and amenity of people ;
- biological integrity of the disturbed surface water aquatic ecosystem;
- suitability of surface water for agricultural use;
- availability and suitability of groundwater for agricultural use;
- maintenance of a stable, non-polluting landform; and

- suitability of the land for a beneficial post mining land use.

### **3.4.3.      *Potential Impacts on the Environmental Value***

#### **General wastes**

Revised Project activities that generate wastes may impact on the environmental values listed above through poor on-site management. Inappropriate disposal of waste may lead to the contamination of land and water and cause adverse effects on ecosystems and human health. Environmental harm will only occur if wastes are not managed appropriately.

#### **Mining Waste**

The management of spoil, coarse rejects and dewatered tailings has the potential to impact on the identified land environmental values.

It is likely that spoil material will be suitable for revegetation. Topsoil is used as a surface treatment to promote revegetation, maximise natural revegetation from propagules (e.g. seeds, etc.) and minimise any effects from sodic spoil present at sub-soil depths. If necessary, consideration may be given to incorporating gypsum (calcium source) into the surface horizon of the final spoil dump to reduce the sodicity.

Results suggest that acid rock drainage (ARD) from coarse rejects and dewatered tailings presents a low risk. If necessary, occurrences of ARD at the revised Project site would be managed using a containment system, such as in-pit encapsulation within inert or neutralising material.

### **3.4.4.      *Proposed Environmental Protection Objective***

The revised Project's environmental protection objectives for wastes are:

- to avoid contaminating land, surface water or groundwater through poor waste management practices;
- to manage waste through the use of licensed contractors, transporters and disposal facilities; and
- to minimise the generation of waste in accordance with the waste management hierarchy listed in the Environmental Protection (Waste Management) Policy 2000 (EPP (Waste)) which involves:
  - implementation of the waste minimisation hierarchy with these waste management options:
  - waste avoidance;
  - waste re-use;
  - waste recycling; and
  - waste disposal (as a last option); and
  - compliance with national and state waste management policies, the EP Act and associated regulatory instruments as a minimum.

### 3.4.5. Performance Criteria

- Manage waste in accordance with the waste management hierarchy and the Waste management plan; and
- Prevent environmental harm through appropriate management of general and mineral waste and waste streams.

### 3.4.6. Control Strategies

#### General wastes

Solid and liquid wastes will be managed by NAC's EMS based on the Waste Management Plan (WMP) in the draft EIS, **Appendix J13**. Liquid wastes are addressed in **Section 3.7**. Surface Water and Mining and tailings wastes are addressed in **Section 3.8** Land Management. Mine waste management is detailed in **Section 4.7**. Solid wastes will be managed as below.

- Waste management mitigation measures and commitments for the revised Project are provided in **Table 3-9**.

**Table 3-9 Summary of Mitigation Measures and Commitments**

Mitigation measure	Commitment
Construction Waste Minimisation	<ul style="list-style-type: none"> <li>▪ Assessment of construction methods and possible waste generation areas will be undertaken in line with the waste management hierarchy to identify the most appropriate measures to manage all wastes.</li> </ul>
Updates to the WMP	<p>The WMP will be periodically updated to incorporate aspects of the revised Project and involved the following process:</p> <ul style="list-style-type: none"> <li>▪ Identification and minimisation of waste streams;</li> <li>▪ Improve where possible on the waste disposal and management techniques currently adopted;</li> <li>▪ All waste generated on-site during the construction and operational phases will be disposed of in accordance with the WMP;</li> <li>▪ Contracts with construction companies will be negotiated to place responsibility on all contractors to adopt best practice waste minimisation procedures;</li> <li>▪ Waste monitoring and auditing will be undertaken; and</li> <li>▪ training will be provided to personnel and contractors in relation to waste management requirements and practices.</li> </ul>
Decommissioning Waste Minimisation	<ul style="list-style-type: none"> <li>▪ An assessment of waste will be undertaken in line with the waste management hierarchy to identify the most appropriate measures to manage the remaining waste.</li> </ul>

#### Hazardous Materials

All hazardous materials used on-site will be recorded in the Hazardous Materials Register (HMR). This register includes details on storage location, storage requirements, handling

information and disposal procedures. This information is also available in MSDS's which are kept for all materials and chemicals maintained within the HMR.

In addition:

- the storage and handling of flammable and combustible liquids will be implemented in accordance with the applicable provisions of AS 1940-2004;
- contractors will provide a list of hazardous chemicals and MSDS prior to bringing chemicals on-site;
- no chemical will be allowed on site without an MSDS;
- a chemical register will be continued on-site;
- corrosive materials will be stored and handled in accordance with AS 3780.8 (Class 8 substances – corrosives);
- fuels, oils and chemicals in containers of 200 L or more will be stored in a bunded area with capacity of at least 110% of the largest container;
- fuels, oils and chemicals in containers less than 200 L capacity will be stored as above or in a fenced, bunded and roofed compound;
- all fuels, oils and chemicals will be clearly labelled;
- transfer of bulk fuel and handling of hazardous chemicals will be undertaken only by trained personnel and in accordance with a Standard Operating Procedure;
- spill cleanup kits including absorbent materials will be kept at each fuel and chemical storage facility; and
- an area will be designated for the temporary storage or bioremediation of hydrocarbon contaminated soils.

The revised Project will continue to generate wastes similar to those presently generated at NAC, which presently have limited market demand. There are likely to be opportunities to reuse and recycle aluminium cans, some containers such as glass bottles, paper, and scrap steel. Some general wastes will be recycled or reused on site, such as pallets, or disposed of by licensed waste management contractors. The revised Project will review the marketability of all wastes for recycling and reuse on a regular basis and will update the WMP accordingly.

### **Waste Rock Management**

Following over ten years of mining operation within the Mine and extensive resource delineation activities within the Study area, NAC believes based on experience that the risk of a significant occurrence of ARD within the Study area is low. This assumption is supported by the geochemical investigations completed for the revised Project's draft EIS, and is further supported by the geology of the revised Project's coal deposits, which were not formed as 'marine regression' environments (typically associated with acid generation), are all the same formation (depositional history), and contain strata with a significant proportion of calcareous material (acid neutralising).

Based on the low level of risk, NAC will continue to use surface water monitoring, on-going geological assessments and rehabilitation performance to monitor for ARD. If required, waste rock dump design investigations will be undertaken to facilitate:



- physical characterisation of available non-acid forming (NAF) materials for burying potentially-acid forming (PAF) materials;
- physical characterisation of the PAF rock to be covered; and
- development of selective placement options.

A surplus of NAF waste rock materials is available within the Study area for construction of earthen covers.

#### **3.4.7. Monitoring**

Waste monitoring and auditing will be undertaken at the revised Project. The purpose of monitoring waste management activities and outcomes on-site include:

- Assessing actual waste results and comparing with predicted impacts and mitigation measures;
- Monitoring for potential environmental impacts; and
- Providing baseline data to enable continuous improvement of waste avoidance, reduction and management measures.

#### **3.4.8. Commitments**

General Waste:

- A WMP will be regularly reviewed and revised as required.
- Recycling of glass, aluminium, steel and cardboards will be undertaken, if feasible.
- Regular monitoring and auditing will be undertaken, with a program to address any outstanding non-conformances.

Waste Rock Management:

- NAC will evaluate the acid generation potential appropriately regularly during mining operations to assess its acid generating capacity.
- The following measures will be implemented to manage mine waste. Low capacity PAF (PAF-LC) and PAF mine waste:
  - progressively backfilled into pit voids and placed below the pre-mining groundwater level; and
  - co-mingled with non-acid forming (NAF) materials in out of pit dumps during construction.

#### **3.4.9. Proposed Environmental Authority Conditions: Schedule C – Waste Management**

##### **Schedule C - Waste management**

- C1** Unless otherwise permitted by the conditions of this environmental authority or with prior approval from the administering authority and in accordance with a relevant standard operating procedure, waste must not be burnt.

- C2** The holder of this environmental authority may burn vegetation cleared in the course of carrying out extraction activities provided the activity does not cause environmental harm at any sensitive place or commercial place.
- C3** The holder of this environmental authority may dispose of inert waste (packing material) associated with blasting into open pits, buried in such a manner that it will not impede saturated aquifers.

### **Disposal of Tyres**

- C4** Scrap tyres resulting from the mining activities can be disposed of into open pits provided tyres are placed as deeply in the spoil as reasonably possible and this practice does not cause an unacceptable fire risk or compromise mine safety.
- C5** Scrap tyres resulting from the mining activities disposed within the operational land must not impede saturated aquifers or compromise the stability of the consolidated landform.

### **Tailings disposal**

- C6** Tailings must be managed in accordance with procedures contained within the current plan of operations. These procedures must include provisions for:
  - a) containment of tailings
  - b) the management of seepage and leachates both during operation and the foreseeable future
  - c) the control of fugitive emissions to air
  - d) maintaining records of the relative locations of any other waste stored within the tailings
  - e) rehabilitation strategy
  - f) monitoring of rehabilitation, research and/or trials to verify the requirements and methods for decommissioning and final rehabilitation of tailings, including the prevention and management of acid mine drainage, erosion minimisation and establishment of vegetation cover.

### **END OF CONDITIONS FOR SCHEDULE C**

### 3.5. Noise and Vibration

#### 3.5.1. Background

The revised Project site is located within a predominantly rural environment with background noise levels influenced by traffic, existing mining activities and local rural activities.

The revised Project has the potential to generate noise and vibration impacts at nearby sensitive receptors. Activities at the revised Project vary in location and nature throughout the mine life. Therefore noise levels at sensitive receptors will also vary throughout the life of the revised Project. Many properties surrounding the revised Project site have been acquired by NAC or are under negotiation. Therefore there are a limited number of sensitive receptors, which may be affected by the revised Project. The nearest sensitive receptors are shown in **Figure 3-1**. Sensitive receptor 3 (in Muldu) has been removed from **Figure 3-1** because NAC have reached agreement to relocate the current tenant and purchase this property.

The Mine and local and mine traffic on the Jondaryan-Muldu Road contributes to the existing noise environment. The Mine and its traffic on the Jondaryan-Muldu Road have been in operation since 2002. The only potential significant ground vibration source in the vicinity of the revised Project site is the Mine.

Background  $L_{A90}$  noise level at each monitoring location is typical of similar rural settings, influenced by local and distant traffic, insects, birds and rustling leaves. Each location monitored displayed a similar trend in background noise variation, with relatively low day time noise levels, which slightly increased during the evening followed by relatively low night time noise levels.

#### Construction & Decommissioning Noise

Due to the proposed construction hours and the separation distances (minimum 400 m) between construction activities and nearby sensitive receptors, noise impact from construction activities will be minimal.

Similarly, due to the proposed decommissioning hours, the limited nature of decommissioning activities and the separation distances (minimum 400 m) between decommissioning activities and nearby sensitivereceptors, noise impact from decommissioning activities will be minimal.

#### Operational Noise

A number of operating scenarios were investigated and noise modelling exercises were carried out, with the aim to assist in developing a mining operation that would demonstrate best practice and comply with legislative noise limits while achieving a feasible and viable mining operation.

The noise modelling exercises and operational scenarios investigated include the:

- effect of replacing the excavator (noisier equipment) with a loader (quieter equipment) to achieve the same output;
- viability of night time operation in Manning Vale East pit with regards to complying with EPP Noise night time criteria;
- comparison of conveyor versus haul truck options;

- feasibility of using existing equipment (not noise attenuated);
- use of a mixture of noise attenuated and existing equipment; and
- use of noise attenuated equipment.

A summary of the investigated scenarios and the noise modelling results are tabulated in **Table 3-10**. For the purpose of presenting the differences in sound power levels (SWL) between existing and noise attenuated equipment, the SWL of existing and noise attenuated excavators, track dozers, loaders and rear dump trucks are tabulated in **Table 3-11**.

**Table 3-10 Summary of the Investigated Scenarios and the Noise Modelling Results**

Scenario	(1) Effect of Replacing Excavator with Loader	(2) Viability of Night Time Operation in Manning Vale East pit	(3) Comparison of Conveyor versus Haul Truck	(4) Existing versus Attenuated Equipment	(5) Mixture of Equipment versus Attenuated Equipment
Period	Day	Night	Day/Night	Day/Night	Night
Pits	All 3	All 3	3 (day) 2 (night)	3 (day) 2 (night)	All 3
Equipment	Excavators, track dozers, loaders and rear dump trucks are attenuated.	Excavators, track dozers, loaders and rear dump trucks are attenuated.	Attenuated rear dump trucks compared to open and unmitigated conveyors.	Excavators, track dozers, loaders and rear dump trucks are attenuated.	Excavators, track dozers, loaders and rear dump trucks are attenuated in all three pits versus excavators, track dozers, loaders and rear dump trucks are attenuated in Manning Vale East pit plus existing equipment at the other two pits.
Results	0 to 0.6 dB(A) lower at sensitive receivers with loader	Between 0 and 6 dB(A) higher at sensitive receivers compared to only two pits operating	Between 2 and 8 dB(A) higher with conveyor at sensitive receivers	Between 4 and 6 dB(A) higher with existing equipment at sensitive receivers	Up to 6 dB(A) lower with attenuated excavators, track dozers, loaders and rear dump trucks in all three pits



**Table 3-11 SWL of existing and attenuated equipment**

Item	Existing equipment sound power level dB(A)	Attenuated equipment sound power level dB(A)
350 t and 500 t Excavator	124	118
900kW Loader	117	114
180 t and 220 t Rear Dump Truck	115	112
50 t to 100 t Track Dozer	115	113

Results from the noise modelling exercises and operating scenarios investigated show that:

- noise levels would be up to 6dB(A) lower at the noise sensitive receivers if the noisier equipment including excavators, track dozers, loaders and rear dump trucks are noise attenuated;
- replacing the excavators with loaders reduces noise levels at the noise sensitive receivers by up to 0.6dB(A);
- to comply with legislative noise limits in EPP Noise, limited mining operation could be allowed in the Manning Vale East pit during the night time; and
- noisier equipment including excavators, track dozers, loaders and rear dump trucks will need to be noise attenuated to achieve compliance with legislative noise limits in EPP Noise.

These critical findings have assisted in developing the mine plan, mining fleet and operational schedule for the revised Project.

### **Maximum Operational Noise ( $L_{A\text{Max}}$ )**

The aim of the maximum operational noise modelling is to predict a realistic worst case instantaneous maximum noise level from the mining operation. It has been assumed that whilst a large number of items of equipment will be operating at average engine speed, some mobile and fixed equipment will be operating at maximum engine speed or load. The following operational scenario has been modelled which is considered conservative and is unlikely to occur on a regular basis.

- A worst case scenario of a haul truck dumping coal into an empty RoM bin (Noise level highest when RoM bin is empty);
- A water truck, wheel dozer and a track dozer operating at maximum engine speed;
- Two rear dump trucks in proximity to Manning Vale West pit and Willeroo pit, respectively, operating at maximum engine speed;
- Two side tipping trucks travelling at maximum engine speed along the haul route in close proximity to the noise sensitive receptors;
- The rest of the equipment fleet operating at average engine speed; and
- Worst case meteorological condition of Stability Class F with a 2.9 m/s wind in the direction of the noise sensitive receptors with both the Manning Vale West and Willeroo Pits operating.

The maximum operational noise level from the mining operation is predicted to range between L<sub>Amax</sub> 11 dB(A) at noise sensitive receptors 31 and L<sub>Amax</sub> 45 dB(A) at noise sensitive receptor 2. The maximum operational noise levels at the noise sensitive receptors will therefore meet the Planning for Noise Control Guideline's sleep disturbance criterion of L<sub>Amax</sub> 52 dB(A) during the worst case temperature inversion condition at all noise sensitive receptors over the life of the revised Project.

### 3.5.2. *Environmental Value*

The revised Project's environmental values to be enhanced or protected are:

- the acoustic qualities suitable for the wellbeing of a community, including its social and economic amenity; and
- for the wellbeing of the individual, including the individual's opportunities to sleep, relax and converse without unreasonable interference from intrusive noise or vibration.

### 3.5.3. *Potential Impacts on the Environmental Value*

Revised Project activities that may impact on the acoustic environmental values are listed below:

- Noise impacts from mining equipment: trucks, hydraulic excavators, drills, dozers, front end loaders, and graders;
- Noise impacts from processing and handling equipment such as crushers, CHPPs, workshop operations, train loadout facilities, haul road, blasting, and light vehicles;
- Vibration impacts from blasting; and
- Noise impacts from operation of the rail spur.

The level of noise at nearby receivers will vary depending on the location and elevation of the noise sources, the intervening topography, noise barriers, atmospheric conditions, and the distance between the source and receiver.

All noise sensitive receptors surrounding the revised Project site are residences. The noise sensitive receptors surrounding the revised Project site and the proposed rail spur are shown in **Figure 3-1**. Sensitive receptor 3 (in Muldu) has been removed from **Figure 3-1** because NAC have reached agreement to relocate the current tenant and purchase this property.

### 3.5.4. *Proposed Environmental Protection Objective*

Pursuant to the EP Act, environmental values to be enhanced and protected by the EPP (Noise) are:

- the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems;
- the qualities of the acoustic environment that are conducive to human health and amenity, including by ensuring a suitable acoustic environment for individuals to sleep, study and be involved in recreation, including relaxation and conversation; and
- the qualities of the acoustic environment that is conducive to protecting the amenity of the community.

### 3.5.5. Performance Criteria

The performance criteria for noise and vibration are:

- Compliance with the requirements of the revised Project's EA;
- Noise and vibration monitoring in accordance with the control strategies outlined in **Section 3.5.6**; and
- The number of substantiated noise and vibration complaints from the community.

### 3.5.6. Control Strategies

Noise and vibration will be managed by NAC's EMS based on the Noise and Vibration Management Plan (NVMP) in the draft EIS, **Appendix J11**.

By implementing noise management and mitigation measures including reduced night time operation, as required, and using attenuated equipment (noise attenuation of noisier equipment including excavators, track dozers, loaders and rear dump trucks), the predicted noise levels from the mining operation will meet the EPP Noise  $L_{Aeq,adj,1\text{ hr}}$  at all noise sensitive receptors over the life of the revised Project except at noise sensitive receiver 3. NHG are currently in discussions with the owners of this property with a view to agreeing on appropriate mitigation measures.

However, the predicted noise level from the mining operation will exceed the *Planning for Noise Control Guideline's* PNL at a number of noise sensitive receptors. The DEHP has acknowledged that a PNL of 28 dB(A) is a very low level for practical compliance purposes and a large number of mines and industries around Queensland struggle to comply with a PNL of 28dB(A).

The following mitigation measures are proposed by NAC as commitments to reduce the revised Project's potential noise impact.

- NAC will establish a real-time noise monitoring network, which will be used in conjunction with a weather forecasting system and an adaptive management process, to proactively relocate, reduce or stop noisier mining operations.
- NAC has developed a NVMP for the revised Project, and is presented in **Appendix J.11**. The NVMP will be administered as an accompanying document to the revised Project's Plan of Operations.
- Based on ambient conditions (climate and the current mine plan) and feedback from the real-time noise monitoring (warning and alarm protocols), NAC may be required to limit or stop mining operations in the Manning Vale East pit during the night time period. This requirement is based on the noise assessment work completed for the revised Project's draft EIS.
- NAC will ensure noisier mining equipment, including excavators, track dozers, loaders and rear dump trucks, is fully attenuated. This requirement is based on the noise assessment work completed for the revised Project's draft EIS.
- Where possible, NAC will schedule noisier operations in-pit at night or during daylight hours only. For example, dumping of overburden and dozer activity on overburden dumps at or above ground surface may be restricted during night periods (10pm to 7am).

- If no suitable or acceptable noise amelioration solutions are available for a particular noise issue, NAC will negotiate in good faith with all affected property owners for property purchase or by agreement implement some other form of amicable arrangement (e.g. acoustic treatment of the dwelling, relocation or replacement of the dwelling at another suitable location, relocation of the landowner to another living arrangement for the period of the issue or any other suitable innovative solution). NAC would be responsible for all reasonable costs associated with any agreed solution to a noise issue. In the event agreement cannot be reached, NAC will enter into mediation with the affected party and employ the services of a third party to facilitate this process
- NAC will ensure proper maintenance and operational procedures will be undertaken to minimise noise emissions from equipment, including proper servicing and maintenance of exhaust systems on mine equipment.
- NAC will implement its NVMP, as presented in **Appendix J.11** to minimise the risk of noise complaints from nearby sensitive receptors to the revised Project. All complaints received in relation to the revised Project's operation will be managed as outlined in NAC's LSMP as presented in **Appendix J.18**. NAC's approach to complaints management is based on the key principles of timeliness, sensitivity, fairness and impartiality, and confidentiality. NAC is committed to open communication with its local stakeholders and active complaint resolution when issues or concerns are raised about its mining operations. Where practicable, NAC using the mine planning process will utilise topsoil and other dumps as noise barriers between active mine operations and nearby noise receptor locations.
- NAC will continue to utilise broad band alarms instead of reverse beepers on all mobile equipment.
- NAC will continue to limit the speed of heavy vehicle traffic on haul roads.
- NAC will continue its current proactive monthly noise monitoring program and will expand its coverage around the revised Project site.
- NAC will continue its proactive assessment of possible noise attenuation options for both mobile or stationary noise emitting equipment. Noise emissions with tonal, impulsive and/or intermittent characteristics will be targeted for noise attenuation.

For the management of airblast overpressure and vibration, the following measures will be adopted for the revised Project.

- Field data will be used to best design blasts with an adequate buffer in place to meet noise/ vibration limits and the type of stemming required for the area.
- In the event of a blast issue, the maximum instantaneous charge of subsequent blasts will be reduced using delays, reduction of hole diameter, etc. (i.e. until the blast issue is resolved).
- In the event of a blast issue, the burden and spacing of subsequent blasts will be changed by altering the drilling pattern and/or delay layout, or altering the hole inclination (i.e. until the blast issue is resolved).
- The stemming depth and type will be adequate for each blast event.
- Blast events will only be conducted during favourable weather conditions.



- The monitoring of blasts will continue at the nearest sensitive receptors based on the interpretation of pre-blast weather data.
- The practice of advising near neighbours will continue in advance of each blast. All new near neighbours surrounding the revised Project site will be proactively invited to join the blast notification contact list.
- A qualified professional with suitable experience will be responsible for the revised Project's blast management.

### 3.5.7. *Monitoring*

A monitoring program will be implemented as per a NVMP and will include the following activities:

- NAC will continue its current proactive monthly noise monitoring program and will expand its coverage around the revised Project site.
- NAC will ensure all complaints will be investigated in a timely manner to determine the source of the nuisance noise. Where appropriate, noise monitoring will be conducted at the affected residence, and as required, noise amelioration solutions will be investigated and implemented by agreement.
- The monitoring of blasts will continue at the nearest sensitive receptors based on the interpretation of pre-blast weather data.
- All blast complaints will be investigated in a timely manner to determine the extent of the issue. Where appropriate, blast monitoring will be conducted at the affected residence, and as required, blast mitigation solutions will be investigated and implemented by agreement.

### 3.5.8. *Commitments*

- Noise and vibration monitoring will be undertaken as per the EA.
- The Proponent will implement the NVMP.
- All substantiated noise and vibration complaints will be investigated and corrective action will be implemented as required.
- The proponent will provide noise and vibration monitoring results to the public as part of the monthly environmental monitoring report.

### 3.5.9. *Proposed Environmental Authority Conditions: Schedule D – Noise*

#### **Schedule D - Noise**

##### **Noise limits**

- D1** The holder of this environmental authority must ensure that noise generated by the mining activities does not cause the criteria in **Table D1 – Noise limits (existing operations) and Table D1b – Noise limits (operations)** to be exceeded at a sensitive place or commercial place.

##### **Table D1a – Noise limits (existing operations)**

Noise level dB(A) measured as	All days		
	7am – 6pm	6pm – 10pm	10pm – 7am
	Noise measured at a 'Noise sensitive place'		
$L_{Ar}$ , 1hour	50	45	40
$L_{Amax}$	-	-	50

**Table D1b – Noise limits (operations<sup>1</sup>)(includes construction activities)**

Noise level dB(A) measured as	All days		
	7am – 6pm	6pm – 10pm	10pm – 7am
	Noise measured at a 'Noise sensitive place'		
L <sub>Aeq</sub> , adj, 15 min	42	42	37
L <sub>Amax</sub>	-	-	50
L <sub>Amax</sub> rail spur	-	-	56
L <sub>Aeq</sub> (24hr) rail spur	-	-	50

**D2** Noise limits in **Table D1a – Noise limits (existing operations)** only apply until the commencement of mining activities (removal of overburden) for the Manning Vale East Pit, the Manning Vale West Pit or the Willeroo Pit as shown on Figure 1.

**D3** If monitoring indicates the potential for exceedance of the relevant limits in **Table D1a** and **Table D1b – Noise Limits** then the environmental authority holder must immediately implement noise abatement measures to avoid exceeding the relevant limits.

#### **Airblast overpressure nuisance**

**D4** The holder of this environmental authority must ensure that blasting does not cause the limits for peak particle velocity and air blast overpressure in **Table D2 – Blasting noise limits** to be exceeded at a sensitive place or commercial place.

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<sup>1</sup> Includes construction activities

**Table D2 – Blasting noise limits**

Blasting noise limits	Sensitive or commercial blasting noise limits	
	Monday to Friday 7am to 6pm Saturday 9am to 1pm	Monday to Friday 6pm to 7am Saturday 1pm to 9am Sunday and Public Holidays
Airblast overpressure	115 dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear) Peak at any time	No blasting
Ground vibration peak particle velocity	5mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time	No blasting

**Monitoring and reporting**

- D5** Noise monitoring and recording must include the following descriptor characteristics and matters:
- LAN,T (where N equals the statistical levels of 1, 10 and 90 and T = 15 to 60 mins)
  - background noise  $L_{A90}$
  - the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to statistical levels
  - atmospheric conditions including temperature, relative humidity and wind speed and directions
  - effects due to any extraneous factors such as traffic noise
  - location, date and time of monitoring
  - if the complaint concerns low frequency noise, Max  $L_{pLIN,T}$  and one third octave band measurements in dB(LIN) for centre frequencies in the 10 – 200 Hz range.
- D6** The holder of this environmental authority must develop and implement a blast monitoring program to monitor compliance with **Table D2 – Blasting noise limits** for
- At least 90% of all blasts undertaken on this site in each year at the nearest sensitive place or commercial place to the centroid of the blast.
  - All blasts conducted during any time period specified by the administering authority at the nearest sensitive place or commercial place.

**END OF CONDITIONS FOR SCHEDULE D**

### 3.6. Groundwater

#### 3.6.1. Background

Five aquifers exist within the revised Project site; the Quaternary alluvial aquifer, the Tertiary basalt aquifer, the Walloon Coal Measures aquifer, and the deeper Marburg Sandstone and Helidon Sandstone aquifers.

The Quaternary Alluvial aquifer is limited in spatial extent and within the revised Project site may only exist within the westernmost part in association with Lagoon Creek, although investigations have shown that Lagoon Creek is very likely disconnected from the regional groundwater system. The alluvial aquifer is known to form a significant groundwater resource outside of the revised Project site, especially in association with Oakey Creek (and its tributary Doctors Creek) south of the revised Project site.

A review of surface geological mapping and bore logs from drilling undertaken as part of the revised Project baseline assessment demonstrates that there is only minor outcrop of the Tertiary Basalt aquifer in the northwestern and extreme southwestern sections of the revised Project site. The basalt is known to form a major aquifer immediately west of the revised Project site.

The Walloon Coal Measures aquifer outcrops over much of the revised Project site, and forms the main groundwater aquifer intersected by the revised Project. On a regional scale the Walloon Coal Measures is considered a confining unit of the GAB however on a local scale it is known to support significant groundwater extraction for stock and domestic use. Groundwater is dominantly held and transmitted within the coal seams, although testing has shown the interburden strata may also hold and transmit significant quantities of water.

The Marburg Sandstone and Helidon Sandstone aquifers are major aquifers of the Great Artesian Basin and are the deepest semi-confined to confined aquifers underlying the revised Project site. These aquifers lie at significant depth below the revised Project's mine pits and will not be affected by the revised Project. The Marburg Sandstone aquifer is separated from the revised Project's mine pits by at least 75 m of low permeability Walloon Coal Measures/Eurombah Formation aquitard-forming strata, and the Helidon Sandstone aquifer is separated from the Marburg Sandstone aquifer by around 200 m of Evergreen Formation, which is a recognised aquitard.

#### 3.6.2. Groundwater quality

Groundwater quality in the area is classified as moderately to very saline (1600 to 6600  $\mu\text{S}/\text{cm}$ ), mildly alkaline, with varying proportions of cations and anions depending on the type of aquifer being tapped. Water associated with basalt tends to have Calcium ( $\text{Ca}^{2+}$ ), Magnesium ( $\text{Mg}^{2+}$ ) and Bicarbonate ( $\text{HCO}_3^-$ ) as the major ions while water pumped from the coal measures tends to have Sodium ( $\text{Na}^+$ ) and Chloride ( $\text{Cl}^-$ ) as the main ions.

Groundwater quality data has been compared to the following guidelines based on the EVs of the revised Project site:

- ANZECC 2000 Guidelines;
- Queensland Water Quality Guidelines 2009 (QWQG); and
- Australian Drinking Water Guidelines 2011 (ADWG).

Generally, groundwater is suitable for stock watering but not for potable uses, except for groundwater obtained from the Basalt aquifer, which is used for potable water.



### 3.6.3. Groundwater use

Groundwater use in and adjacent the revised Project site is limited to landholders who draw on groundwater through bores for water supply purposes. Aquifers accessed by identified groundwater users include the Quaternary alluvium, Tertiary Basalt, Walloon Coal Measures and Marburg Sandstone. The current Mine uses groundwater from bores accessing the Tertiary Basalt aquifer as the main potable water supply, groundwater inflows to the mining pits from the Walloon Coal Measures aquifer for industrial purposes (dust suppression), and maintains access to the Marburg Sandstone and Helidon Sandstone aquifers as an emergency water supply for industrial purposes. In general, reliance on groundwater for industrial purposes has decreased significantly since the WWRP Pipeline was brought online in 2010. No Groundwater Dependant Ecosystems have been identified within or adjacent the revised Project site.

### 3.6.4. Potential Impacts on the Environmental Objectives

The potential impacts on groundwater during mine dewatering and operation are:

- the pressure head within aquifers surrounding the revised Project will reduce, which may result in an increased depth to water surface of bores located within the area of impact; and
- reduced pressure head within aquifers will potentially reduce the rate at which groundwater can be extracted from bores due to a reduced head of water above the pump.

The drawdown of the water table associated with the revised Project is likely to have some impact on the surrounding shallow aquifers (Tertiary Basalt and Walloon Coal Measures), but little to no impact on the deeper aquifers (Marburg Sandstone and Helidon Sandstone) as these aquifers are located well below and are poorly connected to the aquifers intersected by the revised Project's mine pits.

The mining and dewatering operations are not expected to have a detrimental impact on the groundwater quality in the revised Project site. Potential sources of contamination to groundwater include tailings, rejects, waste rock and site environmental incidents, such as oil and chemical spills. These sources of contamination are more likely to have a localised impact at the surface with minimal depth penetration.

### 3.6.5. Performance Criteria

- Compliance with the requirements of the revised Projects' EA;
- No adverse changes to groundwater quality as a direct result of this project;
- Landholder concerns will be assessed and managed in a timely manner;
- Implement the control strategies as described in this GMIMP; and
- The groundwater monitoring network will:
  - be installed and maintained by a person possessing appropriate qualifications and experience in the fields of hydrogeology and groundwater monitoring program design to be able to competently make recommendations about these matters;
  - be constructed in accordance with methods prescribed in the "Minimum Construction Requirements for Water Bores in Australia" (National Uniform Drillers Licensing Committee, 2012) by an appropriately qualified driller; and

- include a sufficient number of ‘bores of compliance’ that are located at an appropriate distance from potential sources of impact from mining activities and provide the following:
  - representative groundwater samples from the uppermost aquifer;
  - background water quality in hydraulically up-gradient or background bore(s) that have not been affected by any mining activities conducted by NAC; and
  - the quality of groundwater down gradient of potential sources of contamination.

### **3.6.6. Control Strategy - Groundwater**

Groundwater will be managed and monitored by NAC’s EMS based on the updated Groundwater Monitoring and Impact Management Plan (GMIMP) in the AEIS, **Appendix H**.

The groundwater monitoring program for the revised Project combines the current monitoring program for the existing Mine with an extended network of monitoring bores for the revised Project.

NAC will expand its existing groundwater monitoring network to encompass the revised Project’s new operational areas as well as increased monitoring outside of the operational areas. NAC’s groundwater monitoring regime will continue its regular assessment of water levels and quality from strategic bores surrounding the revised Project site to help identify potential impacts from the revised Project and to confirm legitimate issues raised by surrounding groundwater users.

If a legitimate groundwater issue is identified by monitoring or complaint investigation, NAC will attempt to reach a mutually agreeable arrangement with all affected neighbouring groundwater users in a timely manner, which may involve the provision of alternative water supplies throughout the revised Project’s life and following mine closure. NAC would be responsible for all reasonable costs associated with the provision of any alternative water supply arrangements. Possible alternative water supply options may include:

- installation of new pumps capable of extracting groundwater from greater depths or more efficiently within existing bores;
- refurbishment of existing bores to improve the efficiency of groundwater extraction;
- deepening of existing bores to target new and/or more reliable aquifers; or
- installation of a new bore at another location on the property.

Construction and decommissioning activities are not expected to impact groundwaters.

### 3.6.7. *Monitoring*

#### **Groundwater**

The groundwater monitoring program for the revised Project combines the current monitoring program for the existing Mine with an extended network of monitoring bores for the revised Project. Data collected from the groundwater monitoring program will:

- be operated in accordance with the revised Project's approved EA, including adoption of suitable guideline criteria and temporal investigation;
- be used in the continued development and refinement of groundwater impact assessment criteria and investigation triggers;
- enable verification and refinement (where necessary) of the groundwater modelling predictions presented in the AEIS; and
- be collated into a database that will be made available to the administering authority on request.

**Table 3-12** summarises the bores that will be monitored, monitoring parameters, and frequency. The groundwater monitoring program combines the existing Mine monitoring bores together with the seven additional bores already installed around the revised Project site.

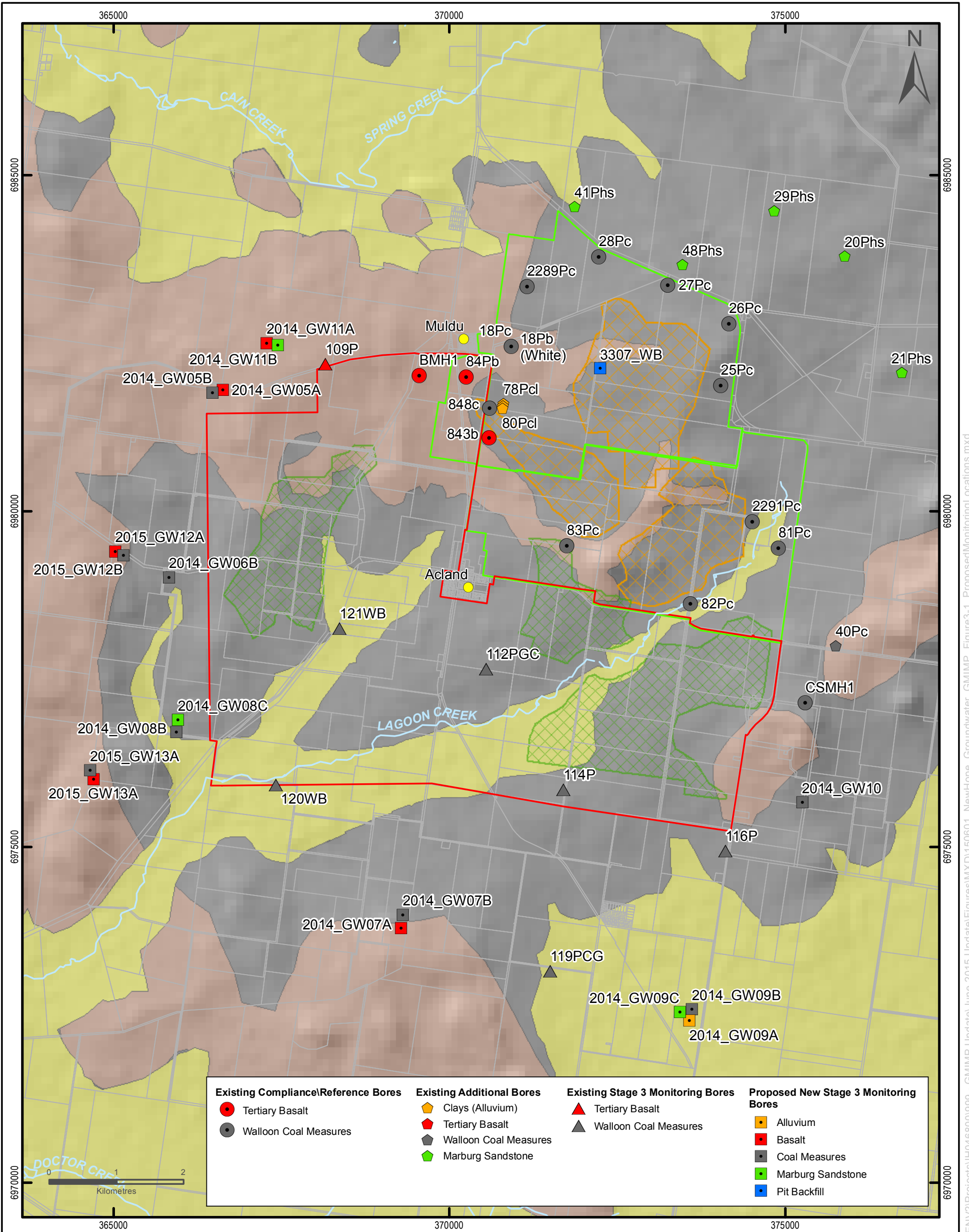
In addition, a further 16 bores will be added to the monitoring network, which brings the total number of bores included in the groundwater monitoring program to 46 (

**Figure 3-3).** The monitoring program for new bores will be established prior to the commencement of mining to ensure there is sufficient baseline information on groundwater levels and quality for those bores.

**Table 3-12 Groundwater Monitoring Schedule**

Monitoring Point	Aquifer	Parameter and Monitoring Frequency
Bores monitored under current monitoring program (Compliance and Reference bores)		
2289P	Coal Measures	Groundwater levels: <b>monthly</b> . Groundwater quality: <b>six monthly</b> to include: Al, As, Ca, Se, Cl, Cu, F, Fe, Total N, K, Mg, Mn, Na, SO <sub>4</sub> , HCO <sub>3</sub> , TDS, EC, pH
2291P	Coal Measures	
18P	Coal Measures	
25P	Basalt	
26P	Coal Measures	
27P	Coal Measures	
28P	Coal Measures	
843	Basalt	
848	Coal Measures	
81P	Coal Measures	
82P	Coal Measures	
83P	Coal Measures	
84P	Basalt	
BMH1	Basalt	
CSMH1	Coal Measures	
Existing monitoring bores to be incorporated into the revised Project's monitoring program		
109P	Basalt	Groundwater levels: <b>monthly</b> . Groundwater quality: <b>six monthly</b> to include: Al, As, Ca, Se, Cl, Cu, F, Fe, Total N, K, Mg, Mn, Na, SO <sub>4</sub> , HCO <sub>3</sub> , TDS, EC, pH
112PGC	Coal Measures	
114P	Coal Measures	
116P	Coal Measures	
119PGC	Coal Measures	
120WB	Coal Measures	
121WB	Coal Measures	
Proposed additional monitoring points which will be monitored as part of the revised Project's monitoring program		
2014_GW05A	Basalt	Groundwater levels: <b>monthly</b> . Groundwater quality: <b>six monthly</b> to include: Al, As, Ca, Se, Cl, Cu, F, Fe, Total N, K, Mg, Mn, Na, SO <sub>4</sub> , HCO <sub>3</sub> , TDS, EC, pH <sup>1</sup>
2014_GW05B	Coal Measures	
2014_GW06B	Coal Measures	
2014_GW07A	Basalt	
2014_GW07B	Coal Measures	
2014_GW08B	Coal Measures	
2014_GW08C	Marburg Sandstone	
2014_GW09A	Oakey Creek Alluvium	
2014_GW09B	Coal Measures	
2014_GW09C	Marburg Sandstone	
2014_GW10	Coal Measures	
2014_GW11A	Basalt	
2014_GW11B	Marburg Sandstone	
2014_GW12A	Basalt	
2014_GW12B	Coal Measures	
2014_GW13A	Basalt	
2014_GW13B	Coal Measures	
3307 WB	Rehabilitated Spoil	





### 3.6.8. Commitments

- The Proponent will implement the GMIMP.
- The frequency of monitoring and the suite of analyses sampled for will be sufficient to ensure early detection of contamination of local groundwater resources of the Great Artesian Basin and any associated groundwater dependent ecosystems.
- Groundwater monitoring, sampling and annual review of the monitoring data will be conducted by a suitably qualified and experienced professional.
- All substantiated groundwater-based complaints will be investigated and dealt with promptly using NAC's complaint handling procedure.
- Compliance with terms and conditions of any water licences.
- Trigger levels will be determined by the proponent before the commencement of mine operations.
- Make-Good Agreements will be entered in to with landowners, prior to de-watering for coal extraction, where it is predicted that mining will unduly impact on the registered bores belonging to those landowners.
- Make-Good Agreements will be entered in to with landowners, where it can be demonstrated that a legitimate and unduly impact on the registered bores belonging to those landowners has occurred due to mining operations.

### 3.6.9. Proposed Environmental Authority Conditions: Schedule E - Groundwater

#### Schedule E - Groundwater

##### Contaminant release

- E1** The holder of this environmental authority must not release contaminants to groundwater.

##### Monitoring and reporting

- E2** All determinations of groundwater quality and biological monitoring must be performed by an appropriately qualified person.
- E3** Groundwater quality and levels must be monitored at the locations and frequencies defined in **Table E1 - Groundwater monitoring locations and frequency** for quality characteristics identified in **Table E2 - Groundwater quality triggers and limits**.

**Table E1 - Groundwater monitoring locations and frequency**

Monitoring Point	Aquifer Compliance Bore (C)	Location (AGD84 – Zone 56)		Parameter <sup>1</sup> and Monitoring Frequency
		Easting (m)	Northing (m)	
2289P	Coal measures (C)	371265	6983532	Groundwater levels: monthly
2291P	Coal measures (C)	374620	6980033	

Monitoring Point	Aquifer Compliance Bore (C)	Location (AGD84 – Zone 56)		Parameter <sup>1</sup> and Monitoring Frequency
		Easting (m)	Northing (m)	
18P	Coal measures (C)	371028	6982641	Groundwater quality:  Six monthly to include: Al, As, Ca, Se, Cl, Cu, F, Fe, Total N, K, Mg, Mn, Na, SO <sub>4</sub> , HCO <sub>3</sub> , TDS, EC, pH
25P	Coal measures(C)	374146	6982057	
26P	Coal measures (C)	374266	6982977	
27P	Coal measures (C)	373360	6983554	
28P	Coal measures (C)	372328	6983977	
843	Basalt (C)	370698	6981283	
848	Coal measures (C)	370705	6981723	
81P	Coal measures (C)	375003	6979638	
82P	Coal measures (C)	373697	6978814	
83P	Coal measures (C)	371854	6979679	
84P	Basalt (C)	370355	6982187	
BMH1	Basalt (C)	369658	6982204	
CSMH1	Coal measures (C)	375404	6977336	
109P	Basalt	368263	6982378	
122PGC	Coal measures	370656	6977837	
114P	Coal measures	371806	6976037	
116P	Coal measures	374220	6975132	
119PGC	Coal measures	371609	6973337	
120WB	Coal measures	367523	6976115	
121WB	Coal measures	368472	6978441	
2014_GW05A	Basalt	366442	6981903	
2014_GW05B	Coal measures	366442	6981903	
2014_GW06B	Coal measures	365778	6979113	
2014_GW07A	Basalt	369310	6973520	
2014_GW07B	Coal measures	369310	6973520	
2014_GW08B	Coal measures	365694	6976838	
2014_GW08C	Marburg Sandstone	365694	6976838	
2014_GW09A	Oakey Creek Alluvium	373739	6972295	
2014_GW09B	Coal measures	373739	6972295	
2014_GW09C	Marburg Sandstone	373739	6972295	

Monitoring Point	Aquifer Compliance Bore (C)	Location (AGD84 – Zone 56)		Parameter <sup>1</sup> and Monitoring Frequency
		Easting (m)	Northing (m)	
2014_GW10	Coal Measures	375329	6975551	
2014_GW11A	Basalt	367466	6982507	
2014_GW11B	Marburg Sandstone	367466	6982507	
2014_GW12A	Basalt	365000	6979400	
2014_GW12B	Coal measures	365000	6979400	
2014_GW13A	Basalt	364650	6976000	
2014_GW13B	Coal measures	364650	6976000	
3307_WB	Rehabilitated Spoil	372408	6982501	

1 - Aluminium (Al), Arsenic (As), Calcium (Ca), Selenium (Se), Chloride (Cl), Copper (Cu), Fluorine (F), Iron (Fe), Total Nitrogen (Total N), Potassium (K), Magnesium (Mg), Manganese (Mn), Sodium (Na), Sulphate (SO<sub>4</sub>), Bicarbonate (HCO<sub>3</sub>), Total dissolves solids (TDS), Electrical conductivity ( EC), Acidity/alkalinity (pH)

**Table E2 - Groundwater quality triggers and limits**

Parameter	Units	Contaminant Limit <sup>1,5</sup>	Monitoring frequency
Al	mg/l	5.0	Half yearly
As	mg/l	.05	Half yearly
Ca	mg/l	1000	Half yearly
Se	mg/l	0.02	Half yearly
Cl	mg/l	TBA	Half yearly
Cu	mg/l	1.0 <sup>2</sup>	Half yearly
F	mg/l	TBA	Half yearly
Fe	mg/l	TBA	Half yearly
NO <sub>3</sub>	mg/l	400	Half yearly
NO <sub>2</sub>	mg/l	30	Half yearly
K	mg/l	TBA	Half yearly
Mg	mg/l	TBA	Half yearly
Mn	mg/l	TBA	Half yearly
Na	mg/l	TBA	Half yearly
SO <sub>4</sub>	mg/l	1000	Half yearly
HCO <sub>3</sub>	mg/l	TBA	Half yearly

Parameter	Units	Contaminant Limit <sup>1,5</sup>	Monitoring frequency
TDS	mg/l	5000 <sup>2,3</sup>	Half yearly
EC	mg/l	7460 <sup>2,3,4</sup>	Half yearly
pH	unit	TBA	Half yearly

1 – Based on Stockwater limits defined in ANZECC (2000)

2 – Defined for beef cattle based on landholder bore survey results

3 – Existing bores 27P, 28P, 2289 and 118P background levels already exceed this limit prior to mine operation

4 – Based on EC to TDS conversion factor of 0.67 as per ANZECC (2000)

**E4** Groundwater levels when measured at the monitoring locations specified in **Table E1 - Groundwater monitoring locations and frequency** must not exceed the groundwater level trigger change thresholds specified in **Table E3 - Groundwater level monitoring** below.

**Table E3 – Groundwater level monitoring**

Monitoring Point	Level trigger threshold <sup>2</sup>
2289P	TBA
2291P	TBA
18P	TBA
25P	TBA
26P	TBA
27P	TBA
28P	TBA
843	TBA
848	TBA
81P	TBA
82P	TBA
83P	TBA
84P	TBA
BMH1	TBA

<sup>2</sup> To be provided – Water level trigger thresholds will be proposed following 12 months of monitoring of the new bores and following the first update of the groundwater model prior to the operation of the revised project.



Monitoring Point	Level trigger threshold <sup>2</sup>
CSMH1	TBA
109P	TBA
122PGC	TBA
114P	TBA
116P	TBA
119PGC	TBA
120WB	TBA
121WB	TBA
2014_GW05A	TBA
2014_GW05B	TBA
2014_GW06B	TBA
2014_GW07A	TBA
2014_GW07B	TBA
2014_GW08B	TBA
2014_GW08C	TBA
2014_GW09A	TBA
2014_GW09B	TBA
2014_GW09C	TBA
2014_GW10	TBA
2014_GW11A	TBA
2014_GW11B	TBA
2014_GW12A	TBA
2014_GW12B	TBA
2014_GW13A	TBA
2014_GW13B	TBA
3307_WB	TBA

**Exceedance Investigation**

- E5** If quality characteristics of groundwater from compliance bores identified in **Table E1 - Groundwater monitoring locations and frequency** exceed any of the trigger levels stated in **Table E2 - Groundwater quality triggers and limits** or exceed any of the groundwater level trigger threshold stated in **Table E3 - Groundwater level monitoring**, the holder of this environmental authority must compare the compliance monitoring bore results to the reference bore results and complete an investigation in accordance with the ANZECC and ARMCANZ 2000.
- E6** Results of monitoring of groundwater from compliance bores identified in **Table E1 - Groundwater monitoring locations and frequency**, must not exceed any of the limits defined in **Table E2 - Groundwater quality triggers and limits**.

**Bore construction and maintenance and decommissioning.**

- E7** The construction, maintenance and management of groundwater bores (including groundwater monitoring bores) must be undertaken in a manner that prevents or minimises impacts to the environment and ensures the integrity of the bores to obtain accurate monitoring

**END OF SCHEDULE E CONDITIONS**

### 3.7. Surface Water Resources

#### 3.7.1. Background

The revised Project site is located within the Lagoon Creek catchment of the greater Condamine River catchment. Lagoon Creek is an ephemeral creek, with a shallow, narrow poorly defined channel and wide floodplains. The creek has been moderately disturbed through past agricultural practices including a number of in-stream dams. NAC is not proposing to divert or alter the Lagoon Creek channel and has offset the revised Project's resource areas from the creek bank by approximately 150 m. Importantly, the 150 m operational offset includes a commitment by NAC to a 50 m 'no mining' buffer to promote the re-establishment of the creek's riparian zone. The buffer distance either side of Lagoon Creek within the Study area will be incorporated into the Mine's current conservation zone. This buffer distance is consistent with the requirements of the *Vegetation Management Act 1999*, which protects remnant vegetation growing within 50 m of a watercourse. In addition to this (Rutherford et al, 2001) recommends that offsets determined based on:

- A starting width of 5 m; plus
- A width not less than the height of the bank from bank toe to bank crest; plus
- A width equal to amount of bank migration expected to occur in the time it takes for vegetation to establish.

Rutherford, et al recommends widths of riparian vegetation are derived based on the 1993 study of contemporary rates of both channel widening and outside bend migration undertaken by Ian Drummond and Associated. This study identifies a maximum vegetation establishment time of 25 years and a bank erosion rate of 1 m/year. Therefore the recommended offset for Lagoon Creek would be in the order of 35 m. This indicates that the 50 m buffer and 150 m offset for Lagoon Creek is well in excess of the current industry standards.

NAC will expand the existing Lagoon Creek monitoring program as part of the Water Resource Management Plan (WRMP) for the revised Project.

#### 3.7.2. Surface water quality

Historical water quality data for Lagoon Creek is limited. DNRM operate one regional water quality gauge on Oakey Creek at Fairview downstream of the confluence with Lagoon Creek. This gauge is located downstream of the Lagoon and Oakey Creek confluence and downstream of several towns, and agricultural areas. Water quality at this site is unlikely to be representative of that in Lagoon Creek as it is influenced by the water quality in Oakey Creek, which up until 2009 included the releases from the upstream WWRF. To this day releases from the WWRF occur on occasion dependant on the volume of water pumped through the Wetalla pipeline.

Water quality data was available from routine water monitoring conducted by NAC under its current environmental monitoring plan for the Mine and from two targeted monitoring events. The monitoring program assesses water quality at the locations outlined in **Table 3-13** and illustrated in **Figure 3-4**.

**Table 3-13 Water Quality Sampling Sites**

Site Code	Description
LCU1	Monitoring site located on Lagoon Creek upstream of the existing mining operation. This site is monitored under the Mine's EA.
LCD1	Monitoring site located on Lagoon Creek downstream of the existing mining operation. This site is in the approximate location of the proposed Manning Vale East pit. This site is monitored under the Mine's EA.
LCD2	Monitoring site located on Lagoon Creek downstream of the existing mining operation. This site is downstream of the proposed Manning Vale East pit. This site is monitored under the Mine's EA.
Site 1, 3, 4 and 5	These 4 sites are located within 200 m of each other and are at the upstream boundary of the revised Project pit areas, insitu sampling was undertaken at this site in 2009 to support the revised Projects baseline activities.
Site 2	Located downstream approximately 5 kms downstream of the downstream boundary of the revised Project mining area (DS1), insitu sampling was undertaken at this site in 2009 to support the revised Projects baseline activities.
AH4	Aquatic ecology monitoring site 4, downstream of the existing mining operations and immediately adjacent to the northern extent of the Manning Vale East and Willeroo pits.
DS1	New water quality monitoring site located at the downstream boundary of the revised Project mining area.

Lagoon Creek water quality data are presented in **Table 3-14**. This table provides the median and ranges of water quality variables from the long term monitoring at the DNRM Oakey Creek at Fairview gauging station and NAC's existing EA monitoring. **Table 3-14** also provides the physicochemistry values recorded during a period of no flow during the 2008 monitoring event.

**Table 3-15** provides a summary of results for water quality monitoring during a flow event (2013), including physicochemical properties, concentrations of nutrients, major ions and dissolved metals. Full sets of water quality results are provided in draft EIS **Appendix G.3.1**.

**Table 3-14 Water Quality Data**

		Temp (°C)	Suspended Solids (mg/L)	Turbidity (NTU)	pH	DO %)	Sulphate (mg/L)	EC (µS/cm)
Site	Time/ Date	N/A	N/A	<25	6.5- 7.5	90-110%	<200	<500
<b>Regional Water Quality Sampling</b>								
Oakey Creek at Fairview (DNRM)	1995 - 2012	20.50 5.9- 34.8	N/A	<b>84</b> (10 – 999)	<b>8.10</b> (5.4- 10.4)	1.2 to 17.8 (mg/L)^	43 (3 - 269)	<b>1018</b> (159 – 3204)
<b>Environmental Authority Monitoring</b>								
LCU1	2008- 2013	22.40 (15.5- 30.5)	18 (2-179)	N/A	7.46 (6.6- 8.4)	N/A	2 (1-190)	210.0 (97- 590)
LCD1	2008- 2013	23.85 (17.9- 29.6)	11 (1-335)	N/A	<b>7.80</b> (7.3- 8.9)	N/A	25 (3-220)	418.5 (176- 3900)
LCD2	2008- 2013	23.40 (19.3- 29.6)	10 (2-353)	N/A	<b>7.80</b> (7.4- 8.9)	N/A	30 (1-200)	<b>596.0</b> (136- 1700)
<b>Insitu Sampling No Flow Event (January 2008)</b>								
Lagoon Creek (Site 1)	23rd Jan 1325	31.42	N/A	<b>94.89</b>	<b>8.90</b>	<b>111.67</b>	N/A	<b>596.4</b>
Lagoon Creek (Site 2)	23rd Jan 1540	26.34	N/A	<b>33.35</b>	<b>8.91</b>	95.23	N/A	463.1
Lagoon Creek (Site 3)	23rd Jan 1730	25.99	N/A	3.15	<b>8.03</b>	94.73	N/A	<b>8 089.6</b>
Lagoon Creek (Site 4)	24th Jan 1430	26.89	N/A	20.45	<b>8.52</b>	<b>65.61</b>	N/A	<b>642.1</b>
Lagoon Creek (Site 5)	24th Jan 1520	30.93	N/A	16.95	<b>8.69</b>	92.10	N/a	<b>636.9</b>

\*Note: Bold indicates exceedance of relevant guidelines, shaded cells indicate median exceeds relevant guidelines. ^ gauge only reports in mg/L

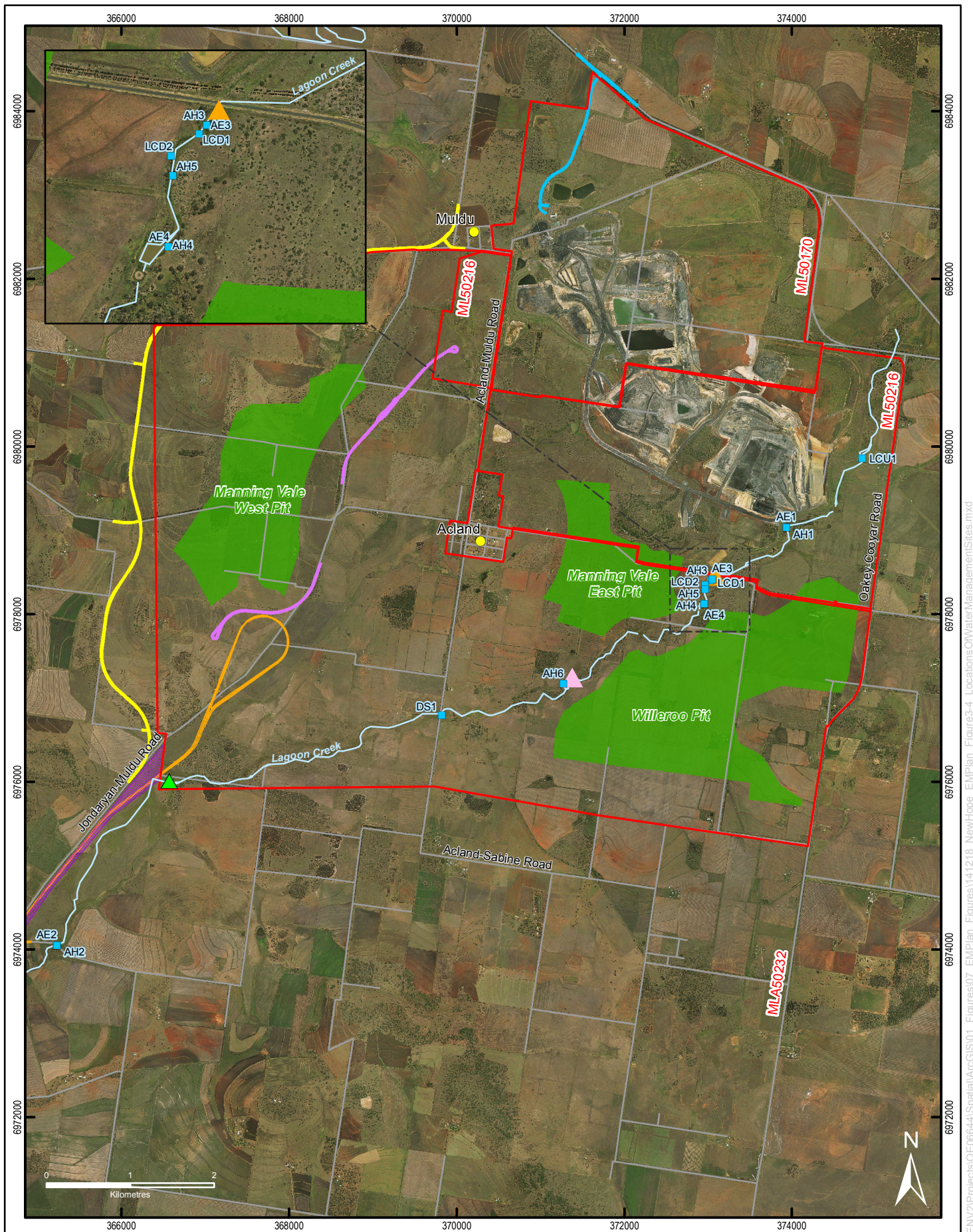


**Table 3-15 Water quality monitoring during a period of flow (March 2013)**

Water quality variable	Unit	Guideline	LCU1	LCD1	AE4	DS1
Flow		N/A	Yes	Yes	Yes	Yes
Temperature*	°C	N/A	23.9	25.9	21.9	21.6
Dissolved oxygen	%	90-110%	<b>15.0</b>	<b>51.8</b>	<b>44.3</b>	<b>46.0</b>
pH	pH Units	6.5-7.5	7.0	7.5	<b>7.6</b>	7.4
Electrical conductivity	µS/cm	<500	240	310	240	280
Turbidity	NTU	<25	8.6	<b>55</b>	19	10
Total nitrogen	mg/L	<0.25	<b>1.4</b>	<b>0.84</b>	<b>1.2</b>	<b>0.97</b>
Ammonia	mg/L	<0.010	<b>0.35</b>	<b>0.037</b>	<b>0.061</b>	<b>0.040</b>
Total phosphorus	mg/L	<0.030	<b>0.15</b>	<b>0.12</b>	<b>0.31</b>	<b>0.26</b>
Filterable reactive phosphorus	mg/L	<0.015	<b>0.052</b>	<b>0.059</b>	<b>0.18</b>	<b>0.17</b>
DIN	mg/L		<b>0.02</b>	<b>0.29</b>	<b>0.02</b>	<0.02
Sodium <sup>#</sup>	mg/L		12	32	15	15
Sulphate <sup>#</sup>	mg/L		1	20	4	5
Total hardness <sup>#</sup>	mg/L	Level 1 >150 Level2 > 200	95	84	98	110
Calcium*	mg/L		20	15	23	22
Magnesium*	mg/L		5.9	8.4	7.7	8.0
Potassium*	mg/L		10	6.0	12	11
Fluoride*	mg/L		<0.1	0.6	0.2	0.1
Chloride*	mg/L		9	26	10	13
<b>Dissolved metals</b>						
Arsenic (As)	µg/L	<0.013	2	1	2	2
Chromium III, (Cr) <sup>^</sup>	µg/L	<0.0027	<2 (8.5)	<2 (7.7)	<2 (8.7)	<2 (9.6)
Copper, (Cu) <sup>^</sup>	µg/L	<0.0014	2 (3.7)	3 (3.4)	<b>4 (3.8)</b>	3 (4.2)
Manganese, (Mn)	µg/L	1.9	1	btl	22	1
Mercury (Hg)	mg/L	<0.00006	btl	btl	btl	btl
Nickel, (Ni) <sup>^</sup>	µg/L	<0.011	5 (29.3)	2 (26.4)	4 (30.1)	4 (33.2)
Zinc (Zn) <sup>^</sup>	µg/L	<0.008	<2 (21.3)	<2 (19.2)	6 (21.9)	<2 (24.1)
Barium, (Ba)*	µg/L		39	28	69	61
Beryllium, (Be)*	µg/L		<1	<1	<1	<1
Cobalt, (Co)*	µg/L		<1	<1	<1	<1
Vanadium, (V)*	µg/L		2	4	8	5

Note - \* indicates no guidelines currently available. # shows water quality indicator values used for protection of drinking water supply (for example the see the EPP (Water) Dawson River Sub-basin), all other indicator values apply to the protection of aquatic ecosystem. ^ Hardness-corrected trigger level shown in brackets following the laboratory result. Shading indicates an exceedance of the hardness-corrected trigger level. Below detection limits (btl) indicates the variable was below detection limits of the laboratory analysis. Shaded and bold values indicate exceedance of the relevant guideline.





# LEGEND

- Towns and Localities
- Sample Site
- ▲ Existing Release Point
- ▲ Proposed Release Point
- ▲ Proposed Compliance Point
- Roads
- Creeks
- Internal Haulage Road
- Revised Access to Mine
- Revised Jondaryan-Muldu Road Diversion
- Revised Rail Spur and Balloon Loop Alignment
- Mining Tenements
- Infrastructure Mining Lease
- Stage 3 Pit Areas



## NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 3-4: Water Quality  
Sample Sites**

Scale 1:60,000 on A4  
Projection: Australian Geodetic Datum – Zone 56 (AGD84)



## **Lagoon Creek**

Water in the Condamine catchment is generally high in concentrations of total phosphorus and in turbidity (CBWC, 1999) and is indicative of catchments that are affected by agriculture. The revised Project site has been impacted by land uses including grazing and dryland cropping. These land-use practices have affected the surrounding waterways including Lagoon Creek. The very high concentrations of nutrients in Lagoon Creek during the flow period indicate mobilisation of inorganic and organic forms of nitrogen and phosphorus from catchment run-off possibly related to agricultural activities.

The concentrations of dissolved oxygen during the period of flow were low and were possibly due to the decomposition of suspended and dissolved organic matter in the rainfall run-off. The turbidity in Lagoon Creek and Oakey Creek was low in comparison to other subcatchments of the Condamine River basin, where high turbidity has been identified as a major influencing and limiting factor for the EV's. The long term monitoring results of EC in Lagoon Creek indicate increased EC levels downstream of the Mine. While it is expected that the EC of Lagoon Creek may increase following controlled releases from the Mine, all releases are undertaken based on strict water quality targets.

It is noted that EC values are generally below guideline values at all sites. Furthermore, EC values immediately downstream of the Mine are significantly lower than the EC values at the DNRM monitoring site on Oakey Creek. This observation suggests that the EC values of the Lagoon Creek catchment are generally lower than the Oakey Creek catchment.

The water quality of the Lagoon Creek catchment is also impacted by the ephemeral nature of Lagoon Creek. Ephemeral waters are variable in their water quality primarily due to the irregularity and intensity of flow/rainfall events. The revised Project site experiences seasonal and highly variable rainfall. Large flow events will generally carry a large sediment load, which can be intensified by a long dry period. Flows and connectivity are also impacted by the numerous waterway barriers as a result of the construction of in-stream farm dams.

### **3.7.3. Existing surface water uses**

Lagoon Creek is an ephemeral drainage system and in-stream farm dams provide the only permanent water source at intermittent stages along Lagoon Creek. Semi-permanent waterholes also exist along Lagoon Creek, but are small in number and moderately degraded.

### **3.7.4. Aquatic Ecology**

No threatened or endangered aquatic flora or fauna (macroinvertebrates, turtles, fish etc.) were found to inhabit the waterways within the revised Project site or the surrounding water courses. Therefore, the likelihood of rare or threatened species occupying the revised Project site is very low.

The drainage pathways are ephemeral waterways and the available aquatic habitat is poor in condition and of low quality due to previous and current land uses, which has resulted in the clearing of riparian vegetation, erosion and bank instability. The aquatic habitat in the revised Project site, although poor, provides habitat for a number of native aquatic species. Although the waterways are not permanent, they do provide a temporary habitat for certain aquatic flora and fauna species, such as small fish species.

### **3.7.5. Final Landform Flood Protection**

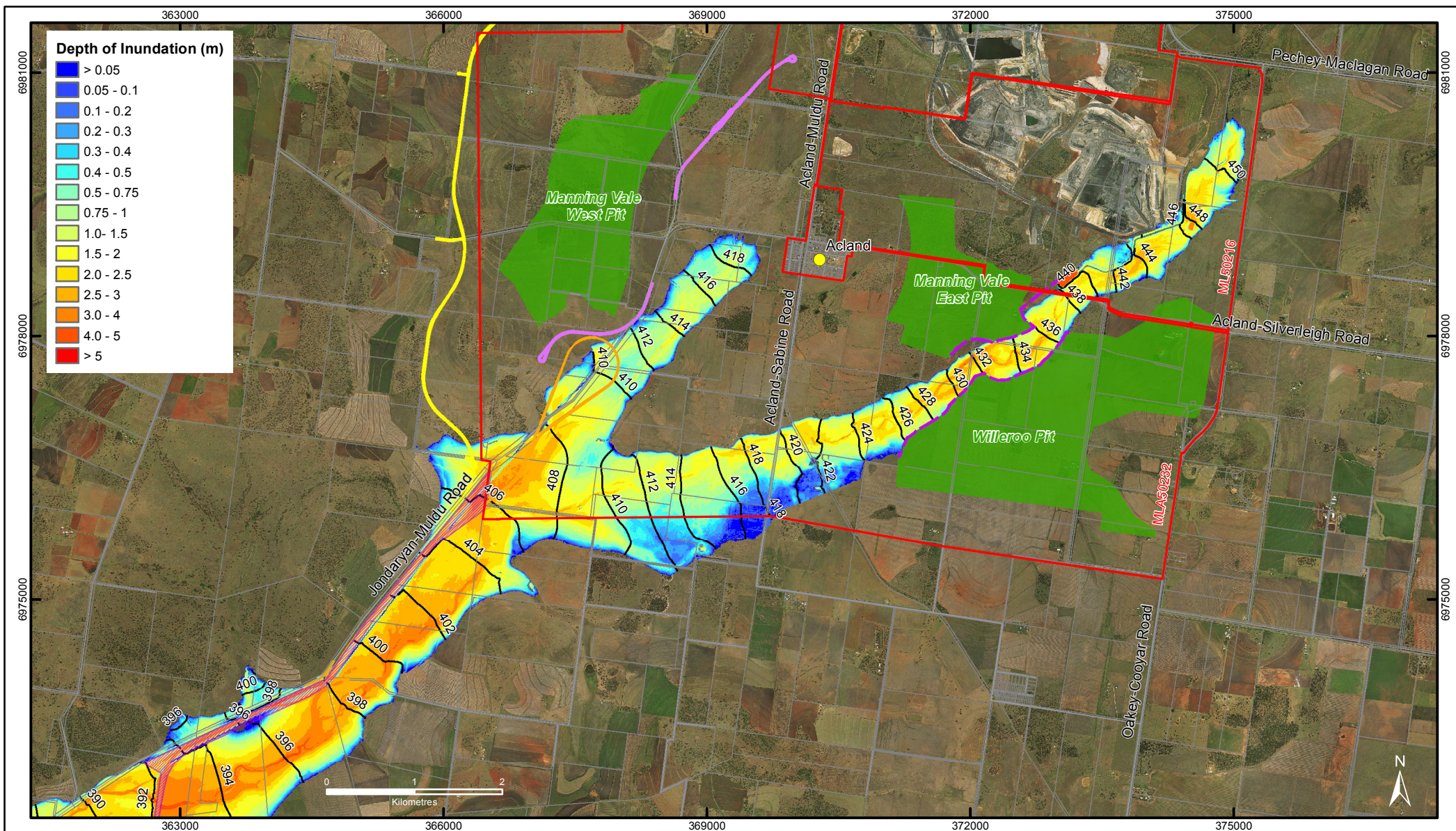
A potential impact of the revised Project is the impact of the final landform on flood behaviour. To mitigate this impact NHG have committed to the design and construct a final depressed landform that is largely located outside the extent of the Probable Maximum Flood (PMF). This commitment was made during the EIS process based on the results of the flood

impact assessment. This commitment was made to be implemented as part of the detailed design of the depressed landform. This design is currently in progress. **Figure 3-5** illustrates the PMF flood extent in the vicinity of the Project.

The Flood Levees will be removed at the end of operations as part of the revised Project's rehabilitation plans. The Flood Levee footprint will be as far as practical returned to natural surface as part of the revised Project's final landform. Therefore the flood extent illustrated in **Figure 3-5** is based on terrain that does not include any flood levees.

Recent updated groundwater modelling has been completed (refer to **Appendix F** of the AEIS) including long term post-mining modelling (modelled as 300 years post-mining). Permanent lakes are predicted to form in all three depressed landforms. The maximum depths of the lakes that are predicted to form are around 33 m in the Manningvale West depressed landform, 18 m in the Manning Vale East depressed landform, and 22 m in the Willeroo depressed landform.







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### 3.7.6. Environmental Values

Environmental water values to be protected, based on EIA information gathered and assessed, have been determined as:

- the biological integrity of a modified surface water aquatic ecosystem; and
- the quality suitability of surface water for agricultural use.

Draft environmental values for surface waters in the Condamine catchment have been released by the Condamine Alliance (2012) and were used to determine the environmental values for Lagoon Creek. The draft environmental values that apply to Lagoon Creek were those identified for the upper Oakey Creek sub-catchment (Condamine Alliance 2012) and are listed in **Table 3-16**.

**Table 3-16 Draft environmental values and description identified for Lagoon Creek (Condamine Alliance 2012).**

Environmental Value		Description
	<b>Aquatic Ecosystems</b>	A community of organisms living within or adjacent to water, including riparian or foreshore area. Levels of protection for aquatic ecosystems: <ul style="list-style-type: none"> <li>■ High ecological/conservation value waters (HEV): waters in which the biological integrity is unmodified or highly valued</li> <li>■ Slightly to moderately disturbed (SMD): waters that retain biological integrity but are affected by human activity.</li> <li>■ Highly disturbed (HD): waters that are significantly degraded by human activity and have lower ecological value</li> </ul>
	<b>Irrigation</b>	Suitability of water supply for irrigation-for example, irrigation of crops, pastures, parks, gardens and recreational areas.
	<b>Farm Water Supply</b>	Suitability of domestic farm water supply, other than drinking water. For example, water used for laundry and produce preparation.
	<b>Stock Watering</b>	Suitability of water supply for production of healthy livestock.
	<b>Human Consumers of Aquatic Foods</b>	Health of humans consuming aquatic foods-such as fish, crustaceans and shellfish (other than oysters) from natural waterways.
	<b>Visual Recreation</b>	Amenity of waterways for recreation which does not involve any contact with water-for example, walking and picnicking adjacent to a waterway.
	<b>Drinking Water</b>	Suitability of raw drinking water supply. This assumes minimal treatment of water is required-for example, coarse screening and/or disinfection.
	<b>Cultural and Spiritual Values</b>	Flowing springs and the Gummingurru Aboriginal Site are recognised as having cultural and spiritual value within the Upper Oakey Creek Sub-catchment.

### 3.7.7. *Potential Impacts on the Environmental Values*

The revised Project site is located within the Lagoon Creek catchment of the greater Condamine River catchment. Lagoon Creek is an ephemeral creek, with a shallow, narrow poorly defined channel and wide floodplains. The creek has been moderately disturbed through past agricultural practices including a number of in-stream dams. NAC is not proposing to divert or alter the Lagoon Creek channel and has offset the revised Project's resource areas from the creek bank by approximately 150 m. Importantly, the 150 m operational offset includes a commitment by NAC to a 50 m 'no mining' buffer to promote the re-establishment of the creek's riparian zone. The buffer distance either side of Lagoon Creek will be incorporated into the Mine's current conservation zone,

NAC will expand the existing Lagoon Creek monitoring program as part of the WRMP for the revised Project. The WRMP is located in **Appendix J.4**.

The revised Project is not expected to have a significant impact on the existing flood regime. Impacts to flooding as a result of the proposed flood protection levee and railway crossing are largely located on land owned by the APC. Furthermore, the analysis indicates that there would not be additional flooding impacts at Jondaryan as a result of the revised Project.

Flood protection for the revised Project's resource areas will be provided through two flood levees designed to provide protection from a PMF flood event, which is well in excess of the current legislative requirements. In addition, NAC has committed to restricting the revised Project's final landform such that it is located largely outside the existing PMF flood extent, and as a result, there are no flooding impacts on the key aspects of the proposed final landform (i.e. the depressed and elevated landforms).

There are currently 15 existing surface water extraction licenced users on Lagoon and Oakey Creek. These licenced users are all located a significant distance downstream with the closest located 19 km downstream of the revised Project site. All but one of the licences are located downstream of the confluence with Oakey Creek and Lagoon Creek. As spells analysis was undertaken to quantify the potential impact of the project on flows at the location of the Lagoon Creek extraction licence. The analysis indicated only minor changes to the flow regime which is not considered to materially change the licence holder's access to water. Therefore, the impacts of the revised Project to downstream users and the environment are expected to be negligible.

NAC is not seeking any new water allocations. The majority of the revised Project water demands are provided from the WWRP through a pipeline constructed in 2009. This beneficial use of a waste water product ensures the revised Project possesses a sufficient and reliable water supply.

As part of NAC's water management system, runoff from disturbed areas will be captured and treated with an amount available for reuse by the revised Project's mining activities. In line with current industry guidelines, NAC's water management system will include a controlled release system to manage rainfall events and minimise adverse impacts to the downstream receiving environment. The ephemeral nature of Lagoon Creek means that controlled releases will occur on a minimal basis over the life of the revised Project, and as a result, are not expected to have a significant impact on water quality, aquatic ecology and downstream water users.

The potential impacts of the revised Project on water quality may result from:

- Conducting mining activities in the vicinity of Lagoon Creek;
- Construction of a haul road crossing at Lagoon Creek;

- Installation of new water management structures;
- Construction of a rail spur and balloon loop through the flood plain of Lagoon Creek; and
- Controlled releases from water storages.

### 3.7.8. *Proposed Environmental Protection Objectives*

The revised Project's environmental protection objectives for surface water and groundwater are to ensure that beyond the revised Project's boundaries no significant adverse impacts are caused to the:

- water quality of the downstream receiving environment and the local groundwater aquifers;
- water levels (extractable quantity) of the local groundwater aquifers; and
- quantity of surface water normally available downstream.

The water quality guidelines adopted for the relevant water quality parameters within Lagoon Creek are presented in **Table 3-17**. The parameters are based on the AWQG's guideline values for the protection of aquatic ecosystems.

**Table 3-17 Lagoon Creek Water quality guidelines for the protection of aquatic ecosystems**

Water quality variable	Guideline Value	Water quality variable	Guideline Value
pH	6.5-7.5	Metals (Dissolved)	
EC ( $\mu\text{S cm}^{-1}$ ) <sup>\$</sup>	<500	Arsenic (As) (mg L <sup>-1</sup> )	<0.013
Turbidity (NTU)	<25	Cadmium (mg L <sup>-1</sup> )*	<0.0002
Dissolved oxygen (DO) (% saturation (mg L <sup>-1</sup> ))	90-110%	Chromium III (Cr) (mg L <sup>-1</sup> )*	<0.0033
Total suspended solids (TSS) (mg L <sup>-1</sup> )	-	Copper (Cu) (mg L <sup>-1</sup> )*	<0.0014
Hardness (CaCO <sub>3</sub> ) (mg L <sup>-1</sup> )	-	Lead (mg L <sup>-1</sup> )*	<0.0034
Sulphate (SO <sub>4</sub> )* (mg L <sup>-1</sup> )	-	Nickel (Ni) (mg L <sup>-1</sup> )*	<0.011
Ammonia (NH <sub>3</sub> ) (mg L <sup>-1</sup> )	<0.010	Zinc (Zn) (mg L <sup>-1</sup> )*	<0.008
Dissolved inorganic nitrogen (DIN) (mg L <sup>-1</sup> )	<0.028	Manganese (Mn) (mg L <sup>-1</sup> )	1.9
Total nitrogen (TN) (mg L <sup>-1</sup> )	<0.25	Mercury (Hg) (mg L <sup>-1</sup> )	<0.00006
Total phosphorus (TP) (mg L <sup>-1</sup> )	<0.030	Beryllium (Be) (mg L <sup>-1</sup> )**	
Filterable reactive phosphorus (FRP) (mg L <sup>-1</sup> )	<0.015	Vanadium* (V) (mg L <sup>-1</sup> )**	
TPH C6 - C9 Fraction* (mg L <sup>-1</sup> )		Cobalt* (Co) (mg L <sup>-1</sup> )**	
TPH C10 - C36 Fraction* (mg L <sup>-1</sup> )		Barium* (Ba) (mg L <sup>-1</sup> )**	

Notes: \* indicates requirement for hardness correction of trigger values (TVs). (\*\*) Indicates trigger values are not specified in AWQG. All trigger values derived from AWQG except for \$ which is derived from the QWQG

In addition to the water quality objectives outlined in **Table 3-17**, water quality guidelines for the protection of drinking water supply (raw water) have additional water quality indicators and these values are presented in **Table 3-18**.

**Table 3-18 Water Quality Objectives for the protection of drinking water supply**

Indicator	Water Quality Objective EPP (Water) for the Dawson River sub-basin
Blue-green algae (cyanobacteria) *	< 5,000 cells/mL
Algal toxin	Level 1: 0.1 µg/L <i>Microcystin</i> * Level 2: 4 µg/L <i>Microcystin</i> *
Cryptosporidium *	0 cysts
<i>Giardia</i> *	0 cysts
Sodium *	30 mg L <sup>-1</sup>
Sulfate *	200 mg L <sup>-1</sup>
Colour *	Level 1: 50 Hazen Units No Level 2
Hardness *	Level 1 > 150 mg L <sup>-1</sup> Level 2 > 200 mg L <sup>-1</sup>
<i>E. coli</i>	None specified for raw water (<10 cfu's for irrigation supply of raw human food crops)
pH	6.5-8.5
Turbidity	Level 1: 500 NTU Level 2: 1000 NTU
Conductivity	Level 1: > 400 µS cm <sup>-1</sup> Level 2 same as Level 1 (no treatment options to remove salt)
Dissolved oxygen	Level 1: < 4 mg L <sup>-1</sup> at surface No Level 2

Source: EPP (Water) Dawson River Sub-basin.

\*indicates a WQO more stringent than for protection of aquatic ecosystem or one not covered by the aquatic ecosystem environmental value.

\*Level 1 denotes Level 1 Hazard and Critical Control Point (HACCP) response rating, namely: treatment-plant-process-change required to ensure water quality and quantity to customers is not compromised.

\*Level 2 denotes Level 2 Hazard and Critical Control Point (HACCP) response rating, namely: treatment-plant-process-change required but water quality and quantity to customers may still be compromised.

### 3.7.9. Performance Criteria

- Compliance with the requirements of the revised Projects's EA;
- Undertake surface water monitoring as described in the WRMP; and
- Implement the control strategies as described in the WRMP.

### 3.7.10. Control Strategy - Surface Water

Surface water will be managed by NAC's EMS based on the WRMP in the draft EIS, **Appendix J4**.

The following surface water management control strategies will continue to be implemented.

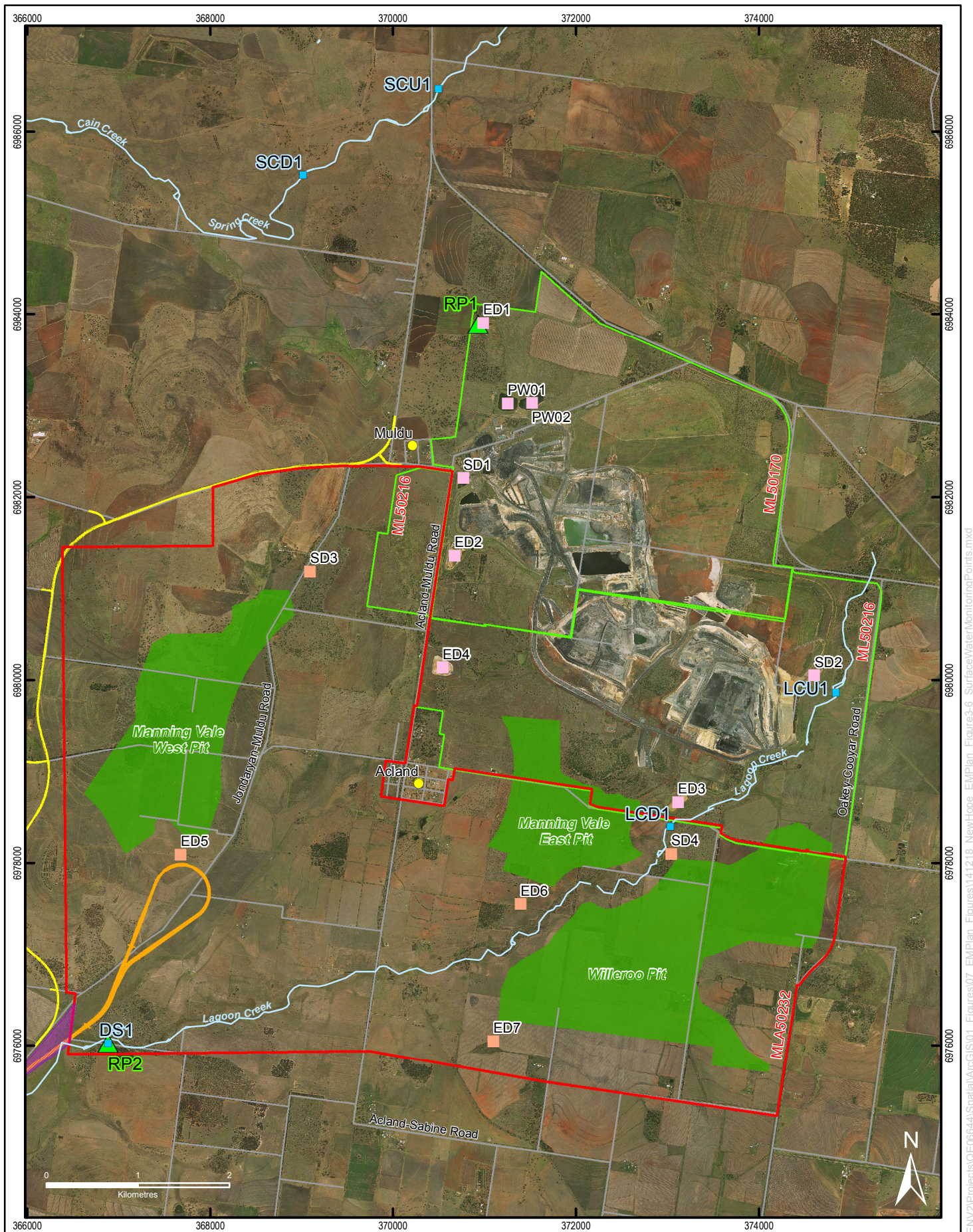


- construction work in creeks will be undertaken in dry weather and conditions of minimal or no flow;
- implementation of the Conservation Zone Management Plan (CZMP) (**Appendix J.6** of the draft EIS) within Lagoon Creek;
- weather conditions will be monitored so that work in creek crossings and erosion prone areas will not take place if rain and/or extreme weather (e.g. storms) are forecast;
- sedimentation fences and bunds will be used to contain fill or excavated material during construction;
- fill and excavated material will be stockpiled away from gully heads, active creek banks, bank erosion or other unstable areas;
- local runoff from disturbed areas will be routed clear of disturbed areas;
- assessment of the integrity and effectiveness of erosion control measures will be undertaken at regular periods and following significant rainfall events; and
- if required the erection of temporary waterway barriers during construction will include the provision to transfer flows from upstream of the works to the downstream channel without passing through the disturbed construction site.
- 'Clean' water runoff from undisturbed areas is diverted away from disturbed areas.
- Surface runoff from disturbed areas on-site is captured in sediment dams and preferentially used on-site for operational purposes to minimise the likelihood of discharge off site.
- Sedimentation dams are designed to capture the bulk of suspended sediment from runoff from disturbed areas prior to any discharge off site.
- Sediment from sediment dams is periodically removed to maintain design capacity.
- Flood bunding will be used to protect infrastructure and mining areas from flooding.
- All water management structures are designed and constructed using practical hydraulic parameters based on an appropriate risk based rainfall event, catchment size, slopes, surface profile and soil types. Water management structures locations are provided in **Figure 3-6**.
- Water stored in environmental and sediment dams is preferentially used as a supplemental water source for coal washing and dust suppression to minimise the likelihood of offsite water discharges.
- The revised Project's water management plan is designed to ensure all off site discharges do not exceed the defined discharge criteria/limits.
- Water from the TSFs is recycled efficiently as possible to reduce water consumption for coal washing purposes.
- All significant quantities of hydrocarbons and chemical products stored on-site are bunded (temporary or permanent). Fuels and oils will be stored in bunded areas in accordance with the applicable provisions of AS1940-2004.

- Spill capture and retention devices are installed in applicable areas as required (e.g. fuelling stations, etc.).
- Contaminated water containing oil or other hydrocarbon products is contained and collected using structures such as an oil-water separator. Captured oily water may be used on site or treated to reduce hydrocarbons to acceptable levels before release.
- Waste oil and other hydrocarbon products are collected and removed from the revised Project site by a licensed operator.
- Sedimentation dams (and supporting structures) to capture runoff water from disturbed areas are installed in a timely manner ahead of planned mining activities.
- Constructed drainage and discharge structures are designed not to alter the natural bed and bank profile.
- All machinery will be stored, refuelled and maintained outside the high banks of watercourses.
- Remedial response strategies will be developed in the event that an off-site release fails to meet the water quality objectives or environmental protection objectives. These actions may include:
  - conducting a rigorous environmental investigation into the incident, including if possible, development of a strategy and/or standard procedures to minimise the likelihood of a recurrence;
  - repairing any damaged areas and re-establishing the banks or scoured areas, if excessive erosion has occurred;
  - supplying an alternate water source; and
  - removing excessive sediment built up from sensitive areas or where it may be causing problems.
- The current monitoring program for surface water will be initially expanded and periodically reviewed to keep pace with the dynamic nature of the revised Project's mine plan.
- Appropriate surface water monitoring data will continue to be collected for trend analysis, impact assessment and complaint investigation.

**Figure 3-6 Water Management Structures**





# LEGEND

- |  |  |
|--|--|
| <span style="color: yellow;">●</span> Towns and Localities     | <span style="color: orange;">—</span> Revised Rail Spur and Balloon Loop Alignment |
| <span style="color: pink;">■</span> Existing Dam               | <span style="color: yellow;">—</span> Jondaryan-Muldu Road Diversion               |
| <span style="color: orange;">■</span> Proposed Dam             | <span style="color: green;">■</span> Stage 3 Pit Areas                             |
| <span style="color: green;">▲</span> Proposed Compliance Point | <span style="color: red;">—</span> Amended Mine Lease Boundary Application         |
| <span style="color: blue;">■</span> Sample Site                | <span style="color: green;">—</span> New Acland Coal Mine                          |
| <span style="color: grey;">—</span> Roads                      | <span style="color: purple;">—</span> Infrastructure Mining Lease                  |
| <span style="color: blue;">—</span> Creeks                     |  |


**NEW HOPE GROUP**


**SKM**

## NEW ACLAND COAL MINE STAGE 3 PROJECT

### Figure 3-6: Surface Water Monitoring Points

Scale 1:55,000 on A4  
Projection: Australian Geodetic Datum – Zone 56 (AGD84)



### **3.7.11. Control Strategy - Sediment and Erosion**

The following sediment and erosion control strategies will continue to be implemented.

- All areas of disturbance on site are kept to an operational minimum and are controlled by strict clearance protocols, involving detailed mine planning within pit areas and a 'permit to disturb' system for the rest of the site.
- Progressive rehabilitation is conducted to help keep exposed areas to an operational minimum.
- Bed and bank stability is managed to minimise erosion and reduce sedimentation.
- Machinery is appropriately selected for each activity to maximise efficiency and minimise site disturbance.
- Contour ripping is carried out immediately after topsoil placement to maximise infiltration and minimise the potential for erosion.
- Topsoil is salvaged for use in rehabilitation.
- As required, water management structures are appropriately protected to prevent scouring, particularly in areas of potential high or concentrated flow (e.g. drains, spillways, etc.).
- Traffic is confined to maintained tracks and roads.
- Water management structures (e.g. dams, waterways, diversion banks, etc.) are installed and upgraded as necessary to adequately manage and control water quality and quantity on the revised Project site.
- Sediment and erosion control strategies from the Best Practice Erosion and Sediment Control Guideline (BPESC Guideline) (IECA 2008) may be applied as required to specific issues as they arise (e.g. during construction near water courses).

### **3.7.12. Control Strategy – Levees**

The existing levee constructed to the west of the Lagoon Creek within ML 50216 will be maintained to protect the South Pit from flooding. As required, new permanent and temporary levees will be constructed within ML 50232 to protect infrastructure and mining areas from future Lagoon Creek flood events. The design criteria for each new levee will be based on a strict risk management protocol for safety and environmental factors. Levee stabilisation (e.g. grass cover) and flood flow protection (e.g. rock armouring) will also be carefully considered, particularly for the design and operation of the revised Project's permanent levees.

### **3.7.13. Control Strategy - Sewage Effluent**

The current package Sewage Treatment Plant (STP) 1, which has a capacity for 130 equivalent persons, will remain in operation for the existing mining area. Effluent from STP 1 drains to the existing on-site sediment dam (SD1). NAC's current EA allows for the use of water from SD 1 for dust suppression purposes. However, to date this practice has not been a common occurrence due to the minimal discharge from STP 1 and the normally low water levels of SD 1. A licensed contractor maintains STP 1.



The revised Project will require construction and operation of a new STP (STP 2) located within the infrastructure area on ML 50232. The capacity of STP 2 is expected to be 150-200 equivalent persons.

Any reuse or disposal of treated sewage effluent will continue to follow the conditions of NAC's current and future EA to ensure protection of the health and wellbeing of people on and off the revised Project site. The STPs will be properly maintained to ensure efficient and environmentally safe operation.

#### **3.7.14. Control Strategy – Lagoon Creek Crossing**

Conservation along Lagoon Creek will be managed by NAC's EMS and be based on the CZMP in the draft EIS, **Appendix J 6**.

A single road crossing will need to be established over Lagoon Creek to facilitate the transport of the RoM coal to CHPP 3 from the Willeroo mining area. The creek crossing will be kept to an operational minimum and will be appropriately engineered to ensure environmental protection and continuity of stream flow.

- The following outlines mitigation measures that will be implemented where practicable:
- Construction work in creeks will be undertaken in dry weather and conditions of minimal or no flow.
- The construction of temporary waterway barriers (if/as required) during construction and operation will include the provision to transfer flows from upstream of the crossing to the downstream channel with minimal disturbance from the construction site and crossing.
- Weather conditions will be carefully monitored prior and during construction activities. Activities within creek crossings and erosion prone areas will not take place if rain and/or extreme weather conditions are forecasted.
- Activities in watercourses will be completed as quickly as operationally possible.
- Sedimentation fences and bunds will be used to contain excavated material during construction. In addition, excavated material will be stockpiled away from gully heads, active creek banks, bank erosion or other unstable areas.
- Sediment traps will be installed to retain sediment generated by activities in order to minimise water turbidity and reduce sediment loads.
- Local runoff from undisturbed areas will be routed clear of disturbed areas.
- Assessment of the integrity and effectiveness of erosion control measures will be undertaken at regular periods. In the first year following construction, this assessment routine will include monthly inspections and inspections after heavy rainfall. Further rehabilitation maintenance will be taken as necessary if erosion of reinstated areas is identified.
- Any excess material that is excavated, and is not waste, will be spread evenly within the floodplain, bed and banks of the watercourse in a manner that does not interfere with the flow of water.
- All fill used within a watercourse will be clean and free from potential pollutants.

- Where practical, structures (if required) will be aligned perpendicular to the direction of water flow.
- Where practicable, cuttings (if required) in watercourse banks will be aligned in the downstream direction.
- Where possible, structures (if required) will be aligned and shaped to minimise the potential for scour.
- Where possible, structures (if required) will be positioned within relatively straight reaches of watercourses rather than on bends.
- The design of structures (if required) will consider the general hydrologic and hydraulic characteristics of the site and potential impacts resulting from the presence of the structure.
- Appropriate measures will be implemented to minimise interference with the flow of water during high flow events and to minimise the potential for changes to flood heights and flood flow paths (e.g. through the use of appropriate sized pipe culverts for a road crossing).
- Where appropriate, measures will be implemented to prevent potential migration of adverse impacts upstream or downstream of the structure.
- As required, erosion control and prevention measures will be implemented (e.g. rock protection works to prevent bank erosion).
- Where possible, new infrastructure (if required) will be located in previously disturbed areas.
- Where possible, existing crossings will be used for temporary access during the construction or maintenance of infrastructure.
- Sediment and erosion control strategies from the BPESC Guideline may be applied as required during the construction of the proposed creek crossing.

### **3.7.15. Monitoring**

#### **Surface Water**

Water sampling will follow the DEHP *Water Quality Sampling Manual* and water samples will be analysed by a National Association of Testing Authorities (NATA) accredited laboratory.

Currently, NAC conducts routine water monitoring of:

- any water leaving the Mine to determine if downstream water users are adversely affected by the Mine's operation;
- on-site water management structures to provide a continuous evaluation of water quality issues; and
- a series of groundwater piezometers located in the Great Artesian Basin, Walloon Coal Measures and Basalt aquifers located within MLs 50170 and 50216 and on surrounding properties to identify potential impacts to drawdown levels and water quality in those aquifers.

Monitoring results are interpreted on receipt and action taken to address any adverse results. Substantiated complaints in relation to water issues are dealt with promptly using NAC's complaint handling procedure. The surface water and groundwater monitoring regime will be expanded to cover the revised Project's development. As is currently practised, the Mine's current Monitoring Plan will be updated to reflect changes to the monitoring regime.

NAC's WRMP will be periodically updated to incorporate the progression in mining over the life of the revised Project. NAC's WRMP is an accompanying document to the Plan of Operations, and as a minimum, includes a summary of water management, current monitoring locations, a site plan, a schematic of the main water management structures and water discharge points, and a description of water use/recycling practices. A monthly evaluation and annual reporting of water monitoring results will be undertaken to check the effectiveness of the revised Project's water management.

After mining has ceased and decommissioning and rehabilitation works are complete, NAC will seek to relinquish the revised Project's mining leases. Prior to relinquishment, NAC will undertake the necessary investigations to ensure there are no long-term or residual impacts on the local groundwater regime as a result of the revised Project's previous mining activities.

### **3.7.16. Commitments**

- An operational separation distance of approximately 150 m will be maintained from the edge of the mining pits to Lagoon Creek, which will include a 50 m conservation buffer where no mining activities will be undertaken.
- The current conservation zone, 50 m either side of Lagoon Creek, from the Mine will be extended for the revised Project to promote the re-establishment of the riparian zone. No mining activities will occur within the proposed conservation zone.
- Sediment dams, environmental dams, pit water storage and other water management structures (e.g. bunds and drains) will be used appropriately by the revised Project as per the WRMP.
- The revised Project's water management will be based on the separation and management of clean and dirty water catchments.
- Water capture within the revised Project's clean areas will be diverted around operational areas and where practical, allowed to discharge off site as part of normal overland flow.
- Water from disturbed areas within the revised Project site will be diverted to sediment dams for treatment and possible reuse as a supplementary supply for the revised Project's water requirement.
- Surface runoff from the revised Project's potentially contaminated areas, such as infrastructure areas, will receive additional levels of treatment (e.g. oil-water separators and bunding). Water captured by these devices will be preferentially reused on site, while captured oil will be collected for recycling by a licensed contractor.
- Progressive rehabilitation will be undertaken as the revised Project's operational areas become available to reduce the amount of disturbed areas.
- Fuel, dangerous goods and hazardous chemicals will be managed as outlined by current standards, guidelines and in compliance with statutory requirements.
- Refuelling locations and handling of fuels will be undertaken away from all waterways including creeks and drainage paths.

- NAC's existing SOP for spills and emergency response procedures will be expanded to incorporate the revised Project. Spill recovery and containment equipment will be available when working adjacent to sensitive drainage paths and within other areas, such as workshops.
- NAC will continue to commit to investigating all legitimate surface water complaints, and if a genuine problem is identified, conduct immediate remediation measures and establish standard operating procedures to minimise the possibility of a reoccurrence of the original issue.
- NAC's current water quality monitoring program will be expanded to incorporate the operational and decommissioning phases of the revised Project. The program is designed to ensure the REMP is effective, to demonstrate compliance with the Mine's strict discharge limits, and to ensure the downstream water quality (physico-chemical parameters, at a minimum) is not being adversely impacted. The REMP will be developed in consultation with DEHP, and will describe the objectives and methods of monitoring. NHG will give consideration to including seasonal macro-invertebrate assessments at relevant sites as part of the process of developing the REMP.

In general, the monitoring program will include the following actions.

- Water quality will be measured upstream and downstream of the revised Project site. Basic water quality indicators (i.e. Salinity, pH, DO, EC, temperature) will continue to be monitored on a monthly basis, or when water is present, and heavy metals, nutrients, anions and cations monitored twice annually.
- Sampling for metals, metalloids, nutrients and hydrocarbons will also be conducted in dams that are proposed to form part of the mine water management release system. This will be undertaken in accordance with Table 3 of the model water conditions for coal mines in the Fitzroy Basin. Monitoring will be undertaken until such time as hazard assessment can demonstrate that these contaminants do not pose a risk to the receiving environment from mine affected water.
- During any release event, the receiving water will be monitored upstream (50 m to 100 m upstream of the release point) and downstream (200 m downstream of the release point) locations. Water quality variables will include basic water quality indicators, suspended solids, heavy metals, nutrients, anions and cations.
- A REMP will be developed in consultation with DEHP, and will describe the objectives and methods of monitoring. NAC will give consideration to including seasonal macro-invertebrate assessments at relevant sites as part of the process of developing the REMP. One additional wet season survey (at least two weeks following a flow event) and one additional dry season survey will be conducted. The current methodology and sites in the draft EIS will be retained. An additional control site located upstream of the existing mine will be included in future monitoring activities.
- The highly ephemeral nature of the Lagoon Creek system makes the area unsuitable habitat for Murray Cod. While the creek does contain woody debris, a habitat for Murray Cod, such areas are devoid of water for the vast majority of the time and therefore are not suitable habitat for Murray Cod. The suitability of habitat within Lagoon Creek for Murray Cod is described in **Chapter 8** of the draft EIS. Additional sampling of water holes during the wet season will be conducted to confirm the absence of Murray Cod at the site, and provide additional characterisation of baseline aquatic values.



- Fuel, dangerous goods, hazardous chemicals and work shop wastes will be managed to ensure compliance with current industry standards and guidelines for safety and environmental protection. These management actions will focus on handling, storage, spill containment, emergency response, establishment of 'standard operating procedures' for key operational aspects, and development of a responsibility matrix for operational and reporting matters.

### 3.7.17. *Proposed Environmental Authority Conditions: Schedule F – Surface Water*

#### Schedule F – Water

- F1** Contaminants that will, or have the potential to cause environmental harm must not be released directly or indirectly to any waters as a result of the authorised mining activities, except as permitted under the conditions of this environmental authority.
- F2** Unless otherwise permitted under the conditions of this environmental authority, the release of mine affected water to waters must only occur from the release points specified in **Table F1 - Mine affected water release points, sources and receiving waters** and depicted in Figure 2 attached to this environmental authority.

**Table F1 - Mine affected water release points, sources and receiving waters**

Release Point (RP) <sup>1</sup>	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)	Mine Affected Water Source and Location <sup>1</sup>	Monitoring Point	Receiving waters description
ED1	27° 15' 40.5603" S	151° 41' 48.32659" E	ED1	Overflow from ED1	Spring Creek
ED2	27° 16' 54.96167" S	151° 41' 36.83113" E	ED2	Overflow from ED2	Lagoon Creek
ED3	27° 18' 29.40913" S	151° 42' 50.52694" E	ED3	Overflow from ED3	Lagoon Creek
ED4	27° 17' 41.49436" S	151° 41' 33.60156" E	ED4	Overflow from ED4	Lagoon Creek
ED5	TBA	TBA	ED5	Overflow from ED5	Lagoon Creek
ED6	TBA	TBA	ED6	Overflow from ED6	Lagoon Creek
ED7	TBA	TBA	ED7	Overflow from ED7	Lagoon Creek

1 - ED – Environmental Dam

- F3** The release of mine affected water to waters in accordance with condition **F2** must not exceed the release limits stated in **Table F2 - Mine affected water release limits** when measured at the monitoring points specified in **Table F1 - Mine affected water release points, sources and receiving waters** for each quality characteristic.

**Table F2 - Mine affected water release limits**

Quality Characteristic	Release Limits	Monitoring frequency
Electrical conductivity (uS/cm)	Release limits specified in Table F3 for variable flow criteria	Real time telemetry for EC and pH. Daily grab samples if telemetry not available  If telemetry is unavailable, the first sample must be taken within 2 hours of commencement of release
pH (pH Unit)	6.0 (minimum) 9.0 (maximum)	
Total suspended solids (mg/l)	100	Daily during release (the first sample must be taken within 2 hours of commencement of release)

- F4** The release of mine affected water to waters from the release points must be monitored at the locations specified in Table F1 - Mine affected water release points, sources and receiving waters for each quality characteristic and at the frequency specified in Table F2 - Mine affected water release limits.

### Mine Affected Water Release Events

- F5** The holder must ensure a stream flow gauging station/s is installed, operated and maintained to determine and record stream flows in Lagoon and Spring Creek upstream of the discharge sites.
- F6** Notwithstanding any other condition of this environmental authority, the release of mine affected water to waters in accordance with condition F2 must only take place during periods of natural flow in accordance with the receiving water flow criteria for discharge specified in Table F2 - Mine affected water release limits for the release point(s) specified in Table F1 - Mine affected water release points, sources and receiving waters.
- F7** The release of mine affected water to waters in accordance with condition F6 must not exceed the Maximum Release Rate (for all combined release point flows) for each receiving water flow criterion for discharge specified in **Table F3 - Mine affected water release during flow events** when measured at the monitoring points specified in **Table F1 - Mine affected water release points**, sources and receiving waters.
- F8** The daily quantity of mine affected water released from each release point must be measured and recorded.
- F9** Release to waters must be undertaken so not as to cause erosion of the bed and banks of the receiving waters or cause material build-up of sediment in such waters.

**Table F3 - Mine affected water release during flow events**

Receiving waters/ stream	Release Point (RP)	Gauging Station (GDA94)	Gauging Station (GDA94)	Receiving Water Flow Criteria for discharge (m <sup>3</sup> /s)	Maximum release rate (for all combined RP flows)	Electrical Conductivity Release Limits
Lagoon Creek	ED2	27° 16' 54.96167" S	151° 41' 36.83113" E	Low Flow <4ML/d for a period of 28 days after natural flow events that exceed 4 ML/d	<1.5ML/d	700
	ED3	27° 18' 29.40913" S	151° 42' 50.52694" E			
	ED4	27° 17' 41.49436" S	151° 41' 33.60156" E			
	ED5	TBA	TBA	Medium Flow (low) >4 ML/d	<1.5ML/d	1500
					<0.7ML/d	2,500
					<0.5ML/d	3,500
	ED6	TBA	TBA	Medium Flow (high) >11.5ML/d	<4.2ML/d	1500
					<2ML/d	2,500
					<1.3ML/d	3,500
	ED7	TBA	TBA	High Flow >35ML/d	<12.5ML/d	1500
					<8ML/d	2,500
					<6ML/d	3,500
Spring Creek	ED1	27° 15' 40.5603" S	151° 41' 48.32659" E	Low Flow <4ML/d for a period of 28 days after natural flow events that exceed 4 ML/d	<1.5ML/d	700

**Notification of Release Event**

**F10** The environmental authority holder must notify the administering authority as soon as practicable and no later than 24 hours after commencing to release mine affected water to the receiving environment. Notification must include the submission of written advice to the administering authority of the following information:

- a) release commencement date/time



- b) details regarding the compliance of the release with the conditions of Department Interest: Water of this environmental authority (that is, contaminant limits, natural flow, discharge volume)
- c) release point/s
- d) release rate
- e) release salinity
- f) receiving water/s including the natural flow rate.

Note: Notification to the administering authority must be addressed to the Manager and Project Manager of the local Administering Authority via email or facsimile.

**F11** The environmental authority holder must notify the administering authority as soon as practicable and nominally no later than 24 hours after cessation of a release event of the cessation of a release notified under Condition **F10** and within 28 days provide the following information in writing:

- a) release cessation date/time
- b) natural flow rate in receiving water
- c) volume of water released
- d) details regarding the compliance of the release with the conditions of Department Interest; Water of this environmental authority (i.e. contaminant limits, natural flow, discharge volume)
- e) all in-situ water quality monitoring results
- f) any other matters pertinent to the water release event.

Note: Successive or intermittent releases occurring within 24 hours of the cessation of any individual release can be considered part of a single release event and do not require individual notification for the purpose of compliance with conditions **F10** and **F11**, provided the relevant details of the release are included within the notification provided in accordance with conditions **F10** and **F11**.

**F12** If the release limits defined in **Table F2 - Mine affected water release limits** are exceeded, the holder of the environmental authority must notify the administering authority within 24 hours of receiving the results.

**F13** The environmental authority holder must, within 28 days of a release that is not compliant with the conditions of this environmental authority, provide a report to the administering authority detailing:

- a) the reason for the release
- b) the location of the release
- c) the total volume of the release and which (if any) part of this volume was non-compliant
- d) the total duration of the release and which (if any) part of this period was non-compliant
- e) all water quality monitoring results (including all laboratory analyses)
- f) identification of any environmental harm as a result of the non-compliance

- g) all calculations
- h) any other matters pertinent to the water release event.

### Receiving Environment Monitoring and Contaminant Trigger Levels

**F14** The quality of the receiving waters must be monitored at the locations specified in **Table F5 - Receiving water upstream background sites and downstream monitoring points** for each quality characteristic and at the monitoring frequency stated in **Table F4 - Receiving waters contaminant trigger levels**.

**Table F4 - Receiving waters contaminant trigger levels**

Quality Characteristic	Trigger Level	Monitoring Frequency
pH	6.5 – 9.0	Daily during the release
Electrical Conductivity (µS/cm)	700	
Total Suspended solids (mg/L)	To Be Determined. Turbidity may be required to assess ecosystems impacts and can provide instantaneous results.	
Sulphate (SO <sub>4</sub> <sup>2-</sup> ) (mg/L)	250 (Protection of drinking water Environmental Value)	

**Table F5 - Receiving water upstream background sites and downstream monitoring points**

Monitoring Points	Receiving Waters Location Description	Latitude (GDA94)	Longitude (GDA94)
Upstream Background Monitoring Points			
LCU1	Lagoon Creek at a point upstream of mine	27° 18' 9.7728" S	151° 44' 23.136" E
LCU2	Spring Creek at a point upstream of mine	27° 14' 18.7728" S	151° 41' 31.2864" E
Downstream Monitoring Points			
LCD1	Lagoon Creek downstream of mine	27° 18' 35.64" S	151° 43' 4.3536" E
LCD2	Lagoon Creek downstream of mine	27° 18' 37.36" S	151° 43' 1.8768" E

Monitoring Points	Receiving Waters Location Description	Latitude (GDA94)	Longitude (GDA94)
SCD1	Spring Creek at a point downstream of mine	27° 14' 47.364" S	151° 40' 36.2028" E
DS1	Located at the downstream boundary of ML50232	27° 19' 26.68" S	151° 41' 7.02 E

**F15** If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in **Table F4 - Receiving waters contaminant trigger levels** during a release event the environmental authority holder must compare the downstream results to the upstream results in the receiving waters and:

- a) where the downstream result is the same or a lower value than the upstream value for the quality characteristic then no additional monitoring and reporting action is required; or
- b) where the downstream results exceed the upstream results complete an investigation into the potential for environmental harm and provide a written report to the administering authority in the next annual return, outlining
  1. details of the investigations carried out
  2. actions taken to prevent environmental harm.

Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with b) of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.

**F16** All determinations of water quality and biological monitoring must be performed by an appropriately qualified person.

### Annual Water Monitoring Reporting

**F17** The following information must be recorded in relation to all water monitoring required under the conditions of this environmental authority and submitted to the administering authority in the specified format:

- a) the date on which the sample was taken
- b) the time at which the sample was taken
- c) the monitoring point at which the sample was taken
- d) the measured or estimated daily quantity of mine affected water released from all release points
- e) the release flow rate at the time of sampling for each release point
- f) the results of all monitoring and details of any exceedances of the conditions of this environmental authority
- g) water quality monitoring data must be provided to the administering authority in the specified electronic format upon request.

**Water Management Plan**

- F18** A Water Resource Management Plan must be developed by an appropriately qualified person and implemented.

**Stormwater and Water sediment controls**

- F19** An Erosion and Sediment Control Plan must be developed by an appropriately qualified person and implemented for all stages of the mining activities on the site to minimise erosion and the release of sediment to receiving waters and contamination of stormwater.
- F20** Stormwater, other than mine affected water, is permitted to be released to waters from:
- a) erosion and sediment control structures that are installed and operated in accordance with the Erosion and Sediment Control Plan required by condition **F19**.
  - b) water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with condition **F18** for the purpose of ensuring water does not become mine affected water.

**END OF SCHEDULE F CONDITIONS**

### 3.7.18. *Proposed Environmental Authority Conditions: Schedule G – Sewage treatment*

#### **Schedule G - Sewage treatment**

- G1** All effluent released from the treatment plant must be monitored at the frequency and for the parameters specified in **Table G1 – Sewage Effluent Quality Targets for Dust Suppression and Irrigation**.

**Table G1 - Sewage Effluent Quality Targets for Dust Suppression and Irrigation**

Contaminant	Unit	Release limit	Limit type	Frequency
5-day Biochemical oxygen demand (uninhibited)	mg/L	20	Maximum	Quarterly
Faecal coliforms, based on the average of a minimum of five samples collected	Colonies/100ml	1000	Maximum	Quarterly
pH	pH units	6.0 – 9.0.	Range	Quarterly

- G2** Treated sewage effluent used for dust suppression or irrigation must not exceed sewage release limits defined in **Table G1 – Sewage Effluent Quality Targets for Dust Suppression and Irrigation**.
- G3** Sewage effluent used for dust suppression or irrigation must not cause spray drift or overspray to any sensitive place.
- G4** Subject to condition G5, sewage effluent from sewage treatment facilities must be reused or evaporated and must not be directly released from the sewage treatment plant to any water way or drainage line.
- G5** In periods of wet weather or following wet weather, when no irrigation of effluent is reasonable practicable and when effluent storage ponds are full, the release of effluent to waters is permitted in accordance with the release limits in **Table F2 - Mine affected water release limits** and locations specified in **Table F 1 – Mine affected water release points, sources and receiving waters**.
- G6** The holder of the environmental authority must ensure that irrigation of effluent is carried out in such a manner that prevents and or minimises environmental harm.
- G7** The holder of this environmental authority is authorised to accept treated wastewater from the Wetalla Wastewater Reclamation Facility and the Oakey RO Plant.



**END OF SCHEDULE G CONDITIONS**

### **3.8. Land Management**

#### **3.8.1. Background**

The revised Project site has a history of grazing and small lot cropping. Allotment and paddock sizes are relatively small and access is generally restricted by a mosaic of boundary and paddock fencing. Nearby land uses include pig farming, dairying, grain storage and various rural homestead properties. Predominant land use patterns of the revised Project site have remained cash and forage cropping in addition to grazing of improved pastures.

Much of the revised Project site has long been cleared of its original vegetation due to agricultural production, although localised areas of original remnant vegetation remain alongside Lagoon Creek, relic alluvial plains and upland low hills. The revised Project site has been subject to long periods of continued dry years and unreliable rainfall since the early 1990's.

The following supporting documents should be used in conjunction with this EM Plan for detailed information relevant to this section:

- Topsoil Management Plan (TMP);
- Final Land Use and Rehabilitation Plan (FLURP);
- Conservation Zone Management Plan (CZMP);
- Pest and Weed management Plan (PWMP);
- Bluegrass Offset Management Plan (BOMP);
- Environmental Offset Strategy; and
- Tailings Storage Facility Management Plans.

#### **Soils**

Twelve soil types have been recorded within the revised Project and surrounding area including two variants. The variants in this survey are for the high quality agricultural soil B1 and cover situations of reduced soil depth (shallow variant) or areas of increasing slope (upland variant). These variants are of minor occurrence but are noted as they have slightly reduced agricultural suitability.

All soils are considered to be suitable for grazing on improved pastures with the exception of some on the upper slopes where steeper soil types exist. Harris et al (1999) described the revised Project site as having a range of fertile soils with a desirable climate which is capable of growing a wide variety of crops and producing quality livestock.

It is extremely unlikely that the revised Project will be impacted by the effects of acid sulphate soils at any stage throughout its life. An ASS assessment in accordance with the QASSIT Technical Manual and the SPP has therefore not been completed for the revised Project.

#### **Land Use and Suitability**

It is anticipated that there will be a net reduction in the land suitability rating as a result of the revised Project. The suitability of post-mine features for cropping and grazing purposes will be affected by the lakes which will form in the depressed landforms, and is likely to be constrained by the slope angle (steepness of the slope gradients), the nature of soil cover

(physical properties of the constructed profiles), and possibly changes in the soil moisture regime. A return to grazing is entirely feasible for much of the revised Project site post-mining, as demonstrated by grazing trials by APC on rehabilitated land.

The surrounding area supports grazing industries for beef and dairy production. Grazing is predominantly based on native pastures and also occurs on mixed farming enterprises combining grain and fodder production. A number of other minor industries including piggeries, horticulture, forage and cash cropping, and animal studs are present within the Study area due to the diversity of soils, proximity to markets and a favourable climate. Cropping for grain production is one of the largest agricultural land uses and industries within the broader Study area with cultivation for cropping and/or sown pasture carried out to some extent.

Cropping lands in suitability classes 1 to 3 are considered well suited for cropping as the benefits outweigh the inputs required to initiate and maintain production. Suitability class 4 is marginal for cropping, based on the extent of inputs required to initiate production. Land that is suitability class 5 has severe limitations based on the inputs required and therefore would not justify a cropping use.

Suitability classes 1 to 3 for grazing of improved pastures are considered suitable for significant pasture improvement. While suitability class 4 offers marginal potential for pasture improvement, suitability class 5 is not suitable for improvement and is therefore restricted to grazing of native pastures. **Table 3-19** shows the suitability classification for non-irrigated crops and grazing for each soil type within the revised Project site.

**Table 3-19 Major Limitations and Land Suitability Class – Pre Mining**

	DRYLAND CROPPING		GRAZING	
Soil Type	Major Limitations and severity	Suitability class	Major Limitations and severity	Suitability class
A1	Plant water availability(2-3) Susceptibility to erosion(2) Soil physical factors(2) Salinity(2) Nutrient deficiency(2) Rockiness(1) Wetness(3) Flooding(1) Workability(2)	2	Plant water availability(2) Susceptibility to erosion(1) Soil physical factors(2) Salinity(2) Nutrient deficiency(1)	2
A2	Plant water availability(3-4) Susceptibility to erosion(2) Soil physical factors(3) Salinity(2) Nutrient deficiency(2) Rockiness(1) Wetness(2) Flooding(2) Workability(3)	3	Plant water availability(3) Susceptibility to erosion(2) Soil physical factors(2) Salinity(2) Nutrient deficiency(2)	3
A3	Plant water availability(5) Susceptibility to erosion(3) Soil physical factors(4) Salinity(2) Nutrient deficiency(3) Rockiness(1) Wetness(3)	4	Plant water availability(4) Susceptibility to erosion(2) Soil physical factors(3) Salinity(2) Nutrient deficiency(2)	4

	DRYLAND CROPPING		GRAZING	
Soil Type	Major Limitations and severity	Suitability class	Major Limitations and severity	Suitability class
	Flooding(2) Workability(3)			
A4	Plant water availability(5) Susceptibility to erosion(3) Soil physical factors(3) Salinity(2) Nutrient deficiency(3) Rockiness(2) Wetness(2) Flooding(2) Workability(2)	5	Plant water availability(4) Susceptibility to erosion(2) Soil physical factors(2) Salinity(2) Nutrient deficiency(2)	4
A5	Plant water availability(2) Topography(5) Susceptibility to erosion(2) Soil physical factors(1) Salinity(1) Nutrient deficiency(1) Wetness(4) Flooding(4) Workability(2)	5	Plant water availability(1) Susceptibility to erosion(2) Soil physical factors(1) Salinity(1) Nutrient deficiency(1)	2
B1 B1v (steeper & shallow variants)	Plant water availability(2) Susceptibility to erosion(2-3) Soil physical factors(1) Salinity(1) Nutrient deficiency(1) Rockiness(1) Wetness(1) Flooding(1) Workability(1)	B1 – 2 B1v - 3	Plant water availability(1) Susceptibility to erosion(2) Soil physical factors(1) Salinity(1) Nutrient deficiency(1)	2
B2	Plant water availability(2) Susceptibility to erosion(2) Soil physical factors(1) Salinity(1) Nutrient deficiency(1) Rockiness(1) Wetness(1) Flooding(1) Workability(1)	2	Plant water availability(1) Susceptibility to erosion(1) Soil physical factors(1) Salinity(1) Nutrient deficiency(1)	1
B3	Plant water availability(4) Susceptibility to erosion(3) Soil physical factors(2) Salinity(3) Nutrient deficiency(2) Rockiness(1) Wetness(1) Flooding(1) Workability(1)	4	Plant water availability(2) Susceptibility to erosion(2) Soil physical factors(1) Salinity(1) Nutrient deficiency(1)	2
B4	Plant water availability(4) Susceptibility to erosion(4) Soil physical factors(3)	4	Plant water availability(3) Susceptibility to erosion(3) Soil physical factors(2)	3

	DRYLAND CROPPING		GRAZING	
Soil Type	Major Limitations and severity	Suitability class	Major Limitations and severity	Suitability class
	Salinity(2) Nutrient deficiency(2) Rockiness(1) Wetness(1) Flooding(1) Workability(1)		Salinity(1) Nutrient deficiency(1)	
BA1	Plant water availability(1) Susceptibility to erosion(3) Soil physical factors(2) Salinity(2) Nutrient deficiency(1) Rockiness(1) Wetness(1) Flooding(1) Workability(1)	3	Plant water availability(1) Susceptibility to erosion(2) Soil physical factors(1) Salinity(1) Nutrient deficiency(1)	2
BA2	Plant water availability(2) Susceptibility to erosion(2) Soil physical factors(2) Salinity(1) Nutrient efficiency(1) Rockiness(2) Wetness(1) Flooding(1) Workability(1)	2	Plant water availability(1) Susceptibility to erosion(1) Soil physical factors(1) Salinity(1) Nutrient deficiency(1)	1
BA3	Plant water availability(5) Susceptibility to erosion(4) Soil physical factors(4) Salinity(1) Nutrient deficiency(2) Rockiness(3) Wetness(2) Flooding(1) Workability(5)	5	Plant water availability(3) Susceptibility to erosion(4) Soil physical factors(2) Salinity(1) Nutrient deficiency(1)	4



## Site Contamination

During the Stage 2 EIS process, discussions were held with local landholders, the then QDPI and the former Rosalie Shire Council regarding the extent of known contaminated sites with the Study area. At the time, it was reported that there were no plunge animal dips present within the Study area as it had been free of ticks for decades.

The remains of the old underground coal mines at Acland and Balgowan are unlikely to be significantly contaminated as coal was hand sorted with no major coal washing facilities available at the time (Ison, 1999). However, localised contamination may exist below greasing points on old machinery installations. Contamination may have occurred in localised areas from agricultural chemicals such as herbicides stored for agricultural activities. However, it is unlikely that any contamination of this kind would be significant.

A search of the Queensland Environmental Management Register (EMR) and the Contaminated Land Register (CLR) has been conducted for the revised Project. The sites which are listed on the EMR are summarised in **Table 3-20**.

**Table 3-20 EMR and CLR Search Results**

Lot	Plan	EMR Result	Location and Description
62	AG2962	Landfill	Acland, former Acland Tip
1	SP16257 2	Petrol Product/Oil Storage	JRLF

### Former Acland Tip

The former Acland Tip (the Tip) is located approximately 1.5 km east of Acland near the intersection of Acland Road and Wileroo Mine Road and was used as a tip from 1977 to 2008 and the majority of wastes disposed were non-putrescible, mainly comprising building waste and domestic waste. Wastes were disposed in pits which were excavated at the Tip on an as required basis. As wastes were disposed, they were progressively compacted and covered with soil.

Based on an investigation in 2009, the Tip contains approximately 61,500 m<sup>3</sup> of soil and waste material. Wastes observed were found to be mainly comprised of solid general waste such as plastics, glass, metal, textiles, construction/demolition waste (e.g. brick, wood, and concrete), and domestic waste. Regulated waste were observed infrequently and included asbestos cement sheeting, disused pesticide containers, empty fuel cans, tyres, and oily substances.

Groundwater and leachate was not encountered on the site during the investigation. Samples of cover material, soil and waste material and underlying natural ground were collected. The majority of samples had low concentrations of potential contaminants such as metals, petroleum based hydrocarbons, and pesticides.

In order to mine the resource beneath the Tip, the material will need to be relocated to an appropriate waste disposal facility. The preferred strategy for the remediation of the Tip is to relocate the soil and waste material to an engineered containment cell within one of the existing mine pits. If this strategy is not feasible, the soil and waste material will be disposed at an appropriate landfill facility.

### 3.8.2. *Environmental Values*

The revised Project's environmental values of the land that are to be protected or enhanced are:

- a beneficial post mining land use – grazing using a self-sustaining vegetation community comprising appropriate exotic/improved pasture species and local native tree, shrub and grass species; and
- a safe, stable, non-polluting landform able to support the agreed post mine land use.

### 3.8.3. *Potential Impacts on the Environmental Value*

The revised Project's activities with potential to impact on the environmental values of land are:

- land disturbance including clearing of vegetation, stripping and stockpiling of topsoil causing potential erosion and degradation of topsoil resources;
- general design and construction including the road diversion, rail loop, access tracks, haul roads, infrastructure, and elevated waste rock dumps;
- relocation of the Acland tip;
- disposal of rejects and tailings within a tailings dam or voids;
- creation of depressed landforms; and
- potential land contamination from the spillage of hazardous materials (e.g. hydrocarbons).

### **Land Use and Suitability**

Factors influencing changes in land suitability include changed physical, chemical and biological properties of soil, changes in the slope and slope length, changes in soil depth and the quality of the underlying spoil, and the formation of lakes in the depressed landforms. Given that the revised Project will involve open cut mining, the potential to affect land suitability is significant. However, a return to grazing is feasible providing final landforms and surface treatments align with such uses sufficient for a sustainable basis and the designated post-mining land use option.

Based on a conservative assessment, it is anticipated that there will be a significant net reduction in the land suitability rating as a result of the revised Project. The underlying objectives of the revised Project's rehabilitation program (**Section 3.9**) are aimed at ensuring:

- a beneficial post-mining land use;
- stable landforms; and
- the preservation of downstream water quality.

### 3.8.4. *Proposed Environmental Protection Objective*

The objectives to protect the environmental values of the mined land are to work towards rehabilitation and decommissioning (see **Section 3.9**) by:

- providing a stable, non-polluting landform;
- providing an agreed beneficial post mining land use such as grazing using a self-sustaining vegetation community comprising appropriate exotic/improved pasture species and local native tree, shrub and grass species;
- controlling the introduction and spread of declared plants and major environmental weeds; and
- protecting remnant and non-remnant native vegetation outside planned operational areas within the revised Project's boundaries.

### 3.8.5. Performance Criteria

The performance criteria for land management are:

- compliance with the requirements of the amended EA No. EPML00335713;
- no unauthorised off-site impacts; and
- development of stable, non-eroding landforms within the former mined land.

### 3.8.6. Control Strategies

Land will be managed by NAC's EMS based on the Topsoil Management Plan in draft EIS, **Appendix J3**, CZMP in draft EIS **Appendix J6**, and the Pest and Weed Management Plan in draft EIS, **Appendix J9**.

## Soil Survey

NAC is committed to undertaking further soil surveys to update the TMP and the FLURP, located in **Appendix J.3** and **J.2** of the draft EIS respectively. The further soil surveys will be undertaken based on the requirements of the RP Act and with consideration to the *Guidelines for Agricultural Land Evaluation in Queensland* (DNR, 1994), the *Australian Soil and Survey Field Handbook* (NCST, 2009), and the *Guidelines for Surveying Soil and Land Resources* (McKenzie et al, 2008). Further soil surveys to update the TMP will be undertaken prior to the commencement of topsoil stripping, and may be undertaken in stages commensurate with the staging of the revised Project.

## Topsoil Management

Suitable topsoil will be stripped for use in the rehabilitation program. The topsoil will either be stockpiled until suitable re-contoured areas are available, or directly returned immediately across the areas to be rehabilitated.

It is anticipated that there is sufficient volume of topsoil available for rehabilitation activities at the revised Project site. Topsoil stripping is necessary wherever land is to be mined, required for out-of-pit dumps or required for infrastructure such as haul roads, hardstands and/or access roads. The topsoil volume required for salvage is dependent on the quality and depth of the resource and the intended final land use of the rehabilitated areas. The actual depth of stripping is dependent on the particular soil types within a given area.

Overall, the revised Project site includes large reserves of topsoil that may be used in mine rehabilitation programs. **Table 3-21** provides summary of the soil types present on the revised Project site and their topsoil strip depth. In general, all soils used in rehabilitation should be applied to no less than 250 mm. This measure provides sufficient depth for re-ripping, should follow-up maintenance work be required.

**Table 3-21 Topsoil Stripping Summary**

Soil Type	Description	Recommendations and Comments	Typical Topsoil Strip depth
A1	Old Alluvial Plains of dark grey brown deep well-structured cracking clays over dark grey brown heavy clay subsoil	These soils are heavy with good fertility. Stripping depth may extend to 70 cm however most sites show increasing salt by 60 cm depth. Magnesium dominates calcium in the cation exchange and ESP's are usually in the slightly to moderately dispersive range so they are not suited to application on sloping sites due to a high erosion potential. However these soils have very high moisture storage potential and readily germinate and support both grasses and native trees.	50 cm
A2	Deep Grey brown uniform clay over hard yellowish brown alkaline subsoils	These soils are lighter clays than A1 with greater proportions of silt and fine sand. Fertility is quite good and the medium clay will facilitate good water holding capacity. As with A1, high salinity occurs after 50 cm depth, magnesium dominates the cations, sodic dispersion potential is high and mechanical dispersion tests (R1) suggest structural problems. Stripping depth should not exceed 50 cm and they are not suited to application on sloping sites due to a high erosion potential. These soils can benefit rehabilitation works if used such that erosion potential is minimised.	40 cm
A3	Old thin sandy alluvial plain on alkaline coarse structured dark brown subsoil.	Similar to A2 but with better physical conditions as calcium dominates the exchange capacity over magnesium. Also clay content is higher but ESP is considered 'dispersive'. As with other alluvial soils, its use in rehabilitation should be confined to lower sloping areas to avoid excessive erosion.	40 cm
A4	Fine thin dark brown sandy loam over hard reddish brown clay subsoil.	Poor soil with a restricted reuse potential on rehabilitation. The hard setting fine sandy loam A horizon has reuse potential but the high fine sand content in addition to 23% clay will cause sealing, low infiltration leading to water shedding. The soil also has low fertility. The clayey subsoil is very poorly structured and highly dispersive and should be avoided completely. Care should be taken not to include the B horizon into stripped topsoil. It is recommended that stripping of this soil be avoided in favour of deeper stripping on other better soils if possible.	10 – 15 cm
A5	Recent brown alluvia on Lagoon Creek	Minor unit but can be stripped to at least 40 cm to a possible maximum of 60 cm.	50 cm
B1	Deep, dark grey brown	These soils are very well structured medium	70 - 90 cm

Soil Type	Description	Recommendations and Comments	Typical Topsoil Strip depth
and variants	well structured, self-mulching and cracking softwood scrub soils on undulating plains.	clays with no real problems to 90 cm depth (or parent rock encountered). The entire profile is non-saline or sodic, calcium dominated cation exchange and desirable pH range. Fertility is high and particle size distribution is such that good infiltration and water holding capacity will occur. Stripping depth can exceed 70 cm up to a maximum of 100 cm. These soils are high quality suited to all areas of minesite rehabilitation.	
B2	Dark brown cracking self-mulching Brigalow and Belah clays over firm red brown clay sub soils	These soils are similar to B1 in that they are good quality and highly productive. The main difference is elevated salt in the red clay B horizon and, depending on the depth to this horizon; they may be saline below 40 cm depth. The surface layer is very well structured sandy medium clay with no significant physical problems. Fertility is high and particle size distribution is such that good infiltration and water holding capacity will occur. Stripping depth should not exceed 40 cm unless further conductivity tests indicate otherwise. The surface 40 cm are high quality suited to all areas of minesite rehabilitation.	40 cm
B3	Thin dark cracking and duplex dark grey soils over hard yellowish brown alkaline subsoils on sandstone.	These soils can be managed in an identical manner to B2 in that the surface 40 cm is high quality clay but increasing salinity and dispersion potential occurs below this depth. The surface layer is a light sandy medium clay with only minor significant physical problems and fertility is quite good. Stripping depth should not exceed 40 cm unless further conductivity tests indicate otherwise. The surface 40 cm is suited to all areas of minesite rehabilitation.	40 cm
B4	Thin red brown sandy clay loam or light clays on hard alkaline red brown clay subsoil on mixed sediments.	These soils may have a tendency to set hard and seal (due to high fine sand content in association with moderate clay content) and fairly low fertility. Soils are non-saline or sodic throughout showing strong basaltic influence. When used on rehabilitation, consideration to the sealing tendency and high erosion potential on sloping land should be considered.	40 cm
BA1	Fine brown light clay over well-structured red brown medium clays over hard brown clay or weathered basalt	Highly productive good quality soil. The whole soil profile to weathered basalt may be used in rehabilitation programs. The lighter textured surface horizon would be better suited to more sloping areas of rehabilitation than heavier clays such as BA2.	70 – 90 cm



Soil Type	Description	Recommendations and Comments	Typical Topsoil Strip depth
BA2	Thick black cracking and mulching medium clay on fresh and weathered basalt	As for BA1 except clay content is higher in the upper soil layer. May be stripped to the basalt bedrock if necessary.	60 – 70 cm
BA3	Shallow generally basaltic rocky upland areas	Any soil that can be physically stripped is suitable however quantities are low and usually very rocky.	0 – 10 cm

As the mine pits expand, there will be more opportunity to strip topsoil and apply it directly to re-contoured areas, thus avoiding topsoil stockpiling. Freshly stripped and placed topsoil retains more viable seed, micro-organisms and nutrients than stockpiled soil. Vegetation establishment is generally improved by the direct return of topsoil and is considered 'best practice' topsoil management.

Stockpiles will be managed so that:

- storage time is minimised;
- soil types with significantly different properties will be stockpiled separately;
- locations are recorded using GPS and data recorded relating to the soil type and volume; and
- stockpile surfaces are ripped and seeded (if natural revegetation does not provide adequate cover).

### Erosion Control

Progressive rehabilitation will be undertaken to stabilise disturbed areas as quickly as practical and to limit erosion. The design parameters for the construction of erosion control work such as rock armoured or grass lined waterways will be in accordance with established principles for engineering and soil conservation earthworks. A number of variables are included such as time of concentration, rainfall intensity, erosivity, gradient, scour velocities and flow estimations. Sediment and hydraulic controls covered in Section 3.7.10 also apply to Land.

The erosion control measures to be employed throughout the life of the revised Project are summarised in **Table 3-22**.

**Table 3-22 Erosion Causes and Control**

Area	Control Measure
Cleared Land	<ul style="list-style-type: none"> <li>▪ restrict clearing to areas essential for the works</li> <li>▪ windrow vegetation debris along the contour</li> <li>▪ minimise length of time soil is exposed</li> <li>▪ divert run-off from undisturbed areas away from the works</li> <li>▪ direct run-off from cleared areas to sediment dam</li> </ul>
Exposed Subsoils	<ul style="list-style-type: none"> <li>▪ minimise length of time subsoil is exposed</li> <li>▪ direct run-off from exposed areas to sediment dam(s)</li> </ul>
Active Pit	<ul style="list-style-type: none"> <li>▪ divert run-off from undisturbed areas away from pit</li> </ul>

Area	Control Measure
	<ul style="list-style-type: none"> <li>▪ pump rainfall run-off from pit only to the environmental dams for future water recycling purposes or use directly from a sump for dust suppression purposes</li> </ul>
Active Waste Rock dump	<ul style="list-style-type: none"> <li>▪ direct all run-off from dumps to sediment dams</li> <li>▪ avoid placement of sodic waste material on final external batters</li> <li>▪ control surface drainage to minimise the formation of active gullies</li> </ul>
Rehabilitation	<ul style="list-style-type: none"> <li>▪ recontour waste rock dumps progressively to landform criteria</li> <li>▪ install drainage control works</li> <li>▪ replace topsoil, rip on the contour and seed</li> <li>▪ direct run-off from rehabilitated areas to sediment dams</li> </ul>
Infrastructure	<ul style="list-style-type: none"> <li>▪ provide protection in drains (e.g. rip rap, grass) where water velocity may cause scouring</li> <li>▪ confine traffic to maintained tracks and roads</li> <li>▪ install sediment traps, silt fences and or hay bales where necessary to control sediment</li> <li>▪ rehabilitate disturbed areas around construction sites promptly</li> </ul>

## Weed Management

Weed management is discussed under Nature Conservation in **Section 3.11.11** of this EM Plan.

## Land Contamination

The following land contamination management control strategies will be implemented to achieve the environmental protection objectives. The strategies focus on good management practices for the storage, handling and use of fuels, oils and chemicals that can result in land contamination.

The new mine workshop and fuel storage areas are recognised as having the potential to contaminate land through hydrocarbon spills. Potential for land contamination from the spilling of hydrocarbons will be minimised through the use of the existing standard operating procedures for the transport, handling and storage of hydrocarbons.

All hydrocarbons will be stored and handled in accordance with the bunding requirements (Section 5.8 Bunds and Compounds) of AS 1940:2004: 'The Storage and handling of combustible and flammable liquids'. Chemical storage areas will be suitably bunded and constructed to minimise the potential for leaks to occur. All chemicals will be stored, handled and used according to provisions in their Material Safety Data Sheet (MSDS).

To minimise the risk associated with fuel oil leaking during tanker unloading, the following measures will be implemented:

- A program of regular equipment inspection and testing will be implemented to ensure reliable performance.
- Operators will be trained in the safe operation of the system and emergency procedures in the event of fuel oil leakage.
- Spill containment equipment will be available at the unloading pad for use in the event of spillage.
- A sump will be provided to collect any spillage and allow recovery.
- Ignition sources will be strictly controlled and limited to avoid a fire.

- Appropriate firefighting materials and equipment will be available to suppress fires.
- An approved fire protection system will be installed around hydrocarbon storage areas.

The following measures will be taken to minimise the potential for the leakage of fuel oil from storage tanks:

- Adequate bunding will be constructed to contain potential spills, in accordance with AS 1940:2004.
- Tank level indicators will be installed on fuel oil tanks for monitoring of fuel oil levels.
- Maintenance of fuel oil tanks will be undertaken, to ensure safe and effective operation of all components.
- Tanks will be designed in accordance with AS 1692:2006: 'Steel tanks for flammable and combustible liquids' to minimise the potential for failure.

### **Acland Tip**

In consultation with regulatory authority, NAC will develop a specific management plan for the transfer of the general waste from the Acland Tip to a general waste disposal cell within the revised Project site. In general, the contents of the former Acland Tip, which have been identified as general waste, will be progressively excavated and relocated to an appropriately sized clay lined cell within the revised Project's active in-pit waste rock dump area. This general waste disposal cell will be constructed above the groundwater table. The transport of the excavated waste material will be conducted in a manner that prevents its loss along the transport route (i.e. from the former Tip to the general waste disposal cell). On completion of the waste transportation phase, the general waste disposal cell will be clay capped ready for final rehabilitation. Final rehabilitation of the general waste disposal cell site will be conducted as part the final rehabilitation phase of the associated waste rock dump. Details of the site will be formally lodged with the DEHP for entry on the EMR. Prior to mine closure, NAC will submit a suitable long term site-based management plan for the site (i.e. as required under the EP Act).

### **3.8.7. Commitments**

The revised Projects mitigations measures and commitments for land resources are presented in **Table 3-23**.

**Table 3-23 Summary of Mitigation Measures and Commitments**

Activity	Mitigation Measures/Commitment
Stock Routes	<ul style="list-style-type: none"> <li>▪ NAC will consult with the DEHP in relation to the realignment of the Jondaryan-Muldu Road and will ensure continuity and operability of the stock route.</li> </ul>
Road Openings and Closures	<ul style="list-style-type: none"> <li>▪ NAC will liaise with the DEHP and other relevant government agencies (e.g. DTMR) to gain all relevant approvals in relation to the opening and closing of roads (including roads which are stock routes) and in land dealings relating to changes in land tenure.</li> </ul>
Fire Breaks and Maintenance Programs	<ul style="list-style-type: none"> <li>▪ NAC will liaise with landowners and local authorities with respect to fire breaks and on-going maintenance programs.</li> </ul>
Off Site Water Discharges	<ul style="list-style-type: none"> <li>▪ An assessment of the likelihood of offsite water discharges during the revised Project's operation was undertaken for the revised</li> </ul>

Activity	Mitigation Measures/Commitment
	<p>Projects' draft EIS and the findings of this assessment demonstrate that the risk of discharge from the revised Project is low. NAC will continue to evaluate and manage this risk over the life of the revised Project.</p>
Land Management and Monitoring Programs	<ul style="list-style-type: none"> <li>▪ NAC will expand its current monitoring programs and grazing trials to incorporate the applicable rehabilitation success criteria to guide its rehabilitation management and to collect the necessary data to demonstrate:               <ul style="list-style-type: none"> <li>○ the geotechnical stability of the constructed landform;</li> <li>○ the successful establishment of a suitable vegetative cover to support the final land use and minimise the potential for erosion; and</li> <li>○ the productivity of the vegetative cover for grazing (beef production).</li> </ul> </li> </ul>
Contaminated Sites	<ul style="list-style-type: none"> <li>▪ NAC will undertake further management of these contaminated sites as the revised Project progresses and ensure all requirements of the EP Act are completed.</li> </ul>
Rail Loop	<ul style="list-style-type: none"> <li>▪ NAC will assess whether this infrastructure will remain at the end of the revised Project's life in consultation with the relevant stakeholders.</li> <li>▪ A decommissioning plan will be developed as part of the mine closure process.</li> </ul>
Dams	<ul style="list-style-type: none"> <li>▪ NAC will consult with the APC Manager as part of the mine closure process to determine which dams will be retained. If retained, each dam will be subject to a general inspection to ensure it is handed over in the best possible condition.</li> <li>▪ As part of the mine closure process, a decommissioning plan will be developed for all dams not to be retained.</li> </ul>
Tailings Storage Facilities	<ul style="list-style-type: none"> <li>▪ NAC will continue to operate all TSFs in accordance with the relevant statutory requirements (including their management plans).</li> <li>▪ As a statutory requirement, all TSFs will be rehabilitated as defined by a decommissioning plan. In general, each TSF will be capped with inert material, topsoiled and vegetated.</li> <li>▪ NAC will ensure these sites are recorded on the EMR and possess a suitable site based management plan as part of the mine closure process.</li> </ul>
General Waste Disposal Cell	<ul style="list-style-type: none"> <li>▪ NAC will develop a specific management plan for the transfer of general waste from the Acland Tip to a general waste disposal cell within the revised Project site.</li> <li>▪ Prior to mine closure, NAC will submit a suitable long term site-based management plan for the site (i.e. as required under the EP Act).</li> </ul>
Offset Strategy	<ul style="list-style-type: none"> <li>▪ NAC will establish a suitable legal mechanism connected to the underlying land title to protect the Dichanthium sericeum based grassland offset in perpetuity. This legal agreement will also include a long term management plan for preservation of the</li> </ul>

Activity	Mitigation Measures/Commitment
	Dichanthium sericeum based grassland offset.
Fossils	<ul style="list-style-type: none"> <li>NAC will take all reasonable and practical measures to identify and prevent impacts to significant fossil specimens during the construction and operational phase of the revised Project. In the event of a significant fossil find, NAC will liaise with the Queensland Museum about strategies to protect the find.</li> </ul>

### 3.8.8. Proposed Environmental Authority Conditions: Schedule H – Land

#### Schedule H - Land and rehabilitation

**H1** Land disturbed by mining must be rehabilitated in accordance with **Table H1 - Rehabilitation Requirements**

**Table H1 - Rehabilitation Requirements**

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
Solid Waste Rock Disposal	Safe	Site safe for humans and animals	Structurally safe and shallow slopes (geotechnically stable). No hazardous materials (geochemically benign).	Monitoring / observation demonstrates safe site
	Non-polluting	No environmental harm attributed to adverse chemical conditions within the waste rock dumps	Minimise erosion (to at least <10t/ha/yr) through selective placement of mine waste, adequate vegetation cover. Runoff and seepage does not cause environmental harm	Suitable for low intensity grazing. Runoff and discharge water (including seepage) meets specified limits.
	Stable	Minimise erosion	Wastes selectively placed above and below original ground level to agreed slopes. Adequate ground cover established to control erosion. Runoff control measures (contour banks, etc) effective in controlling erosion.	Suitable for low intensity grazing
	Self-	To return to agreed grazing	Slope and other landform design criteria	Refer Table H2



Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
	sustaining	land capability	achieved. Establish adequate vegetation cover.	and Table H3
Tailings Dams	Safe	Site safe for humans and animals	Structurally safe (geotechnically stable). Adequate capping. Accessibility to voids is permanently removed.	Monitoring / observation demonstrates safe site
	Non-polluting	Acid mine drainage will not cause environmental harm	Adequately capped. Minimise erosion through adequate vegetation cover to less than 10t/ha/yr. Runoff and seepage controlled by water management.	Monitoring meeting release limits. Suitable for low intensity grazing
	Stable	Minimise erosion	Stored in both pits below natural surface level and in dams above natural surface. Establish adequate vegetation cover.	Monitoring demonstrates revegetation success. No structural erosion present. Suitable for low intensity grazing
	Self-sustaining	To return to agreed grazing land capability	Monitoring demonstrates successful revegetation.	Refer Table H2 and Table H3
Mine Infrastructure Areas	Safe	Site safe for humans and animals	Hazardous materials removed.	Monitoring / observation demonstrates safe site
	Non-polluting	Undertake contaminated land assessment.	Remediate contamination so that runoff and seepage are of good quality.	Monitoring meeting release limits.
	Stable	Minimise erosion	Remove infrastructure or allow continued use of useful infrastructure. Establish adequate vegetation cover.	Slope will be a maximum of 17° (30%)
	Self-sustaining	To return to agreed grazing	Return to previous use (grazing). Establish	Refer Table H2 and Table H3

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
		land capability	adequate groundcover.	
Linear Infrastructure areas	Safe	Site safe for humans and animals	Structurally safe (geotechnically stable).	Monitoring / observation demonstrates safe site
	Non-polluting	No environmental harm attributed to adverse chemical conditions within the rehabilitation areas.	Runoff and seepage controlled by water management (e.g. dams).	Monitoring meeting release limits.
	Stable	Minimise erosion	Remove infrastructure, rip reshape and revegetate or allow continued use of useful infrastructure.	Suitable for low intensity grazing
	Self-sustaining	To return to agreed grazing land capability	Remove infrastructure or allow continued use of useful infrastructure. Establish adequate vegetation cover.	Refer Table H2 and Table H3

**Table H2 – Rehabilitation Acceptance Criteria – Grazing Lands**

Land Suitability Class	Acceptance Criteria – Grazing Land						
	Non-polluting	Stability and Sustainability Land Use					
	Active Rill / Gully Erosion	Vegetation Cover	Native and Exotic Grass Species Diversity (spp./ha)	Slopes	Geotechnical Stability	Active Rill / Gully Erosion	Declared Weeds

2 to 5	Absence ( $<10\text{t/ha/yr}$ )	$> 50\%$	$\geq 4$	Maximum $17^\circ$	stable	absence	absence
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**Table H3 – Rehabilitation Acceptance Criteria – Treed Areas**

Land Suitability Class	Acceptance Criteria – Grazing Land Treed Areas						
	Non-polluting	Stability and Sustainable Land Use					
	Active Rill / Gully Erosion	Vegetation Cover (including tree / shrub canopy)	Native Tree / Shrub & Native / Exotic Grass Species Diversity (spp./ha)	Slopes	Geotechnical Stability	Active Rill / Gully Erosion	Declared Weeds
2 to 5	Absence ( $<10\text{t/ha/yr}$ )	$> 50\%$	<i>Eucalyptus</i> spp. $\geq 2$ <i>Acacia</i> spp. $\geq 2$ Other tree / shrub spp. $\geq 2$ Grass $\geq 3$	Maximum $17^\circ$	stable	absence	absence

**H2** Rehabilitation must commence progressively in accordance with the plan of operations.

## Regulated Dams and Levees

- H3** The consequence category of any structure must be assessed by a suitable qualified and experienced person in accordance with the *Manual for Assessing Categories and Hydraulic Performance of Structures* (EM635) at the following times:
- a) Prior to the design and construction of the structure, if it is not an existing structure; or
  - b) If it is an existing structure, prior to the adoption of this schedule; or
  - c) Prior to any change in its purpose or the nature of its stored contents.
- H4** A consequence assessment report and certification must be prepared for each structure assessed and the report may include a consequence for more than one structure.
- H5** Certification must be provided by the suitable qualified and experienced person who undertook the assessment, in the form set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635).

## Design and construction of a regulated structure

- H6** Condition H7 to H11 inclusive do not apply to existing structures
- H7** All regulated structures must be designed by and constructed under the supervision of a suitable qualified and experienced person in accordance with the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635).
- H8** Construction of a regulated structure is prohibited unless the holder has submitted a consequence category assessment report and certification to the administering authority has been certified by a suitable qualified person for the design and the design plan and the associated operating procedures in compliance with the relevant condition of this authority.
- H9** Certification must be provided by the suitable qualified and experienced person who oversees the preparation of the design plan set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635), and must be recorded in the Regulated Dams/Levees register.
- H10** Regulated structures must:
- a) be designed and constructed in accordance with and conform to the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635);
  - b) be designed and constructed with due consideration given to ensuring that the design integrity would not be compromised on account of:
    - 1. floodwaters from entering the regulated dam from any watercourse or drainage line; and

2. wall failure due to erosion by floodwaters arising from any watercourse or drainage line.
- c) (only for regulated dams associated with a failure to contain seepage) have the floor and sides of the dam designed and constructed to prevent or minimise the passage of the wetting front and any entrained contaminants through either the floor or sides of the dam during the operational life of the dam and for any period of decommissioning and rehabilitation of the dam.

**H11** Certification by the suitable qualified and experienced person who supervises the construction must be submitted to the administering authority on the completion of construction of the regulated structure and state that:

- a) The 'as constructed' drawings and specifications meet the original intent of the design plan for that regulated structure;
- b) Construction of the regulated structure is in accordance with the design plan.

### **Operation of a regulated structure**

**H12** Operation of a regulated structure, except for an existing structure, is prohibited unless the holder has submitted to the administering authority:

- a) One paper copy and one electronic copy of the design plan and certification of the 'design plan' in accordance with condition H8.
- b) A set of 'as constructed' drawings and specifications, and
- c) Certification of those 'as constructed drawings and specifications' in accordance with condition H9, and
- d) Where the regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the DSA volume across the system, a copy of the certified system design plan;
- e) The requirements of this authority relating to the construction of the regulated structure have been met;
- f) The holder has entered the details required under this authority into a Register of Regulated Dams; and
- g) There is a current operational plan for the regulated structures.

**H13** For existing structures that are regulated structures:

- a) Where the existing structure that is a regulated structure is to be managed as part of an integrated containment system for the purposes of sharing DSA volume across the system, the holder must submit to the administering authority within 12 months of the commencement of this condition a copy of the certified system design plan including that structure; and
- b) There must be a current operational plan for the existing structures.

**H14** Each regulated structure just be maintained and operated for the duration of its operational life until decommissioned and rehabilitated in a manner that is



consistent with the current operational plan and if applicable the current design plan and associated certified 'as constructed' drawings.

### **Mandatory reporting level**

- H15** Conditions H16 to H19 inclusive apply to Regulated Structures which have not been certified as low consequence category for 'failure to contain – overtopping'.
- H16** The Mandatory Reporting Level (the MRL) must be marked on a regulated dam in such a way that during routine inspections of the dam it is clearly observable.
- H17** The holder must, as soon as practical and within forty-eight (48) hours of becoming aware, notify the administering authority when the level of the contents of a regulated dam reaches the MRL.
- H18** The holder must, immediately on becoming aware that the MRL has been reached, act to prevent the occurrence on any unauthorised discharges from the regulated dam.
- H19** The holder must record any changes to the MRL in the Register of Regulated Structures.

### **Design storage allowance**

- H20** The holder must assess the performance of each regulated dam or linked containment system over the preceding November to May period based on actual observations of the available storage in each regulated dam or linked containment system taken prior to 1 July of each year.
- H21** By 1 November of each year, storage capacity must be available in each regulated dam (or network of linked containment systems with a shared DSA volume) to meet the Design Storage Allowance (DSA) volume of the dam (or network of linked containment systems).
- H22** The holder must, as soon as possible and within forty-eight (48) hours of becoming aware that the regulated dam (or network of linked containment system) will not have the available storage to meet the DSA volume on 1 November of any year, notify the administering authority.
- H23** The holder must, immediately on becoming aware that a regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on 1 November of any year, act to prevent the occurrence of any unauthorised discharge from the regulated dam or linked containment systems.

### **Annual inspection report**

- H24** Each regulated dam must be inspected each calendar year by a suitable qualified and experienced person.
- H25** At each inspection the condition and adequacy of all components of the regulated structure must be assessed and a suitable qualified and experienced person must prepare an annual inspection report containing details of the assessment and include recommended actions to ensure the integrity of the regulated structure.

**H26** The suitable qualified and experienced person who prepared the annual inspection report must certify the report in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635).

**H27** The holder must:

- a) Within 20 business days of receipt of the annual inspection report provide to the administering authority:
  1. The recommendations section of the annual inspection report; and
  2. If applicable, any actions being taken in response to those recommendations; and
- b) If, following receipt of the recommendations and (if applicable) actions, the administering authority requests a full copy of the annual inspection report from the holder, provide this information to the administering authority within 10 business days of receipt of the request.

### **Transfer arrangements**

**H28** The holder must provide a copy of any reports, documentation and certifications prepared under this authority, including but not limited to and Register of Regulated Structures, consequence assessment, design plan and other supporting documentation, to a new holder on transfer of this authority.

### **Decommissioning and rehabilitation**

**H29** Dams must not be abandoned but be either:

- a) Decommissioned and rehabilitated to achieve compliance with condition H30;  
or
- b) Be left in-situ for a beneficial use(s) provided that:
  1. It no longer contains contaminants that will migrate into the environment; and
  2. It contains water of a quality that is demonstrated to be suitable for the intended beneficial use(s); and
  3. The administering authority, the holder of the environmental authority and the landholder agree in writing that the dam will be used by the landholder following cessation of the resource activity.

**H30** After decommissioning, all significantly disturbed land caused by carrying out of the resource activity must be rehabilitated to meet the final acceptance criteria:

- a) The landform is safe for humans and fauna;
- b) The landform is stable with no subsidence of erosion gullies for at least three (3) years;
- c) Any contaminated land (e.g. contaminated soils) is remediated and rehabilitated;
- d) Not allowing for acid mine drainage; or
- e) There is no ongoing contamination to waters (including groundwater);

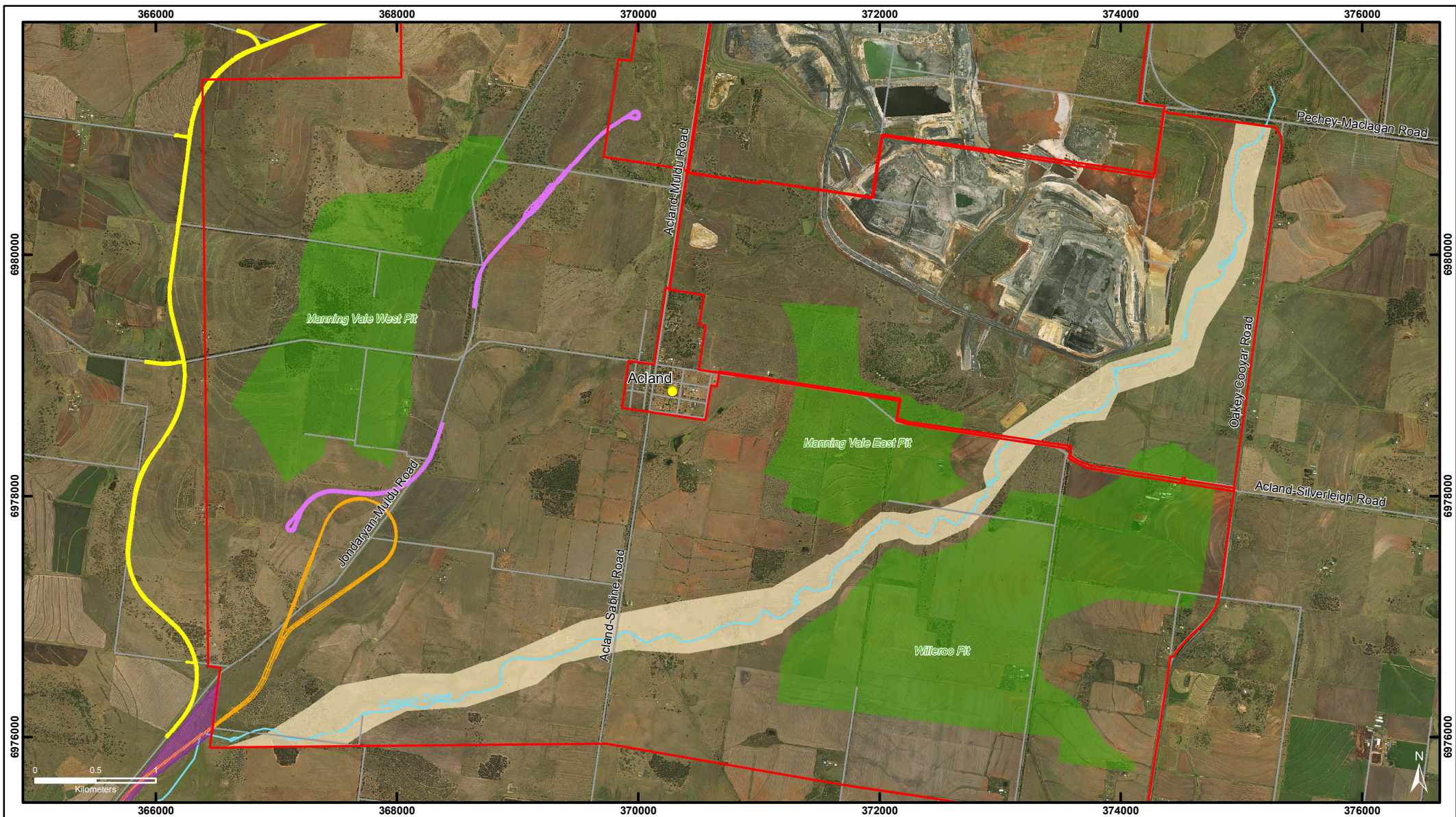
- f) All significantly disturbed land is reinstated as defined in **Table H1 – Rehabilitation requirements**;
- g) For land that is not being cultivated by the landholder:
  - 1. Groundcover, that is not a declared pest species is established and self-sustaining;
  - 2. Vegetation of similar species richness and species diversity to pre-selected analogue sites is established and self-sustaining; and
  - 3. The maintenance requirements for rehabilitated land are no greater than that required for the land prior to its disturbance caused by carrying out of the resource activity.
- h) For land that is cultivated by the landowner, cover crop is revegetated, unless the landholder will be preparing the site for cropping within 3 months of resource activities being completed.

### **Register of Regulated Dams**

- H31** A Register of Regulated Dams must be established and maintained by the holder for each regulated dam
- H32** The holder must provisionally enter the required information in the Register of Regulated Dams when a design plan for a regulated dam is submitted to the administering authority.
- H33** The holder must make a final entry of the required information in the Register of Regulated Dams once compliance with condition H12 and H13 has been achieved.
- H34** The holder must ensure that the information contained in the Register of Regulated Dams is current and complete on any given day.
- H35** All entries in the Register of Regulated Dams must be approved by the chief executive offices for the holder of this authority, or the delegate, as being accurate and correct.
- H36** The holder must, at the same time as providing the annual return, supply to the administering authority a copy of the records contained in the Register of Regulated Dams, in the electronic format required by the administering authority.

Additional Schedule H proposed conditions are provided in **Section 3.10.8**.





#### LEGEND

- |  |  |
|--|--|
| <span style="color: yellow;">●</span> Towns and Localities                         | <span style="color: grey;">—</span> Roads  |
| <span style="color: purple;">—</span> Internal Haulage Road                        | <span style="border: 2px solid red; display: inline-block; width: 15px; height: 10px;"></span> Mining Tenements  |
| <span style="color: blue;">—</span> Revised Access to Mine                         | <span style="background-color: purple; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> Infrastructure Mining Lease |
| <span style="color: yellow;">—</span> Revised Jondaryan-Muldu Road Diversion       | <span style="background-color: green; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> Stage 3 Pit Areas            |
| <span style="color: orange;">—</span> Revised Rail Spur and Balloon Loop Alignment | <span style="background-color: tan; border: 1px solid black; display: inline-block; width: 15px; height: 10px;"></span> Lagoon Creek Buffer Zone       |

 **NEW HOPE**  
GROUP

 **SKM**  
SINCLAIR KNIGHT MERZ

#### NEW ACLAND COAL MINE STAGE 3 PROJECT

**Figure 3-7: Lagoon Creek Buffer Zone**

Scale 1:43,000 on A4  
Projection: Australian Geodetic Datum – Zone 56 (AGD84)



### 3.10. Rehabilitation and Decommissioning

This section of the EM Plan should be read in conjunction with the current FLURP which is designed to provide NAC's long term rehabilitation management strategy for its mining activities. NAC has also produced a number of additional documents that support or complement the FLURP and this section of the EM Plan that include topsoil management, final landform design and nature conservation.

The revised Project's general rehabilitation areas comprise the greater part of the active mining areas, the out-of-pit dumps, the slopes of depressed landforms and mine infrastructure. With the exception of the depressed land forms where permanent lakes will establish, the general rehabilitation areas for the revised Project equate to approximately 2,030 ha and have been designated to be returned to a final land use of 'grazing with scattered areas of native tree species for shade, ecological and aesthetic purposes'. The rehabilitation strategy will allow a majority of the former revised Project site to be re-incorporated into APC's agricultural activities. The return of the revised Project land to grazing is consistent with the current land uses practised within the region and is considered a long term sustainable outcome for the revised Project.

#### 3.10.1. Background

##### **Post Mining Land Use**

The overriding principle for the rehabilitation program at the Mine and revised Project is that the land should be returned to a post-mine land use that will be stable, self-sustaining and will only require maintenance commensurate with the proposed final land use.

The proposed post-mine land use for disturbed areas for the Mine and revised Project will be grazing, using native and pasture (exotic) grass species combined with smaller areas of local native tree and shrub species. This nominated land use will ensure that the land remains agriculturally productive, is consistent with the surrounding land uses, and can be re-incorporated into AGC's business.

Rehabilitation will be conducted progressively behind the active mine path as areas become operationally available. Progressive and final rehabilitation requirements will be further guided by the outcomes of this EIS process.

##### **Post Mine Land Form**

The primary design objective is the creation of stable final landforms that are compatible with the proposed final land use. NAC will use experience gained at the Mine and other NHG mines, specialist consultants and relevant research findings to meet this design objective.

Stable landforms will continue to be progressively established as part of the mining process using integrated mine planning and proven earthmoving techniques. The final slopes will be engineered to ensure geotechnical stability and designed to incorporate the required water management structures to manage storm runoff. Established topsoil and revegetation techniques will be applied to create a self-sustaining vegetation community capable of supporting grazing. A regular monitoring regime and grazing trial program will be implemented to demonstrate rehabilitation success, guide maintenance activities, and to develop a long term management regime.

The proposed final landform will require rehabilitation of the following main disturbance areas:

- the out-of-pit waste rock dumps (elevated landforms) associated with the North, South, Manning Vale West and Willaroo Pits;



- the in-pit waste rock dumps at the North, Centre, South, Manning Vale East, Manning Vale West and Willeroo Pits;
- the out-of-pit tailings storage facility (TSF), west of the North Pit;
- the in-pit TSFs within the North and Centre Pits;
- dams not required by the background landowner; and
- infrastructure areas not required by the background landowner.

The Mine's proposed depressed landforms will be backfilled by the existing mining operations or progression of the revised Project. The Central Pit's waste rock material will backfill the North Pit's depressed landform. The Centre Pit's depressed landform will be backfilled by tailings from the CHPP. While the South Pit's depressed landform will be backfilled with waste rock material from the revised Project's Manning Vale East Pit and coarse rejects from the CHPP.

The revised Project's depressed landforms will be reshaped to depressed landforms. NAC has produced a *Final Landform Management Report (SKM 2013)* that outlines the methodology behind the development of the depressed landforms. The *Final Landform Management Report (SKM 2013)* is provided as an Appendix for the *New Acland Coal Mine Stage 3 Project – Environmental Impact Statement (SKM 2013)*.

Permanent lakes are predicted to form in all three depressed landforms.

Updated analytical modelling of salinity in the pit lakes based on the updated numerical groundwater model shows that at the end of the modelled time period (300 years) the highest predicted lake salinity occurs in the Manning Vale West depressed landform, with a predicted lake salinity of around 2,100 mg/L, compared to around 4,100 mg/L for native groundwater in the Walloon Coal Measures. Salinity in the Manning Vale East and Willeroo depressed landforms is predicted to be 270 mg/L and 365 mg/L respectively at the end of the modelled period.

The no adverse effects range for total dissolved solids (salinity) for beef cattle in the *Australian and New Zealand Guidelines for fresh and marine water quality: Volume 3 - Primary industries* (ANZECC, 2000) is 0-4,000 mg/L. Accordingly, salinity in the depressed landforms is within the no adverse effects range for beef cattle at the end of the modelled period (300 years).

As the Manning Vale West and Willeroo depressed landforms are expected to be net gaining water bodies, salinity levels are expected to continue to rise beyond the modelled period of 300 years, however water levels are expected to stabilize due to evaporations losses. Accordingly it has been assumed that in the long term salinity levels in the Manning Vale West and Willeroo will eventually result in water in these depressed landforms becoming unsuitable for stock watering.

The Manning Vale East depressed landform is expected to be a net losing water body (with sub-surface flow from Manning Vale East going into the Manning Vale West or Willeroo depressed landforms). Salinity levels in the Manning Vale East depressed landform are expected stabilise and accordingly water in this depressed landform is expected to be suitable for stock watering in the long term.

## Rehabilitation Strategy

The knowledge gained so far from the existing mining activities will be adapted and used in rehabilitation programs for continuation of the Mine and implementation of the revised Project.

Rehabilitation strategies for the Mine and revised Project will include all areas of disturbance and will be reviewed on a regular basis in order to take into account any changes to mine operations, changes in legislative requirements, results of on-going studies and monitoring and/or through the introduction of future innovations in rehabilitation techniques.

NAC's rehabilitation strategy for the revised Project is designed, as a minimum:

- to create a final landform that is stable and self-sustaining;
- not impacting on water qualities of the downstream receiving environment;
- possesses maintenance requirements commensurate with the final land use; and
- longer term achieves statutory compliance for eventual surrender of the associated mining tenure.

The management requirements for general rehabilitation areas within the Mine (Stages 1, 2 and the proposed Stage 3) are specified within NAC's FLURP.

The FLURP (SKM, 2013) is a comprehensive planning document that details rehabilitation matters, such as rehabilitation goals/objectives, progressive rehabilitation, topsoil management, revegetation techniques, maintenance, decommissioning, rehabilitation acceptance criteria (development and application), monitoring and reporting. In addition, NAC is also exploring the possibility of trialling native grass species within the general rehabilitation areas.

In general, there will be a loss of land suitability as a result of mining across the revised Project site. However, following successful rehabilitation, agricultural production will remain possible post mining, in the form of grazing.

NAC's rehabilitation strategy for the revised Project is based on:

- expanding and updating the existing rehabilitation strategy for the Mine's general disturbance areas;
- undertaking progressive rehabilitation; and
- implementing a range of specialised revegetation management practices for the revised Project's designated conservation zones and environmental offset areas.

NAC documents that are relevant to the rehabilitation strategy are listed in **Section 3.10.7**.

## Jondaryan Rail Loadout Facility

In February 2012, the NHG announced a commitment to move the JRLF to a location on the new ML providing approval is given for the revised Project. An assessment has been conducted for the revised Project to quantify potential impacts for the new rail spur and balloon loop and associated infrastructure.

Subject to all statutory approvals being received in 2015, the new rail spur and balloon loop, TLF and MHF will be constructed over an estimated two year period with completion in

approximately 2017. Therefore, decommissioning of the JRLF will commence in 2018 and is expected to be completed in 2019. The existing JRLF site will be returned to its original land use, namely grazing.

## **Decommissioning**

The decommissioning and final rehabilitation of the revised Project site will occur on a staged basis over several years. A contaminated site assessment will be carried out as part of the Final/Progressive Rehabilitation Report required for full or partial surrender of the revised Project's EA and mining leases. **Section 3.10.6** provides information on the proposed decommissioning control strategies.

### **3.10.2. Environmental Values**

The revised Project's environmental values of the land that are to be protected or enhanced are:

- a beneficial post mining land use – grazing using a self-sustaining vegetation community comprising appropriate exotic/improved pasture species and local native tree, shrub and grass species; and
- a safe, stable, non-polluting landform able to support the agreed post mine land use.

### **3.10.3. Potential Impacts on the Environmental Value**

In addition to the impacts provided under Land Management in **Section 3.8.3**, the potential impacts to environmental values for rehabilitation and decommissioning include the following:

- Ineffective or insufficient decommissioning of infrastructure;
- Ineffective rehabilitation of landform including waste material management; and
- Low revegetation survival rate.

### **3.10.4. Proposed Environmental Protection Objective**

NAC plan to return the revised Project site back to a landform that supports a grazing land use, in accordance with the Rehabilitation requirements for mining projects Guideline (DEHP 2012), and aligned to the following general rehabilitation goals:

- Safe to humans and wildlife;
- Non-polluting;
- Stable; and
- Able to sustain an agreed post-mining land use. Progressive rehabilitation will be undertaken throughout the life of mine as land becomes available.

To achieve this, the following objectives will be regularly reviewed and revised according to mine planning, rehabilitation and decommissioning progress, revegetation trial results, and potential changes to agreed final land:

- Infrastructure is decommissioned and removed/buried as agreed with the Administering Authority during closure planning, except features (such as dams and/or roads), that landowners may request to remain;

- Remaining voids are formed with either low gradients or public and livestock access is permanently prevented;
- The surface water and groundwater leaving the revised Project site is expected to be of a similar quality prior to mining activities, and will remain this way without on-going management; and
- Revegetation cover will match local analogue sites where required, reduce erosion and be self-sustaining. Information on the description and selection of appropriate analogue sites is provided in the FLURP.

### **Rehabilitation Domains**

Four rehabilitation domains have been determined for the revised Project:

- Solid waste rock disposal areas (spoil, waste rock dumps, reject disposal areas);
- Tailings dams;
- Infrastructure areas; and
- Linear Infrastructure areas.

These four areas will generally receive similar rehabilitation treatment, such as tailings emplacements will be capped with mine spoil then, topsoiled and seeded. Once the tailings areas are capped with mine spoil they will receive a similar treatment to other areas of mine spoil/waste dumps, etc. Mine and linear infrastructure areas will generally not require spoil placement or capping but receive topsoil and seeding treatments similar to the solid waste disposal and capped tailings dams.

Goals for these domains are shown in **Table 3-24**.

**Table 3-24 Strategies to Achieve Rehabilitation Goals**

Domain	Rehabilitation Goals			
	Safe	Non-Polluting	Stable landform	Sustains Agreed Land Use
<b>Solid Waste Rock Disposal</b>	Structurally safe (geotechnically stable). No hazardous materials (geochemically benign).	Minimise erosion through adequate vegetation cover. Runoff and seepage controlled by selective placement and water management (e.g. dams).	Place wastes selectively above and below original ground level to the agreed slopes. Establish adequate vegetation cover.	Return to previous use (grazing)
<b>Tailings Dams</b>	Structurally safe (geotechnically stable). Adequate capping.	Adequately capped. Minimise erosion through adequate vegetation cover. Runoff and seepage controlled by water management.	Stored both in pits below natural surface level and in dams above natural surface. Establish adequate vegetation cover.	Return to previous use (grazing)
<b>Mine Infrastructure areas</b>	Hazardous materials removed.	Remediate contamination so that runoff and seepage are of good quality.	Remove infrastructure or allow continued use of useful infrastructure. Establish adequate vegetation cover.	Return to previous use (grazing)
<b>Linear Infrastructure areas</b>	Structurally safe (geotechnically stable).	Runoff and seepage controlled by water management (e.g. dams).	Remove infrastructure rip reshape and revegetate or allow continued use of useful infrastructure	Return to previous use (grazing)

The proposed final landform for the revised Project is shown in **Figure 2-5**.

#### **3.10.5. Performance Criteria**

Proposed rehabilitation acceptance criteria have been developed to monitoring the progress of rehabilitation efforts for the revised Project. The key criteria used to determine rehabilitation success are:

- Vegetation cover – measured as a percentage;
- Species diversity – determined from analogue sites;
- Slope;
- Erosion status;



- Absence of declared plants (weeds);
- Exchangeable Sodium Percentage (ESP) – as a measure of soil dispersion;
- Cation Exchange Capacity (CEC) – as a measure of nutrient availability;
- Downstream water quality; and
- Root Zone Salinity (RZS).

Vegetation cover, species diversity, slope angle, erosion status and the absence of declared weeds have been incorporated into the proposed acceptance criteria in **Table 3-25**. Exchangeable Sodium Percentage ESP, CEC and RZS have been incorporated into the monitoring and reporting framework provided in the FLURP.

**Table 3-25** and

**Table 3-28** illustrate the proposed rehabilitation acceptance criteria for all areas disturbed by mining. The acceptance criteria does not apply to conservation zone areas within the Mine and revised Project as these are covered separately in the CZMP, which is provided in **Appendix J.6** of the draft EIS.

**Table 3-25 Proposed Rehabilitation Acceptance Criteria – Grazing Lands**

Land Suitability Class	Acceptance Criteria – Grazing Land						
	Non-polluting	Stability and Sustainable Land Use					
	Active Rill/Gully Erosion	Vegetation Cover <sup>1</sup>	Native and Exotic Grass Species Diversity (sp./ha) <sup>2</sup>	Slopes <sup>3</sup>	Geotechnical Stability	Active Rill/Gully Erosion	Declared Weeds
2	absence	= or > 50%	= or > 4	8.5°-17°	stable	absence	absence
3	absence	= or > 50%	= or > 4	8.5°-17°	stable	absence	absence
4	absence	= or > 50%	= or > 4	8.5°-17°	stable	absence	absence
5	absence	= or > 50%	= or > 4	8.5°-17°	stable	absence	absence

Note:

- 1) Vegetation covers at analogue sites with a Land Suitability Class of 4 & 5 were the highest at 45% and 56% respectively (page 42). As most post-mining land will be class 4 & 5, an average of the higher vegetation covers in classes 4 & 5 (50%) were included across all land suitability classes
- 2) This criteria is the highest diversity value found at only 1 of the 4 analogue sites (page 42), however it has been added to all land suitability classes in the acceptance criteria
- 3) This criterion has been developed separately from experience at the Mine (i.e. demonstrated geotechnical stability). Slope will be designed from 8.5° to 17° (15% to 30%) but consideration will be given to the lower slope angles. Further information can be located in the Final Landform Management Report (SKM 2013) that accompanies New Acland Coal Mine Stage 3 Project – Environmental Impact Statement (SKM 2013).

**Table 3-26 Proposed Rehabilitation Acceptance Criteria – Treed Areas (generally <5%)**

Land Suitability Class	Acceptance Criteria – Grazing Land Treed Areas						
	Non-polluting	Stability and Sustainable Land Use					
	Active Rill/Gully Erosion	Vegetation Cover (incl. tree/shrub canopy) <sup>1</sup>	Native Tree/shrub & Native/Exotic Grass Species Diversity (sp./ha) <sup>2</sup>	Slopes <sup>3</sup>	Geotechnical Stability	Active Rill/Gully Erosion	Declared Weeds
2-5	absence	= or > 50%	Eucalyptus sp. = or >2 Acacia sp. = or >2 Other tree/shrub sp. = or >2 Grass = or > 3	8.5° - 17°	stable	absence	absence

Note:

- 1) This criteria is an average from analogue sites.
- 2) The majority of the rehabilitated land will be returned to grazing with exotic pastures established. Where pockets of trees/shrubs have been established the diversity criteria will apply taking into account the limited diversity of some remnant communities near the mine.
- 3) This criteria has been developed separately from experience at the Mine (i.e. demonstrated geotechnical stability). Slope will be designed from 8.5° to 17° (15% to 30%) but consideration will be given to the lower slope angles. Further information can be located in the Final Landform Management Report (SKM 2013) that accompanies New Acland Coal Mine Stage 3 Project – Environmental Impact Statement (SKM 2013).

### 3.10.6. Control Strategies

Rehabilitation and Decommissioning will be managed by NAC's EMS based on the FLURP **Appendix J2** of the draft EIS and, towards the end of mining, by a dedicated Mine Closure Management Plan.

To date, rehabilitation at the Mine has demonstrated that conventional rehabilitation on a range of materials mined has been successful. The knowledge gained will be used to further develop rehabilitation strategies for the revised Project. The FLURP provides information on which the following is based.

The rehabilitation strategy at the revised Project consists of the following integrated measures:

- appropriate pre-disturbance preparation, such as a topsoil management plan and integrated mine planning to efficiently coordinate mining activities;
- implementation of practical landform designs to prevent erosion and establish long term geotechnical stability;
- identification of an appropriate post-mine land use consistent with local environmental constraints;
- avoiding the placement of sodic/dispersive materials near the surface of the dumps or within the plant root zone;

- appropriate management of the final TSF waste, including capping with benign waste rock, revegetation to form a stable cover to resist erosion and establishment of a long term site based management plan;
- revegetation trials for selection of appropriate revegetation species and methodologies and development of a long term management regime;
- progressive rehabilitation of disturbed areas using appropriate rehabilitation procedures;
- a rehabilitation monitoring program to assess rehabilitation success against accepted performance indicators; and
- a corrective action program to address areas of substandard rehabilitation.

### **Progressive Rehabilitation**

A progressive rehabilitation program will continue to be implemented for the Mine and revised Project and will be administered by each Plan of Operations. Progressive rehabilitation will commence as soon as possible when areas become available within the operational land.

The main features of the progressive rehabilitation process are:

- construction of waste dumps in 10 m lifts on external dump faces, with a maximum working dump lift height of 30 m;
- development of a stable slope design that incorporates appropriate water management structures (e.g. contour banks, etc.);
- use of suitable topsoil, which will either be stockpiled until recontoured areas are available or respread immediately across available recontoured areas;
- contour ripping to water promote infiltration and minimise run off;
- seeding with an appropriate seed mix (grass, shrub and tree species) prior to the commencement of the wet season to maximise the benefits of subsequent rainfall;
- application of appropriate fertiliser or other soil ameliorants for plant establishment if required; and
- the battering down of final void slopes to create depressed landforms that can safely support the proposed final land use.

The projected progression of mining activities and the conceptual final topography of the site will be further defined by the on-going planning process for the mine expansion. This information will further guide proposed rehabilitation activities.

As discussed in **Section 2.3.4** of the AEIS, the total disturbance footprint for the revised Project is 1,815 ha (includes disturbance on existing Mining Lease areas and off-lease areas such as the rail infrastructure off-lease areas), this is presented in **Table 3-28**. An indicative rehabilitation schedule for the Mine and revised Project in **Table 3-28**.

**Table 3-27 Total disturbance over the life of the revised Project**

Type of Disturbance	Disturbance Area (Ha)
Mining Areas	1201
Elevated Landforms	311
Depressed Landforms	Included in Mining Areas
Rehabilitation batter of slopes	128
Mine Infrastructure	175
<b>Total</b>	<b>1,815</b>

**Table 3-28 Cumulative Indicative Rehabilitation Targets – Mine and revised Project**

Production Year	Rehabilitated Area (ha)	Cumulative Area Rehabilitated (ha)
To Date	N/A	507
2014-15	100	607
2016-17	112	719
2018-19	234	952
2020-21	241	1,193
2022-23	233	1,426
2024-25	146	1,572
2026-27	156	1,728
2028-29	142	1,870
>2030	886	2,756
<b>Total</b>	<b>2,249</b>	<b>2,756</b>

### Design of Final Landforms

As an important component of the planning phase for the revised Project, NAC has developed a feasible mining methodology to eliminate unusable post-mined land for the revised Project. The main driver for this approach was to ensure the final out-of-pit dumps (elevated landforms) and final voids (depressed landforms) are battered down to a safe and stable angle to allow the sustainable application of the revised Project's proposed final land use. A conceptual final land use plan for the revised Project is shown in **Figure 2-5**. The number of elevated landforms and their respective locations within the revised Project's final landform design have been influenced by the mining sequence and the number of pits operating at any moment in time.

The revised Project's elevated landforms have been designed such that the average angle on the face of the dumps will be 10 degrees on average. This slope is based on the current out of pit dumps angles that have successfully been constructed within the existing ML50170 (Stage 1) and ML50216 (Stage 2). An average batter of 10 degrees is believed to be safe and sustainable, and there is evidence at the Mine that this batter is geotechnically stable. The general design parameters for the revised Project's elevated landforms are provided in **Table 3-29**.

Slopes up to 13 degrees occur naturally within the vicinity of the revised Project site. Three examples of natural local landforms have been included for comparison purposes as presented in **Table 3-30**. In general, the revised Project's elevated landforms (in terms of physical dimensions) are relatively commensurate with the surrounding local topography.

**Table 3-29 General Design Parameters for Elevated Landforms**

Elevated landforms	Height (m)	Volume (Mm <sup>3</sup> )	Area (footprint) (ha)	Proposed slope (degrees)	Longest slope length (m)
Manning Vale East Pit	45	23.4	67	8.5-17	300
Manning Vale West Pit	45	25.6	137	8.5-17	300
Willeroo Pit	45	23.5	108	8.5-17	300

**Table 3-30 Local Topographic Features in the Study area**

Local topographic features	Height (m)	Area (footprint) (Ha)	Slope (degrees)	Longest Slope Length (m)
Bottle Tree Hill	56	150	11	700
Radar Hill	65+	450+	7	1,000
Surrounding Ridgeline	80+	NA	>20	>2,000

### Use of Spoil Material

The spoil associated with the revised Project consists of weathered and fresh overburden having slightly higher clay content than the interburden and floor material. This material is generally geochemically benign, with negligible acid generation potential. During the initial phases of operation, and continuing throughout life of mine, it is proposed to carry out analysis of overburden and tailings material to confirm its geochemical characteristics, and if necessary, implement a series of mitigation measures as outlined above.

Overall, the material tested is likely to be suitable for revegetation. Topsoil will also be used as a surface treatment prior to revegetation to minimise any effects from sodic spoil.

### Revegetation

The revegetation methods for all the revised Project's types of disturbed land will normally consist of the following:

- Respreading stockpiled or freshly stripped topsoil;
- Contour ripping;
- Application of appropriate fertiliser for plant establishment, after soil chemical analysis, if required; and
- Seeding with an appropriate seed mix in a one-pass operation.

Competent materials such as basalt may be placed on steeper slopes to aid stability. Contour ripping is used to improve infiltration and reduce mechanical impedance for tree root establishment. This action is normally undertaken immediately after surface preparation and before revegetation. A seed mix containing native and pasture (exotic) grass and local native shrub and tree species is used to establish a sustainable vegetation cover in a one-pass operation.

Revegetation will normally occur prior to the commencement of the wet season (October-December) to maximise the benefits of subsequent rainfall or following the heat of Summer (February-March) – this practice occurs at the existing operations.

### Seed Mix



Example seed mixes for the Grazing Lands and Treed Areas are included in **Table 3-31** and **Table 3-32**.

The seed mixes will be modified over time as species suitability/success and seeding rates are monitored and assessed. Further information is available in the FLURP.

**Table 3-31 Example Seed Mix – Grazing Lands**

Botanical Name	Common Name	Seeding rate (kg/ha)
<i>Cynodon dactylon</i>	Green Couch	2.0
<i>Chloris gayana</i>	Katambora Rhodes Grass	5.0
<i>Echinochloa utilis</i> *	Japanese Millet	3.0
<i>Panicum coloratum</i>	Bambatsii Panic	3.0
<i>Panicum maximum</i>	Gatton Panic	4.0

Note: \* denotes exotic/weed species

**Table 3-32 Example Seed Mix – Treed Areas**

Botanical Name	Common Name	Seeding rate (kg/ha)
<i>Angophora costata</i> spp <i>costata</i>	Smoothbark Apple	0.3
<i>Allocasuarina littoralis</i>	Black She-Oak	0.3
<i>Casuarina cristata</i>	Belah	0.3
<i>Eucalyptus crebra</i>	Narrow Leaf Ironbark	0.3
<i>Eucalyptus melanophloia</i>	Silver-leaf Ironbark	0.3
<i>Eucalyptus orgadophylla</i>	Mountain Coolabah	0.3
<i>Alphitonia excelsa</i>	Red Ash	0.2
<i>Geijera parviflora</i>	Wilga	0.3
<i>Acacia leiocalyx</i>	Black Wattle	0.2
<i>Acacia salicina</i>	Sally Wattle	0.2
<i>Acacia stenophylla</i>	River Cooba	0.2
<i>Acacia harpophylla</i>	Brigalow	0.2
<i>Senna artemisioides</i>	Silver Cassia	0.2
<i>Dodonaea viscosa</i>	Sticky-hop Bush	0.2
<i>Cynodon dactylon</i>	Green Couch	1.0
<i>Bothriochloa deceptions</i>	Pitted Blue Grass	2.0
<i>Bothriochloa bladhii</i>	Forest Blue Grass	2.0
<i>Dicanthium sericeum</i>	Qld Blue Grass	2.0
<i>Echinochloa utilis</i> *	Jap Millet	2.0

Note: \* denotes exotic/weed species

## Rehabilitation Maintenance

Rehabilitated areas will be monitored in order to identify any areas in need of maintenance. Rehabilitated areas that have not achieved the designated acceptance criteria will be repaired.

Supplementary plantings or seeding may be used to increase species diversity and/or groundcover. Maintenance work will be performed to repair any areas exhibiting excessive

soil erosion. If problem areas occur, they will be investigated to determine the reason for substandard rehabilitation and to identify appropriate methods for repair.

### **Grazing Trials**

NAC is currently undertaking a formal long term grazing trial within a rehabilitate area of the North Pit's Elevated Landform on ML 50170 at the Mine. This grazing trial includes slope areas and will involve a comparison process with an analogue site in the vicinity of the Mine. The grazing trial program is being managed by the APC and will involve a formal study and report by a professional third party agricultural consultancy and local university. This grazing trial program will be a continuous process with new areas progressively added to the original trial area each year.

The grazing trial program will be expanded to include the revised Project's rehabilitation areas designated for grazing. Further information on the grazing trial is available in the FLURP.

### **Decommissioning**

A Life of Mine (LoM) Plan has been developed for New Acland Coal Mine (including the revised Project). The LoM Plan will be continuously revised based on economic, geological and engineering factors. In addition, this LoM Plan will be used to guide the day-to-day operational activities (i.e. to guide medium and short term mine planning).

The decommissioning and final rehabilitation of the revised Project will occur on a staged basis over several years. On the completion of mining, infrastructure will be treated as follows:

- mine roads will be left behind for use as farm roads or if not required, rehabilitated;
- water dams will remain if required by the relevant landowner and approved by regulators, otherwise, they will be rehabilitated;
- buildings, plant and equipment will be removed and the surface rehabilitated, including the CHPP, workshop, offices, storage tanks and material handling facility and train loadout facility;
- concrete pads will be covered with benign waste rock, topsoiled and revegetated or removed and disposed to the nearest landfill;
- contaminated land management will be completed as required under the EP Act;
- all TSFs will possess a competent final cover system; and
- the final voids remaining at the end of the mine life will be battered down to form depressed landforms to support the proposed final land use.

The final void remaining at the end of the mine life at the South and Centre Pits will cover approximately 50 ha with a maximum depth of approximately 60 m. A bund and fence will be constructed around the crest of the pit to prevent access to the final void.

#### **3.10.7. Commitments**

The following commitments encompass the Land Management and Rehabilitation and Decommissioning aspects of the revised Project:

- A FLURP has been drafted and will be regularly updated to capture project and rehabilitation changes;
- Progressive rehabilitation of disturbed areas using appropriate rehabilitation procedures;
- A rehabilitation monitoring program to assess rehabilitation success and a corrective action program to address areas of failed rehabilitation;
- Final voids will be managed to ensure they are safe, stable and non-polluting. The following management plans that will be implemented and regularly reviewed and are relevant to land management and rehabilitation and decommissioning include:
  - FLURP;
  - TMP;
  - CZMP;
  - TSTP;
  - BOMP; and
  - PWMP.
- NAC will demonstrate in a scientifically rigorous manner the success of the revised Project's rehabilitation to allow future surrender of the associated MLs.
- NAC will consult with government and community on a regular basis over the life of the revised Project to report on the progress of rehabilitation and other matters.
- NAC is committed to maximising the revised Project's rehabilitation success to ensure the APC can function as a competitive agribusiness. NAC will also continue to draw on the APC's expertise to assist and enhance rehabilitation management.
- NAC will use experience gained at the Mine and other mines in Queensland to meet its stable landform objective. Stable landforms will be established following mining, using soils capable of supporting vegetation communities adapted to the local environment. The stability of the post-mine landform will be achieved by applying sound rehabilitation practices. The disturbed land will be rehabilitated to a condition that is self-sustaining or to a condition where the maintenance requirements are consistent with the post-mining land use.
- NAC will use the existing grazing trial:
  - to assess the success of the current rehabilitated area in relation to the performance of cattle growth (beef production);
  - to evaluate current rehabilitation practices from a final land use perspective; and
  - as required, to develop new rehabilitation strategies to improve rehabilitation and long term grazing performance.
- Longer term, the APC will also use this information to develop appropriate land management plans for NAC's former mined land within both the current Mine and the revised Project site.

## Mine Closure Plan

A Mine Closure Plan will be submitted to the Regulatory Authority at least five years prior to the proposed surrender of New Acland Coal Mine's environmental authority and associated mining tenure. The Mine Closure Plan will be a dynamic document updated on an annual basis, and will be implemented via the revised Projects' Plan of Operations.

Major stakeholders including the DEHP, other relevant government departments and agencies, as well as the public will be consulted as part of the mine closure process.

A Final Rehabilitation Report and Environmental Audit Statement will be produced as a statutory requirement of the surrender process for the EA and the associated ML relinquishments.

### 3.10.8. *Proposed Environmental Authority Conditions: Schedule H – Land*

#### Contaminated Land

- H37** Before applying for surrender of a mining lease, the holder must (if applicable) provide to the administering authority a site investigation report under the Act, in relation to any part of the mining lease which has been used for notifiable activities or which the holder is aware is likely to be contaminated land, and also carry out any further work that is required as a result of that report to ensure that the land is suitable for its final land use.
- H38** Before applying for progressive rehabilitation certification for an area, the holder must (if applicable) provide to the administering authority a site investigation report under the Act, in relation to any part of the area the subject of the application which has been used for notifiable activities or which the holder is aware is likely to be contaminated land, and also carry out any further work that is required as a result of that report to ensure that the land is suitable for its final land use under condition H1.
- H39** Minimise the potential for contamination of land by hazardous contaminants.

#### Biodiversity offsets

- H40** Significant residual impacts to prescribed matters of state environmental significance must not exceed the maximum authorised residual impact area listed for that matter in **Table H4 - Matters of State Environmental Significance**.  
  
NOTE: Deemed conditions in Sections 18, 22, 24 and 25 of the *Environmental Offsets Act 2014* are taken to be conditions of this authority.
- H41** The holder of the environmental authority must provide an environmental offset for the following maximum significant residual impacts on matters of state environmental significance in accordance with the requirements of the *Environmental Offsets Act 2014* (including deemed conditions), the *Environmental Offsets Regulation 2014* and the Queensland Environmental Offsets Policy 2014.

**Table H4: Maximum authorised impacts on endangered and of concern regional ecosystems**

RE	VM Act status	Maximum area of residual impact (ha) <sup>1</sup>
11.3.1	Endangered	12
11.3.21	Endangered	35.9
11.9.5	Endangered	12.6
11.3.2	Of concern	4.8
11.3.17	Of concern	7
11.8.11	Of concern	4.1
11.9.10	Of concern	4.1
11.9.13	Of concern	3.6
Common name Species name	NC Act status	Total area of residual impact (ha)
Koala <i>Phascolarctos cinereus</i>	Special least concern	19.5
Belson's Panic <i>Homopholis belsonii</i>	Endangered	70.8*

\*The residual impact to *Homopholis belsonii* is 70.8 ha as shown in the EPBC Offset Calculator of the BOS. The area of 87 ha is the calculated offset area as shown in the EPBC Offset Calculator.

**H42** Residual impacts are not authorised on any Matters of State Environmental Significance not identified in **Table H4 – Matters of State Environmental Significance**.

**END OF SCHEDULE H CONDITIONS**





#### LEGEND

- Towns and Localities
- Roads
- Mining Tenements
- In-pit Tailings Storage Facility



#### NEW ACLAND COAL MINE STAGE 3 PROJECT

#### Figure 3-8: Location of In-Pit Tailings Storage Facilities (ITSF)

Scale 1:40,000 on A4  
Projection: Australian Geodetic Datum – Zone 56 (AGD84)



### 3.11. Nature Conservation

#### 3.11.1. Background

The Study area has a long history of vegetation clearing and grazing, which has caused:

- significant fragmentation and losses of remnant vegetation;
- suppression of natural regeneration;
- loss of topsoil through erosion including the loss of productive seed banks;
- a reduction in native shrub and groundcover diversity and abundance; and
- weed invasion.

Most of the original vegetation has been cleared in the Study area for agriculture, grazing and mining operations, with the remaining remnant vegetation generally located within road reserves, hills and ridgelines some remnant woodland present in association with Lagoon Creek. Approximately 10 % of the Study area contains vegetation communities which can be classified as remnant or regrowth examples of specific regional ecosystem types. The balance comprises improved pasture, scattered clumps of trees and individual paddock trees.

Terrestrial flora, fauna and biodiversity studies have occurred at various times over the past 13 years, up to the most recent results of the 2013 surveys.

The Wildnet database and EPBC Protected Matters Search Tool identifies the species listed in **Table 3-33** as possibly occurring on the revised Project site. **Table 3-33** describes the preferred habitat for these species and whether the species have been located on the revised Project site.

**Table 3-33 Species possibly found in the vicinity of the Study area**

Scientific Name/Common Name	NC Act Status	EPBC Act Status	Preferred Habitat	Presence in revised Project area
<b>Birds</b>				
<i>Erythrotriorchis radiates</i> - Red Goshawk	-	E	Occurs over woodland and forested areas in tropical and warm temperate Australia. They prefer mosaic landscapes with a large population of prey (birds) and permanent water. Preferred habit is open forest to allow for fast attacks and manoeuvring in flight.	Not present – habitat throughout the revised Project is highly disturbed and there is a lack of permanent water bodies and with very little area of forest or woodland. Species or nests have not been located following surveys consistent with DotE survey guidelines.
<i>Geophaps scripta scripta</i> - Squatter Pigeon	V	V	This species prefers open forests to sparse, open woodlands. The species forages in well drained, gravelly, sandy and loamy soils that support open forest to woodland communities.	Not present – while grasslands with surrounding woodlands observed in the vicinity of the revised Project, the species has not been recorded during the surveys completed over past 13 years.

Scientific Name/Common Name	NC Act Status	EPBC Act Status	Preferred Habitat	Presence in revised Project area
				Species has not been located following surveys consistent with DotE survey guidelines.
<i>Lathamus discolor</i> - Swift Parrot	E	E	In Queensland known to occur in ironbark, red gum and yellow box woodlands and forests on which they feed on nectar in flowers.	Not present – species is known to have high level of site fidelity, and as no previous records of the species are known from the revised Project area, it is reasonable to conclude that this species is not present.
<i>Neochmia ruficauda ruficauda</i> - Star Finch (eastern)	E	E	Occurs in grassland and grassy woodland near permanent water. Population believed to be between Bowen, Winton and Wowan – north of the Study area.	Not present - revised Project site is outside the range of the Star Finch.
<i>Ninox strenua</i>	V	-	Occurs along the Great dividing Range and adjacent inland slopes. Prefers tall, wet eucalypt forests.	Not present, lack of tall, wet forests in the vicinity of the revised Project area.
<i>Poephila cincta cincta</i> - Black-throated Finch (southern)	E	E	Prefers grassy open woodlands and forests dominated by Eucalyptus, Corymbia and Melaleuca. Usually associated with riparian vegetation.	Not present – revised Project area is in the “may occur” part of the species modelled distribution, however the revised Project area does not encompass habitat that is likely to be inhabited by the species.
<i>Rostratula australis</i> - Australian Painted Snipe	V	V	Favours shallow fresh waterbodies inundated or waterlogged grasslands. Sites usually include rank emergent tussocks of grass sedges and rushes	Not present – areas of poor quality vegetation along Lagoon Creek. Species has not been located following surveys consistent with DotE survey guidelines.
<i>Turnix melanogaster</i> - Black-breasted Button-quail	V	V	Prefers vine thickets and rainforests that are periodically water-stressed.	Not present – very small area of isolated semi-evergreen vine thicket located on eastern edge of in the revised Project site. Species has not been located following surveys consistent with DotE survey guidelines.
<i>Xanthomyza phrygia</i> - Regent Honeyeater	-	E	They use the moister fertile sites in dry box-ironbark woodland and forests such as creekflats and river valleys.	Not present – preferred habitat not present on Project site. Species has not been located following surveys consistent with DotE survey guidelines.

Scientific Name/Common Name	NC Act Status	EPBC Act Status	Preferred Habitat	Presence in revised Project area
<b>Mammals</b>				
<i>Chalinolobus dwyeri</i> - Large-eared Pied Bat	V	V	Has been recorded in sandstone gorges in tall eucalypt forests, dry sclerophyll woodlands and forests and rainforests and wet sclerophyll forests. They prefer a combination of sandstone cliffs to provide roosting habitat that are adjacent to higher fertility areas such as box gum woodlands and river/rainforest corridors that can be used for foraging. The species also favours habitat with a canopy.	Not present – This species is highly dependent on sandstone caves for roosting, which do not occur in the revised Project area. Hollow roosting sites available in the revised Project area are only provide opportunistic habitat if the species was flying over the area.
<i>Dasyurus hallucatus</i> - Northern Quoll	-	E	Habitat includes rocky areas in eucalypt forest/woodlands, rainforest, beach scrubs. Eucalypt forests and woodland communities usually have a high level of structural diversity. Typically habitat includes some form of high relief rocky area, surrounded by vegetation for uses as dens.	Not present – The Northern Quoll has only been recorded as far south as the Sunshine Coast, approximately 150 km to the north-east of the Project area (DSEWPaC, 2011a). Additionally, the revised Project area is highly fragmented and moderately suitable patches of denning habitat are disconnected from fauna movement corridors and subject to predation by predatory pests.
<i>Nyctophilus corbeni</i> - South-eastern Long-eared Bat	-	V	Occurs in larger remnants with a well-developed understorey. Throughout inland Queensland, the habitat for this species is dominated by various eucalypt and bloodwood species and various types of tree mallee with it being most abundant in vegetation with a distinct canopy and a dense cluttered shrub layer.	Not present – The Project area lacks suitable habitat for this species. There are no patches of vegetation with a distinct canopy and a dense cluttered shrub layer in the Project area.
<i>Petrogale penicillata</i> - Brush-tailed Rock-wallaby	V	V	Prefers rock faces with large tumbled boulders, ledges and caves. Known to occur in a variety of the vegetation types such as dense rainforest wet sclerophyll forest vine thicket and dry sclerophyll forest.	Not present - no large tumbled boulders, ledges or caves located within the project site. Vegetation communities are highly fragmented and of low structural diversity.
<i>Potorous tridactylus</i> - Long-nosed Potoroo (SE	V	V	Prefers dense understorey vegetation such as coastal heathlands and sclerophyll forests, with dense ground cover. Also prefers sandy soils	Not present – The Project area lacks suitable habitat for this species. There are no patches of vegetation with dense undergrowth in the Project area.

Scientific Name/Common Name	NC Act Status	EPBC Act Status	Preferred Habitat	Presence in revised Project area
Mainland			where it is able to dig for food resources (fungi).	The Project area supports high numbers of the predatory pests Foxes ( <i>Vulpes vulpes</i> ) and Feral Cats ( <i>Felis catus</i> ) which prey on this species and have contributed to its decline.
<i>Pteropus poliocephalus</i> - Grey-headed Flying-fox	-	V	This species feeds in a variety of habitats including rainforests, forests and woodlands communities, urban areas and gardens and orchards. It roosts in trees located near water such as lakes rivers and the coast.	Known – has been recorded in the vicinity of the revised Project area. (Black Flying-fox were recorded foraging and sheltering within the revised Project area.)
<b>Reptiles</b>				
<i>Anomalopus mackayi</i> - Five-clawed Worm-skink	E	V	This species occurs in woodland and grasslands, including bluegrass grasslands, poplar box and brigalow communities. In modified areas, the species has been found sheltering under sheet metal, timber and hay bales.	Not present – bluegrass, poplar box and brigalow communities are found within the revised Project site. The species has not been recorded during the surveys completed over past 13 years.
<i>Delma torquata</i> - Collared Delma	V	V	This species is found in poplar box, lemon-scented gum and ironbark forests on stony soils and rocky ridges in southern Queensland. These communities usually have an understorey of grasses and lantana that produce thick leaf litter. The species seeks the protection of fallen timber and stones.	Not present – potentially suitable habitat in poplar box and brigalow communities. Eucalypt communities along rocky ridge lines have been recorded during surveys and these areas provide possible habitat. The species has not been recorded during the surveys completed over past 13 years.
<i>Egernia rugosa</i> - Yakka Skink	V	V	The Yakka Skink is known to occur in brigalow communities, as well as poplar box woodlands. The species has been found in cavities around buried rocks stumps and logs, it also seeks refuge in hollow logs and to burrow tunnels. In cleared areas, the species is known to find shelter under log piles, erosion gullies and rabbit warrens.	Not present – no burrow systems or latrine sites have been identified. The species has not been recorded during the surveys completed over past 13 years.
<i>Furina dunmali</i> - Dunmall's Snake	V	V	This species is very rare and secretive. There are few records of its occurrence. It has been recorded at sites in brigalow, cypress pine and sheoak communities, on black alluvial cracking soils. The	Not present – habitat occurring in brigalow communities. The species has not been recorded during the surveys completed over past 13 years.



Scientific Name/Common Name	NC Act Status	EPBC Act Status	Preferred Habitat	Presence in revised Project area
			species has been found sheltering under fallen timber and ground litter, it could make use of cracks in clay soils.	
<i>Paradelma orientalis</i> - Brigalow Scaly-foot	V	V	This species has been recorded in a variety of open woodland communities and soils types. Specific habitat preferred by the species, relevant to the Study area includes brigalow/belah open forest and mountain coolibah open woodland. Its preferred micro habitat includes sandstone slabs, logs, fallen bark, leaf litter and grass tussocks. The species is known to be able to persist in areas that have been cleared and disturbed.	Not present – preferred habitat of brigalow/belah open forest and mountain coolibah open woodland recorded within the revised Project site. The species has not been recorded during the surveys completed over past 13 years.
<i>Tympanocryptis pinguicollis</i> - Grassland Earless Dragon	-	E	Occurs in naturally treeless native tussock grassland on black or brown clay loams. It prefers ungrazed or lightly grazed paddocks with a slight slope dominated by wallaby grasses, spear grasses, tussocks grasses and kangaroo grasses. They are known to shelter under rocks and sometimes in insect holes. The species has been collected from Brookstead, Pittsworth and Toowoomba	Very unlikely – grasslands present within the revised Project area. The species has not been recorded during the surveys completed over past 13 years.
<b>Plants</b>				
<i>Bothriochloa biloba</i> - Lobed Blue-grass	-	V	This species is from the Darling Downs and northern NSW. It grows in in cleared eucalypt forests and relict grassland often dominated by other grasses such as Queensland Blue-grass. It prefers heavy textured soils – black and brown clays.	Known
<i>Cadellia pentastylis</i> - Ooline	V	V	Occurs in dry rainforest, semi-evergreen vine thickets and dry sclerophyll communities.	Unlikely – preferred habitat is not present or in a very degraded condition within the revised Project site.
<i>Clematis fawcettii</i> - Stream Clematis	V	V	Occurs on loamy soils growing in the gaps of canopies in dry rainforests near streams and semi-evergreen vine thicket, usually near watercourses.	Unlikely – the only semi-evergreen vine thicket doesn't occur near a stream
<i>Dichanthium</i>	V	V	Occurs in black cracking clay in	Possible – in blue grass

Scientific Name/Common Name	NC Act Status	EPBC Act Status	Preferred Habitat	Presence in revised Project area
queenslandicum - King Blue-grass			tussock grasslands mainly in association with other species of blue grass.	grasslands throughout the revised Project site.
<i>Digitaria porrecta</i> - Finger Panic Grass	NT	E	Occurs in grassland on basaltic plains and in undulating woodlands and open forests. Usually occurs on dark and fine textured soils with some degree of seasonal cracking. It persists in disturbed locations. It is found in vegetation communities dominated by mountain coolibah and poplar box.	Known
<i>Haloragis exalata</i> subsp. <i>velutina</i> - Tall Velvet Sea-berry	V	V	This species occurs in rainforest and rainforest margins, including dry rainforests. It is often found in damp areas near watercourses.	Unlikely – no suitable habitat within the revised Project site. Nearest record is from the Bunya Mountains.
<i>Homopholis belsonii</i> - Belson's Panic	E	V	Found in poor soils in dry woodlands of belah, poplar box and sometimes brigalow. It typically prefers light to moderate shade.	Known
<i>Lepidium peregrinum</i> - Wandering Pepper-cress	-	E	This species was thought to be extinct until recently rediscovered in near Clifton in northern NSW. Was found in open riparian forest growing in sandy alluvium.	Unlikely – no suitable sandy soils observed within the revised Project area.
<i>Picris evae</i> - Hawkweed	V	V	Occurs in Eucalypt open woodlands with grassy understory composed of <i>Dichanthium</i> species. The species has been found growing along roadsides and in cultivated areas, on black, dark grey or red-brown soils and clay loam soils.	Possible – in grassland and brigalow communities.
<i>Rhaponticum australe</i> - Austral Cornflower	V	V	Occurs in eucalypt open forest with grassy understorey on roadsides and in road reserves.	Known, has been found adjacent to the rail spur alignment.
<i>Sarcochilus weinthalii</i> - Blotched Sarcochilus	E	V	Found growing in trees of rainforests and dry scrubs.	Unlikely – no suitable habitat recorded within the revised Project area.
<i>Streblus pendulinus</i> - Siah's Backbone	-	E	This species grows mainly along watercourses in well-developed rainforest, gallery forest or drier rainforests.	Unlikely - no suitable habitat recorded within the revised Project area.
<i>Thesium australe</i> - Austral Toadflax	V	V	Occurs in grasslands and grassy woodlands. Commonly associated with kangaroo grass.	Possible – grassland and grassy woodland habitat occurs within the revised Project area.

### 3.11.2. Terrestrial Flora

The Study area has a reduced 'conservation significance' due to historic clearing for cropping and pasture improvement for grazing. Isolated patches of woodland exist amongst grazing and cropping areas as well as narrow strips retained along road reserves. The condition of the remnant vegetation is variable, with most areas being subjected to long-term grazing impacts, and as a consequence, present a moderate to low diversity of native flora. Native grasslands occur in road reserves and paddocks not subject to regular ploughing, cropping or grazing. The better quality examples occur in lightly grazed areas.

Two endangered regional ecosystems will be impacted by the revised Project and are listed in **Table 3-34** for State classification, (**Table 3-35** for Commonwealth listings), and shown in **Figure 3-9**.

**Table 3-34 Regional Ecosystems Observed**

Regional Ecosystem Code	VM Act Status	Description
11.3.1	Endangered	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains
11.3.2	Of concern	<i>Eucalyptus populnea</i> woodland on alluvial plains
11.3.17	Of concern	<i>Eucalyptus populnea</i> woodland with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> on alluvial plains
11.3.21	Endangered	<i>Dichanthium sericeum</i> and/or <i>Astrebla</i> spp. grassland on alluvial plains. Cracking clay soils
11.8.11	Of concern	<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks
11.8.5; 11.8.5a	Least concern	<i>Eucalyptus orgadophila</i> open woodland on Cainozoic igneous rocks
11.9.5	Endangered	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks
11.9.10	Of concern	<i>A. harpophylla</i> , <i>E. populnea</i> open forest on Cainozoic fine-grained sedimentary rocks
11.9.13	Of concern	<i>Eucalyptus moluccana</i> or <i>E. microcarpa</i> open forest on fine grained sedimentary rocks

**Table 3-35 EPBC Threatened Ecological Communities of the Study area**

Threatened Ecological Community	EPBC status	Description
Brigalow ( <i>Acacia harpophylla</i> ) dominated and co-dominated community (RE 11.3.1 and 11.9.5)	Endangered	This community occurs as scattered patches along Lagoon Creek and within the Manning Vale West pit. There are small isolated patches across the southern part of the Study area, outside the mine footprint. This community is around 15 metres in height and comprises a canopy with <i>Acacia harpophylla</i> and <i>Casuarina cristata</i> . The understorey includes <i>Geijera parvifolia</i> and <i>Eremophila mitchellii</i> . There are moderate weed infestations present (up to 20%) in some patches, including African boxthorn and Mayne's pest and tree pear.
Bluegrass dominant grasslands of the Brigalow Belt Bioregions (North and South) (RE 11.3.21 and 11.8.11)	Endangered	Scattered patches of the community are located along Lagoon Creek, in the western part of the Study area, within the Manning Vale West Pit and along road sides.

### 3.11.3. Weeds

Significant environmental weed species and declared pest plants noted within the Study area include Mother of Millions (*Bryophyllum delagoense*), Prickly pear (*Opuntia stricta*), Velvet Tree Pear (*Opuntia tomentosa*), Noogoora burr (*Xanthium pungens*), Bathurst burr (*Xanthium spinosum*) and African Boxthorn (*Lycium ferocissimum*).

### 3.11.4. Terrestrial Fauna and Avifauna

A total of 149 vertebrate fauna species have been recorded within the Study area to date, comprising 23 mammals, 92 bird species, 25 reptiles and 9 frog species. Comprehensive fauna surveys within the Study area to date have recorded a total of two vertebrate fauna species of conservation significance.

Overall, the habitat in the study area for the fauna species targeted in this report, and other native species generally, is of poor quality. The site has previously undergone significant clearing for cultivation and grazing and is heavily disturbed and mostly comprised of cleared land and access tracks. The small patches of remnant vegetation that remain are generally associated with Lagoon Creek and farm houses. As a result, these small patches are highly fragmented, isolated and subject to edge effects. Consistent with a landscape in this condition, the area is heavily invaded by introduced pest species such as the Feral Cat (*Felis catus*) and Wild Dog (*Canis familiaris*), Indian Mynas (*Acridotheres tristis*), Red Fox (*Vulpes vulpes*) and European Rabbits (*Oryctolagus cuniculus*), and weeds including Velvet Tree Pear (*Opuntia tomentosa*) and Rhodes Grass (*Chloris gayana*).

### 3.11.5. Pest Species

A total of ten introduced species were recorded within the Study area, including one amphibian, two birds and seven mammals. The introduced species include the cane toad, house mouse, fox, feral cat, black rat and European hare.

### **3.11.6.     *Aquatic Flora and Fauna***

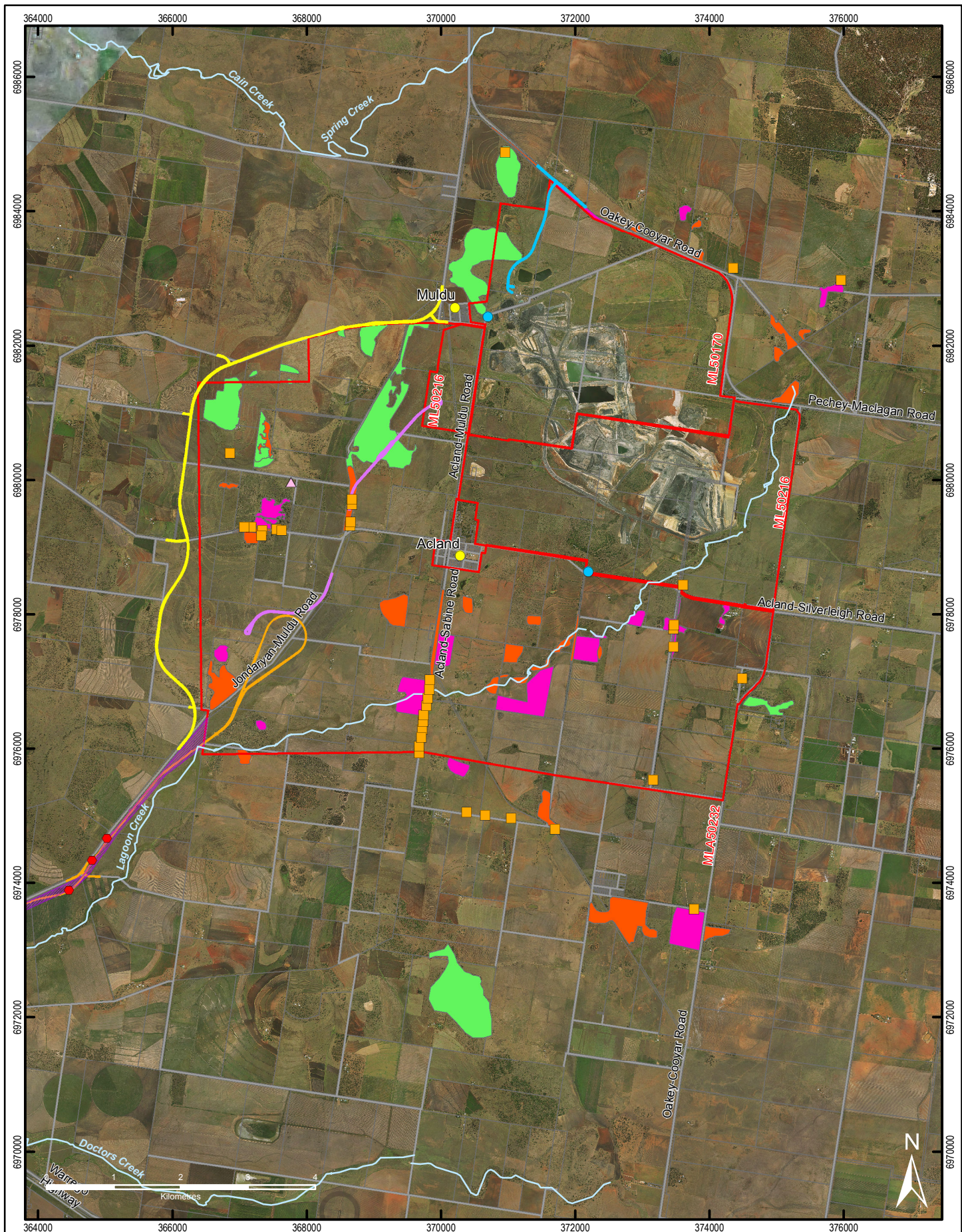
Aquatic flora and fauna surveys were undertaken between 2008 and 2013 within the Study area and no threatened or endangered aquatic flora or fauna (macroinvertebrate, turtles and fish) could be found inhabiting the waterways within the Study area or the surrounding water courses.

The existing aquatic habitat along Lagoon Creek, while categorised in poor condition, provides a habitat for a number of native aquatic species. Although this section of Lagoon Creek is not a permanent waterway it does provide a degree of temporary habitat for aquatic species. Ephemeral waterways can provide areas for colonisation, and as a result, certain fish and invertebrate species may utilise these habitats for dispersion, breeding and juvenile stages of development.

### **3.11.7.     *Environmental Values***

The environmental values to be protected or enhanced are the terrestrial and aquatic flora and fauna of the highly disturbed ecosystems in the vicinity of the revised Project.





#### LEGEND

- |  |  |  |
|--|--|--|
| <ul style="list-style-type: none"> <li>Towns and Localities</li> <li>Internal Haulage Road</li> <li>Revised Access to Mine</li> <li>Revised Jondaryan-Muldu Road Diversion</li> <li>Revised Rail Spur and Balloon Loop Alignment</li> <li>Roads</li> <li>Creeks</li> </ul> | <ul style="list-style-type: none"> <li>Cadastre</li> <li>Mining Tenements</li> <li>Infrastructure Mining Lease</li> <li><b>Threatened Flora</b> <ul style="list-style-type: none"> <li>Bothriochloa biloba</li> <li>Digitaria porrecta</li> <li>Homopholis belsonii</li> <li>Rhaponticum australe</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li><b>Observed Regional Ecosystems</b> <ul style="list-style-type: none"> <li>Endangered</li> <li>Of Concern</li> <li>Least Concern</li> </ul> </li> </ul> |
|--|--|--|

NEW HOPE GROUP

SINCLAIR KNIGHT MERZ  
**SKM**

#### NEW ACLAND COAL MINE STAGE 3 PROJECT

#### Figure 3-9: Observed Regional Ecosystems

Scale 1:75,000 on A4  
Projection: Australian Geodetic Datum – Zone 56 (AGD84)



### 3.11.8. Potential Impacts on Terrestrial Flora and Fauna

#### Vegetation Clearing

There are two Commonwealth Threatened Ecological Communities present within the Study area. (Bluegrass grassland and Brigalow woodland). Non-remnant (regrowth) Bluegrass grassland and Brigalow woodland will be subject to some disturbance and/or loss.

The revised Project will result in the clearing of 64.7 ha of these two threatened ecological communities and 144.4 ha of nine regional ecosystems and, as listed in **Table 3-36**.

The area of vegetation to be cleared has increased as a result of clearing for the rail spur. The rail spur corridor will be typically 40 m wide (20 m from the rail centreline to the boundary fence), as described in **Section 13.6.4** of the draft EIS. The construction of the rail spur will result in the clearing of the 1.5 ha of Poplar Box woodland, south of Lagoon Creek and north of the Jondaryan-Sabine Road. The width of clearing in this patch of Poplar Box will be limited to 40 m to reduce the loss of vegetation within this community.

An area of disturbance to Belson's panic habitat is 70.8 ha.

**Table 3-36 Area of threatened ecological communities and regional ecosystems to be cleared**

Threatened Ecological Community	EPBC status	Area cleared (ha)
Brigalow ( <i>Acacia harpophylla</i> ) dominated and co-dominated community	Endangered	24.6
Bluegrass dominant grasslands of the Brigalow Belt Bioregions (North and South)	Endangered	40.1
Total area of TECs		64.7
Regional Ecosystem	VM Status	Area cleared (ha)
<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains (RE 11.3.1)	Endangered	12.0
<i>Eucalyptus populnea</i> woodland on alluvial plains (RE11.3.2)	Of concern	4.8
<i>Eucalyptus populnea</i> woodland with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> on alluvial plains (RE11.3.17)	Of concern	7.0
<i>Dichanthium sericeum</i> and/or <i>Astrebla</i> spp. grassland on alluvial plains. Cracking clay soils (RE 11.3.21)	Endangered	35.9
<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks (RE 11.8.11)	Of concern	4.1
<i>Eucalyptus orgadophila</i> open woodland on Cainozoic igneous rocks (RE 11.8.5 and 11.8.5a)	Least concern	60.3
<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks (RE 11.9.5)	Endangered	12.6
<i>Acacia harpophylla</i> , <i>Eucalyptus populnea</i> open forest on Cainozoic fine-grained sedimentary rocks (RE 11.9.10)	Of concern	4.1
<i>Eucalyptus moluccana</i> or <i>E. microcarpa</i> open forest on fine grained sedimentary rocks (RE 11.9.13)	Of concern	3.6
Total area of regional ecosystems		144.4

One EPBC Act listed fauna species has been recorded from the Study area, the Grey-headed Flying Fox (*Pteropus poliocephalus*). The revised Project will result in the temporary reduction in foraging habitat at a local level, potentially adversely impacting on the foraging

behaviour of members of the local Flying Fox population. The Koala has been confirmed within the revised Project site and makes use of the poplar box woodland as habitat, 19.5 ha of which will be cleared for the revised Project, which comprises REs 11.3.2, 11.3.17, 11.9.10 and 11.9.13.

## **Fragmentation**

Fragmentation has two primary effects. First, it creates new edges between remnants and cleared or disturbed land leading to 'edge' effects. These consequences include physical changes to the remnant in the border region, such as different levels of exposure to the sun and wind and changes in water cycles and local air temperature. Biotic changes include invasion by opportunistic species with good dispersal or colonising abilities such as weeds and feral animals. Second, it isolates and creates barriers between remnants.

A review of current RE mapping demonstrates that the vegetation within the Study area is already highly fragmented to the point where there are no large patches of vegetation remaining and those that do remain are poorly connected. Fragmentation impacts associated with the proposal are expected to be minimal.

The revised Project will result in the clearing of native vegetation and habitat. As previously described, vegetation and habitat across the revised Project site is already highly fragmented, disconnected from adjacent areas of habitat and scattered cleared farming country.

Fragmentation of vegetation and habitat will occur in patches to the west and east of the Manning Vale Pit and to habitat along Lagoon Creek.

While the revised Project will lead to clearing of 144.4 ha of remnant vegetation, there will be 278.6 ha of native vegetation and habitat unaffected by the revised Project. Vegetation along Lagoon Creek will be retained and continue to provide habitat connectivity.

## **Weed Proliferation**

A suite of weed species already occur within the Study area, and as a consequence, there is potential that these may be spread into new areas as a result of construction traffic and bulk earthworks. However, using established weed management practices, the revised Project is not expected to introduce new weed species or cause significant weed infestations.

## **Feral Animal Species**

Feral animal species have been sited within the Study area and include the Cat, European Red Fox, Rabbit, Hare, Pig and Cane Toad. The revised Project will not contribute to an increase in populations of any of these species through the implementation of appropriate management measures.

### **3.11.9. Potential Impacts on Aquatic Flora and Fauna**

Activities with the potential to affect aquatic flora and fauna are:

- the alteration of hydrological regimes and stream water quality on-site; and
- release of water from the Study area.

### **3.11.10. Proposed Environmental Protection Objective**

The environmental protection objective is to manage the terrestrial and aquatic flora and fauna within the Study area and to minimise the risks to flora and fauna outside the immediate Study area.

### **3.11.11. Control Strategies**

Nature conservation will be managed by NAC's EMS based on the CZMP, Koala Species Management Plan (KSMP), TSTP, PWMP, BOMP, and FLURP.

Mitigation measures intended to reduce the potential impacts of the revised Project on flora and fauna values of the Study area are described below.

All areas to be cleared will have their boundaries surveyed and clearly marked by tape, pegs or other means. All site clearance will conform to the limits of the current mine plan. Particular attention will be paid to defining the boundaries of clearing where endangered and of concern regional ecosystems are present.

All vegetation clearance will be restricted to what is required for safe operations. A plan for dealing with fauna during clearing and construction will be prepared to outline protocols for dealing with injured wildlife and other necessary actions relating to fauna.

The conservation value of previously disturbed or cleared sections of the Study area which are outside the proposed mining area, will be managed to reduce fragmentation of vegetation and to meet existing commitments and statutory requirements.

The existing flora and fauna monitoring program will be continued and expanded as required to protect flora and fauna of 'conservation significance' within and surrounding the Study area. The monitoring program will be broadened as required for the revised Project and will continue until decommissioning and final rehabilitation.

NAC will also investigate the possibility of avoiding one of the identified areas of significant vegetation located in the vicinity of the planned infrastructure area (Brigalow and Poplar Box). Future detailed design and construction planning will help confirm the likelihood of this outcome. If feasible, possible options for the long term protection of the area of significant vegetation would be enclosure in a dedicated protection zone and incorporation into the CZMP.

NAC is committed to the implementation of a KSMP, which will include specific conservation management actions, such as:

- staff induction to include description of species of conservation significance that could be encountered at the revised Project site;
- the use of fauna spotters during clearing of vegetation;
- relocation of fauna captured during pre-clearing operations;
- incorporate of Koala feed trees into rehabilitation along Lagoon Creek; and
- monitoring of fauna incident rates to identify high mortality areas with a view to incorporating additional protective measures where appropriate.

### **3.11.12. Threatened Species Translocation Plan**

NAC intends to transplant all threatened/protected species endangered by the revised Project's activities to a new suitable location for long term protection. This approach will require detailed planning and preparation, and as minimum involve:

- better defining of all threatened/protected species that may be impacted by the revised Project's activities (i.e. at an appropriate scale);

- identification of suitable locations for the recovered plants (i.e. based on plant numbers, habitat requirements, avoiding possible future revised Project activities, etc.);
- collection of propagules (e.g. seeds, etc.) prior to transplanting for propagation to protect against genetic loss from potential establishment failure; and
- implementation of the TSTP.

The TSTP will include the transplantation management goals/objectives, site details, a propagule collection and propagation strategy, planned transplantation techniques (e.g. site preparation, transplanting methods, timing, watering regime - pre and post transplantation, etc.), transplantation success criteria, a monitoring and reporting regime, a maintenance regime for weeds and poor establishment, and a comprehensive long term management regime. The TSTP would require Commonwealth and State approvals under the EPBC Act and EP Act, respectively.

#### 3.11.13. Bluegrass Offset Management Plan

The revised Project will clear 40.1 hectares of Queensland Bluegrass (*Dichanthium sericeum*) grassland community, which is classified as a significant vegetation community by the Commonwealth and State governments. As a result, NAC is proposing to develop a biodiversity offset for the 40.1 hectares of *Dichanthium sericeum* grassland community. The proposed biodiversity offset will be located on land owned and controlled by APC, and comprise an area in the order of approximately 90 ha.

To gain acceptance from DotE for its biodiversity offset, NAC is proposing to conduct a trial during the approvals and construction phase of the revised Project to demonstrate that a Bluegrass grassland community comprising the appropriate species can be developed. The BOMP (**Appendix J.8** of the draft EIS) has outlined the methodology for establishing and managing a Bluegrass grassland community.

#### 3.11.14. Weed Management

A PWMP has been prepared for the revised Project and is presented in **Appendix J.9**. Ongoing pest control will occur on an as needs basis to ensure population numbers are kept low. Thereby, minimising the potential impacts on native flora and fauna within the revised Project site.

#### 3.11.15. Monitoring

Routine ecological monitoring is currently undertaken for the Mine. This monitoring is set to be expanded to incorporate the Study area, for example, the monitoring requirements of the proposed new vegetation related management plans. To ensure consistency with baseline data, monitoring will be scheduled to follow significant regional rainfall.

Other issues that will be considered in the monitoring program include:

- monitoring the protection of 'endangered' and 'of concern' vegetation through pre-clearing checks and delineating vegetation to be retained;
- monitoring the revegetation of 'endangered' and 'of concern' regional ecosystems;
- establishment of a wildlife monitoring program using appropriate survey techniques and population indices to monitor the impacts on target species and to determine level of use of regeneration areas and disturbed habitats; and
- weed monitoring in conservation and buffer zones.



### 3.11.16. *Proposed Environmental Authority Conditions: Schedule I – Nature Conservation*

No specific EA conditions are proposed for nature conservation.

## 3.12. **Community**

### 3.12.1. *Background*

The consultation program implemented by NAC, as described in this section, reflects both the formal consultation activities carried out specifically for the revised Project and the existing community and stakeholder engagement activities undertaken as part of NAC's on-going community consultation program for the Mine.

A comprehensive community stakeholder engagement program has been undertaken as part of the EIS assessment. Consultation with all key stakeholders will continue throughout the life of the revised Project. During the consultation period, more than 627 contacts were made with the revised Project team via the revised Project contact points, community information sessions, CRG meetings, individual meetings and discussions during visits to the New Hope Community Information Centre since the announcement of the revised Project in November 2012.

A summary of the top five key feedback topics raised by stakeholders through all engagement activities is provided in **Table 3-37**.

**Table 3-37 Detail of Key Feedback Topics**

No.	Times Topic Raised	Key Feedback Topic	Feedback Detail	Proposed mitigation
1	105	Engagement activities	Requests for information about community information sessions, site tours and stakeholder briefings contributed to the amount of times this feedback topic was raised as it was used to capture general engagement activities. Advisory agencies were also interested in hearing about engagement activities.	NAC will continue to provide proactive stakeholder engagement activities about the revised Project and notify the community about these.
2	97	Sponsorship and donation	Requests for and discussions about current NHG sponsorships are included here. A number of stakeholders also wanted to know more about which organisations NHG sponsored.	NHG will continue to contribute sponsorships and donations to support schools, sporting groups and not-for-profit organisations in the local region.
3	93	Employment opportunities	The general community raised interest in employment opportunities as part of the revised Project – these primarily came from people attending the New Hope Community Information Centre. Many were supportive of additional jobs for the community and pleased most workers were expected to be from the local region.	Revised Project to provide an additional 135 jobs, and 260 jobs during construction. NAC has a local employment policy, where possible. These concerns have also been addressed in Chapter 16.

No.	Times Topic Raised	Key Feedback Topic	Feedback Detail	Proposed mitigation
4	78	Community partnerships	Discussions about and requests for community partnerships with NHG, including attendance at the CareFlight events, education partnerships, career expos, and Oakey Chamber of Commerce meetings.	NHG has established a Community Investment Fund to identify and support additional community projects that promote the community's cultural, social, health or environmental wellbeing.
5	56	Draft EIS	Feedback was received in response to information provided to stakeholders and advisory bodies regarding the draft EIS. Comments include: "Thanks for the information. When do you think the draft EIS will go in to the Mines Department for approval?" "Thanks...please let us know if there is anything we can do to assist in support of your EIS application."	NAC will continue to inform stakeholders about the approvals process and provide proactive engagement activities to seek feedback on the revised Project.

Stakeholder comments regarding the revised Project have been generally supportive with 64% of contacts with stakeholders recorded as being positive, particularly regarding the changes NAC made to develop the revised Project plan, indicating these revisions have addressed key concerns about the original proposal. Just 6% of contacts with stakeholders were recorded as negative since announcement of the revised Project in November 2012.

There has been a general view that the revised Project is an opportunity for the local area to gain additional employment, training, sponsorship, community investment and business opportunities for Oakey and the surrounding communities.

### **3.12.2. Environmental Value**

The environmental values that are to be protected and enhanced are the 'lifestyle of the local community', including the wealth, health, safety, and wellbeing of the community surrounding the revised Project site.

### **3.12.3. Potential Impacts on the Environmental Value**

Mining activities have the potential for the following impacts (positive and negative) on community environmental values:

- dust;
- noise;
- ground vibration;
- water level and quality impacts;

- downstream water quality;
- lighting;
- traffic;
- airblast overpressure;
- community lifestyle; and
- local economy.

#### **3.12.4. Proposed Environmental Protection Objective**

The revised Project's environmental protection objective is to minimise environmental nuisance to neighbours from mining and associated activities and to respond to concerns expeditiously.

#### **3.12.5. Commitments**

- NAC will continue to consult with relevant stakeholders using a variety of communication mechanisms to ensure that the local community is continually engaged about the revised Project. NAC will also continue to ensure its neighbours are properly consulted in relation to revised Project.
- NAC will continue its current policy of informing near neighbours in advance of each blast event on site. NAC will continue to consult with local authorities and/or relevant State government departments in relation to mining related issues.
- The revised Project has an established and operational complaints procedure that includes:
  - maintenance of a register of complaints held on-site;
  - a process for receiving, handling, investigating and documenting complaints;
  - investigation follow up and a response as soon as practicable to the complainant; and
  - a commitment to resolving legitimate complaints in an amicable and timely manner.

#### **3.12.6. Proposed Environmental Authority Conditions: Schedule J - Community**

No specific EA conditions are proposed for community.

### **3.13. Visual Amenity and Lighting**

#### **3.13.1. Background**

The undulating nature of the revised Project site generally provides for extensive views of a predominately rural landscape with a medium degree of visual amenity. Apart from the Mine, the revised Project site is dominated by interspersed vegetated landscapes with unobtrusive residential developments.

In its initial stages, the revised Project would be a visually prominent feature within the landscape and, to an extent, will conflict with the existing nature of the visual environment. The nature of the works will initially alter the existing visual environment through excavation of a predominately rural landscape and the removal of vegetation.

As is common with the broader region, residential dwellings surrounding the revised Project site are sparsely located and it is considered that approximately eight of the 23 sensitive receptors would have an expansive view of the various works being undertaken for the revised Project.

Primarily, traffic on Oakey-Cooyar would have the highest level of visibility over the revised Project site. However, as the traffic is considered as a temporary receptor, impacts are considered to be minor. Sensitive receptors within Acland would also have views of the revised Project site due to its proximity, but suitable mitigation measures such as vegetation screening will minimise visual impacts.

### **3.13.2. Environmental Value**

The environmental values of the visual amenity and lighting environment to be enhanced or protected under this EM Plan are the qualities of the visual amenity and lighting environment that support the safety, lifestyle, general living and wellbeing of humans.

### **3.13.3. Potential Impacts on the Environmental Value**

Through the clearing of vegetation, the excavation of the mine pit areas and the establishment of out-of-pit spoil dumps, the revised Project will alter the local visual environment and landscape character throughout the life of the mining operations.

#### **Visual Amenity**

During construction, operation and decommissioning of the revised Project, aspects that would be most visible from the nearby sensitive receptors include:

- out-of-pit spoil dumps;
- mine pit areas and voids located close to the boundaries of the revised Project site and the sensitive receptors;
- the rail spur and TLF;
- the MHF; and
- the realignment of Jondaryan-Muldu Road.

The relatively undulating topography surrounding the revised Project site provides for both expansive and limited views. Although, some higher points within the landscape provide for significant views of the revised Project, the presence of vegetation on localised hills and ridgelines limits views from other vantage points.

Motorists travelling along Oakey-Cooyar Road would have extensive views of the mine pit areas and out-of-pit spoil dumps due to both the expansive views to the west from this road and its proximity to the revised Project site.

Acland is expected to experience visual impacts due to both the proximity of the revised Project and expansive views to the west.

Visual impacts on the western side of the revised Project site would generally be confined to the rail spur and re-alignment of Jondaryan-Muldu Road. A ridgeline running along the western boundary of the revised Project site would limit views of mining activities.

Sensitive receptors located to the north and north-east of the revised Project site are expected to experience limited visual impacts due to the fact that existing operations at the Mine

would offset impacts. Rehabilitation such as re-vegetation has occurred in these areas, limiting views of the existing mining activities.

## Lighting

Night lighting is expected to create a glow in the night sky that will be visible from the surrounding region and nearby residences. Permanent lighting around the CHPP precinct, MHF, TLF and mining areas will contribute to a general glow in the night sky, as well as in-pit machinery, mobile equipment and mining vehicles. Lighting for the revised Project has the potential to cause impacts to the operations of the Oakey Airbase and Training Centre. The Aviation Hazard Management produced for the revised Projects' draft EIS (**Appendix J.17**) of this outlines the mitigation measures that will be implemented for the revised Project.

However, as the Mine already provides some luminance in the night sky, it is unlikely that the revised Project will substantially increase the existing visual impact of night time glow. The CHPP will be upgraded at its current location and as such, only slight changes in night lighting would be experienced. Furthermore, the light emitted from the new TLF area is expected to be reduced by comparison to the current JRLF.

The impacts on fauna from night lighting are expected to be minimal due to the location and extent of remnant vegetation.

### 3.13.4. *Proposed Environmental Protection Objective*

NAC will ensure that light from the revised Project does not cause a nuisance to any nearby light sensitive receptors (e.g. nearby residents or drivers using roadways adjacent to the Mine).

### 3.13.5. *Control Strategies*

NAC will continue to implement the following light pollution control strategies for the revised Project.

- Legitimate light complaints will be dealt with promptly using NAC's complaint handling procedure. Appropriate control strategies will be implemented as necessary in order to address the cause(s) of legitimate complaints and to otherwise ensure compliance is maintained.
- As currently practised, near neighbours to the revised Project will be provided with afterhours contact numbers to allow prompt response to complaints, such as noise and light.
- As required, light sources at the revised Project will be fitted with shielding devices (e.g. glare shields and screens) to reduce and remove light pollution.
- Where possible, lighting required for the revised Project site will be oriented inwards, carefully focussed on the areas requiring illumination and screened from the outside.

### 3.13.6. *Proposed Environmental Authority Conditions: Schedule K - Light*

No specific EA conditions are proposed for Light.



### **3.14. Cultural Heritage**

#### **3.14.1. Background**

Indigenous and non-indigenous cultural heritage places and values have been recorded as part of cultural heritage investigations conducted over the revised Project site at various times.

Further information on the non-indigenous and indigenous cultural heritage over the Study area is available in **Chapter 12** of the draft EIS.

#### **3.14.2. Non-indigenous Cultural Heritage**

Under the Queensland Heritage Register, one registered item exists within the Study area – the Acland Mining Museum or former Acland No. 2 Colliery. The significance of the Acland Mining Museum from a heritage perspective is that it provides an insight into the development of mining technology and methodologies over the long period.

#### **3.14.3. Indigenous Cultural Heritage**

From archaeological records, the Acland area was an important route for Aboriginal people travelling to the bunya nut festivals in the Bunya Mountains. This triennial festival with its social, economic and spiritual associations had a major significance for the tribes of southeast Queensland and northern New South Wales.

A number of artefact scatters and sites have been found within the revised Project site during surveys and a greater number of indigenous sites were located in proximity to artefact reduction sites and quarries. (Refer to **Chapter 12**). The Aboriginal people either camped within the Acland area en-route to the bunya nut harvests, or utilised its resources.

NAC has a legal agreement with the Traditional Owner Group - Western Wakka Wakka and has a Cultural Heritage Management Plan (CHMP) in place.

#### **3.14.4. Environmental Value**

The cultural and scientific significance of European and Aboriginal occupation in the vicinity of the revised Project.

#### **3.14.5. Potential Impacts on the Environmental Value**

Potential impacts on cultural heritage values include loss of and/or damage to artefacts and places of European and Aboriginal significance without proper assessment, collection and/or relocation.

#### **3.14.6. Proposed Environmental Protection Objective**

The revised Project's environmental protection objective is to preserve the cultural heritage values (Indigenous and Non-Indigenous) of the revised Project site.

#### **3.14.7. Performance Criteria**

The performance criteria for cultural heritage management are:

- compliance with requirements of the *Aboriginal Cultural Heritage Act 2003* (ACH Act) and the revised Projects' CHMP;

- conformance with the ACMP (**Appendix J.12**) and Acland Management Strategy (**Chapter 3**);
- avoidance of all cultural heritage sites wherever possible; and
- cultural heritage clearance processes prior to ground disturbance.

#### **3.14.8. Control Strategies - Non-indigenous Cultural Heritage**

##### **Acland Management Strategy**

In developing the Acland Management Strategy, the following guiding principles were adopted:

- remove dysfunctional buildings and infrastructure in a state of disrepair;
- tidy up and maintain land;
- retain items of local historical or heritage significance;
- enhance amenity of Tom Doherty Park and the Acland Community Hall; and
- meet legal obligations.

The Acland Management Strategy outlining the property types and structures in Acland currently owned by the NHG is provided in **Chapter 3**.

##### **Acland Colliery Management Plan**

To satisfy its obligations as an owner of a Queensland Heritage listed site, the NHG has developed the ACMP for the Acland No.2 Colliery, and is provided in **Appendix J.12** of the draft EIS. The purpose of the ACMP is to set out an agreed framework for the management, preservation and maintenance of the listed structures within the former Acland No.2 Colliery site.

As a Queensland Heritage listed site, the significance of the former Acland No.2 Colliery requires that the following general commitments are undertaken.

- The historical mine site, including all built, moveable and landscape features should be maintained and conserved within their original setting, particularly where possible elements of moderate and high rankings of significance;
- Significant elements should be maintained;
- Intrusive elements should be removed;
- Development on or immediately adjoining the site should be avoided or if necessary only undertaken with full consideration of the cultural heritage significance of the site; and
- The scale, form and setting of the place should be respected and any proposed management or use options should be sympathetic to its historic use.

The ACMP provides an overview of the statutory and non-statutory requirements for the listed items including inspection and maintenance schedules and associated record-keeping requirements. A total of twenty-one management commitments have been included in the ACMP to ensure the former Acland No.2 Colliery receives a high standard of management and is protected for future generations.

#### **3.14.9. Control Strategies - Indigenous Cultural Heritage**

NAC has an existing CHMP with members of the Western Wakka Wakka which meets duty of care standards set by the ACH Act. NAC is legally bound to implement and maintain the legal agreements and CHMPs with the Western Wakka Wakka Traditional Owners. NAC will ensure all of its cultural heritage responsibilities are met.

#### **3.14.10. Control Strategies - Fossils**

If fossils are located during the development and operation phases of the revised Project, NAC will advise the Queensland Museum.

#### **3.14.11. Commitments**

NAC will ensure the following:

- All employees and contractors will undertake cultural heritage awareness training; and
- All indigenous cultural heritage management will be in accordance with the revised Projects' CHMP.

#### **3.14.12. Proposed Environmental Authority Conditions**

No specific EA conditions are proposed with respect to cultural heritage.

## **4. Environmental Management**

### **4.1. Monitoring**

#### **4.1.1. Background**

Environmental monitoring is performed in accordance with the EA to provide data to measure the impact of the revised Project on the surrounding environment and to measure the efficiency/effectiveness of the various environmental impact control strategies.

The current Environmental Monitoring Plan will be updated to incorporate the expanded requirements of the revised Project. The monitoring program will outline the environmental monitoring to be undertaken, including monitoring sites, parameters and their frequency of measurement and will also make reference to monitoring procedures and records. The Environmental Monitoring Plan will be made available to the administering authority on request.

The monitoring will include rehabilitation success, surface water quality, groundwater quality and level, air quality (PM<sub>10</sub> particulate and dust deposition levels), noise, blasting (air blast over-pressure and vibration), and as required, light. Commitments and EA conditions have been included in the relevant sections of the EM Plan.

Environmental monitoring data will be collected for the various monitoring parameters, stored for a period of at least five years in a suitable accessible format, and reported internally to key personnel on at least a monthly basis, and externally to the DEHP on an as required basis.

### **4.2. Reporting**

#### **4.2.1. Internal**

All environmental incidents will be recorded, and as require, investigated.

#### **4.2.2. External**

NAC aims to provide timely, relevant and appropriately presented information to government authorities, the local community and the general public on the environmental performance of the revised Project.

Reporting commitments under the EA and other legislation will be complied with and includes:

- preparing an Annual Return, as required under the EP Act;
- submitting the annual National Pollutant Inventory (NPI) report;
- reporting incidents that may potentially compromise compliance with the EA immediately to the administering authority; and
- preparing reports as required under other legislation, for example, the National Greenhouse and Energy Reporting System (NGERS) and Energy Efficiency Opportunities.

### 4.3. Environmental Management System

The revised Project operations will take place under NHG's EMS, which is consistent with ISO 14001. The EMS will be the cornerstone of the operation's due diligence approach to environmental management and encompasses the measures used to identify, prevent or minimise environmental harm, ensure compliance and promote continuous improvement. It will encompass legal and other requirements such as the EA for the revised Project and also risks and opportunities that this EM Plan defines.

### 4.4. Research

NAC supports research in mining and has committed support to the Australian Coal Association Research Program (ACARP). As required NAC will commission the necessary research to address any outstanding environmental or rehabilitation issues identified in relation to operation of the revised Project.

NAC also contributes to the COAL21 fund which aims at fully realising the potential of advanced technologies to reduce or eliminate greenhouse gas emissions associated with the use of coal.

### 4.5. Roles and Responsibilities

All revised Project and existing Mine staff have a responsibility to work under a General Duty of Care of the EP Act, and must implement requirements in an EMS based on agreed plans and procedures outlined in this EM Plan and other supporting environmental management plans to be administered through each Plan of Operations.

The General Manager will hold ultimate responsibility for environmental compliance and implementation of NAC's Environmental Policy in accordance with Sections 492 and 493 of the EP Act.

The responsibility of NAC, at a minimum is outlined below:

- Implement and monitor requirements in the EMS;
- Provide suitable environmental training/instruction in line with the EMS;
- Ensure regular EMS reviews are undertaken;
- Ensure that appropriate and adequate resources are provided to enable the requirements of the EMS and the corresponding EA;
- Any major environmental incidents are reported in a timely and appropriate manner to the relevant internal and external bodies;
- External contractors responsibilities, as a minimum, shall:
  - Understand and comply with the EMS and the corresponding EA;
  - Undergo relevant site inductions and environmental awareness training/instruction to understand their responsibilities while on site under this EMS;
  - Ensure environmental safeguards are in place to avoid environmental harm;
  - Ensure all equipment used is in good service and all precautions in place to avoid environmental harm;



- Regularly inspect and monitor activities for environmental compliance and proactive environmental management; and
- Report all environmental incidents to the NAC Environmental representative or manager within 24 hours.

#### **4.6. Staff Training**

NAC will ensure that all employees, contractors and visitors receive appropriate environmental awareness training. This action is achieved through a variety of methods including induction training, formal presentations and impromptu meetings.

Specifically, NAC requires that employees, contractors and visitors are aware of:

- their roles and responsibilities (including environmental incident reporting);
- the environmental impacts, potential or actual, of their activities on-site;
- natural hazards such as poisonous and venomous animals;
- the potential consequences of poor environmental performance; and
- site emergency procedures.

Employees and contractors required to undertake work on-site must undergo an environment, health and safety induction. Records of training content and attendance are maintained. Relevant environmental matters for inductions and training may include:

- environmental policy;
- duty of care and duty to notify;
- hazard and incident reporting;
- environmental awareness;
- risk management;
- chemicals and hydrocarbon management;
- land management;
- water management; and
- waste management.

#### **4.7. Communications**

##### **4.7.1. Internal**

Internal communications will be continued as per existing mine operations, including the following activities:

- Environmental reporting in weekly/monthly reports;
- Environmental items regularly discussed at toolbox meetings;

- Complaints reported, recorded and managed;
- Environmental risk assessment incorporated into pre-start and JSEA checklists; and
- Regular environmental communiques via email, noticeboards, etc.

#### **4.7.2. External**

External communications will include:

- Statutory environmental reporting including Annual Returns, environmental incidents, and breaches of the EA;
- NPI and NGRS reporting; and
- Complaints.

#### **4.8. Documentation**

All relevant environmental documentation will be maintained within the existing EMS on-site, and will be maintained as required under the EA.

#### **4.9. Environmental Auditing and Review**

Environmental audits will be undertaken to assess site compliance with the EA, the EP Act, and any other relevant legislation as required. Audits shall also be undertaken to assess the performance of the sites' EMS.

An environmental auditing program will be implemented for the revised Project. The program will include:

- internal environmental audits – frequency decided by risk, as required by NAC's EMS;
- environmental management system review – frequency decided by risk, as required by NAC's EMS;
- Plan of Operations audits – with each Plan of Operations (usually annually); and
- administering authority audits – at a frequency determined by the DEHP.

##### **4.9.1. Evaluation of Compliance**

Evaluation of compliance will be achieved through the use of an environmental auditing program as discussed above.

##### **4.9.2. Non-conformity, Corrective Action and Preventive Action**

A Register of non-conformances and corrective actions will be kept to proactively manage and prevent future incidents or non-conformances. A level of severity will be recorded, and according to this level, the issue will be dealt with in one of several ways:

- Root cause analysis conducted;
- Actions to address the non-conformance including:
  - Remediation actions;

- Prevention of repeat non-conformances; and/or
- Changes to process, systems or design;
- Person(s) responsible to address, manage and close-out non-conformance; and
- Time-frame to complete process.

#### **4.9.3. Control of Records**

All reports, meeting minutes, incidents, complaints, non-conformance register(s), and associated environmental communications will be maintained on-site and available when required by auditors, Administering Authority or other relevant party.

All environmental monitoring data and supporting information managed within the EMS will be held on-site using a centralised data management system.

#### **4.9.4. Internal and External Audits**

NAC will conduct environmental audits to assess compliance with regulatory requirements and the performance of the EMS.

The objectives of the environmental auditing and review programs are to:

- To demonstrate that the revised Project is operated in accordance with its Environmental Authority;
- Monitor and report on compliance with statutes, EMS commitments and Plan of Operations, environmental policy, company standards, best practice guidelines and signatory codes;
- Monitor the EMS for consistency with the principles of ISO14001; and
- Ensure a senior management review of performance, via consideration of the audit reports.

#### **4.10. Management Review**

During development of the revised Project, management review will be undertaken with the contract review process and annually once the revised Project is operational.

Documentation to be prepared for a management review includes:

- Audit/compliance results;
- Contractor environmental performance history;
- Non-conformance status and progress of listed items;
- Management of changes in mine operation, legislation, or organisational structure; and
- Recommendations for improvement.

This review process should be an iterative one which provides workable recommendations to the management of the mine.

#### 4.11. Management Plans and Monitoring Programs

There are 20 management plans that support the revised Project development and its environmental approvals application. These management plans have all been drafted for submission with the draft EIS and the AEIS. They will be revised to suit practical implementation and will be regularly reviewed and updated as changes occur to the revised Project. The list of management plans is provided below:

- ITSF Management Plan (**Appendix J.1** of the draft EIS)
- Final Land Use and Rehabilitation Plan (**Appendix J.2** of the draft EIS)
- Topsoil Management Plan (**Appendix J.3** of the draft EIS)
- Water Resource Management Plan (**Appendix J.4** of the draft EIS)
- Groundwater Monitoring & Impact Management Plan (Revised) (**Appendix H** of the AEIS)
- Conservation Zone Management Plan (**Appendix J.6** of the draft EIS)
- Threatened Species Translocation Plan (**Appendix L** of the AEIS)
- Bluegrass Offset Management Plan (**Appendix J.8** of the draft EIS)
- Pest and Weed Management Plan (**Appendix J.9** of the draft EIS)
- Air Quality Management Plan (**Appendix J.10** of the draft EIS)
- Noise and Vibration Management Plan (**Appendix J.11** of the draft EIS)
- Acland Colliery Management Plan (**Appendix J.12** of the draft EIS)
- Waste Management Plan (**Appendix J.13** of the draft EIS)
- Social Impact Management Plan (Revised) (**Appendix E** of the AEIS)
- Emergency Management Plan (**Appendix J.15** of the draft EIS)
- Strategic and Corporate Risk Management Framework (**Appendix J.16** of the draft EIS)
- Aviation Hazard Management Plan (**Appendix J.17** of the draft EIS)
- Local Stakeholder Management Plan (**Appendix J.18** of the draft EIS)
- Koala Species management Plan (**Appendix B** of the AEIS)
- Acland Management Plan (**Appendix I** of the AEIS)
- Revised Biodiversity Offset Strategy (**Appendix M** of the AEIS, and **Attachment C** of Project Memorandum 2)

#### 4.12. Proposed Environmental Authority Conditions

Environmental monitoring will occur in accordance with the requirements of the EA and is addressed in the relevant Schedule Conditions above.

## 5. References

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## Appendix A Proposed Environmental Authority Conditions

### A.1 Proposed Conditions

#### Schedule A - General

- A1** This environmental authority authorises environmental harm referred to in the conditions. Where there is no condition or this environmental authority is silent on a matter, the lack of a condition or silence does not authorise environmental harm.
- A2** In carrying out the mining activity authorised by this environmental authority, the holder of this environmental authority must comply with Figure 1 (Revised Project Overview – Mine Area).
- A3** The holder of this environmental authority must:
- e) install all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority
  - f) maintain such measures, plant and equipment in a proper and efficient condition
  - g) operate such measures, plant and equipment in a proper and efficient manner
  - h) ensure all instruments and devices used for the measurement or monitoring of any parameter under any condition of this environmental authority are properly calibrated.

#### Monitoring

- A4** Except where specified otherwise in another condition of this environmental authority, all monitoring records or reports required by this environmental authority must be kept for a period of not less than 5 years.
- A5** Upon request from the administering authority, copies of monitoring records and reports will be made available and provided to the administering authority's nominated office within 10 business days or an alternative timeframe agreed between the administering authority and the holder.
- A6** Any management or monitoring plans, systems or programs required to be developed and implemented by a condition of this environmental authority should be reviewed for effectiveness in minimising the likelihood of environmental harm on an annual basis, and amended promptly if required, unless a particular review date and amendment program is specified in the plan, system or program.

#### Financial assurance

- A7** The activity must not be carried out until the environmental authority holder has given financial assurance to the administering authority as security for compliance with this environmental authority and any costs or expenses, or likely costs or expenses, mentioned in section 298 of the Act.

- A8** The amount of financial assurance must be reviewed by the holder of this environmental authority when a plan of operations is amended or replaced or the authority is amended.

### **Risk management**

- A9** The holder of this environmental authority must develop and implement a risk management system for mining activities which mirrors the content requirement of the Standards Australia Risk management – Principles and guidelines (AS/NZS ISO 31000:2009), or the latest edition of a Standards Australia for risk management, to the extent relevant to environmental management, prior to the commencement of mining activities.

### **Notification of emergencies, incidents and exceptions**

- A10** The holder of this environmental authority must notify the administering authority by written notification within 24 hours after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with, the conditions of this environmental authority.
- A11** Within 10 business days following the initial notification of an emergency or incident, or receipt of monitoring results, whichever is the latter, further written advice must be provided to the administering authority, including the following:
- d) results and interpretation of any samples taken and analysed
  - e) outcomes of actions taken at the time to prevent or minimise unlawful environmental harm
  - f) proposed actions to prevent a recurrence of the emergency or incident.

### **Complaints**

- A12** The holder of this environmental authority must record all environmental complaints received about the mining activities including:
- i) name, address and contact number for of the complainant
  - j) time and date of complaint
  - k) reasons for the complaint
  - l) investigations undertaken
  - m) conclusions formed
  - n) actions taken to resolve the complaint
  - o) any abatement measures implemented
  - p) person responsible for resolving the complaint.
- A13** The holder of this environmental authority must, when requested by the administering authority, undertake relevant specified monitoring within a reasonable timeframe nominated or agreed to by the administering authority to

investigate any complaint of environmental harm. The results of the investigation (including an analysis and interpretation of the monitoring results) and abatement measures, where implemented, must be provided to the administering authority within 10 business days of completion of the investigation, or no later than 10 business days after the end of the timeframe nominated by the administering authority to undertake the investigation.

### **Third-party reporting**

**A14** The holder of this environmental authority must:

- d) within 1 year of the commencement of this environmental authority, obtain from an appropriately qualified person a report on compliance with the conditions of this environmental authority
- e) obtain further such reports at regular intervals, not exceeding 3 yearly intervals, from the completion of the report referred to above; and
- f) provide each report to the administering authority within 90 days of its completion.

**A15** Where a condition of this environmental authority requires compliance with a standard, policy or guideline and the standard is amended or changed subsequent to the issue of this environmental authority, the holder of this environmental authority must:

- c) comply with the amended or changed standard, policy or guideline within 2 years of the amendment or change being made, unless a different period is specified in the amended standard or relevant legislation, or where the amendment or change relates specifically to regulated structures referred to conditions H3 to H36, the time specified in that condition
- d) until compliance with the amended or changed standard, policy or guideline is achieved, continue to remain in compliance with the corresponding provision that was current immediately prior to the relevant amendment or change.

### **Schedule B - Air**

#### **Dust and particulate matter monitoring**

**B1** The Proponent shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that the dust and particulate matter emissions generated by the mining activities do not cause exceedances of the following levels when measured at any sensitive or commercial place:

- a) Dust deposition of 120 milligrams per square metre per day, averaged over 1 month, when monitored in accordance with the most recent version of Standards Australia AS/NZS 3580.10.1 Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method.

- b) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM<sub>10</sub>) suspended in the atmosphere of 50 micrograms per cubic metre over a 24-hour averaging time, for no more than 5 exceedances recorded each year, when monitored in accordance with the most recent version of either:
1. Standards Australia AS/NZS 3580.9.6 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM<sub>10</sub> high volume sampler with size-selective inlet - Gravimetric method; or
  2. Standards Australia AS/NZS 3580.9.9 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM<sub>10</sub> low volume sampler - Gravimetric method.
  3. Standards Australia AS 3580.9.8 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM<sub>10</sub> continuous direct mass method using a tapered element oscillating microbalance analyser;
- c) A concentration of particulate matter suspended in the atmosphere of 90 micrograms per cubic metre over a 1 year averaging time, when monitored in accordance with the most recent version of AS/NZS3580.9.3:2003 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - Total suspended particulate matter (TSP) - High volume sampler gravimetric method.

**B2** If monitoring indicates the potential for exceedance of the relevant limits in condition B1 then the environmental authority holder must immediately implement dust abatement measures to avoid exceeding the relevant limits.

**B5** An Air Emissions Management Plan must be developed by a suitably qualified person and implemented. The Air Emissions Management Plan must incorporate a program for continuous improvements for the management of dust resulting from mining operations with respect to, but not limited to:

- d) The collection of air quality and meteorological data in accordance with Table A: Air quality monitoring requirements;
- e) A system to identify adverse meteorological conditions likely to produce elevated levels of dust including PM<sub>10</sub> at a sensitive or commercial place due to the mining conditions; and
- f) A dust control strategy which activates a timely implementation of dust control management actions aimed to avoid elevated levels of dust including PM<sub>10</sub> at a sensitive or commercial place due to mining activities.

**B6** A copy of the Air Emissions Management Plan and any changes to the Air Emissions Management Plan must be provided to DEHP on request.

**Table A. Air quality monitoring requirements**

Monitoring location*	Air quality indicator	Instrument	Frequency	Air quality	Nuisance limit	Monitoring method
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				limit		
1,2 (Acland)	PM <sub>10</sub>	TEOM	Continuou s	50µg/ m <sup>3</sup> (24 hr avg)		AS 3580.9.8- 2008
	TSP	Hi-Vol Sampler	24hr, 1 day in 6	90µg/ m <sup>3</sup> (annual )	80µg/m <sup>3</sup> (24 hr avg)	AS/NZS 3580.9.3:200 3
	TSP# <sup>1</sup>	Modified TEOM v	Continuou s	90µg/ m <sup>3</sup> (annual )	80µg/m <sup>3</sup> (24 hr avg)	Modified TEOM
	Insoluble solids	Dust gauge	Monthly		120mg/m <sup>2</sup> /d ay	AS/NZS 3850.10.1:20 03
	Wind speed and direction		Hourly			AS 3580:14- 2011
35,36 (west of mine site)	PM <sub>10</sub>	TEOM	Continuou s	50µg/ m <sup>3</sup> (24 hr avg)		AS/NZS 3580.9.8- 2008
	TSP	Hi-Vol Sampler	24hr, 1 day in 6	90µg/ m <sup>3</sup> (annual )	80µg/m <sup>3</sup> (24 hr avg)	AS/NZS 3580.9.3:200 3
	Insoluble solids	Dust gauge	Monthly		120mg/m <sup>2</sup> /d ay	AS/NZS 3850.10.1:20 03
Acland- Silverleigh Road (at	PM <sub>10</sub>	TEOM	Continuou s	50µg/ m <sup>3</sup> (24 hr avg)		AS/NZS 3580.9.8- 2008

site on Fig 3-2 where real time PM <sub>10</sub> and dust deposition is monitored.	TSP	Hi-Vol Sampler	24hr, 1 day in 6	90µg/m <sup>3</sup> (annual)	80µg/m <sup>3</sup> (24 hr avg)	AS/NZS 3580.9.3:2003
	Insoluble solids	Dust gauge	Monthly		120mg/m <sup>2</sup> /day	AS/NZS 3850.10.1:2003
as per Figure 3-2.	Insoluble solids	Dust gauge	Monthly		120mg/m <sup>2</sup> /day	AS/NZS 3850.10.1:2003
Siting of monitoring equipment						AS/NZS 3580.1.1:2007

\*See Figures 3-1 and 3-2 Revised Environmental Management Plan (New Acland AEIS)

\*See Figures 3-1 and 3-2 Revised Environmental Management Plan (New Acland AEIS, August 2014)

#Data from the modified TEOM and Hi-Vol samplers to be used to calibrate the modified TEOM for monitoring TSP. Calibration results can be used at other sites to derive TSP. Once the TEOM has been calibrated (calibration undertaken over at least 6 months period from June to December), a modified TEOM can be used to measure TSP instead of Hi-Vol sampler.  
1 The modified TEOM can be used to measure TSP at other sites.

### Schedule C - Waste management

- C1** Unless otherwise permitted by the conditions of this environmental authority or with prior approval from the administering authority and in accordance with a relevant standard operating procedure, waste must not be burnt.
- C2** The holder of this environmental authority may burn vegetation cleared in the course of carrying out extraction activities provided the activity does not cause environmental harm at any sensitive place or commercial place.
- C3** The holder of this environmental authority may dispose of inert waste (packing material) associated with blasting into open pits, buried in such a manner that it will not impede saturated aquifers.

### Disposal of Tyres

- C4** Scrap tyres resulting from the mining activities can be disposed of into open pits provided tyres are placed as deeply in the spoil as reasonably possible and this practice does not cause an unacceptable fire risk or compromise mine safety.

- C5** Scrap tyres resulting from the mining activities disposed within the operational land must not impede saturated aquifers or compromise the stability of the consolidated landform.

## Tailings disposal

- C6** Tailings must be managed in accordance with procedures contained within the current plan of operations. These procedures must include provisions for:
- containment of tailings
  - the management of seepage and leachates both during operation and the foreseeable future
  - the control of fugitive emissions to air
  - maintaining records of the relative locations of any other waste stored within the tailings
  - rehabilitation strategy
  - monitoring of rehabilitation, research and/or trials to verify the requirements and methods for decommissioning and final rehabilitation of tailings, including the prevention and management of acid mine drainage, erosion minimisation and establishment of vegetation cover.

## Schedule D - Noise

### Noise limits

- D1** The holder of this environmental authority must ensure that noise generated by the mining activities does not cause the criteria in **Table D1 – Noise limits (existing operations)** and **Table D1b – Noise limits (operations)** to be exceeded at a sensitive place or commercial place.

**Table D1a – Noise limits (existing operations)**

Noise level dB(A) measured as	All days		
	7am – 6pm	6pm – 10pm	10pm – 7am
	Noise measured at a 'Noise sensitive place'		
$L_{Ar}$ , 1hour	50	45	40
$L_{Amax}$	-	-	50

**Table D1b – Noise limits (operations<sup>3</sup>)(includes construction activities)**

Noise level dB(A) measured as	All days		
	7am – 6pm	6pm – 10pm	10pm – 7am
	Noise measured at a 'Noise sensitive place'		
L <sub>Aeq</sub> , adj, 15 min	42	42	37
L <sub>Amax</sub>	-	-	50
L <sub>Amax</sub> rail spur	-	-	56
L <sub>Aeq</sub> (24hr) rail spur	-	-	50

**D2** Noise limits in **Table D1a – Noise limits (existing operations)** only apply until the commencement of mining activities (removal of overburden) for the Manning Vale East Pit, the Manning Vale West Pit or the Willeroo Pit as shown on Figure 1.

**D3** If monitoring indicates the potential for exceedance of the relevant limits in **Table D1a** and **Table D1b – Noise Limits** then the environmental authority holder must immediately implement noise abatement measures to avoid exceeding the relevant limits.

#### **Airblast overpressure nuisance**

**D4** The holder of this environmental authority must ensure that blasting does not cause the limits for peak particle velocity and air blast overpressure in **Table D2 – Blasting noise limits** to be exceeded at a sensitive place or commercial place.

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<sup>3</sup> Includes construction activities



**Table D2 – Blasting noise limits**

Blasting noise limits	Sensitive or commercial blasting noise limits	
	Monday to Friday 7am to 6pm Saturday 9am to 1pm	Monday to Friday 6pm to 7am Saturday 1pm to 9am Sunday and Public Holidays
Airblast overpressure	115 dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear) Peak at any time	No blasting
Ground vibration peak particle velocity	5mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time	No blasting

**Monitoring and reporting**

- D5** Noise monitoring and recording must include the following descriptor characteristics and matters:
- h) LAN,T (where N equals the statistical levels of 1, 10 and 90 and T = 15 to 60 mins)
  - i) background noise  $L_{A90}$
  - j) the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to statistical levels
  - k) atmospheric conditions including temperature, relative humidity and wind speed and directions
  - l) effects due to any extraneous factors such as traffic noise
  - m) location, date and time of monitoring
  - n) if the complaint concerns low frequency noise, Max  $L_{pLIN,T}$  and one third octave band measurements in dB(LIN) for centre frequencies in the 10 – 200 Hz range.
- D6** The holder of this environmental authority must develop and implement a blast monitoring program to monitor compliance with **Table D2 – Blasting noise limits** for
- c) At least 90% of all blasts undertaken on this site in each year at the nearest sensitive place or commercial place to the centroid of the blast.
  - d) All blasts conducted during any time period specified by the administering authority at the nearest sensitive place or commercial place.

## Schedule E - Groundwater

### Contaminant release

- E1** The holder of this environmental authority must not release contaminants to groundwater.

### Monitoring and reporting

- E2** All determinations of groundwater quality and biological monitoring must be performed by an appropriately qualified person.
- E3** Groundwater quality and levels must be monitored at the locations and frequencies defined in **Table E1 - Groundwater monitoring locations and frequency** for quality characteristics identified in **Table E2 - Groundwater quality triggers and limits**.

**Table E1 - Groundwater monitoring locations and frequency**

Monitoring Point	Aquifer Compliance Bore (C)	Location (AGD84 – Zone 56)		Parameter <sup>1</sup> and Monitoring Frequency
		Easting (m)	Northing (m)	
2289P	Coal measures (C)	371265	6983532	Groundwater levels: monthly  Groundwater quality: Six monthly to include: Al, As, Ca, Se, Cl, Cu, F, Fe, Total N, K, Mg, Mn, Na, SO <sub>4</sub> , HCO <sub>3</sub> , TDS, EC, pH
2291P	Coal measures (C)	374620	6980033	
18P	Coal measures (C)	371028	6982641	
25P	Coal measures (C)	374146	6982057	
26P	Coal measures (C)	374266	6982977	
27P	Coal measures (C)	373360	6983554	
28P	Coal measures (C)	372328	6983977	
843	Basalt (C)	370698	6981283	
848	Coal measures (C)	370705	6981723	
81P	Coal measures (C)	375003	6979638	
82P	Coal measures (C)	373697	6978814	
83P	Coal measures (C)	371854	6979679	
84P	Basalt (C)	370355	6982187	
BMH1	Basalt (C)	369658	6982204	
CSMH1	Coal measures (C)	375404	6977336	
109P	Basalt	368263	6982378	
122PGC	Coal measures	370656	6977837	
114P	Coal measures	371806	6976037	
116P	Coal measures	374220	6975132	
119PGC	Coal measures	371609	6973337	

Monitoring Point	Aquifer Compliance Bore (C)	Location (AGD84 – Zone 56)		Parameter <sup>1</sup> and Monitoring Frequency
		Easting (m)	Northing (m)	
120WB	Coal measures	367523	6976115	
121WB	Coal measures	368472	6978441	
1A	Basalt	366548	6982090	
1B	Coal measures	366548	6982090	
2A	Basalt	365884	6979300	
2B	Coal measures	365884	6979300	
3A	Basalt	369416	6973707	
3B	Coal measures	369416	6973707	
4A	Basalt	365800	6977025	
4B	Coal measures	365800	6977025	
4C	Marburg Sandstone	365800	6977025	
5A	Oakey Creek alluvium	373845	6972482	
5B	Coal measures	373845	6972482	
5C	Marburg Sandstone	373845	6972482	
6	Coal measures	375435	6975738	
7A	Basalt	367572	6982694	
7B	Coal measures	367572	6982694	
8	Mine Pit Backfill	372514	6982689	

1 - Aluminium (Al), Arsenic (As), Calcium (Ca), Selenium (Se), Chloride (Cl), Copper (Cu), Fluorine (F), Iron (Fe), Total Nitrogen (Total N), Potassium (K), Magnesium (Mg), Manganese (Mn), Sodium (Na), Sulphate (SO<sub>4</sub>), Bicarbonate (HCO<sub>3</sub>), Total dissolves solids (TDS), Electrical conductivity ( EC), Acidity/alkalinity (pH)

**Table E2 - Groundwater quality triggers and limits**

Parameter	Units	Contaminant Limit <sup>1,5</sup>	Monitoring frequency
Al	mg/l	5.0	Half yearly
As	mg/l	.05	Half yearly
Ca	mg/l	1000	Half yearly
Se	mg/l	0.02	Half yearly
Cl	mg/l	TBA	Half yearly
Cu	mg/l	1.0 <sup>2</sup>	Half yearly

Parameter	Units	Contaminant Limit <sup>1,5</sup>	Monitoring frequency
F	mg/l	TBA	Half yearly
Fe	mg/l	TBA	Half yearly
NO <sub>3</sub>	mg/l	400	Half yearly
NO <sub>2</sub>	mg/l	30	Half yearly
K	mg/l	TBA	Half yearly
Mg	mg/l	TBA	Half yearly
Mn	mg/l	TBA	Half yearly
Na	mg/l	TBA	Half yearly
SO <sub>4</sub>	mg/l	1000	Half yearly
HCO <sub>3</sub>	mg/l	TBA	Half yearly
TDS	mg/l	5000 <sup>2,3</sup>	Half yearly
EC	mg/l	7460 <sup>2,3,4</sup>	Half yearly
pH	unit	TBA	Half yearly

1 – Based on Stockwater limits defined in ANZECC (2000)

2 – Defined for beef cattle based on landholder bore survey results

3 – Existing bores 27P, 28P, 2289 and 118P background levels already exceed this limit prior to mine operation

4 – Based on EC to TDS conversion factor of 0.67 as per ANZECC (2000)

**E4** Groundwater levels when measured at the monitoring locations specified in **Table E1 - Groundwater monitoring locations and frequency** must not exceed the groundwater level trigger change thresholds specified in **Table E3 - Groundwater level monitoring** below.

**Table E3 – Groundwater level monitoring**

Monitoring Point	Level trigger threshold <sup>4</sup>
2289P	TBA
2291P	TBA
18P	TBA
25P	TBA

<sup>4</sup> To be provided – Water level trigger thresholds will be proposed following 12 months of monitoring of the new bores and following the first update of the groundwater model prior to the operation of the revised project.

Monitoring Point	Level trigger threshold <sup>4</sup>
26P	TBA
27P	TBA
28P	TBA
843	TBA
848	TBA
81P	TBA
82P	TBA
83P	TBA
84P	TBA
BMH1	TBA
CSMH1	TBA
109P	TBA
122PGC	TBA
114P	TBA
116P	TBA
119PGC	TBA
120WB	TBA
121WB	TBA
1A	TBA
1B	TBA
2A	TBA
2B	TBA
3A	TBA
3B	TBA
4A	TBA
4B	TBA
4C	TBA
5A	TBA
5B	TBA
5C	TBA
6	TBA
7A	TBA



Monitoring Point	Level trigger threshold <sup>4</sup>
7B	TBA
8	TBA

### Exceedance Investigation

- E5** If quality characteristics of groundwater from compliance bores identified in **Table E1 - Groundwater monitoring locations and frequency** exceed any of the trigger levels stated in **Table E2 - Groundwater quality triggers and limits** or exceed any of the groundwater level trigger threshold stated in **Table E3 - Groundwater level monitoring**, the holder of this environmental authority must compare the compliance monitoring bore results to the reference bore results and complete an investigation in accordance with the ANZECC and ARMCANZ 2000.
- E6** Results of monitoring of groundwater from compliance bores identified in **Table E1 - Groundwater monitoring locations and frequency**, must not exceed any of the limits defined in **Table E2 - Groundwater quality triggers and limits**.

### Bore construction and maintenance and decommissioning.

- E7** The construction, maintenance and management of groundwater bores (including groundwater monitoring bores) must be undertaken in a manner that prevents or minimises impacts to the environment and ensures the integrity of the bores to obtain accurate monitoring

### Schedule F – Water

- F1** Contaminants that will, or have the potential to cause environmental harm must not be released directly or indirectly to any waters as a result of the authorised mining activities, except as permitted under the conditions of this environmental authority.
- F2** Unless otherwise permitted under the conditions of this environmental authority, the release of mine affected water to waters must only occur from the release points specified in **Table F1 - Mine affected water release points, sources and receiving waters** and depicted in Figure 2 attached to this environmental authority.

**Table F1 - Mine affected water release points, sources and receiving waters**

Release Point (RP) <sup>1</sup>	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)	Mine Affected Water Source and Location <sup>1</sup>	Monitoring Point	Receiving waters description
ED1	27° 15' 40.5603" S	151° 41' 48.32659" E	ED1	Overflow from ED1	Spring Creek

ED2	27° 16' 54.96167" S	151° 41' 36.83113" E	ED2	Overflow from ED2	Lagoon Creek
ED3	27° 18' 29.40913" S	151° 42' 50.52694" E	ED3	Overflow from ED3	Lagoon Creek
ED4	27° 17' 41.49436" S	151° 41' 33.60156" E	ED4	Overflow from ED4	Lagoon Creek
ED5	TBA	TBA	ED5	Overflow from ED5	Lagoon Creek
ED6	TBA	TBA	ED6	Overflow from ED6	Lagoon Creek
ED7	TBA	TBA	ED7	Overflow from ED7	Lagoon Creek

1 - ED – Environmental Dam

- F3** The release of mine affected water to waters in accordance with condition **F2** must not exceed the release limits stated in **Table F2 - Mine affected water release limits** when measured at the monitoring points specified in **Table F1 - Mine affected water release points, sources and receiving waters** for each quality characteristic.

**Table F2 - Mine affected water release limits**

Quality Characteristic	Release Limits	Monitoring frequency
Electrical conductivity (uS/cm)	Release limits specified in Table F3 for variable flow criteria	Real time telemetry for EC and pH. Daily grab samples if telemetry not available  If telemetry is unavailable, the first sample must be taken within 2 hours of commencement of release
pH (pH Unit)	6.0 (minimum) 9.0 (maximum)	
Total suspended solids (mg/l)	100	Daily during release (the first sample must be taken within 2 hours of commencement of release)

- F4** The release of mine affected water to waters from the release points must be monitored at the locations specified in Table F1 - Mine affected water release points, sources and receiving waters for each quality characteristic and at the frequency specified in Table F2 - Mine affected water release limits.

### Mine Affected Water Release Events

- F5** The holder must ensure a stream flow gauging station/s is installed, operated and maintained to determine and record stream flows in Lagoon and Spring Creek upstream of the discharge sites.
- F6** Notwithstanding any other condition of this environmental authority, the release of mine affected water to waters in accordance with condition F2 must only take place during periods of natural flow in accordance with the receiving water flow criteria for discharge specified in Table F2 - Mine affected water release limits for the release point(s) specified in Table F1 - Mine affected water release points, sources and receiving waters.
- F7** The release of mine affected water to waters in accordance with condition **F6** must not exceed the Maximum Release Rate (for all combined release point flows) for each receiving water flow criterion for discharge specified in **Table F3 - Mine affected water release during flow events** when measured at the monitoring points specified in **Table F1 - Mine affected water release points**, sources and receiving waters.
- F8** The daily quantity of mine affected water released from each release point must be measured and recorded.
- F9** Release to waters must be undertaken so not as to cause erosion of the bed and banks of the receiving waters or cause material build-up of sediment in such waters.

**Table F3 - Mine affected water release during flow events**

Receiving waters/ stream	Release Point (RP)	Gauging Station (GDA94)	Gauging Station (GDA94)	Receiving Water Flow Criteria for discharge (m <sup>3</sup> /s)	Maximum release rate (for all combined RP flows)	Electrical Conductivity Release Limits
Lagoon Creek	ED2	27° 16' 54.96167" S	151° 41' 36.83113" E	Low Flow <4ML/d for a period of 28 days after natural flow events that exceed 4 ML/d	<1.5ML/d	700
	ED3	27° 18' 29.40913" S	151° 42' 50.52694" E			
	ED4	27° 17' 41.49436" S	151° 41' 33.60156" E			
	ED5	TBA	TBA	Medium Flow (low) >4 ML/d	<1.5ML/d	1500
					<0.7ML/d	2,500
					<0.5ML/d	3,500
	ED6	TBA	TBA	Medium Flow (high) >11.5ML/d	<4.2ML/d	1500
					<2ML/d	2,500
					<1.3ML/d	3,500
	ED7	TBA	TBA	High Flow >35ML/d	<12.5ML/d	1500
					<8ML/d	2,500
					<6ML/d	3,500
Spring Creek	ED1	27° 15' 40.5603" S	151° 41' 48.32659" E	Low Flow <4ML/d for a period of 28 days after natural flow events that exceed 4 ML/d	<1.5ML/d	700

**Notification of Release Event**

**F10** The environmental authority holder must notify the administering authority as soon as practicable and no later than 24 hours after commencing to release mine affected water to the receiving environment. Notification must include the submission of written advice to the administering authority of the following information:

- g) release commencement date/time

- h) details regarding the compliance of the release with the conditions of Department Interest: Water of this environmental authority (that is, contaminant limits, natural flow, discharge volume)
- i) release point/s
- j) release rate
- k) release salinity
- l) receiving water/s including the natural flow rate.

Note: Notification to the administering authority must be addressed to the Manager and Project Manager of the local Administering Authority via email or facsimile.

**F11** The environmental authority holder must notify the administering authority as soon as practicable and nominally no later than 24 hours after cessation of a release event of the cessation of a release notified under Condition **F10** and within 28 days provide the following information in writing:

- g) release cessation date/time
- h) natural flow rate in receiving water
- i) volume of water released
- j) details regarding the compliance of the release with the conditions of Department Interest; Water of this environmental authority (i.e. contaminant limits, natural flow, discharge volume)
- k) all in-situ water quality monitoring results
- l) any other matters pertinent to the water release event.

Note: Successive or intermittent releases occurring within 24 hours of the cessation of any individual release can be considered part of a single release event and do not require individual notification for the purpose of compliance with conditions **F10** and **F11**, provided the relevant details of the release are included within the notification provided in accordance with conditions **F10** and **F11**.

**F12** If the release limits defined in **Table F2 - Mine affected water release limits** are exceeded, the holder of the environmental authority must notify the administering authority within 24 hours of receiving the results.

**F13** The environmental authority holder must, within 28 days of a release that is not compliant with the conditions of this environmental authority, provide a report to the administering authority detailing:

- i) the reason for the release
- j) the location of the release
- k) the total volume of the release and which (if any) part of this volume was non-compliant
- l) the total duration of the release and which (if any) part of this period was non-compliant
- m) all water quality monitoring results (including all laboratory analyses)
- n) identification of any environmental harm as a result of the non-compliance



- o) all calculations
- p) any other matters pertinent to the water release event.

### Receiving Environment Monitoring and Contaminant Trigger Levels

**F14** The quality of the receiving waters must be monitored at the locations specified in **Table F5 - Receiving water upstream background sites and downstream monitoring points** for each quality characteristic and at the monitoring frequency stated in **Table F4 - Receiving waters contaminant trigger levels**.

**Table F4 - Receiving waters contaminant trigger levels**

Quality Characteristic	Trigger Level	Monitoring Frequency
pH	6.5 – 9.0	Daily during the release
Electrical Conductivity (µS/cm)	700	
Total Suspended solids (mg/L)	To Be Determined. Turbidity may be required to assess ecosystems impacts and can provide instantaneous results.	
Sulphate (SO <sub>4</sub> <sup>2-</sup> ) (mg/L)	250 (Protection of drinking water Environmental Value)	

**Table F5 - Receiving water upstream background sites and downstream monitoring points**

Monitoring Points	Receiving Waters Location Description	Latitude (GDA94)	Longitude (GDA94)
Upstream Background Monitoring Points			
LCU1	Lagoon Creek at a point upstream of mine	27° 18' 9.7728" S	151° 44' 23.136" E
LCU2	Spring Creek at a point upstream of mine	27° 14' 18.7728" S	151° 41' 31.2864" E
Downstream Monitoring Points			
LCD1	Lagoon Creek downstream of mine	27° 18' 35.64" S	151° 43' 4.3536" E
LCD2	Lagoon Creek downstream of mine	27° 18' 37.36" S	151° 43' 1.8768" E

Monitoring Points	Receiving Waters Location Description	Latitude (GDA94)	Longitude (GDA94)
SCD1	Spring Creek at a point downstream of mine	27° 14' 47.364" S	151° 40' 36.2028" E
DS1	Located at the downstream boundary of ML50232	27° 19' 26.68" S	151° 41' 7.02 E

**F15** If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in **Table F4 - Receiving waters contaminant trigger levels** during a release event the environmental authority holder must compare the downstream results to the upstream results in the receiving waters and:

- c) where the downstream result is the same or a lower value than the upstream value for the quality characteristic then no additional monitoring and reporting action is required; or
- d) where the downstream results exceed the upstream results complete an investigation into the potential for environmental harm and provide a written report to the administering authority in the next annual return, outlining
  - 3. details of the investigations carried out
  - 4. actions taken to prevent environmental harm.

Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with b) of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.

**F16** All determinations of water quality and biological monitoring must be performed by an appropriately qualified person.

### Annual Water Monitoring Reporting

**F17** The following information must be recorded in relation to all water monitoring required under the conditions of this environmental authority and submitted to the administering authority in the specified format:

- h) the date on which the sample was taken
- i) the time at which the sample was taken
- j) the monitoring point at which the sample was taken
- k) the measured or estimated daily quantity of mine affected water released from all release points
- l) the release flow rate at the time of sampling for each release point
- m) the results of all monitoring and details of any exceedances of the conditions of this environmental authority
- n) water quality monitoring data must be provided to the administering authority in the specified electronic format upon request.

## Water Management Plan

- F18** A Water Resource Management Plan must be developed by an appropriately qualified person and implemented.

## Stormwater and Water sediment controls

- F19** An Erosion and Sediment Control Plan must be developed by an appropriately qualified person and implemented for all stages of the mining activities on the site to minimise erosion and the release of sediment to receiving waters and contamination of stormwater.
- F20** Stormwater, other than mine affected water, is permitted to be released to waters from:
- c) erosion and sediment control structures that are installed and operated in accordance with the Erosion and Sediment Control Plan required by condition **F19**.
  - d) water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with condition **F18** for the purpose of ensuring water does not become mine affected water.

## Schedule G - Sewage treatment

- G1** All effluent released from the treatment plant must be monitored at the frequency and for the parameters specified in **Table G1 – Sewage Effluent Quality Targets for Dust Suppression and Irrigation**.

**Table G1 - Sewage Effluent Quality Targets for Dust Suppression and Irrigation**

Contaminant	Unit	Release limit	Limit type	Frequency
5-day Biochemical oxygen demand (uninhibited)	mg/L	20	Maximum	Quarterly
Faecal coliforms, based on the average of a minimum of five samples collected	Colonies/100ml	1000	Maximum	Quarterly
pH	pH units	6.0 – 9.0.	Range	Quarterly

- G2** Treated sewage effluent used for dust suppression or irrigation must not exceed sewage release limits defined in **Table G1 – Sewage Effluent Quality Targets for Dust Suppression and Irrigation**.
- G3** Sewage effluent used for dust suppression or irrigation must not cause spray drift or overspray to any sensitive place.

- G4** Subject to condition G5, sewage effluent from sewage treatment facilities must be reused or evaporated and must not be directly released from the sewage treatment plant to any water way or drainage line.
- G5** In periods of wet weather or following wet weather, when no irrigation of effluent is reasonable practicable and when effluent storage ponds are full, the release of effluent to waters is permitted in accordance with the release limits in **Table F2 - Mine affected water release limits** and locations specified in **Table F1 – Mine affected water release points, sources and receiving waters**.
- G6** The holder of the environmental authority must ensure that irrigation of effluent is carried out in such a manner that prevents and or minimises environmental harm.
- G7** The holder of this environmental authority is authorised to accept treated wastewater from the Wetalla Wastewater Reclamation Facility and the Oakey RO Plant.

### Schedule H - Land and rehabilitation

- H1** Land disturbed by mining must be rehabilitated in accordance with **Table H1 - Rehabilitation Requirements**

**Table H1 - Rehabilitation Requirements**

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
Solid Waste Rock Disposal	Safe	Site safe for humans and animals	Structurally safe and shallow slopes (geotechnically stable). No hazardous materials (geochemically benign).	Monitoring / observation demonstrates safe site
	Non-polluting	No environmental harm attributed to adverse chemical conditions within the waste rock dumps	Minimise erosion (to at least <10t/ha/yr) through selective placement of mine waste, adequate vegetation cover. Runoff and seepage does not cause environmental harm	Suitable for low intensity grazing. Runoff and discharge water (including seepage) meets specified limits.
	Stable	Minimise erosion	Wastes selectively placed above and below original ground level to agreed slopes. Adequate ground cover established to control erosion. Runoff control measures	Suitable for low intensity grazing

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
			(contour banks, etc) effective in controlling erosion.	
	Self-sustaining	To return to agreed grazing land capability	Slope and other landform design criteria achieved. Establish adequate vegetation cover.	Refer Table H2 and Table H3
Tailings Dams	Safe	Site safe for humans and animals	Structurally safe (geotechnically stable). Adequate capping. Accessibility to voids is permanently removed.	Monitoring / observation demonstrates safe site
	Non-polluting	Acid mine drainage will not cause environmental harm	Adequately capped. Minimise erosion through adequate vegetation cover to less than 10t/ha/yr. Runoff and seepage controlled by water management.	Monitoring meeting release limits. Suitable for low intensity grazing
	Stable	Minimise erosion	Stored in both pits below natural surface level and in dams above natural surface. Establish adequate vegetation cover.	Monitoring demonstrates revegetation success. No structural erosion present. Suitable for low intensity grazing
	Self-sustaining	To return to agreed grazing land capability	Monitoring demonstrates successful revegetation.	Refer Table H2 and Table H3
Mine Infrastructure Areas	Safe	Site safe for humans and animals	Hazardous materials removed.	Monitoring / observation demonstrates safe site
	Non-polluting	Undertake contaminated land assessment.	Remediate contamination so that runoff and seepage are of good quality.	Monitoring meeting release limits.
	Stable	Minimise erosion	Remove infrastructure or allow continued use of useful infrastructure.	Slope will be a maximum of 17°



Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
			Establish adequate vegetation cover.	(30%)
	Self-sustaining	To return to agreed grazing land capability	Return to previous use (grazing). Establish adequate groundcover.	Refer Table H2 and Table H3
Linear Infrastructure areas	Safe	Site safe for humans and animals	Structurally safe (geotechnically stable).	Monitoring / observation demonstrates safe site
	Non-polluting	No environmental harm attributed to adverse chemical conditions within the rehabilitation areas.	Runoff and seepage controlled by water management (e.g. dams).	Monitoring meeting release limits.
	Stable	Minimise erosion	Remove infrastructure, rip reshape and revegetate or allow continued use of useful infrastructure.	Suitable for low intensity grazing
	Self-sustaining	To return to agreed grazing land capability	Remove infrastructure or allow continued use of useful infrastructure. Establish adequate vegetation cover.	Refer Table H2 and Table H3

**Table H2 – Rehabilitation Acceptance Criteria – Grazing Lands**

Land Suitability Class	Acceptance Criteria – Grazing Land						
	Non-polluting	Stability and Sustainability Land Use					
	Active Rill / Gully Erosion	Vegetation Cover	Native and Exotic Grass Species	Slopes	Geotechnical Stability	Active Rill / Gully Erosion	Declared Weeds

			<b>Diversity (spp./ha)</b>				
2 to 5	Absence ( $<10\text{t/ha/yr}$ )	$> 50\%$	$\geq 4$	Maximum $17^\circ$	stable	absence	absence

**Table H3 – Rehabilitation Acceptance Criteria – Treed Areas**

<b>Land Suitability Class</b>	<b>Acceptance Criteria – Grazing Land Treed Areas</b>						
	<b>Non-polluting</b>	<b>Stability and Sustainable Land Use</b>					
	<b>Active Rill / Gully Erosion</b>	<b>Vegetation Cover (including tree / shrub canopy)</b>	<b>Native Tree / Shrub &amp; Native / Exotic Grass Species Diversity (spp./ha)</b>	<b>Slopes</b>	<b>Geotechnical Stability</b>	<b>Active Rill / Gully Erosion</b>	<b>Declared Weeds</b>
2 to 5	Absence ( $<10\text{t/ha/yr}$ )	$> 50\%$	<i>Eucalyptus</i> spp. $\geq 2$ <i>Acacia</i> spp. $\geq 2$ Other tree / shrub spp. $\geq 2$ Grass $\geq 3$	Maximum $17^\circ$	stable	absence	absence

- H2** Rehabilitation must commence progressively in accordance with the plan of operations.

### **Regulated Dams and Levees**

- H3** The consequence category of any structure must be assessed by a suitable qualified and experienced person in accordance with the *Manual for Assessing Categories and Hydraulic Performance of Structures* (EM635) at the following times:
- d) Prior to the design and construction of the structure, if it is not an existing structure; or
  - e) If it is an existing structure, prior to the adoption of this schedule; or
  - f) Prior to any change in its purpose or the nature of its stored contents.
- H4** A consequence assessment report and certification must be prepared for each structure assessed and the report may include a consequence for more than one structure.
- H5** Certification must be provided by the suitable qualified and experienced person who undertook the assessment, in the form set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635).

### **Design and construction of a regulated structure**

- H6** Condition H7 to H11 inclusive do not apply to existing structures
- H7** All regulated structures must be designed by and constructed under the supervision of a suitable qualified and experienced person in accordance with the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635).
- H8** Construction of a regulated structure is prohibited unless the holder has submitted a consequence category assessment report and certification to the administering authority has been certified by a suitable qualified person for the design and the design plan and the associated operating procedures in compliance with the relevant condition of this authority.
- H9** Certification must be provided by the suitable qualified and experienced person who oversees the preparation of the design plan set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635), and must be recorded in the Regulated Dams/Levees register.
- H10** Regulated structures must:
- d) be designed and constructed in accordance with and conform to the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635);

- e) be designed and constructed with due consideration given to ensuring that the design integrity would not be compromised on account of:
  - 3. floodwaters from entering the regulated dam from any watercourse or drainage line; and
  - 4. wall failure due to erosion by floodwaters arising from any watercourse or drainage line.
- f) (only for regulated dams associated with a failure to contain seepage) have the floor and sides of the dam designed and constructed to prevent or minimise the passage of the wetting front and any entrained contaminants through either the floor or sides of the dam during the operational life of the dam and for any period of decommissioning and rehabilitation of the dam.

**H11** Certification by the suitable qualified and experienced person who supervises the construction must be submitted to the administering authority on the completion of construction of the regulated structure and state that:

- c) The 'as constructed' drawings and specifications meet the original intent of the design plan for that regulated structure;
- d) Construction of the regulated structure is in accordance with the design plan.

### **Operation of a regulated structure**

**H12** Operation of a regulated structure, except for an existing structure, is prohibited unless the holder has submitted to the administering authority:

- h) One paper copy and one electronic copy of the design plan and certification of the 'design plan' in accordance with condition H8.
- i) A set of 'as constructed' drawings and specifications, and
- j) Certification of those 'as constructed drawings and specifications' in accordance with condition H9, and
- k) Where the regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the DSA volume across the system, a copy of the certified system design plan;
- l) The requirements of this authority relating to the construction of the regulated structure have been met;
- m) The holder has entered the details required under this authority into a Register of Regulated Dams; and
- n) There is a current operational plan for the regulated structures.

**H13** For existing structures that are regulated structures:

- c) Where the existing structure that is a regulated structure is to be managed as part of an integrated containment system for the purposes of sharing DSA volume across the system, the holder must submit to the administering authority within 12 months of the commencement of this condition a copy of the certified system design plan including that structure; and

d) There must be a current operational plan for the existing structures.

- H14** Each regulated structure just be maintained and operated for the duration of its operational life until decommissioned and rehabilitated in a manner that is consistent with the current operational plan and if applicable the current design plan and associated certified 'as constructed' drawings.

### **Mandatory reporting level**

- H15** Conditions H16 to H19 inclusive apply to Regulated Structures which have not been certified as low consequence category for 'failure to contain – overtopping'.
- H16** The Mandatory Reporting Level (the MRL) must be marked on a regulated dam in such a way that during routine inspections of the dam it is clearly observable.
- H17** The holder must, as soon as practical and within forty-eight (48) hours of becoming aware, notify the administering authority when the level of the contents of a regulated dam reaches the MRL.
- H18** The holder must, immediately on becoming aware that the MRL has been reached, act to prevent the occurrence on any unauthorised discharges from the regulated dam.
- H19** The holder must record any changes to the MRL in the Register of Regulated Structures.

### **Design storage allowance**

- H20** The holder must assess the performance of each regulated dam or linked containment system over the preceding November to May period based on actual observations of the available storage in each regulated dam or linked containment system taken prior to 1 July of each year.
- H21** By 1 November of each year, storage capacity must be available in each regulated dam (or network of linked containment systems with a shared DSA volume) to meet the Design Storage Allowance (DSA) volume of the dam (or network of linked containment systems).
- H22** The holder must, as soon as possible and within forty-eight (48) hours of becoming aware that the regulated dam (or network of linked containment system) will not have the available storage to meet the DSA volume on 1 November of any year, notify the administering authority.
- H23** The holder must, immediately on becoming aware that a regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on 1 November of any year, act to prevent the occurrence of any unauthorised discharge from the regulated dam or linked containment systems.

### **Annual inspection report**

- H24** Each regulated dam must be inspected each calendar year by a suitable qualified and experienced person.



- H25** At each inspection the condition and adequacy of all components of the regulated structure must be assessed and a suitable qualified and experienced person must prepare an annual inspection report containing details of the assessment and include recommended actions to ensure the integrity of the regulated structure.
- H26** The suitable qualified and experienced person who prepared the annual inspection report must certify the report in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635).
- H27** The holder must:
- c) Within 20 business days of receipt of the annual inspection report provide to the administering authority:
    - 3. The recommendations section of the annual inspection report; and
    - 4. If applicable, any actions being taken in response to those recommendations; and
  - d) If, following receipt of the recommendations and (if applicable) actions, the administering authority requests a full copy of the annual inspection report from the holder, provide this information to the administering authority within 10 business days of receipt of the request.

### **Transfer arrangements**

- H28** The holder must provide a copy of any reports, documentation and certifications prepared under this authority, including but not limited to and Register of Regulated Structures, consequence assessment, design plan and other supporting documentation, to a new holder on transfer of this authority.

### **Decommissioning and rehabilitation**

- H29** Dams must not be abandoned but be either:
- c) Decommissioned and rehabilitated to achieve compliance with condition H30; or
  - d) Be left in-situ for a beneficial use(s) provided that:
    - 4. It no longer contains contaminants that will migrate into the environment; and
    - 5. It contains water of a quality that is demonstrated to be suitable for the intended beneficial use(s); and
    - 6. The administering authority, the holder of the environmental authority and the landholder agree in writing that the dam will be used by the landholder following cessation of the resource activity.
- H30** After decommissioning, all significantly disturbed land caused by carrying out of the resource activity must be rehabilitated to meet the final acceptance criteria:
- i) The landform is safe for humans and fauna;
  - j) The landform is stable with no subsidence of erosion gullies for at least three (3) years;

- k) Any contaminated land (e.g. contaminated soils) is remediated and rehabilitated;
- l) Not allowing for acid mine drainage; or
- m) There is no ongoing contamination to waters (including groundwater);
- n) All significantly disturbed land is reinstated as defined in **Table H1 – Rehabilitation requirements**;
- o) For land that is not being cultivated by the landholder:
  - 4. Groundcover, that is not a declared pest species is established and self-sustaining;
  - 5. Vegetation of similar species richness and species diversity to pre-selected analogue sites is established and self-sustaining; and
  - 6. The maintenance requirements for rehabilitated land are no greater than that required for the land prior to its disturbance caused by carrying out of the resource activity.
- p) For land that is cultivated by the landowner, cover crop is revegetated, unless the landholder will be preparing the site for cropping within 3 months of resource activities being completed.

### **Register of Regulated Dams**

- H31** A Register of Regulated Dams must be established and maintained by the holder for each regulated dam
- H32** The holder must provisionally enter the required information in the Register of Regulated Dams when a design plan for a regulated dam is submitted to the administering authority.
- H33** The holder must make a final entry of the required information in the Register of Regulated Dams once compliance with condition H12 and H13 has been achieved.
- H34** The holder must ensure that the information contained in the Register of Regulated Dams is current and complete on any given day.
- H35** All entries in the Register of Regulated Dams must be approved by the chief executive offices for the holder of this authority, or the delegate, as being accurate and correct.
- H36** The holder must, at the same time as providing the annual return, supply to the administering authority a copy of the records contained in the Register of Regulated Dams, in the electronic format required by the administering authority.

### **Contaminated Land**

- H37** Before applying for surrender of a mining lease, the holder must (if applicable) provide to the administering authority a site investigation report under the Act, in relation to any part of the mining lease which has been used for notifiable activities or which the holder is aware is likely to be contaminated land, and also carry out any

further work that is required as a result of that report to ensure that the land is suitable for its final land use.

**H38** Before applying for progressive rehabilitation certification for an area, the holder must (if applicable) provide to the administering authority a site investigation report under the Act, in relation to any part of the area the subject of the application which has been used for notifiable activities or which the holder is aware is likely to be contaminated land, and also carry out any further work that is required as a result of that report to ensure that the land is suitable for its final land use under condition H1.

**H39** Minimise the potential for contamination of land by hazardous contaminants.

### **Biodiversity offsets**

**H40** Significant residual impacts to prescribed matters of state environmental significance must not exceed the maximum authorised residual impact area listed for that matter in **Table H4 - Matters of State Environmental Significance**.

NOTE: Deemed conditions in Sections 18, 22, 24 and 25 of the *Environmental Offsets Act 2014* are taken to be conditions of this authority.

**H41** The holder of the environmental authority must provide an environmental offset for the following maximum significant residual impacts on matters of state environmental significance in accordance with the requirements of the *Environmental Offsets Act 2014* (including deemed conditions), the *Environmental Offsets Regulation 2014* and the Queensland Environmental Offsets Policy 2014.

**Table H4: Maximum authorised impacts on endangered and of concern regional ecosystems**

RE	VM Act status	Maximum area of residual impact (ha) <sup>1</sup>
11.3.1	Endangered	12
11.3.21	Endangered	35.9
11.9.5	Endangered	12.6
11.3.2	Of concern	4.8
11.3.17	Of concern	7
11.8.11	Of concern	4.1
11.9.10	Of concern	4.1
11.9.13	Of concern	3.6
Common name Species name	NC Act status	Total area of residual impact (ha)
Koala <i>Phascolarctos cinereus</i>	Special least concern	19.5
Belson's Panic <i>Homopholis belsonii</i>	Endangered	70.8

**H42** Residual impacts are not authorised on any Matters of State Environmental Significance not identified in **Table H4 – Matters of State Environmental Significance**.

**END OF SCHEDULE H CONDITIONS**

## A.2 EA Condition Definitions

Words and phrases used throughout this licence are defined below except where identified in the *Environmental Protection Act 1994* or subordinate legislation. Where a word or term is not defined, the ordinary English meaning applies, and regard should be given to the Macquarie Dictionary.

“**µg/L**” means micrograms per litre.

“**administering authority**” means the Environmental Protection Agency or its successor.

“**airblast overpressure**” is the energy transmitted from the blast site within the atmosphere in the form of pressure waves, consisting of both audible (noise) and inaudible (concussion) energy. The maximum excess pressure in this wave is the peak airblast overpressure measured in decibels linear (dB).

“**ambient (or total) noise**” at a place, means the level of noise at the place from all sources (near and far), measured as the Leq for an appropriate time interval.

“**annual exceedance probability**” means the probability that the given event will be exceeded within a one year period.

“**appropriately qualified person**” means a person or body possessing appropriate experience and qualifications to perform these tasks.

“**ARD**” means acid rock drainage and refers to the low pH, high heavy metal pollutant typical of sulphidic mine wastes, and most commonly associated with the production of ferrous iron and sulphuric acid through the oxidation of sulphide minerals.

“**authority**” means Environmental Authority under the *Environmental Protection Act 1994*.

“**background noise level**” means noise, measured in the absence of the noise under investigation, as either:

- **L A<sub>90,T</sub>** being the A-weighted sound pressure level exceeded for 90 percent of the time period of not less than 15 minutes, using Fast response, or
- **L LAbg,T** being the arithmetic average of the minimum readings during a representative time period of not less than 15 minutes, using Fast response.

“**blasting**” means the use of explosive materials to fracture-

- a) rock, coal and other minerals for later recovery; or
- b) structural components or other items to facilitate removal from a site or for reuse.

“**commercial place**” means a place used as an office or for business or commercial purposes, other than a place within the boundaries of the operational land.

“**construction**” in relation to tailings dams includes building a new dam and modifying or lifting an existing dam.

“**dam**” means a containment or proposed containment whether permanent or temporary, which is designed to contain, divert or control flowable substances. However this does not include a fabricated or manufactured tank or container designed to a recognised standard.

“**dB (Linear) Peak**” is the maximum reading in decibels (dB) obtained using the “P” time – weighting characteristic as specified in AS 1259.1 – 1990 with all frequency – weighted networks inoperative.



**“design plan”** - in the context of a dam design is the documentation required under the “Code of Environmental Compliance for High Hazard Dams Containing Hazardous Waste” to describe the physical dimensions of the dam, the materials and standards to be used for construction of the dam, the procedures and criteria to be used for operating the dam and the decommissioning and rehabilitation objectives in terms procedures, works and outcomes at the end of dam life. The documents can include design and investigation reports, drawings, specifications and certifications.

**“design plan in the context of a dam design”** is the documentation required under the Code of Environmental Compliance for High Hazard Dams Containing Hazardous Waste to describe the physical dimensions of the dam, the materials and standards to be used for construction of the dam, the procedures and criteria to be used for operating the dam and the decommissioning and rehabilitation objectives in terms procedures, works and outcomes at the end of dam life, The documents can include design and investigation reports, drawings, specifications and certifications.

**“design storage allowance”** as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.

**“declared pest plant”** means a plant that has been declared under the *Land Protection (Pest and Stock Route Management) Act 2002*.

**“environmental authority holder”** means the holder of this environmental authority.

**“environmental nuisance”** is unreasonable interference or likely interference with an environmental value caused by:

- a) noise, dust, odour, light; or
- b) an unhealthy, offensive or unsightly condition because of contamination; or
- c) another way prescribed by regulation.

**“EP Act”** means the Environmental Protection Act 1994.

**“flowable substance”** means matter or mixture of materials which can be forced to or otherwise flow under any conditions possible in a situation. It includes water, other liquids or a mixture that includes water or any other liquid or suspended solids.

**“foreseeable future”** is the period used for assessing the total risk of an event occurring. Permanent structures and ecological sustainability should be expected to still exist at the end of a 150 year foreseeable future with an acceptable risk of failure before that time.

**“hazardous waste”** means any substance, whether liquid, solid or gaseous, derived by or resulting from, the processing of minerals that tends to destroy life or impair or endanger health.

**“high hazard dam”** means a dam defined as high hazard in the DERM Information Sheet on Determining Dams Containing Hazardous Waste.

**“infrastructure”** means water storage dams, roads and tracks, buildings and other structures built for the purpose of mining activities but does not include facilities required for the long terms management of mining impacts or the protection of potential resources. Such facilities include dams containing hazardous waste, waste rock dumps, voids, or ore stockpiles and buildings or other structures whose ownership can be transferred and which have a residual beneficial use for the next owner of the operational land or the background land owner.

**“L<sub>Amax adj,T</sub>”** means the average maximum A-weighted sound pressure level, adjusted for noise character and measured over a time period of not less than 15 minutes, using Fast response.

**“L<sub>Ar, 1 hour</sub>”** means the specific noise level measured as the A-weighted equivalent continuous noise level (L<sub>Aeq</sub>) plus any adjustment for the character of the noise (tonal and/or impulsive) determined over a reference time period of one hour.

**“land”** in the “land Schedule 2” of this document means land excluding waters and the atmosphere.

**“land capability”** as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.

**“land suitability”** as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.

**“land use”** term to describe the selected post mining use of the land, which is planned to occur after the cessation of mining operations.

**“leachate”** means a liquid that has passed through or emerged from, or is likely to have passed through or emerged from, a material stored, processed or disposed of at the operational land which contains soluble, suspended or miscible contaminants likely to have been derived from the said material.

**“mandatory reporting level”** the volume below the spillway crest, equivalent to the lower of the AEP, 72 hour storm or the AEP wave allowance (AEP is the annual exceedance probability).

**“maximum”** means that the measured value of the quality characteristic or contaminant must not be greater than the release limit stated.

**“MaxLpA,T”** means the maximum A-weighted sound pressure level measured over a time period of not less than 15 minutes, using Fast response.

**“median”** means the middle value, where half the data are smaller, and half the data are larger. If the number of samples is even, the median is the arithmetic average of the two middle values.

**“mg/kg”** means milligrams per kilogram.

**“mg/L”** means milligrams per litre.

**“minimum”** means that the measured value of the quality characteristic or contaminant must not be less than the release limit stated.

**“ng/L”** means nanograms per litre.

**“noise sensitive place”** means:

- a legal dwelling, caravan park, residential marina or other residential premises; or
- a motel, hotel or hostel; or
- a kindergarten, school, university or other educational institution; or
- a medical centre or hospital; or

- a protected area; or
- a public park or gardens.

and includes the curtilage of any such place.

**“noxious”** means harmful or injurious to health or physical well being, other than trivial harm.

**“offensive”** means causing unreasonable offence or displeasure; is unreasonably disagreeable to the sense; disgusting, nauseous or repulsive, other than trivial harm.

**“peak particle velocity (ppv)”** is a measure of ground vibration magnitude and is the maximum instantaneous particle velocity at a point during a given time interval in mms-1. (Peak particle velocity can be taken as the vector sum of the three component particle velocities in mutually perpendicular directions).

**“percent slope”** =  $\frac{\text{height difference (metres)}}{\text{horizontal difference (metres)}} \times 100$

**“protected area”** means:

- a protected area under the *Nature Conservation Act 1992*; or
- a marine park under the *Marine Parks Act 2004*; or
- a World Heritage Area.
- **“progressive rehabilitation”** means rehabilitation (defined below) undertaken progressively OR a staged approach to rehabilitation as mining operations are ongoing.

**“range”** means that the measured value of the quality characteristic or contaminant must not be greater than the higher release limit stated nor lower than the lower release limit stated.

**“rehabilitation”** means the process of reshaping and revegetating land to restore it to a stable landform and in accordance with the acceptance criteria set out in this Environmental Authority and, where relevant, includes remediation of contaminated land.

**“representative”** means a sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the mining activities.

**“residual void”** means an open pit resulting from the removal of ore and/or waste rock, which will remain following the cessation of all mining activities and completion of rehabilitation processes.

**“sediment dam”** means a structure for the capture and treatment of stormwater runoff contaminated only by sediments from disturbed areas and which discharge off-site once full.

**“self sustaining”** means an area of land which has been rehabilitated and has maintained the required acceptance criteria without human intervention for a period nominated by the administering authority.

**“sensitive place”** [e.g. odour and dust] has the same meaning as and includes a noise sensitive place and a commercial place.

**“significant disturbance”** – includes land

- a) if it is contaminated land; or
- b) it has been disturbed and human intervention is needed to rehabilitate it.
  - i. to a state required under the relevant environmental authority; or
  - ii. if the environmental authority does not require the land to be rehabilitated to a particular state – to its state immediately before the disturbance.

Some examples of disturbed land include:

- areas where soil has been compacted, removed, covered, exposed or stockpiled;
- areas where vegetation has been removed or destroyed to an extent where the land has been made susceptible to erosion; (vegetation & topsoil)
- areas where land use suitability or capability has been diminished;
- areas within a watercourse, waterway, wetland or lake where mining activities occur;
- areas submerged by tailings or hazardous contaminant storage and dam walls in all cases;
- areas under temporary infrastructure. Temporary infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be removed after mining activities have ceased; or
- areas where land has been contaminated and a suitability statement has not been issued.

However, the following areas are not included:

- areas off lease (e.g. roads or tracks which provide access to the mining lease);
- areas previously significantly disturbed which have achieved the rehabilitation outcomes;
- by agreement with the DERM, areas previously significantly disturbed which have not achieved the rehabilitation objective(s) due to circumstances beyond the control of the mine operator (such as climatic conditions);
- areas under permanent infrastructure. Permanent infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc), which is to be left by agreement with the landowner. The agreement to leave permanent infrastructure must be recorded in the Landowner Agreement and lodged with the DERM;
- disturbances that pre-existed the grant of the tenure unless those areas are disturbed during the term of the tenure.

**“spillway”** means the passage or outlet from the dam through which surplus water flows.

**“spillway crest”** means the highest point (elevation) of the spillway, above which water will flow along the spillway and discharge from the dam if the flow rate is sufficient.

**“stable”** means land form dimensions are or will be stable within tolerable limits now and in the foreseeable future. Stability includes consideration of geotechnical stability, settlement and consolidation allowances, bearing capacity (traffic ability), erosion resistance and geochemical stability with respect to seepage and contaminant generation.

**“suitably qualified and experienced person”** in relation to dams means a person who is a Registered Professional Engineer of Queensland under the provisions of the *Professional Engineers Act 2002* or a Corporate Member of the Institution of Engineers Australia or holds equivalent professional qualifications and has the following: (a) knowledge of engineering principles related to the structures, geomechanics, hydrology, hydraulics, chemistry and environmental impact of dams; and (b) at least a total of five years of suitable experience and demonstrated experience in at least four of the following areas: investigation, design, or construction of dams, operation and maintenance of dams, geomechanics with particular emphasis on stability, geology and geochemistry, hydrology with particular reference to flooding, estimation of extreme storms, water management or meteorology, hydraulics with particular reference to sediment transport and disposition, erosion control, beach processes, and hydrogeology with particular reference to groundwater, solute transport processes and monitoring thereof; and dam safety.

**“the holder”** means the holder of this Environmental Authority.

**“tolerable limits”** means that a range of values could be accepted to achieve an overall environmental management objective (eg a range of settlement of a tailing capping could still meet the objective of draining the cap quickly, preventing pondage and limiting infiltration and percolation).

**“waters”** - includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water in natural or artificial watercourses, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater or any part thereof.



## **APPENDIX B – REVISED ENVIRONMENTAL OFFSET STRATEGY**



# ENVIRONMENTAL OFFSET STRATEGY

*New Acland Coal Mine Stage 3 Project*

JUNE 2015



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## 1. Introduction

New Acland Coal Pty Ltd (NAC) developed a Biodiversity Offset Strategy (BOS) in accordance with the Queensland Environmental Offsets Policy (Version 1.0) 2014 and the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) Environmental Offsets Policy 2012, for the construction of the revised New Acland Stage 3 Project (Project).

The BOS was initially provided in the Project's Environmental Impact Statement (EIS) during early 2014. Since initial release, the BOS has been twice updated, once as part of the Project's Additional Information for the EIS during mid-2014, and again as part of an information request by the Office of the Coordinator General during late 2014.

This document replaces the last version (October 2014) of the BOS for the Project and has been re-named the 'Environmental Offset Strategy (EOS)' to ensure consistency with the nomenclature of the 'Coordinator General's Evaluation Report on the Environmental Impact Statement for the New Acland Coal Mine Stage 3 Project (December 2014)'.

In general, the EOS discusses the State and Commonwealth offset requirements for the Project including:

- policy requirements;
- Queensland Coordinator General's Conditions;
- Commonwealth EPBC Approval;
- offset approach;
- impacts on Matters of State environmental significance;
- impacts on Commonwealth threatened species and communities;
- proposed offsets for significant residual impacts on Matters of State environmental significance;
- proposed offsets for significant residual impacts on Commonwealth threatened species and communities;
- securing offsets; and
- management of offsets.

The EOS is also designed to address the requirements of the relevant Conditions of the 'Coordinator General's Evaluation Report on the Environmental Impact Statement for the New Acland Coal Mine Stage 3 Project (December 2014)'.

## 2. Policy Requirements

Two offset policies apply to the Project, at the State and Commonwealth levels. The offset requirements for the Project and each applicable policy have been assessed within this Strategy.

The offset policies to be considered for the Project are the:

- *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offset Policy 2012* (EPBC EOP); and
- *Queensland Environmental Offsets Policy 2014* Version 1.0 (QEOP).

### 2.1. EPBC EOP

The following has been extracted from the EPBC EOP.

The use of offsets to compensate for adverse impacts to heritage values is appropriate in some circumstances. In cases where offsetting of adverse impacts on heritage values is considered possible and appropriate, the principles of this policy apply with regard to determining what constitutes a suitable offset. Offsets for impacts on heritage values should improve the integrity and resilience of the heritage values of the property involved. This may include offsets in areas adjacent to the property.

The EPBC Act environmental offsets policy has five key aims, to:

1. ensure the efficient, effective, timely, transparent, proportionate, scientifically robust and reasonable use of offsets under the EPBC Act;
2. provide proponents, the community and other stakeholders with greater certainty and guidance on how offsets are determined and when they may be considered under the EPBC Act;
3. deliver improved environmental outcomes by consistently applying the policy;
4. outline the appropriate nature and scale of offsets and how they are determined; and
5. provide guidance on acceptable delivery mechanisms for offsets.

### 2.2. QEOP

The main purpose of the *Queensland Environmental Offsets Act 2014* is to counterbalance the significant residual impacts of particular activities on prescribed environmental matters through the use of environmental offsets.

The supporting QEOP provides a decision-support tool to enable consistent assessment by administering agencies of offset proposals provided by authority holders to satisfy offset conditions.



An offset condition may only be imposed on an authority for a prescribed environmental matter. Prescribed environmental matters are:

- a Matter of National Environmental Significance (MNES);
- a Matter of State Environmental Significance; and
- a Matter of Local Environmental Significance.

The Project will provide offsets for the significant residual impacts to both matters of National and State Environmental Significance.

### 3. Queensland Coordinator General's Conditions

Queensland's Coordinator General has prescribed a series of Conditions within the Evaluation Report on the Environmental Impact Statement for the New Acland Coal Mine Stage 3 Project (December 2014) to manage the Project's significant residual impacts to matters of National and State Environmental Significance.

These Conditions are located within Appendix One (Imposed Conditions), Appendix Two (Stated Conditions) and Appendix Three (Recommended Conditions) of the 'Coordinator General's Evaluation Report on the Environmental Impact Statement for the New Acland Coal Mine Stage 3 Project (December 2014)'.

In summary, the applicable Conditions of Appendix One are regulated by the Queensland Coordinator General under Queensland's *State Development and Public Works Organisation Act 1971* and require an updated EOS to be re-lodged within a specified timeframe and pre-clearance ecological surveys to be conducted within the Project's disturbance areas before construction activities.

The applicable Conditions of Appendix Two are regulated by the Queensland Department of Environment and Heritage Protection (DEHP) under Queensland's *Environmental Protection Act 1994* and state the Conditions of the Project's Environmental Authority for management of Matters of State Environmental Significance.

The applicable Conditions of Appendix Three are recommended to the Commonwealth Department of the Environment (DotE) for the management of significant residual impacts to matters of National Environmental Significance. The DotE will use these Conditions to guide their approval of the Project under the EPBC Act (EPBC Approval).

## 4. Commonwealth EPBC Approval

NAC is still awaiting the Commonwealth Minister for the Environment's decision on the Project's EPBC Approval for the management of the significant residual impacts to matters of National Environmental Significance.

If a positive approval decision is received from the Commonwealth Minister for the Environment, NAC will update the Project's EOS for the State and Commonwealth, and as required, address all new requirements of the EPBC Approval.

## 5. Offset Approach

### 5.1. Avoidance

The Project avoids mining within Acland and includes a buffer zone along Lagoon Creek, where a revegetation program will be implemented over the life of the Project. The Project also avoids Poplar Box and Brigalow vegetation near the rail loop. **Figure 1** shows the location of the Project, while **Figure 2** sets out the Project's footprint.

Impacts on all ecological values have been avoided and minimised as far as practicable. The Project will use ongoing opportunities to further avoid impacts at a local scale through the detailed design and construction phases.

### 5.2. Residual Impacts

The Project will impact on Threatened Ecological Communities (TEC), Endangered and Of Concern Regional Ecosystems (REs), watercourse vegetation and threatened species (**Figure 2**).

TECs are those communities listed as threatened under the Commonwealth EPBC Act. REs are those vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform and soil. A community that is a TEC can correspond with an RE, but not necessarily.

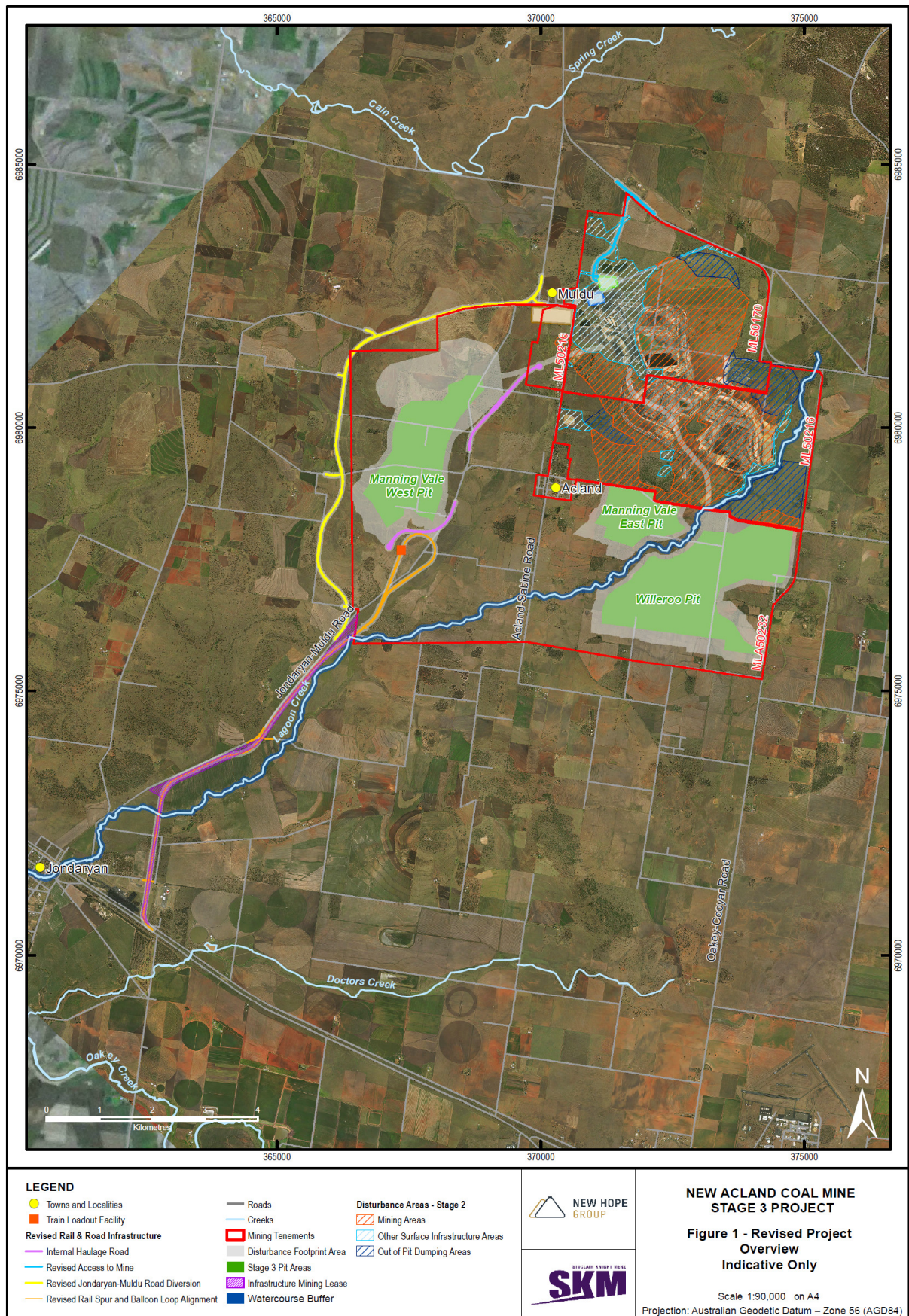
The residual and unavoidable impacts resulting from clearing required for the Project will be offset in accordance with the EPBC EOP and QEOP. The offsets proposed are intended to satisfy both policies, for example, one offset for Brigalow will satisfy both the EPBC EOP and QEOP requirements.

Residual impacts requiring offsets under EPBC EOP and QBOP have been calculated for the Project and verified using the EPBC EOP offset calculator. Where watercourses, as defined under the *Vegetation Management Act 1999* (VM Act), will be impacted upon by clearing, the area requiring offsetting has been calculated by applying the applicable buffers as per the regional vegetation management code and Department of Natural Resources and Mines stream order mapping. This buffer has been applied to the field verified vegetation mapping.

The DEHP Biodiversity Planning Assessment Mapping identifies regional corridors in the vicinity of the Project. The value attributed to connectivity has been based on impacts on Endangered and Of Concern REs, watercourses and protected species within the corridor areas. Additionally, with the proposed mitigation measures for fragmentation, barrier effects and reduction in vegetation communities and habitats, the overall function of the corridors are not expected to be compromised or significantly impacted.

The impacts on flora and fauna protected under the EPBC Act and *Nature Conservation Act 1992* (NC Act) that are classified and known to occur on the site have been included in this strategy. The offsets that are proposed under the EPBC EOP and QEOP provide a net environmental gain and cover all of the significant residual impacts associated with the Project.





**Figure 1: Project's operational footprint**



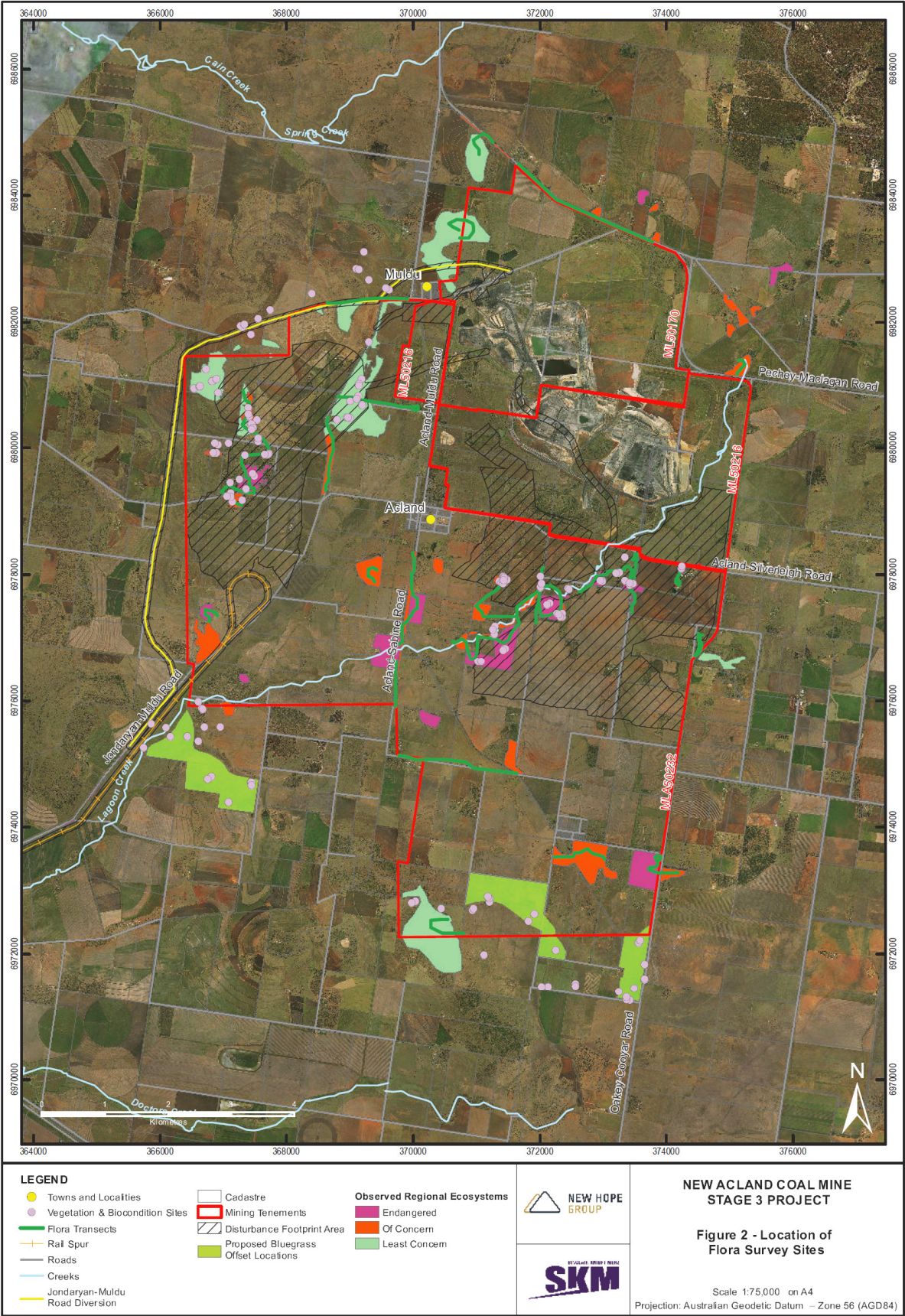


Figure 2: Project’s BioCondition survey sites and RE locations

## 6. Impacts on Matters of State Environmental Significance

The Project will have an impact on the following Matters of State Environmental Significance:

- remnant endangered regional ecosystems;
- remnant endangered grassland regional ecosystems;
- remnant of concern regional ecosystems;
- remnant of concern grassland regional ecosystems;
- watercourse regional ecosystem;
- fauna listed as Endangered, Vulnerable and special least concern under the NC Act; and
- flora listed as Endangered or Vulnerable under the NC Act.

The Project's predicted impacts to Matters of State Environmental Significance are listed in **Table 1**.

The Matters of State Environmental Significance affected by the Project are a combination of endangered and of concern regional ecosystems, a watercourse regional ecosystem and flora and fauna listed in the NC Act.

An area of 2.39 ha of the poplar box woodland (11.3.2) falls within 50 metres of Lagoon Creek, which is a stream order 2, making the area of the community that is adjacent to Lagoon Creek a Matter of State Environmental Significance.

**Table 1: Impact to Matters of State Environmental Significance**

RE	VM Act Class	BVG 1: 1M	Short Description (Regulation)	Total area (ha)	Riparian "Regional" corridor (%)	"State" terrestrial corridor (%)	Area in Stream Order Buffer
11.3.1	E	25a	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	12.0	0	0	0
11.3.2	OC	17a	<i>Eucalyptus populnea</i> woodland on alluvial plains	4.8	0	0	2.39 (SO2)
11.3.17	OC	25a	<i>Eucalyptus populnea</i> woodland with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> on alluvial plains	7.0	0	0	0



RE	VM Act Class	BVG 1: 1M	Short Description (Regulation)	Total area (ha)	Riparian "Regional" corridor (%)	"State" terrestrial corridor (%)	Area in Stream Order Buffer
11.3.21	E	30a	<i>Dichanthium sericeum</i> and/or <i>Astrebla</i> spp. grassland on alluvial plains. Cracking clay soils	35.9	0	0	0
11.8.11	OC	30b	<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks	4.1	0	0	0
11.9.5	E	25a	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks	12.6	0	0	0
11.9.10	OC	25a	<i>Eucalyptus populnea</i> , <i>Acacia harpophylla</i> , open forest on fine-grained sedimentary rocks	4.1	0	0	0
11.9.13	OC	13d	<i>Eucalyptus moluccana</i> or <i>E. microcarpa</i> open forest on fine grained sedimentary rocks	3.6	0	0	0

(BVG – Broad Vegetation Group; E – Endangered; OC – Of Concern; SO – Stream Order)

Listed Species	NC Act Status	Description
<i>Phascolarctos cinereus</i> - Koala	Special least concern*	Poplar Box woodland, that is habitat for the Koala, will be cleared for the Project in the Manning Vale West pit, in areas adjacent to Lagoon Creek and along the rail spur corridor.
<i>Homopholis belsonii</i> - Belson's Panic	Endangered	Twelve patches were found in the Bluegrass dominated grassland community and are within the Manning Vale West Pit and the Willaroo Pit, to the south of Lagoon Creek. This species has been found in the shelter of trees in the Brigalow and Poplar Box vegetation communities.

(\* = A change in the Koala's conservation status is pending.)

## 7. Impacts on Commonwealth threatened species and communities

The Project will result in the clearing of two threatened ecological communities, comprising 40.1 ha of Bluegrass dominant grasslands and 24.6 ha of Brigalow (**Table 2**).

One flora species that is listed under the EPBC Act has been recorded from within the disturbance footprint of the Project site, *Homopholis belsonii* (Belson's Panic) (**Table 2**).

The EPBC Offset calculator the each of the Matters of National Environmental Significance is included in **Appendix A**. The justification of the scores used in the Offset calculators is also provided in **Appendix A**.

**Table 2: Impact on Matters of National Environmental Significance**

Threatened Ecological Community	EPBC Act Status	Significantly Impacted	Primary reason for the outcome
Bluegrass dominant grasslands of the Brigalow Belt Bioregions (North and South)	Endangered	Yes – 40.1 ha	Significant impact as per the MNES Guidelines Version 1.1
Brigalow ( <i>Acacia harpophylla</i> dominant and co-dominant)	Endangered	Yes – 24.6 ha	Significant impact as per the MNES Guidelines Version 1.1 Brigalow
<b>Listed Flora Species</b>			
<i>Homopholis belsonii</i> (Belson's Panic)	Vulnerable	Yes	Significant impact as per the MNES Guidelines Version 1.1

## 8. Proposed offsets for residual impacts on Matters of State Environmental Significance

The Project's impacts on Matters of State Environmental Significance are described below and quantified in **Table 3**. NAC's management strategies for the Project's impacts on Matters of State Environmental Significance are also discussed below.

### 8.1. Brigalow Offset

The total impact of the Project on Brigalow is 28.7 ha, which includes both Queensland and Commonwealth listed communities, comprising RE 11.3.1, RE 11.9.5 and RE 11.9.10. The Brigalow Offset for Queensland and Commonwealth impacts will be collocated to improve the ecological benefit and management of the offset.

To date, an Offset Broker has been engaged to identify potential third-party offset sites. Two prospective third-party offset sites have recently been identified approximately 50 kilometres northwest of Chinchilla and approximately 75 kilometres northwest of Kingaroy, respectively. Both these sites are adjacent the Barakula State Forest and for privacy reasons remain confidential. Selection of a final site is still required and will involve further engagement of the Offset Broker and negotiation of a 'Call Option' with the third party owner(s) for access for ecological/bio-condition assessment of the site(s) and possible acquisition of one of the sites as the Project's Brigalow Offset.

During early to mid 2015, the New Hope Group acquired mining tenures (exploration and mineral development) and grazing properties in the North Surat Basin from Cockatoo Coal Pty Ltd. A potential Brigalow Offset site has subsequently been identified on one of the acquired properties approximately 18 kilometres south of Wandoan. This site is currently undergoing an ecological/bio-condition assessment to determine its suitability for use as the Project's Brigalow Offset. This site is also outside the New Hope Group's potential area of mine development within the North Surat Basin.

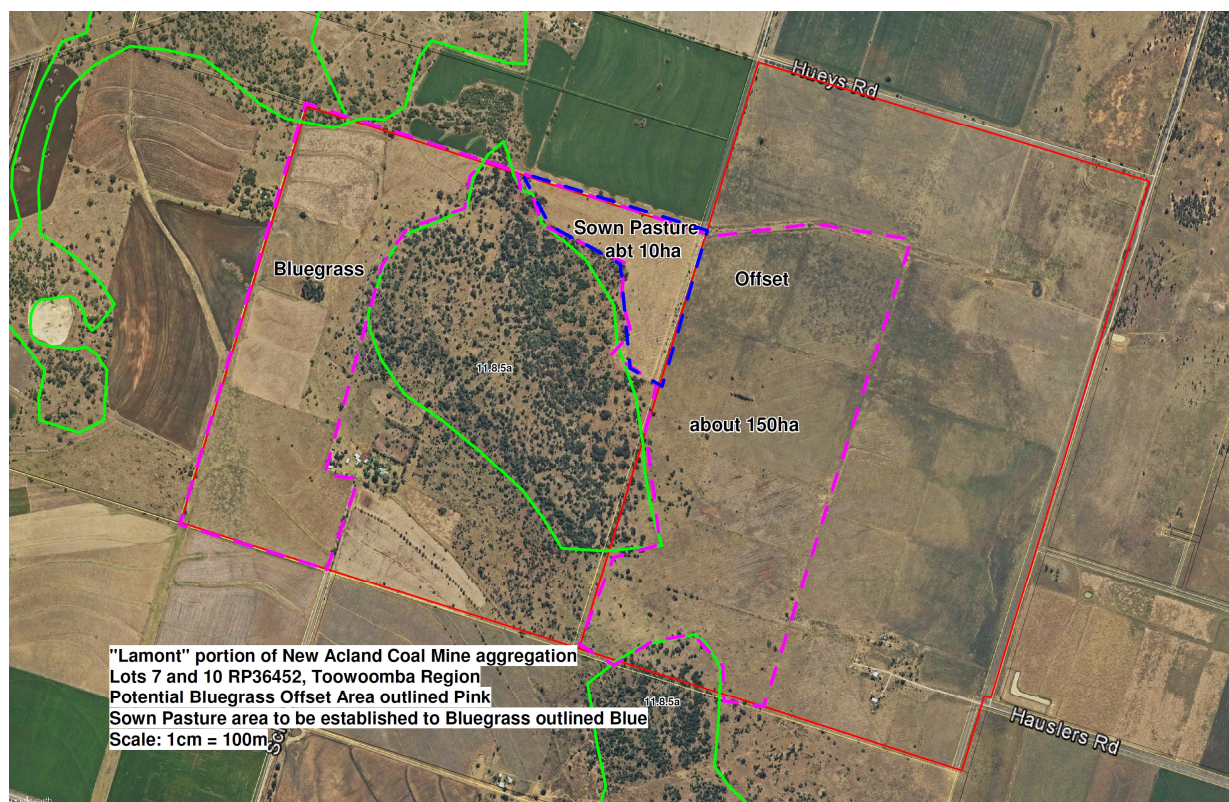
The use of suitable New Hope Group owned land for offsetting purposes is the preferred Company strategy as it offers financial, legal and long term management benefits. A third party offset option for Brigalow will be the Project's 'fall-back' option. The Project's comparatively small quantum of offset requirement for Brigalow and the current down turn in the mining industry (project development) basically ensure that a third party option can easily be sourced by an Offset Broker should it be required for the Project.

### 8.2. Bluegrass (Natural Grasslands) Offset

The impacted Bluegrass community requiring offsetting under both Queensland and Commonwealth legislation, consists of RE 11.3.21 and 11.8.11, and is 40.1 ha in total area. During the development of the Project's EIS, an area of 247 ha was identified on property owned by the Acland Pastoral Company (New Hope Group) as being suitable for the location of the Project's Bluegrass Offset.



During mid to late 2014, an area of approximately 150 hectares was officially defined as the Project's Bluegrass Offset site within the original 247 ha identified as suitable land for Bluegrass establishment. The Project's Bluegrass Offset remains contiguous with a State-defined Regional Biodiversity Corridor and close to the Project site, and therefore, offers additional ecological advantages. The Project's Bluegrass Offset is approximately 3 kilometres to the south of the Project's southern boundary and is located on Lots 7 and 10 on RP36452 (**Figure 3**).



**Figure 3: Bluegrass Offset Site**

The Project's Bluegrass Offset site has been under development since 2010 and has involved:

- an initial spelling from grazing activities to promote natural regeneration from the soil seed bank and seed drift from surrounding areas;
- seed harvesting of local provenience seed sources and preparation of the harvested seed for sowing of areas requiring repair or maintenance;
- development of a sustainable grazing regime for Bluegrass pasture management;
- photographic monitoring and general assessment; and
- seeking external advice about pasture management on the Darling Downs.

Development of the Project's Bluegrass Offset is currently managed by the Acland Pastoral Company with support from a specialist pasture consultant. The next management steps for the Project's Bluegrass Offset site will require:

- a benchmarking ecological/bio-condition assessment of the site for comparison purposes during future assessment work;
- establishment of an ecological/bio-condition assessment regime (three year cycle) to assess establishment progress;
- continued annual photographic and pasture establishment monitoring of specific reference sites;
- fencing and signage of the site;
- continued seed harvesting of local provenance seed sources and preparation of the harvested seed for maintenance purposes;
- identifying suitable areas for potential re-location of the listed grass species, Belson's Panic; and
- developing a program of maintenance works for recalcitrant grass and weed species.

In relation to grazing management of the Project's Bluegrass Offset site, a new regime has been implemented that accords with the Queensland Grazing Management Guidelines 2014 (i.e. as a best practice approach). This regime involves a program of seasonal rests, early wet season spelling and strategic grazing events to encourage seed set and recruitment of new plants.

In terms of pasture establishment monitoring, a series of monitoring sites has been established within the Project's Bluegrass Offset site. The monitoring system employed is an adaptation of a system established for monitoring the Castlevale Nature Refuge (200,000ha in the Brigalow Bioregion), which has operated since 2008 to the satisfaction of both the DEHP and the pastoral company (i.e. in terms of achieving the joint beneficial objectives of ecological and pasture management).

The continued establishment of the Project's Bluegrass Offset on Acland Pastoral Company land adjacent the Project site provides ecological financial, legal and long term management benefits.

### **8.3. Poplar Box and Gum-topped Box Offset(s)**

NAC is currently investigating its options for the establishment of offsets for Poplar Box (RE 11.3.2 and 11.3.17) and Gum-topped Box (RE 11.9.13) in the Bioregion. Initial field investigations identified a potential area in close proximity to the Project site to offset the clearing of 15.4 ha of these communities. An initial ecological/bio-condition assessment of the area conducted during late 2014 identified that the site offered a potential opportunity to offset the Project's Poplar Box requirements with some minor additional Brigalow (**Figure 4**).



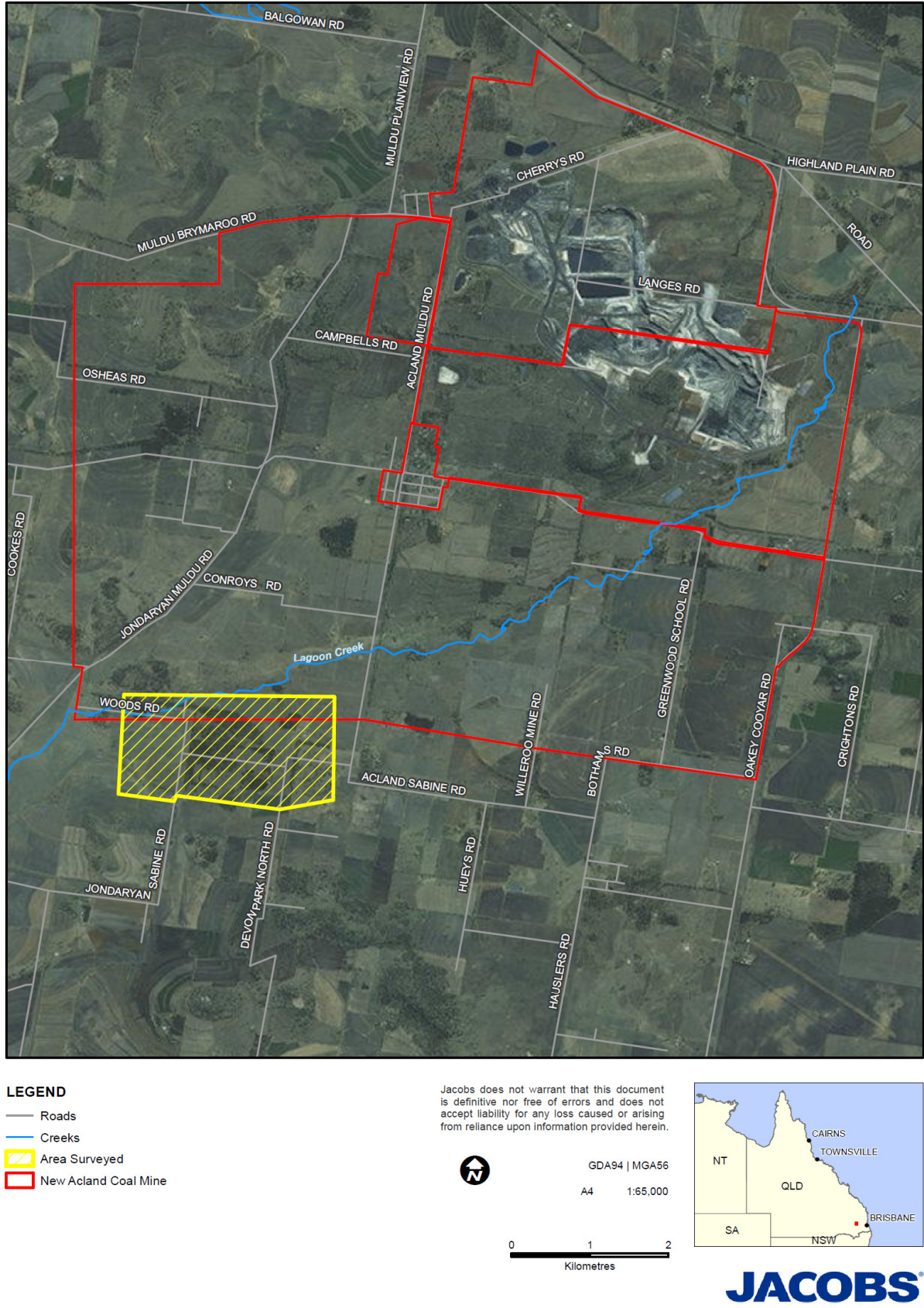


Figure 4: Potential Poplar Box Offset Site

The following key observations were made from the ecological/bio-condition assessment of the potential Poplar Box offset area:

- there is regeneration of the overstorey and understorey species throughout the vegetation that demonstrates that with management, these areas are likely to continue to mature and reach a higher quality condition;
- there is regeneration of tree and shrub species occurring in cleared areas, that with ongoing management such as planting, encouraging regeneration, grazing management and possible use of fire is able to expand the area of vegetation;
- patches of vegetation of RE 11.3.17 could be encouraged with regeneration along the small drainage line that flows to Lagoon Creek; and
- the central area of vegetation that includes REs 11.3.17, 11.9.5 and 11.9.10 is an area of 25 ha that is a relatively intact habitat that provides a core that could be used to further expand and join with other surrounding areas of vegetation.

NAC has recently engaged new ecological consultants to conduct a gap analysis in relation to the Project's offset requirements that will include re-evaluation of the 2014 ecological/bio-condition assessment for the Project's Poplar Box Offset and exploration of the possible options for the Project's Gum-topped Box Offset.

#### **8.4. Fauna listed under *Nature Conservation Act 1992***

Habitat for the Koala, a special least concern species under the NC Act, will be cleared for the Project. The Project will impact an area of approximately 19.5 ha of potential Koala habitat that meets the criteria of "habitat critical to the survival" of Koala and includes REs 11.3.2, 11.3.17, 11.9.10 and 11.9.13. Details of impacted areas for each RE is provided in **Table 3**.

NAC has committed to the implementation of a Koala Species Management Plan for the Project that includes re-vegetation commitments along the riparian zone of Lagoon Creek within the Project area. This re-vegetation work commenced during

NAC will work with the ecological consultants to properly address this offset matter. NAC is also aware that the conservation status for Koala under the NC Act will change in the near future.

**Table 3: Impacts on Matters of State Significance**

RE	Regional Ecosystem	Common Name	Cth Status	VM Act Status	Area cleared (ha)
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	Brigalow	Endangered	Endangered	12.0
11.9.5	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks	Brigalow	Endangered	Endangered	12.6
11.9.10	<i>Acacia harpophylla</i> , <i>Eucalyptus populnea</i> open forest on Cainozoic fine-grained sedimentary rocks	Brigalow	-	Of concern	4.1
Total:					28.7
11.3.21	<i>Dichanthium sericeum</i> and/or <i>Astrelba</i> spp. grassland on alluvial plains. Cracking clay soils	Bluegrass grass dominated natural grassland	Endangered	Endangered	35.9
11.8.11	<i>Dichanthium sericeum</i> grassland on Cainozoic igneous rocks	Bluegrass grass dominated natural grassland	Endangered	Of concern	4.1
Total:					40.1*
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	Poplar Box	-	Of concern	4.8
11.3.17	<i>Eucalyptus populnea</i> woodland with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> on alluvial plains	Poplar Box	-	Of concern	7.0
Total:					11.8
11.9.13	<i>Eucalyptus moluccana</i> or <i>E. microcarpa</i> open forest on fine grained sedimentary rocks	Gum-topped Box	-	Of concern	3.6
Total:					3.6

(\* = The total area has been rounded up based on the individual RE areas.; The red highlighted REs signify potential Koala habitat.; Cth = Commonwealth; RE = Regional Ecosystem; VM Act = Vegetation Management Act)



## 8.5. Plants listed under the *Nature Conservation Act 1992*

As previously stated, one species of plant listed under the NC Act, Belson's Panic, will be affected by the Project. During April 2015, NAC commissioned a re-survey of Belson's Panic as a component of the Project's on-going pre-clearance ecological survey effort (see Section 3).

The targeted habitat surveys for Belson's Panic were undertaken during mid-April 2015 within a 77 ha search area based on GIS data from the Project's previous EIS studies, and a separate and additional 73 ha area based on KBR assessment of present REs consistent with Belson's Panic habitat requirements. The results of these surveys identified that suitable Belson's Panic habitat was only present within 25 ha of the previously mapped 77 ha survey area, and within 39 ha of the additional 73 ha surveyed. As a result, a total of 64 ha of suitable Belson's Panic habitat was identified during the entire survey effort. Importantly, the results of the survey have provided a revised understanding of the location and extent of Belson's Panic habitat within the Project's proposed disturbance footprint area.

Consequently, NAC is re-evaluating its translocation proposal for this species and is considering a combination of translocation and offsetting as a more practical approach for the potential residual impacts. NAC's final offset strategy for Belson's Panic will be guided by further technical advice from the ecological consultants and consultation with the State and Commonwealth regulatory authorities.

As a component of the Project's EIS, NAC provided a Threatened Species Translocation Plan (TSTP). If translocation is adopted as a management strategy, the TSTP will be revised based on the findings of the offset re-evaluation process. The translocated specimens of Belson's Panic will either be re-established within suitable habitat of the Project's Bluegrass Offset or within suitable habitat of the Project's Conservation Zone along Lagoon Creek.

NAC has had preliminary discussions with its Offset Broker in relation to offset availability for Belson's Panic. NAC will also assess what offset opportunities for Belson's Panic are available within the New Hope Group's land. The offset strategy for Belson's Panic will be based on REs consistent with Belson's Panic habitat requirements.

## 9. Proposed offsets for residual impacts on Commonwealth threatened species and communities

The offset areas for Project's impacted TECs and listed species have been calculated using the EPBC Offset calculator and the assessment of the condition of TECs within the Project site. **Table 4** lists the areas to be provided as offsets for predicted residual impacts.

For the Project's Brigalow Offset, the area of residual impact has been calculated as 24.6 ha, using the area of the constituent regional ecosystems – 11.3.1 and 11.9.5. The EPBC Calculator has defined an area of 60 ha as a suitable quantum to offset the residual impact, which is based on the 24.6 ha residual disturbance area and an assessment of the condition of the impacted community and a conservative estimate for the time of a patch of Brigalow to reach ecological benefit. The 60 ha area has been used as the preliminary size of the Project's Brigalow Offset to be secured. Once the offset option for Brigalow has been selected as previously described in Section 8, the ecological consultants will reassess the final quantum of offset required based on the ecological condition of the selected offset site.

For the Project's Bluegrass Offset, the area of residual impact has been calculated as 40.1 ha, using the area of the constituent regional ecosystems – 11.3.21 and 11.8.11. The EPBC Calculator has defined an area of 90 ha as a suitable quantum to offset the residual impact, which is based on the 40.1 ha residual disturbance area and an assessment of the condition of the impacted community and a condition assessment of the original 247 ha offset area completed in 2013. As described in Section 8, the Project's Bluegrass Offset has been defined on 150 ha parcel of land owned by the Acland Pastoral Company approximately 3 kilometres to the south of the Project's southern boundary (**Figure 3**). NAC's ecological consultants will reassess the final quantum of offset required based on the ecological condition of the Project's Bluegrass Offset, which will occur during the proposed benchmarking ecological/bio-condition assessment of the site.

**Table4: Proposed Federal Offsets**

Threatened Species or Community	Area (ha)	Proposed Offset
Brigalow (Acacia harpophylla dominant and co-dominant)	24.6	60 ha of naturally regenerating Brigalow will be required to offset the impact to this community.
Bluegrass dominant grasslands of the Brigalow Belt Bioregions (North and South)	40.1	90 ha of Bluegrass dominated grasslands will be required to offset the impact to this community. An area of 150 ha has been created for this offset and is currently under development.
<i>Homopholis belsonii</i> (Belson's Panic)	69.3	90 ha of grasslands will be required to offset the impact to this species. Recalculation of this offset requirement will be undertaken using the updated survey data. A combination of translocation and offsetting is proposed for this species.

### 9.1. Brigalow Offset

The total Brigalow impact for the Project is 24.6 ha and has been classified as the EPBC listed TEC, comprising REs 11.3.1 and RE 11.9.5. An offset of approximately 60 ha has been calculated to offset the impact of the Project on the Brigalow TEC.

To date, an Offset Broker has been engaged to identify potential third-party offset sites. Two prospective third-party offset sites have recently been identified approximately 50 kilometres northwest of Chinchilla and approximately 75 kilometres northwest of Kingaroy, respectively. Both these sites are adjacent the Barakula State Forest and for privacy reasons remain confidential. Selection of a final site is still required and will involve further engagement of the Offset Broker and negotiation of a 'Call Option' with the third party owner(s) for access for ecological/bio-condition assessment of the site(s) and possible acquisition of one of the sites as the Project's Brigalow Offset.

During early to mid 2015, the New Hope Group acquired mining tenures (exploration and mineral development) and grazing properties in the North Surat Basin from Cockatoo Coal Pty Ltd. A potential Brigalow Offset site has subsequently been identified on one of the acquired properties approximately 18 kilometres south of Wandoan. This site is currently undergoing an ecological/bio-condition assessment to determine its suitability for use as the Project's Brigalow Offset. This site is also outside the New Hope Group's potential area of mine development within the North Surat Basin.

The use of suitable New Hope Group owned land for offsetting purposes is the preferred Company strategy as it offers financial, legal and long term management benefits. A third party offset option for Brigalow will be the Project's 'fall-back' option. The Project's comparatively small quantum of offset requirement for Brigalow and the current downturn in the mining industry (project development) basically ensure that a third party option can easily be sourced by an Offset Broker should it be required for the Project.

### 9.2. Bluegrass (Natural Grasslands) Offset

The total Bluegrass dominated natural grasslands impact for the Project is 40.1 ha and has been classified as the EPBC listed TEC, comprising REs 11.3.21 and 11.8.11. An offset of approximately 90 ha has been calculated to offset the impact of the Project on the Bluegrass TEC.

During the development of the Project's EIS, an area of 247 ha was identified on property owned by the Acland Pastoral Company (New Hope Group) as being suitable for the location of the Project's Bluegrass Offset. During mid to late 2014, an area of approximately 150 ha was officially defined as the Project's Bluegrass Offset site within the original 247 ha identified as suitable land for Bluegrass establishment.

The Project's Bluegrass Offset remains contiguous with a State-defined Regional Biodiversity Corridor and close to the Project site, and therefore, offers additional ecological advantages. The Project's Bluegrass Offset is approximately 3 kilometres to the south of the Project's southern boundary and is located on Lots 7 and 10 on RP36452 (**Figure 3**).

The Project's Bluegrass Offset site has been under development since 2010 and has involved:

- an initial spelling from grazing activities to promote natural regeneration from the soil seed bank and seed drift from surrounding areas;
- seed harvesting of local provenience seed sources and preparation of the harvested seed for sowing of areas requiring repair or maintenance;
- development of a sustainable grazing regime for Bluegrass pasture management;
- photographic monitoring and general assessment; and
- seeking external advice on pasture management on the Darling Downs.

Development of the Project's Bluegrass Offset is currently managed by the Acland Pastoral Company with support from a specialist pasture consultant. The next management steps for the Project's Bluegrass Offset site will require:

- a benchmarking ecological/bio-condition assessment of the site for comparison purposes during future assessment work;
- establishment of an ecological/bio-condition assessment regime (three year cycle) to assess establishment progress;
- continued annual photographic and pasture establishment monitoring of specific reference sites;
- fencing and signage of the site;
- continued seed harvesting of local provenience seed sources and preparation of the harvested seed for maintenance purposes;
- identifying suitable areas for potential re-location of the listed grass species, Belson's Panic; and
- developing a program of maintenance works for recalcitrant grass and weed species.

In relation to grazing management of the Project's Bluegrass Offset site, a new regime has been implemented that accords with the Queensland Grazing Management Guidelines 2014 (i.e. as a best practice approach). This regime involves a program of seasonal rests, early wet season spelling and strategic grazing events to encourage seed set and recruitment of new plants.

In terms of pasture establishment monitoring, a series of monitoring sites has been established within the Project's Bluegrass Offset site. The monitoring system employed is an adaptation of a system established for monitoring the Castlevale Nature Refuge (200,000ha in the Brigalow Bioregion), which has operated since 2008 to the satisfaction of both the DEHP and the pastoral company (i.e. in terms of achieving the joint beneficial objectives of ecological and pasture management).

The continued establishment of the Project's Bluegrass Offset on Acland Pastoral Company land adjacent the Project site provides ecological financial, legal and long term management benefits.

### 9.3. Belson's Panic Offset

The total Belson's Panic impact for the Project is 69.3 ha based on the REs consistent with Belson's Panic habitat requirements. An offset of approximately 90 ha has been calculated to offset the impact of the Project on Belson's Panic. The required offset is also based on the REs consistent with Belson's Panic habitat requirements.

During April 2015, NAC commissioned a re-survey of Belson's Panic as a component of the Project's on-going pre-clearance ecological survey effort (see Section 3).

The targeted habitat surveys for Belson's Panic were undertaken during mid-April 2015 within a 77 ha search area based on GIS data from previous EIS studies, and a separate and additional 73 ha area based on KBR assessment of present REs consistent with Belson's Panic habitat requirements. The results of these surveys identified that suitable Belson's Panic habitat was only present within 25 ha of the previously mapped 77 ha survey area, and within 39 ha of the additional 73 ha surveyed. As a result, a total of 64 ha of suitable Belson's Panic habitat was identified during the entire survey effort. Importantly, the results of the survey have provided a revised understanding of the location and extent of Belson's Panic habitat within the Project's proposed disturbance footprint area.

Consequently, NAC is re-evaluating its translocation proposal for this species and is considering a combination of translocation and offsetting as a more practical approach for the potential residual impacts. NAC's final offset strategy for Belson's Panic will be guided by further technical advice from the ecological consultants and consultation with the State and Commonwealth regulatory authorities.

As a component of the Project's EIS, NAC provided a Threatened Species Translocation Plan (TSTP). If translocation is adopted as a management strategy, the TSTP will be revised based on the findings of the offset re-evaluation process. The translocated specimens of Belson's Panic will be either be re-established within suitable habitat of the Project's Bluegrass Offset or within suitable habitat of the Project's Conservation Zone along Lagoon Creek.

NAC has had preliminary discussions with its Offset Broker in relation to offset availability for Belson's Panic. NAC will also assess what offset opportunities for Belson's Panic are available within the New Hope Group's land. The offset strategy for Belson's Panic will be based on REs consistent with Belson's Panic habitat requirements.



## 10. Delivery of Biodiversity Offsets

Prior to receipt of the Project's major approvals (Mining Leases and Environmental Authority and EPBC Approval), NAC will confirm the details of each the Project's offsets in consultation with the applicable Commonwealth and State regulatory authorities (i.e. DotE and DEHP, respectively).

Once the Project has received all its major approvals, NAC will finalise the legal and other arrangements required for the delivery of the Project's various offset areas. The delivery of the Project's various offsets will be governed by statutory conditions and timeframes, and whether an offset is third party sourced or Company land based. Each third party offset will require a legal agreement with the landowner, which is normally driven by a 'Call Option' process. NAC is working to minimise third party interactions for the delivery of the Project's various offsets.

NAC will generate an Offset Management Plan for each of the Project's offset matters. As a minimum, each of the Project's Offset Management Plans will comply with its legal requirements and be designed to meet regulatory expectations. Section 11 outlines the minimum requirements for each of the Project's Offset Management Plans.

NAC will evaluate a range of legally binding mechanisms for securing the Project's various offset areas in perpetuity. The legally binding mechanisms available in Queensland for offset protection include:

- an environmental offset protection area, under Section 30 of the *Environmental Offsets Act 2014*;
- 'gazettal as a protected area (e.g. a nature refuge)' under the NC Act;
- 'voluntary declaration of an area of high nature conservation value' under the VM Act; or
- use of a 'covenant' under the *Land Title Act 1994* or *Land Act 1994*.

## 11. Management of Offset Areas

As explained previously, NAC will deliver an Offset Management Plan for each of the Project's offset matters. As a minimum, each of the Project's Offset Management Plans will be consistent with Condition 4 of Appendix 3 (Recommended Conditions) of the 'Coordinator General's Evaluation Report on the Environmental Impact Statement for the New Acland Coal Mine Stage 3 Project (December 2014)'.

Condition 4 (Offset Management Plan) prescribes the following legal requirements.

- (a) The approval holder must submit an Offset Management Plan to the Minister for approval at least 3 months prior to commencement of construction for the project.
- (b) The Offset Management Plan must be consistent with relevant Recovery Plans, threat abatement plans, conservation advice and project species management plans, including the Bluegrass Offsets Management Plan (Appendix J.8, EIS, New Acland Coal Mine Stage 3 project).
- (c) The Offset Management Plan must include:
  - (i) details of the offset areas (including maps in electronic Geographic Information System format), site descriptions, environmental values relevant to MNES, amounts of primary habitat for each EPBC listed species, connectivity with other habitat and biodiversity corridors, a rehabilitation program, and conservation and management measures for long-term protection;
  - (ii) a detailed survey and description of the condition of the offset area/s prior to any management activities, including existing EPBC listed species and communities which has the potential to be restored or improved (the baseline condition);
  - (iii) details of how the offset/s have been or will be legally secured;
  - (iv) a description of the potential risks to the successful implementation of the Offset Management Plan, and include details of the contingency measures that will be implemented to mitigate against these risks;
  - (v) management measures for EPBC listed species and communities and EPBC listed species habitat;
  - (vi) a monitoring program for the offset site/s. The monitoring program must:
    - (A) clearly set out performance indicators,
    - (B) measure the success of the management measures against stated performance criteria,
    - (C) include monitoring parameters, frequencies, triggers, corrective actions, timing and scope for the duration of the project approval

- (vii) details of how the plan will be updated to incorporate and address outcomes from research undertaken for EPBC listed threatened species and communities;
  - (viii) an outline of how milestones and compliance will be reported;
  - (ix) details of who will be undertaking monitoring, review, and implementation of the Offset Management Plan (if this person is not the approval holder).
- (d) The Offset Management Plan must be approved by the Minister in writing prior to the commencement of the project.
- (e) Offsets detailed in the Offset Management Plan must be legally secured within two years of commencement of the project or as required under relevant Queensland legislation, whichever is earlier.
- (f) The approved Offset Management Plan must be implemented.

NAC will ensure that its various Offset Management Plans satisfy where necessary their applicable Commonwealth and State requirements. NAC will continue to consult with the Commonwealth and State regulatory authorities to ensure this outcome (i.e. DotE and DEHP, respectively).

## Appendix A – EPBC Offset Calculator

### EPBC Calculator Inputs - Brigalow TEC – October 2014

Calculator Variable	Input	Explanation	Reference document/s
Impact description	Clearing of a threatened ecological community for construction of the Project	Residual impact on Brigalow in Project area (24.6 ha). Community is present in small, fragmented areas of brigalow are located along Lagoon Creek that flows through the Project area	Appendix H.1 MNES Report.
Impact area	24.6 ha residual impact	Field surveys to confirm presence of brigalow community, consistent with listing advice. Condition of vegetation was recorded by BioCondition surveys (Eyre et al. 2011) and by using the listing advice condition criteria.	Appendix H.1 MNES Report; Appendix G Terrestrial Ecology Field Survey Results BioCondition – A Condition Assessment Framework for Terrestrial Biodiversity in Queensland – Assessment Manual (Eyre et al. 2011)
Quality of vegetation impacted (0-10)	5	Components of habitat quality for consideration in the EPBC Act offsets assessment guide include site condition, site context and species stocking rate. Site condition - Condition of the vegetation was found to be impacted by clearing, weed infestation and grazing. Site condition score 6. Site context – Patches of the community are scattered and fragmented across the landscape, with limited connection to other areas of vegetation. There is some connection long Lagoon Creek. Site condition score 5. Species stocking rate – Surveys found a dominance of common species, with no listed fauna and one listed flora species. The species stocking rate is considered to be	Appendix G Terrestrial Ecology Field Survey Results Ecological Equivalence Methodology Guideline Version 1 (DERM, 2011)

Calculator Variable	Input	Explanation	Reference document/s
		low. Species stocking rate is 4. The average score across the three components is 5.	
Proposed offset Area	60 ha	Area of Brigalow community that NAC is seeking to secure on a third party property.	
Risk related time horizon	20 years	Offset will be secured “in perpetuity” so the maximum timeframe has been used.	
Time until ecological benefit	15 years	The time until benefit is 15 years, as the Brigalow community will be present on the offset property.	
Start area	60 ha	Area of Brigalow community that NAC is seeking to secure on a third party property.	
Start quality	5	The start quality is an estimate and is to be confirmed once negotiations with the third party landholder allow for NAC to undertake a survey of the potential offset site.	
Risk of loss (%) without offset	15%	<p>The risk of loss without an offset is estimated to be 15% on the basis that the loss of the community from clearing is low due to the operation of clearing controls (Qld Vegetation Management Act and Cth EPBC Act). It is very unlikely that there will be approvals in place for the clearing of vegetation and there is not pending threat of clearing.</p> <p>This level of risk has been assigned as the clearing of vegetation on these properties needs planning approval from the State and Commonwealth governments, as it is both remnant vegetation and a threatened ecological community. While approval for the clearing of vegetation is possible, an applicant will need to provide information to the regulators on the impact of the development of the values of the vegetation and provide an offset for the residual impact of the clearing.</p>	
Future quality without offset (scale of 0-10)	4	The future quality of the vegetation is anticipated to decline slightly over the 15 year period of the evaluation. This is as a result of the gradual increase in impact of weeds and grazing and the likely continued exclusion of fire.	
Risk of loss	5%	Risk of loss of the Brigalow community at	



Calculator Variable	Input	Explanation	Reference document/s
(%) with offset		an offset site is considered to be 5%. The offset site will be protected and managed to improve the quality of the community. A covenant placed on title of the offset property will avert the risk of loss of the offset area as the landowner will not be able to obtain development approval that has an impact on the offset.	
Future quality with offset (scale of 0-10)	8	The future quality of the offset vegetation will be 8. This is on the basis that the Brigalow community is present at the site and will respond to management and removal of threats (weeds, grazing) to lead to regeneration of the community.	
Confidence in result (quality)	50%	Confidence in the quality result is rated a relatively low level, as the offset site has yet to be inspected and the quality of the existing vegetation to be evaluated. Without specific knowledge of the offset vegetation, a very conservative level of confidence has been applied.	
Confidence in result (risk of loss)	50%	Confidence in the risk result is rated a relatively low level, as the offset site has yet to be inspected and the quality of the existing vegetation to be evaluated. Without specific knowledge of the offset vegetation, a very conservative level of confidence has been applied.	

#### **EPBC Calculator Inputs - Bluegrass dominant grasslands of the Brigalow Belt Bioregions (North and South) – October 2014**

Calculator Variable	Input	Explanation	Reference document/s
Impact description	Clearing of a threatened ecological community for construction of the Project	Residual impact on Bluegrass dominant grasslands in Project area (40.1 ha). The community is present in scattered areas along Lagoon Creek and patch in Manning Vale west pit.	Appendix H.1 MNES Report.
Impact area	40.1 ha residual impact	Field surveys to confirm presence of Bluegrass dominant grasslands community, consistent with listing advice. Condition of vegetation was recorded by	Appendix H.1 MNES Report; Appendix G Terrestrial

Calculator Variable	Input	Explanation	Reference document/s
		BioCondition surveys (Eyre et al. 2011) and by using the listing advice condition criteria.	Ecology Field Survey Results BioCondition – A Condition Assessment Framework for Terrestrial Biodiversity in Queensland – Assessment Manual (Eyre et al. 2011)
Quality of vegetation impacted (0-10)	5	<p>Components of habitat quality for consideration in the EPBC Act offsets assessment guide include site condition, site context and species stocking rate.</p> <p>Site condition - Condition of the vegetation was found to be impacted by clearing, weed infestation and grazing. Site condition score 6.</p> <p>Site context – Patches of the community are scattered and fragmented across the landscape, with limited connection to other areas of vegetation. Site condition score 5.</p> <p>Species stocking rate – Surveys found a dominance of common species, with no listed fauna and one listed flora species. The species stocking rate is considered to be low. Species stocking rate is 4.</p> <p>The average score across the three components is 5.</p>	
Proposed offset Area	90 ha	This is the area of the grassland community that NAC has on its land, adjacent to the Project.	
Risk related time horizon	20 years	Offset will be secured “in perpetuity” so the maximum timeframe has been used.	
Time until ecological benefit	15 years	The time until benefit is 15 years, as the grassland community will be present within the offset sites, however will require management of weeds and grazing the achieve the realisation of the offset objectives.	
Start area	90 ha	This is the area of the grassland community that NAC has on its land, adjacent to the Project.	
Start quality	4	The start quality has been derived from	

Calculator Variable	Input	Explanation	Reference document/s
		surveys of the disturbance area of the Project. The start quality of 4 reflects that there is encroachment of woody vegetation at the edges of some of the community, use of the community for grazing and the widespread presence of weeds that compete with native species within the community.	
Risk of loss (%) without offset	15%	<p>The risk of loss without an offset is estimated to be 15% on the basis that the loss of the community from clearing is low due to the operation of clearing controls (Qld Vegetation Management Act and Cth EPBC Act).</p> <p>This level of risk has been assigned as the clearing of vegetation at the offset sites needs planning approval from the State and Commonwealth governments, as it is both remnant vegetation and a threatened ecological community. While approval for the clearing of vegetation is possible, an applicant will need to provide information to the regulators on the impact of the development of the values of the vegetation and provide an offset for the residual impact of the clearing.</p>	
Future quality without offset (scale of 0-10)	3	The future quality of the vegetation is anticipated to decline slightly over the 15 year period of the evaluation. This is as a result of the gradual increase in impact of weeds and grazing.	
Risk of loss (%) with offset	5%	Risk of loss of the grassland community at an offset site is considered to be 5%. The offset site will be protected and managed to improve the quality of the community. A covenant placed on title of the offset property will avert the risk of loss of the offset area as the landowner will not be able to obtain development approval that has an impact on the offset.	
Future quality with offset (scale of 0-10)	8	The future quality of the offset vegetation will be 8. This is on the basis that the grassland community is present at the site and will respond to management and removal of threats (weeds, grazing) to lead to regeneration of the community.	

Calculator Variable	Input	Explanation	Reference document/s
Confidence in result (quality)	75%	Confidence in the quality result is rated at 75%, as the sites have been surveyed and there is knowledge of the current state of both the impact area and offset area.	
Confidence in result (risk of loss)	75%	Confidence in the risk result is rated at 75%, as there is knowledge of the management of the impact and offset sites and the risks that are present with the management of the offset.	

### EPBC Calculator Inputs - *Homopholis belsonii* – October 2014

Calculator Variable	Input	Explanation	Reference document/s
Impact description	Clearing of a threatened species for construction of the Project	Residual impact on <i>Homopholis belsonii</i> in Project area (69.3 ha). The species is associated with poplar box woodland (RE 11.3.2), mountain coolibah woodland (RE11.8.5), poplar box/brigalow woodland (RE11.3.17) and brigalow/poplar box open forest (RE 11.9.10).	Appendix H.1 MNES Report.
Impact area	69.3 ha residual impact	Field surveys to confirm presence of <i>Homopholis belsonii</i> .	Appendix H.1 MNES Report; Appendix G Terrestrial Ecology Field Survey Results BioCondition – A Condition Assessment Framework for Terrestrial Biodiversity in Queensland – Assessment Manual (Eyre et al. 2011)
Quality of vegetation impacted (0-10)	5	Components of habitat quality for consideration in the EPBC Act offsets assessment guide include site condition, site context and species stocking rate. Site condition - Condition of the vegetation was found to be impacted by clearing, weed infestation and grazing. Site condition score 6. Site context – Patches of the community are	

Calculator Variable	Input	Explanation	Reference document/s
		scattered and fragmented across the landscape, with limited connection to other areas of vegetation. Site condition score 4. Species stocking rate – Surveys found a dominance of common species, with no listed fauna and one listed flora species. The species stocking rate is considered to be medium. Species stocking rate is 5. The average score across the three components is 5.	
Proposed offset area	Proposed offset areas	90 ha	
Risk related time horizon	20 years	Offset will be secured “in perpetuity” so the maximum timeframe has been used.	
Time until ecological benefit	15 years	The time until benefit is 15 years, to allow for the successful establishment of the species at offset sites and for the plants to reproduce.	
Start area	Proposed offset areas	90 ha	
Start quality	4	The start quality has been derived from surveys of the disturbance area of the Project. The start quality of 4 reflects that there is encroachment of woody vegetation at the edges of some of the communities in which <i>Homopholis belsonii</i> is located, use of the community for grazing and the widespread presence of weeds that compete with <i>Homopholis belsonii</i> within the communities.	
Risk of loss (%) without offset	15%	<p>The risk of loss of the species without an offset is estimated to be 15% on the basis that the loss of the species from clearing is low due to the operation of clearing controls (Qld Nature Conservation Act and Cth EPBC Act).</p> <p>This level of risk has been assigned as the clearing of the species on the offset properties needs planning approval from the State and Commonwealth governments, as the species is a listed under both Queensland and Commonwealth legislation. While approval for the clearing of vegetation is possible, an applicant will need to provide information to the</p>	



Calculator Variable	Input	Explanation	Reference document/s
		regulators on the impact of the development of the values of the species and provide an offset for the residual impact of the clearing.	
Future quality without offset (scale of 0-10)	3	The future quality of the vegetation community in which the species is found is anticipated to decline slightly over the 15 year period of the evaluation. This is as a result of the gradual increase in impact of weeds and grazing.	
Risk of loss (%) with offset	5%	Risk of loss of the species at an offset site is considered to be 5%. The offset site will be protected and managed to improve the quality of the community. A covenant placed on title of the offset property will avert the risk of loss of the offset area as the landowner will not be able to obtain development approval that has an impact on the offset.	
Future quality with offset (scale of 0-10)	8	The future quality of the offset vegetation will be 8. This is on the basis that the community in which the species is present at the site and will respond to management and removal of threats (weeds, grazing) to lead to regeneration of the species. The species will also be translocated where it will establish additional communities of the species.	
Confidence in result (quality)	80%	Confidence in the quality result is rated at 80%, as the sites have been surveyed and there is knowledge of the current state of both the impact area and offset area.	
Confidence in result (risk of loss)	80%	Confidence in the risk result is rated at 80%, as there is knowledge of the management of the impact and offset sites and the risks that are present with the management of the offset.	

## **APPENDIX C – GMIMP**





# GROUNDWATER MONITORING AND IMPACT MANAGEMENT PLAN

*New Acland Coal Mine Stage  
3 Project*

**JUNE 2015**





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# 1. Introduction

This Groundwater Monitoring and Impact Management Plan (GMIMP) has been prepared to address the issues associated with the predicted impacts on groundwater at and surrounding the revised Project site from the proposed Stage 3 Expansion, south and west of New Acland Coal Pty Ltd's (NAC) current mining operation. It sets out the groundwater monitoring program for the revised Project site and the associated groundwater impact triggers that will invoke further assessment and groundwater impact management. The GMIMP is designed to provide consistency with the revised Project's Environmental Management Plan (EMP) and regulatory requirements.

Groundwater management plans are typically prepared following the issue of an Environmental Authority (EA) and address the relevant conditions stipulated therein. This plan has been developed as part of the Environmental Impact Statement (EIS) process and will be amended and finalised as necessary following the issue of a new draft Environmental Authority (EA) for the revised Project site.

The GMIMP will be administered as a supporting document to the revised Project's Plan of Operations.

The existing Mine currently operates under EA EMPL00335713 which covers Mining Leases (MLs) 50170 and 50216 immediately to the north of the revised Project area. The existing EA includes a number of conditions relating to groundwater monitoring and groundwater impact triggers. These conditions have been incorporated into the GMIMP for the revised Project site.

The GMIMP is structured as follows.

- Section 2: describes the principal aquifers of interest around the revised Project site, local use of groundwater, and the predicted impacts on groundwater from the revised Project's operations.
- Section 3: describes the groundwater monitoring program for the revised Project site including monitoring locations, monitoring frequency, and the parameters to be recorded/analysed.
- Section 4: sets out the groundwater impact triggers and protocols for investigating, and if required, mitigating the impacts on groundwater from the revised Project's operations.
- Section 5: describes the process of continual review and improvement of the GMIMP to ensure it continues to meet its objectives.

## 2. Predicted Impacts on Groundwater Levels

This section provides a summary of the five aquifers of interest in the vicinity of the revised Project site, the local use of groundwater and the predicted impacts from the revised Project's operations on these aquifers.

### 2.1. Principal Aquifers of Interest at the revised Project site

In the vicinity of the revised Project site, three of the principal aquifers of interest – the Walloon Coal Measures, the Marburg Sandstone, and the Helidon Sandstone – are subartesian aquifers within the Great Artesian Basin Groundwater Management Unit (GAB GMU). The *Water Resource (Great Artesian Basin) Plan 2006*, a subordinate regulation to the Water Act (2000), covers the management of all artesian and subartesian water in the vicinity of the revised Project site.

To implement the *Water Resource (Great Artesian Basin) Plan 2006*, the Queensland Government has produced the Great Artesian Basin Resource Operations Plan (GABROP). This plan came into force during early 2007 and was amended during late 2012. The GABROP applies to artesian, subartesian and spring connected water, and provides processes for dealing with unallocated water reserves (general and State). The GABROP subdivides the GAB GMU into 25 management areas. The revised Project is located within the Eastern Downs groundwater management area (Eastern Downs GMA) of the GAB GMU.

The revised Project access to unallocated general and State water reserves is very limited as a consequence of the status of the Eastern Downs GMA. Capping of abstraction volumes is employed to prevent overexploitation of groundwater and is essential for the Eastern Downs GMA, which is currently over allocated.

In addition to the three subartesian GAB aquifers at the revised Project site, the Tertiary Basalt and Quaternary Alluvium aquifers in the vicinity of the revised Project site contribute to the local hydrological environment.

The Quaternary Alluvial aquifer is not present within the revised Project site, except potentially for a very small portion of the far southeastern corner. However, to the south and north of the revised Project site, the Alluvial aquifer is associated with the Oakey and Myall Creeks and is known to support significant groundwater abstraction. Groundwater contained within the Quaternary Alluvium associated with Oakey Creek is managed under the Oakey Creek groundwater management area (Oakey Creek GMA). The water resource cap of the Oakey Creek GMA applies to abstraction for the mining, oil and gas industries.

The Tertiary Basalt aquifer is only present to a minor extent within the northwest of the revised Project site, however the aquifer becomes prolific immediately west of the revised Project site. Groundwater contained within the Tertiary Basalt aquifer is managed under the Eastern Downs GMA. As previously explained, the water resource cap of the Eastern Downs GMA applies to abstraction for the mining, oil and gas industries.

#### *Quaternary Alluvial Aquifers*

Quaternary alluvium across the revised Project site is limited in extent and thickness and is not considered to possess significant potential to supply water. The nearest alluvium supporting groundwater supplies is the Oakey Creek Alluvium to the southeast of the revised Project site where the alluvium reaches a maximum thickness of 60 m. The proposed mine pits will not intersect this aquifer, with the closest occurrence of the Alluvial aquifer occurring approximately 2 km from the southernmost proposed mining area. Oakey Creek is an ephemeral watercourse located approximately 10 km to the south-east of the revised Project area and has been characterised in previous studies as a losing stream, i.e. water flow in the

creek is not derived from groundwater, but rather shallow alluvial groundwater receives recharge from the creek.

### ***Tertiary Basalt Aquifer***

Tertiary Basalts are present in the north and west of the revised Project site and become more prevalent to the west of the revised Project site, varying in thickness up to 140 m. These occurrences are the result of Tertiary lava flows which have infilled pre-Tertiary age palaeo channels (ancient former drainage systems), making their thickness highly variable. The basalts are discrete lava flows interbedded with clay horizons which have the potential to act as aquitards (impermeable layers) within the basalt aquifer. Groundwater within the Tertiary Basalt aquifer is dominantly stored and transmitted through fractures in the rock mass.

NAC currently draws groundwater from the basalt aquifer for potable water supply under a licensed allocation of 160 ML/year. In general, NAC only uses around 11 ML/year from the basalt aquifer for potable water production (based on recorded 2012 abstraction). The basalt aquifer is used by local landowners, predominantly to the west of the site, for private water supply.

### ***Walloon Coal Measures Aquifer***

The Walloon Coal Measures consist of grey and light grey shales, siltstones, fine clayey sandstones, carbonaceous shales, mudstones and coal seams. The coal seams are laterally continuous but are characterised by rapid lateral variation of the interseam sediment thickness. The Walloon Coal Measures comprises three major coal intervals – Waipanna, Acland-Sabine and Balgowan. The revised Project site will extract coal from the Acland-Sabine interval but leave the underlying Balgowan interval in place.

Although not widely considered to form a regional GAB aquifer, the Walloon Coal Measures is a subartesian aquifer within the GAB of particular interest with regard to potential groundwater impacts from mining activities, as it is continuous across the revised Project site and surrounding area, and is widely exploited by surrounding properties for water supply.

At its deepest point the revised Project will mine down to approximately 75 m below ground surface (i.e. as the deepest economically recoverable coal). The Mine currently utilises groundwater that seeps into the active mine pits from the coal measures, mainly for dust suppression purposes.

### ***Marburg Sandstone Aquifer***

The Marburg Sandstone is a confined subartesian aquifer. It underlies the Walloon Coal Measures and consists of sandstone, minor coal, and conglomerate rock types. The productive water bearing units are interbedded with low permeability rock units such as mudstone, siltstone and shale.

Aquitards (low permeability strata) within and below the overlying Walloon Coal Measures act as effective confining layers for the Marburg Sandstone aquifer which occurs at a depth of approximately 150 mBGL within the revised Project site, generally 75 m below the bottom of active mine pits.

In the past, the Mine regularly extracted groundwater from the Marburg Sandstone aquifer for coal washing. This practice has been significantly reduced following a water supply agreement with the Toowoomba Regional Council (TRC) for the supply of recycled water from the Wetalla Water Reclamation Facility (WWRF). Groundwater levels in the Marburg Sandstone aquifer in the vicinity of the revised Project site have and are predicted to continue to recover as a result of the significant reduction in abstraction. NAC will maintain its licence



arrangements for the Marburg Sandstone aquifer as an emergency water supply. To facilitate this arrangement, NAC will run periodic abstraction campaigns up to a total of approximately 10 ML/year to keep pumping equipment operational.

### **Helidon Sandstone Aquifer**

The Helidon Sandstone aquifer lies approximately 500–600 m below ground level at the revised Project site, and is isolated from the overlying aquifers by the relatively impermeable Evergreen Formation which is approximately 200 m thick. This subartesian aquifer is extensive within the area and is utilised for a number of large commercial/industrial abstractions within this portion of the Eastern Downs GMA (e.g. Oakey abattoir).

In the past, the Mine regularly extracted groundwater from the Helidon Sandstone aquifer primarily for coal washing purposes. This practice has been significantly reduced following a water supply agreement with the TRC for the supply of recycled water from the WWRF. NAC will maintain its licence arrangements for the Helidon Sandstone aquifer as an emergency water supply. To facilitate this arrangement, NAC will run periodic abstraction campaigns up to a total of approximately 20 ML/year to keep pumping equipment operational. Groundwater levels in the Helidon Sandstone aquifer in the vicinity of the revised Project site are predicted to recover as a result of the significant reduction in abstraction.

As a condition of NAC's abstraction licence, groundwater modelling has been required to evaluate the impact of abstraction from the Helidon Sandstone aquifer and its interaction with other abstractions from this aquifer within the Eastern Downs GMA. This information has been reported to the then Department of Environment and Resource Management (DERM).

Based on the depth of the Helidon Sandstone Aquifer and the presence of a significant aquitard (Evergreen Formation), the mining of coal across the revised Project site is not anticipated to have any impact on water levels in this aquifer.

## **2.2. Current and Future Groundwater Use at the Mine**

The Mine's main operational water supply is recycled water from the WWRF, which has been secured for the life of the revised Project through a long term agreement with the TRC. NAC also supplements its operational water supply with recycled water from its in-pit tailings dam, limited extraction from shallow groundwater sources (e.g. Tertiary Basalt for potable supply), and surface water captured in environmental and other dams. As previously explained, prior to the agreement with the TRC, groundwater was the main water source for the Mine.

NAC currently holds water licences to extract groundwater from the Tertiary Basalt, the Marburg Sandstone, and the Helidon Sandstone aquifers. NAC's actual groundwater abstraction from the Helidon Sandstone aquifer is well below its 710 ML allocation, with a recorded usage of about 17 ML in 2012.

The current allocation from the Marburg Sandstone aquifer is 271 ML/year. NAC reduced its original allocation of 571 ML/year from the Marburg Sandstone aquifer during 2009. Groundwater abstraction for 2012 amounted to 10.5 ML from the Marburg Sandstone. As explained previously, NAC has a licence to extract 160 ML/year from the Tertiary Basalt, but utilises around 11 ML/year.

Groundwater abstraction from the Marburg and Helidon Sandstone aquifers has reduced to a small percentage of the licensed allocation with the commissioning of the WWRF pipeline in 2009. As a result, the revised Project's dependence on the local Eastern Downs GMA is minimal, with the usage figures for 2012 being representative of future usage (including for the revised Project), alleviating potential long term pressure on these aquifers. The



abstraction of water from the Tertiary Basalt aquifer for potable use at the revised Project site will continue at 2012 rates of around 11 ML/year. All NAC's groundwater abstraction is conducted within its legal allocated limits under the *Water Act 2000*.

### 2.3. Groundwater Use around the revised Project Site

A search of the Department of Natural Resources and Mines (DNRM) bore database was conducted to identify groundwater bores in the vicinity of the revised Project site. **Table 2-1** summarises the bores identified from the DNRM database within a zone extending 8 km beyond the revised Project's mining lease application area (50232). The location of all bores outside the revised Project area, including the current Mine site, are shown on **Figure 2-1**, **Figure 2-2** and **Figure 2-3**. It should be noted that it is considered highly likely that other non-registered bores may also exist.

**Table 2-1 DNRM Database - Bores within 8 km of New Acland Coal Mine<sup>1</sup>**

Aquifer	Existing bores	Proposed bores
Quaternary Alluvium	159	0
Tertiary Basalt	81	0
Walloon Coal Measures	132	1
Marburg Sandstone	44	0
Helidon Sandstone	1	0
Not defined <sup>2</sup>	413	26
Total:	857	

- Notes:
1. Not including bores listed as 'abandoned and destroyed'.
  2. The DNRM database only identifies the source aquifers for around 50% of the bores within 8km of the mining leases.

The Walloon Coal Measures aquifer supplies both fresh and brackish water and is utilised extensively in the vicinity of the revised Project site for stock and domestic supply. It is considered likely that a large proportion of the bores identified in **Table 2-1**, for which source aquifer details are not available, abstract water from the Walloon Coal Measures aquifer. The DNRM bore data suggest that this aquifer generally produces yields between 0.1 L/sec and 5.4 L/sec, on average lower than yields from other aquifers in the database search area. Water quality is generally listed in the DNRM database as "potable" with some occurrences of "brackish" water for this aquifer.

The expanse of Tertiary Basalt to the west and north-west of the revised Project site supports water supplies for stock watering and potable supply. Groundwater in the Tertiary Basalt aquifer is generally of potable quality. The yield from the basalt bores ranges from 0.1 L/sec to 15.6 L/sec but is typically less than 3 L/sec, and is highly dependent on the degree of fracturing encountered. Exploration activities by NAC's sister company, New Hope Exploration Pty Ltd, observed that water storage within the Tertiary Basalt aquifer was discretely located in association with fracture zones within the basalt. It is considered likely that some of the bores identified in **Table 2-1** for which the source aquifer is not defined intersect the Tertiary Basalt aquifer.

The majority of the Marburg Sandstone bores are located to the east of the revised Project site (**Figure 2-3**). The DNRM bore database shows that this aquifer is generally qualitatively listed in the database as being of 'potable' quality, and yields range from 0.4 L/sec to 10.7 L/sec. It is considered likely that some of the bores identified in **Table 2-1** for which the source aquifer is not defined intersect the Marburg Sandstone aquifer.

The nearest bore (apart from those owned and operated by NAC) which abstract from the Helidon Sandstone aquifer is located 6.5 km south of the revised Project site in the area of the Oakey township. Other known bores in accessing the Helidon Sandstone are located approximately 15 km to the east (Toowoomba Cooby Dam Bore and Hampton Irrigators), and 15 km to the south (Oakey abattoir) of the revised Project site.

## 2.4. Predicted Impacts on Groundwater Levels and Users

As excavation of the revised Project's active mine pits proceeds below the Walloon Coal Measures' water table, groundwater will discharge into the pits. Dewatering of the Walloon Coal Measures aquifer will result in the lowering of groundwater levels in the aquifer in the immediate vicinity of the revised Project site. Groundwater levels in the Tertiary Basalt and Marburg Sandstone aquifers around the revised Project site will also be affected by dewatering the Walloon Coal Measures due to induced through-flow and leakage of groundwater from these aquifers to the Walloon Coal Measures.

Mining is planned to advance in a general north to south direction for the revised Project. The active mine pits will be excavated as a progressive series of strips that advance across the Walloon Coal Measures aquifer (resource area). As each active mine pit (new strip) advances, the previous strip is backfilled with mined material and rehabilitated. Following cessation of mining, groundwater will continue to discharge to the rehabilitated final voids, driven by evaporative discharge from the pit lakes that will form in the voids. A steady state equilibrium will be reached where the pit lake levels recover to an equilibrium where evaporation from the lakes balances groundwater inflow, at a level below that of the pre-mining water table.

The revised Project's EIS (SKM 2013) included the development and calibration of a transient groundwater flow model to predict groundwater drawdown in the surrounding aquifers over the life of the revised Project and following closure. The model and its predictions were updated as part of the AEIS (Jacobs SKM, 2014). The model is subdivided vertically into four separate layers which represent the separate hydrogeological units. The revised Project's timescale extends to 2030 and is incorporated within the model by using mining zones which are activated according to the mining schedule and de-activated as they are rehabilitated.

Impacts on groundwater levels will vary spatially over time as the mined area migrates across the revised Project site. The model predicts the greatest impacts on groundwater levels surrounding the revised Project will occur around 2030 at the end of mining. This corresponds to the Life of Mine Plan when the deepest areas of working will result in the most widespread drawdown.

Full details of the model, model calibration, predicted impacts on groundwater over the life of the revised Project are presented in the updated modelling report, presented as Appendix F of the AEIS (Jacobs SKM, 2014).

### *Predicted Impacts on the Alluvial Aquifer*

A small amount of drawdown within the alluvium, less than 2 m, is predicted in an isolated area in the vicinity of Lagoon Creek adjacent the southwest of the revised Project site. As detailed in the EIS, previous groundwater investigations and a general lack of DNRM-registered bores in this area suggest that the alluvium associated with Lagoon Creek is shallow and dry; it is therefore likely that the predictions of drawdown in this area are a

modelling artefact related to layering and model setup. The impact of predicted groundwater drawdown associated with the revised Project mining activities on the alluvium of Oakey and Myall Creeks (including their tributaries of Doctors, Lagoon and Spring Creeks) is also represented by the predicted change in flows in the Oakey and Myall Creeks. Model results indicate that no additional losses to baseflow as a result of the revised Project are expected to occur, above any historic or current impacts. Overall, model results indicate very little to no impact to the alluvial aquifer from the revised Project.

### ***Predicted Impacts on the Tertiary Basalt Aquifer – 2030***

The predicted drawdown in the Tertiary Basalt aquifer for the year 2030, which represents both the end of mining and the time of maximum predicted impact from the revised Project's operation, is presented in **Figure 2-1**. For the Tertiary Basalt aquifer, groundwater drawdown is limited to the area northwest of the revised Project site. Drawdown of up to 7 m in the Basalt is limited outside of the revised Project site to mainly the north and northwest areas, with drawdowns of between 1 and 5 m extending around 8 km from the western boundary of the revised Project site. Drawdown exceeding greater than around 7 m does not occur outside of the revised Project site. There are 12 non-APC DNRM-registered bores beyond the revised Project boundary that are predicted to experience drawdowns from mining activity of greater than 2 m for the time of deepest working across the widest area (2030).

Drawdowns of the order predicted in the Tertiary Basalt aquifer are for the most part not considered to be significant in terms of affecting the yield or access to groundwater in existing bores abstracting from the Tertiary Basalt aquifer.

### ***Predicted Impacts on the Walloon Coal Measures Aquifer – 2030***

The predicted drawdown in the Walloon Coal Measures aquifer for the year 2030, which represents both the end of mining and the time of maximum predicted impact from the revised Project's operation, is presented in **Figure 2-2**.

**Figure 2-2** shows that drawdowns in excess of 5 m outside of the revised Project site are restricted to areas less than 5 km to the south, west and northwest. There are 19 non-APC DNRM-registered bores beyond the revised Project boundary that are predicted to experience drawdowns from mining activity greater than 2 m for the time of deepest working across the widest area (2030). This number of bores excludes those bores in the DNRM database without defined source aquifers. The 1 m predicted drawdown contour in the Walloon Coal Measures aquifer is reasonably widespread to the west and northwest of the revised Project site, extending up to 9 km from the lease boundaries.

Drawdowns of the order predicted in the Walloon Coal Measures aquifer are not considered to be significant in terms of affecting the yield or access to groundwater in existing bores abstracting from this aquifer outside of the revised Project site lease boundary, except for the few bores on properties within 5 km of the western lease boundary and 2 km of the eastern lease boundary.

### ***Predicted Impacts on the Marburg Sandstone Aquifer – 2030***

**Figure 2-3** presents the predicted drawdown in the Marburg Sandstone aquifer for the year 2030, which represents both the end of mining and the time of maximum predicted impact from the revised Project's operation. The Marburg Sandstone aquifer is situated approximately 75 m below the lowest level of working in the Walloon Coal Measures aquifer. Drawdowns are predicted to be much less in this aquifer beneath the active mine pits and do not exceed much more than 10 m. Low levels of drawdown in the Marburg Sandstone aquifer (more than 1 m) are expected to propagate up to 9 km from the revised Project site.



**Figure 2-3** indicates a limited number of Marburg Sandstone bores in the immediate vicinity of the revised Project site, within 9 non-APC DNRM-registered bores predicted to experience drawdowns from mining activity greater than 2 m for the time of deepest working across the widest area (2030). However, it is acknowledged that some of the bores from the DNRM database that have no details of their source aquifer may abstract from the Marburg Sandstone aquifer.

Drawdowns of the order predicted in the Marburg Sandstone aquifer are for the most part not considered to be significant in terms of affecting the yield or access to groundwater in existing bores abstracting from the Marburg Sandstone aquifer.

### *Predicted Impacts on the Helidon Sandstone Aquifer*

The Helidon Sandstone aquifer is not represented in the groundwater model as it lies some 200 m below the base of the Marburg Sandstone aquifer, and separating these two units is the relatively low permeability Evergreen Formation. The revised Project site is therefore not anticipated to have any significant impact on the Helidon Sandstone aquifer. NAC's current abstraction from this aquifer has substantially reduced prior to the revised Project's implementation resulting in the recovery of groundwater levels and the alleviation of some resource pressure on this GAB aquifer.

### *Impacts on Groundwater Levels – Post Mining*

After cessation of mining in 2030, groundwater levels are predicted to gradually recover so that for the most part there is less than 5 m residual drawdown outside the revised Project's boundaries in the Walloon Coal Measures aquifer. Recovery to pre-mining conditions throughout the revised Project site is limited by evapotranspirative losses from the depressed landforms (rehabilitated final voids). Due to the high regional potential evapotranspiration rate, groundwater discharge to the depressed landforms is predicted continue at a rate of around 1 ML/day. Drawdown adjacent the last areas to be mined is predicted to remain relatively minor (approximately 2 to 6 m) due to the ongoing evaporation-driven groundwater discharge into the depressed landforms. Permanent lakes are predicted to form in all three depressed landforms (rehabilitated final voids). The maximum depths of the lakes that are predicted to form are around 33 m in the Manningvale West depressed landform, 18 m in the Manningvale East depressed landform, and 22 m in the Willeroo depressed landform. Groundwater level recovery within the depressed landforms remains at 2 to 6 m below the level of the pre-mining water table in the long term, due to the ongoing evapotranspirative groundwater discharge. As a result, the depressed landforms form a depression of the potentiometric surface within the vicinity of the depressed landforms and act as a groundwater sink that will not permit any pooled water within or adjacent to the depressed landforms to flow outwards into the regional groundwater system.

The 1 m drawdown extent in the Walloon Coal Measures aquifer is predicted to remain at approximately 6 km from the revised Project boundary at its greatest (western) extent in the long term post-mining due to ongoing evapotranspiration-driven groundwater discharge to the depressed landforms. Within the Tertiary Basalt and Marburg Sandstone aquifers, groundwater levels recover such that maximum drawdowns do not exceed much more than 2 to 3 m for either aquifer in the long term. However, the extent of drawdown for these two aquifers, modelled as the 1 m drawdown contour, in the long term remains at a similar proximal distance from the revised Project site as at the final year of mining. The groundwater system is expected to recover post-mining to a new steady state-equilibrium such that no additional groundwater impacts are expected other than those that exist at the end of mining in 2030.

### *Impacts on Groundwater Quality*

The drawdown of groundwater levels in the Walloon Coal Measures aquifer around the revised Project's depressed landforms will result in the movement of groundwater towards these depressed landforms. The aquifers surrounding the revised Project site will continue to receive recharge via the same processes that occurred prior to the operational phase of the revised Project (via rainfall infiltration over time). Therefore, the groundwater quality in the vicinity of the revised Project site is not anticipated to be affected as a result of mining.

As the Marburg Sandstone aquifer is confined by the overlying lower Walloon Coal Measures, the potential for impacts on water quality within this aquifer from the revised Project's mining activity is considered negligible.

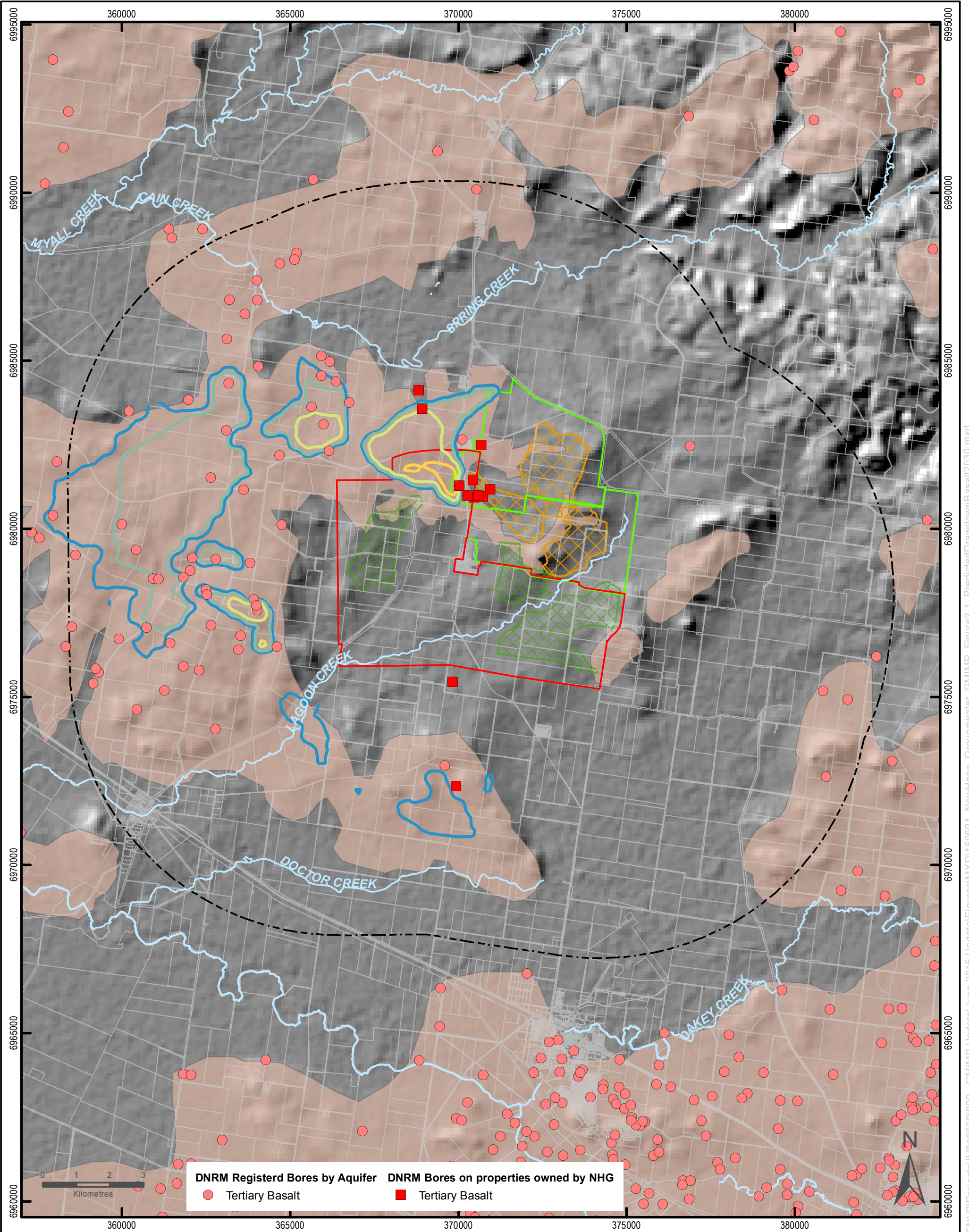
The operational phase of the revised Project is not expected to impact on groundwater quality.

Water captured within the revised Project's depressed landforms (former final voids) possesses the potential to be saline owing to inflows of saline groundwater from the Walloon Coal Measures aquifer. This captured water may be further concentrated over time due to the region's high evaporation rate which exceeds the rate of groundwater inflow. Similarly, dilution of the captured water is expected during extended periods of rainfall. The depressed landforms will act as groundwater sinks with a permanent drawdown relative to the surrounding aquifer, and as a result, will not permit pooled water to flow outwards into the regional system. Therefore, any pooled saline water should remain confined within the depressed landforms and not have an impact on the water quality of the surrounding aquifers.

From an acid rock drainage perspective, it is unlikely that any water captured in the revised Project's depressed landforms will become acidic from oxidation of pyrites in the Walloon Coal Measures aquifer because of the neutralising effect of the surrounding sediments which are naturally alkaline. To date, NAC has not experienced any occurrences of acid rock drainage at New Acland Coal Mine.

Groundwater quality will continue to be monitored throughout the life of the revised Project to identify trends and assess whether impacts are occurring over time.





<b>LEGEND</b>		
<b>Predicted Drawdown Contour (m)</b>	Watercourse	Stage 3 Pit Areas
1	New Acland Coal Mine - Stage 3	Existing Permission
2	New Acland Coal Mine Stage 3 - 8km Buffer	
5	New Acland Coal Mine	
10	Cadastral	
20	Modelled extent of Basalt occurrence	
30		

**NEW HOPE GROUP**

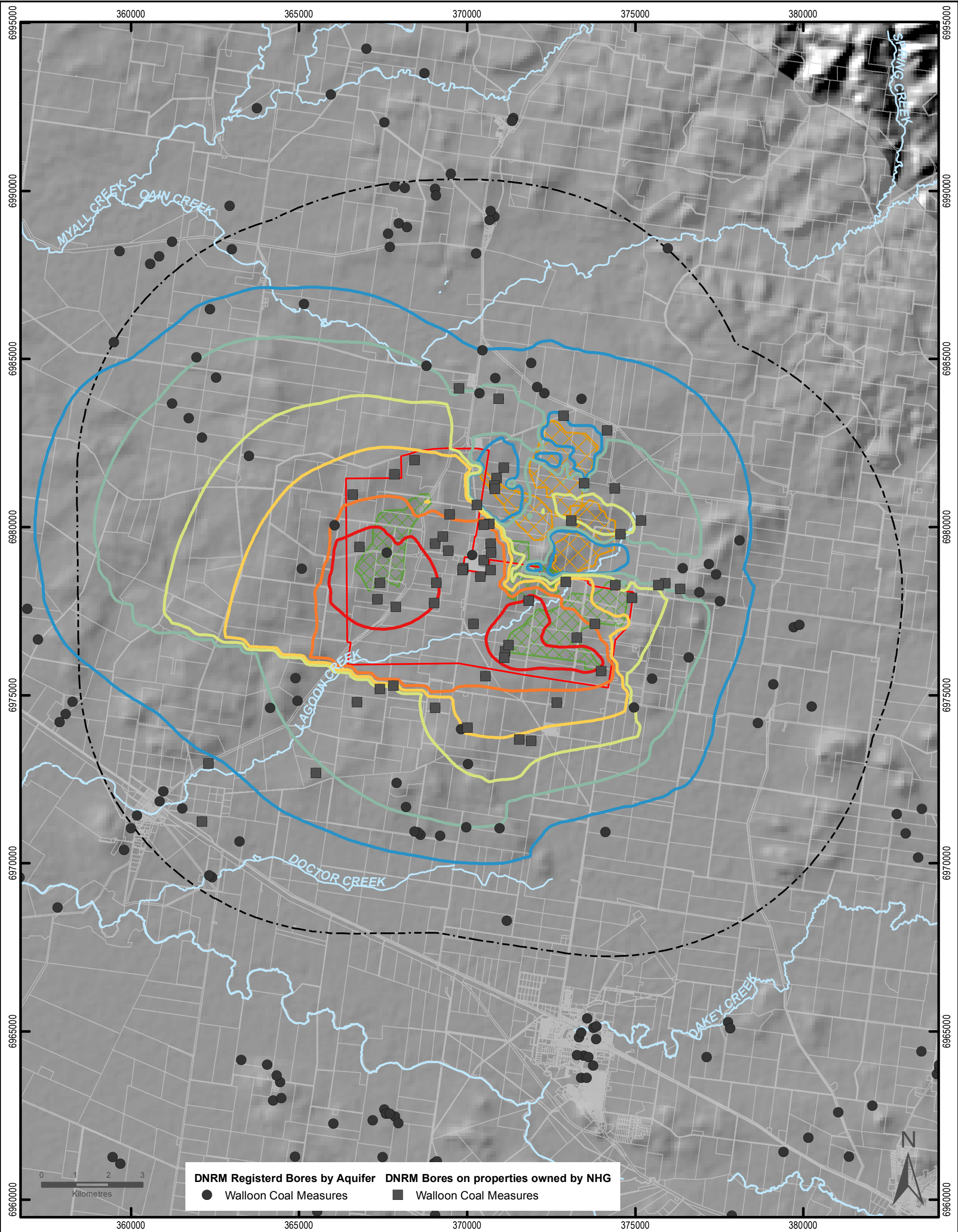
**SINCLAIR KNIGHT MERZ SKM**

**NEW ACLAND COAL MINE  
STAGE 3 PROJECT**

**Figure 2-1 - Predicted Drawdown  
in the Tertiary Basalt  
2030 (End of Mining)**

Scale 1:150,000 on A4  
Projection: Australian Geodetic Datum – Zone 56 (AGD84)





<b>LEGEND</b>		
<b>Predicted Drawdown Contour (m)</b>	Watercourse	Stage 3 Pit Areas
1	New Acland Coal Mine - Stage 3	Existing Permission
2	New Acland Coal Mine Stage 3 - 8km Buffer	
5	Cadastre	
10	Modelled extent of Walloon Coal Measures	
20		
30		

NEW HOPE GROUP

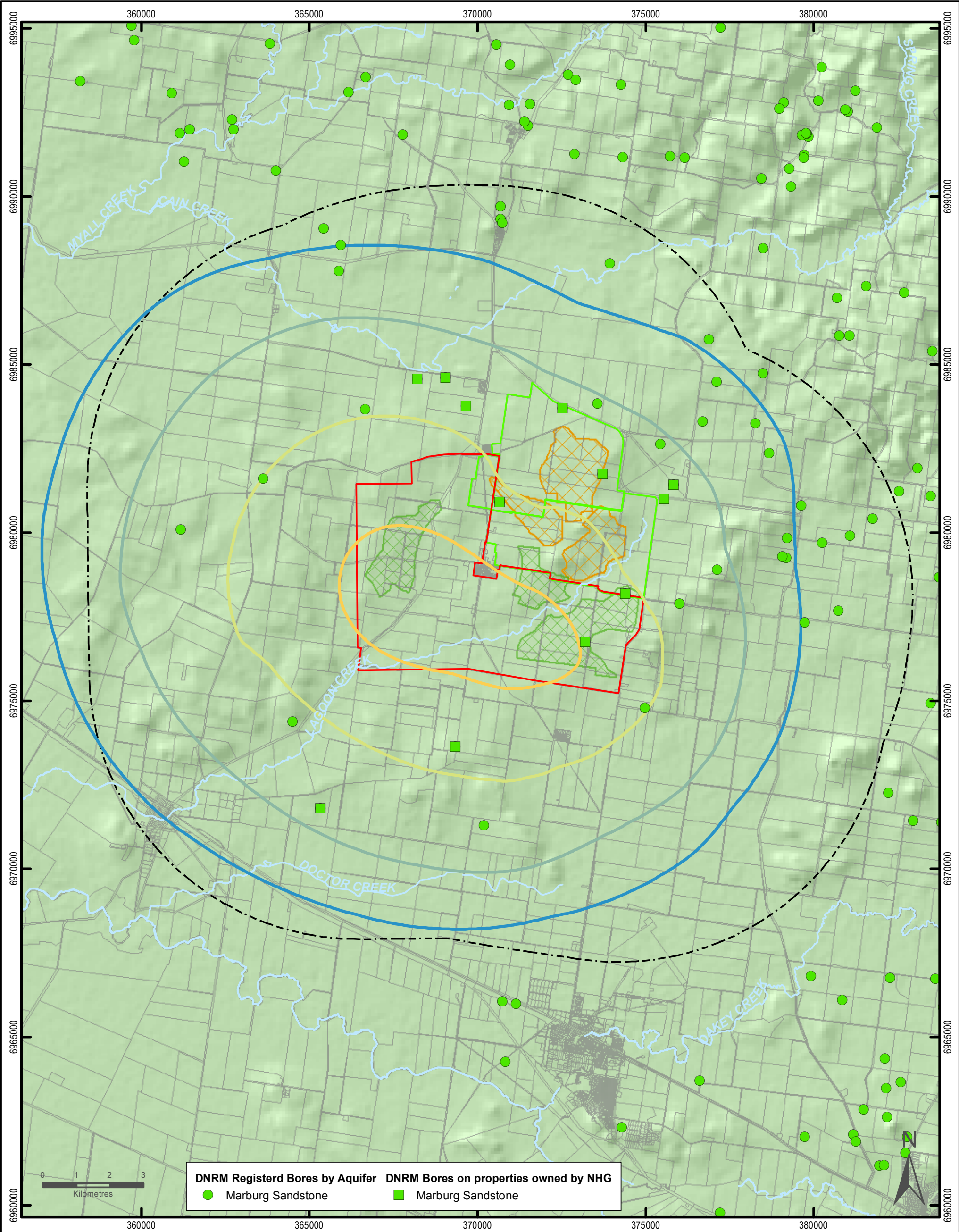
SINCLAIR KNIGHT MERZ  
**SKM**

**NEW ACLAND COAL MINE  
STAGE 3 PROJECT**

**Figure 2-2 - Predicted Drawdown  
in the Walloon Coal Measures  
2030 (End of Mining)**

Scale 1:150,000 on A4  
Projection: Australian Geodetic Datum – Zone 56 (AGD84)





<b>LEGEND</b> <b>Predicted Drawdown Contour (m)</b> 1 2 5 10 20 30	<b>Watercourse</b> New Acland Coal Mine - Stage 3 New Acland Coal Mine Stage 3 - 8km Buffer New Acland Coal Mine Cadastre Stage 3 Pit Areas Existing Permission	<b>Modelled extent of Marburg Sandstone</b> <b>DNRM Registered Bores by Aquifer</b> Marburg Sandstone <b>DNRM Bores on properties owned by NHG</b> Marburg Sandstone	 	<b>NEW ACLAND COAL MINE STAGE 3 PROJECT</b> <b>Figure 2-3 - Predicted Drawdown in the Marburg Sandstone 2030 (End of Mining)</b>  Scale 1:150,000 on A4 Projection: Australian Geodetic Datum – Zone 56 (AGD84)
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### 3. Groundwater Monitoring Program

#### 3.1. Existing Groundwater Conditions

Baseline groundwater monitoring was undertaken as part of the revised Project's EIS (SKM 2013). The methodology undertaken for the assessment of groundwater resources included:

- the review of geological, hydrogeological and groundwater quality data collected for the current Mine;
- the review of other background data available on local hydrogeology and groundwater use;
- the installation of four production and 11 observation bores to characterise the local hydrogeology around the revised Project site;
- the undertaking of aquifer pumping tests to determine aquifer parameters; and
- the formulation of a hydrogeological conceptual model to serve as the basis for a numerical model.

The detail of the baseline groundwater assessment is presented within Chapter 6 Groundwater Resources of the revised Project's EIS (SKM 2013).

Baselines have been defined for monitoring bores associated with the groundwater monitoring program for existing operations at New Acland Coal Mine. Long term monitoring of bores for the expanded groundwater monitoring program which covers the revised Project will be undertaken to establish bore-specific groundwater level and quality baselines. The Life of Mine Plan will allow sufficient time for parameter baselines to be established in advance of any potential impacts from mining across the revised Project area.

#### *Groundwater Levels in the Walloon Coal Measures across the revised Project Site*

Groundwater level data for the Walloon Coal Measures aquifer across the revised Project site indicate that currently the general direction of groundwater flow is southerly, falling from an elevation of around 430 mAHD in the north to 390 mAHD in the south. This direction of flow is consistent with a fall in the topographic elevation and geological dip across the revised Project Site. The long term data for monitoring bores indicate that the current mining operations on ML 50170 (Stage 1) and ML50216 (Stage 2) are not currently having a significant drawdown impact on groundwater levels in the Walloon Coal Measures aquifer within the revised Project site.

#### *Groundwater Quality*

A groundwater monitoring program is currently undertaken in accordance with EA EPML00335713 for the current mining operation. This monitoring has provided sufficient data to define bore-specific baseline concentrations for the monitored parameters, and these are detailed in the regular groundwater monitoring reports prepared by independent consultants, Waste Solutions Australia (WSA). NAC's current groundwater monitoring program is regulated by the the Department of Environment and Heritage Protection (DEHP). In 2012, WSA prepared a comprehensive review of groundwater quality monitoring undertaken to date at the Mine in order to review and if necessary establish new groundwater quality background limits. This report is presented as **Appendix A**.



### *Walloon Coal Measures Aquifer*

Water quality for the Walloon Coal Measures aquifer shows typically neutral to slightly alkaline pH, with values generally falling within the potable range (6.5 to 8.5). Electrical conductivity (EC) values range from 530  $\mu\text{S}/\text{cm}$  to 11,700  $\mu\text{S}/\text{cm}$  but more typically range from 3,000  $\mu\text{S}/\text{cm}$  to 6,000  $\mu\text{S}/\text{cm}$ , reflecting the slightly brackish to brackish nature of the groundwater where naturally occurring sodium and chloride are the dominant ions. The majority of the bores currently monitored have total dissolved solids (TDS) levels below 4,000 mg/L, which indicates the quality is suitable for watering livestock. At TDS levels between 4,000 mg/L and 10,000 mg/L, animals may have an initial reluctance to drink but should adapt to these conditions without adverse effects.

Water supplies from Walloon Coal Measures aquifer include some of potable quality but the typically brackish nature of the groundwater from this aquifer means supplies are mainly used for stock watering.

### *Tertiary Basalt Aquifer*

The bores in the Tertiary Basalt aquifer currently monitored under the existing groundwater monitoring program yield water of essentially neutral pH (between 7.0 and 8.0). Salinity in the Tertiary Basalt aquifer is generally lower than the Walloon Coal Measures aquifer, with EC and TDS ranging from 1,400  $\mu\text{S}/\text{cm}$  to 4,300  $\mu\text{S}/\text{cm}$  and 870 mg/L to 2,900 mg/L, respectively.

## **3.2. Groundwater Monitoring Program**

The groundwater monitoring program for the revised Project combines the current monitoring program for the existing Mine with an extended network of monitoring bores enclosing the revised Project area. Data collected from the groundwater monitoring program will:

- be operated in accordance with the revised Project's approved EA;
- be collated into six monthly and annual reviews of groundwater monitoring;
- be used in the continued development and refinement of groundwater impact assessment criteria and investigation triggers;
- enable verification and refinement of the groundwater modelling predictions presented in the revised Project's AEIS (Jacobs SKM 2014); and
- be collated into a database that will be made available to the administering authority on request.

The groundwater monitoring program conforms to Conditions C21 to C33 of the current EA EMPL00335713 for New Acland Coal Mine. **Table 3-1** summarises the bores that will be monitored, monitoring parameters, and frequency. The groundwater monitoring program combines the existing monitoring bores together with an additional 7 bores that have been installed around the revised Project area. In addition, a further 18 bores will be added to the monitoring network which brings the total number of bores included in the groundwater monitoring program to 40. Proposed additional monitoring bore locations have been chosen based on model drawdown predictions and presence of aquifers and receptors of interest. The monitoring program for new bores will be established prior to the commencement of the revised Project's mining schedule to ensure there is sufficient baseline information on groundwater levels and quality for those bores.



**Table 3-1 Groundwater Monitoring Schedule**

Monitoring Point	Aquifer	Parameter and Monitoring Frequency
Bores monitored under current monitoring program (Compliance and Reference bores)		
2289P	Coal Measures	Groundwater levels: <b>monthly</b> . Groundwater quality: <b>six monthly</b> to include: Al, As, Ca, Se, Cl, Cu, F, Fe, Total N, K, Mg, Mn, Na, SO4, HCO3, TDS, EC, pH
2291P	Coal Measures	
18P	Coal Measures	
25P	Coal Measures	
26P	Coal Measures	
27P	Coal Measures	
28P	Coal Measures	
843	Basalt	
848	Coal Measures	
81P	Coal Measures	
82P	Coal Measures	
83P	Coal Measures	
84P	Basalt	
BMH1	Basalt	
CSMH1	Coal Measures	
Existing Stage 3 monitoring bores to be incorporated into the revised Project’s monitoring program		
109P	Basalt	Groundwater levels: <b>monthly</b> . Groundwater quality: <b>six monthly</b> to include: Al, As, Ca, Se, Cl, Cu, F, Fe, Total N, K, Mg, Mn, Na, SO4, HCO3, TDS, EC, pH
112PGC	Coal Measures	
114P	Coal Measures	
116P	Coal Measures	
119PGC	Coal Measures	
120WB	Coal Measures	
121WB	Coal Measures	

Monitoring Point	Aquifer	Parameter and Monitoring Frequency
<b>Proposed additional monitoring points which will be monitored as part of the revised Project's monitoring program</b>		
2014_GW05A	Basalt	Groundwater levels: <b>monthly</b> . Groundwater quality: <b>six monthly</b> to include: Al, As, Ca, Se, Cl, Cu, F, Fe, Total N, K, Mg, Mn, Na, SO <sub>4</sub> , HCO <sub>3</sub> , TDS, EC, Ph <sup>1</sup>
2014_GW05B	Coal Measures	
2014_GW06B	Coal Measures	
2014_GW07A	Basalt	
2014_GW07B	Coal Measures	
2014_GW08B	Coal Measures	
2014_GW08C	Marburg Sandstone	
2014_GW09A	Oakey Creek Alluvium	
2014_GW09B	Coal Measures	
2014_GW09C	Marburg Sandstone	
2014_GW10	Coal Measures	
2014_GW11A	Basalt	
2014_GW11B	Marburg Sandstone <sup>2</sup>	
2014_GW12A	Basalt	
2014_GW12B	Coal Measures	
2014_GW13A	Basalt	
2014_GW13B	Coal Measures	
3307_WB	Rehabilitated Spoil	

1. Aluminium (Al), Arsenic (As), Selenium (Se), Copper (Cu), Fluorine (F), Iron (F), Total Nitrogen (Total N), Manganese (Mn); Calcium (Ca), Chloride (Cl), Potassium (K), Magnesium (Mg), Sodium (Na), Sulphate (SO<sub>4</sub>), Bicarbonate (HCO<sub>3</sub>), Carbonate (CO<sub>3</sub>), Total Dissolved Solids (TDS), Electrical Conductivity (EC); Acidity/Alkalinity (pH).
2. Bore originally targeted Walloon Coal Measures however drilling results indicate no Walloon Coal Measures at this location

The locations of the monitoring bores in **Table 3-1** are presented in **Figure 3-1**. The final location of the proposed additional bores may vary slightly depending on land access and proximity to local groundwater users. These bores will be individually identified in accordance with the bore naming convention at the revised Project site.

The existing Mine EA reference bores (BMH1 and CSMH1) are located within the predicted zone of groundwater drawdown from operation of the revised Project. NAC will accordingly re-assess the location of these reference bores and if necessary install new reference bores outside the revised Project's predicted zone of groundwater drawdown.

The groundwater monitoring network will:

- be installed and maintained by a person possessing appropriate qualifications and experience in the fields of hydrogeology and groundwater monitoring program design to be able to competently make recommendations about these matters;
- be constructed in accordance with methods prescribed in the latest edition of "Minimum Construction Requirements for Water Bores in Australia" (National Uniform Drillers Licensing Committee, 2012) by an appropriately qualified driller; and
- include a sufficient number of 'bores of compliance' that are located at an appropriate distance from potential sources of impact from mining activities and provide the following:
  - representative groundwater samples from the uppermost aquifer;
  - background water quality in hydraulically up-gradient or background bore(s) that have not been affected by any mining activities conducted by NAC; and
  - the quality of groundwater down gradient of potential sources of contamination including groundwater passing the relevant bore(s) of compliance.

Groundwater monitoring will be undertaken by appropriately qualified personnel. Groundwater level measurements, sample collection, storage and transportation will be undertaken in accordance with procedures conforming to the current industry standard: AS/NZS 5667.1, .11 1998.

The data gathered from the groundwater monitoring program will be collated into a database which will include:

- a site plan showing sample locations;
- tabulated results of the monitoring compared with applicable background/trigger levels;
- all data collected during each monitoring round;
- a record of chain of custody of the samples from sampling through to analysis;
- laboratory analysis certificates;
- groundwater monitoring program reports, and
- a description of the procedures, methods and calculations used.

Groundwater sample analysis will continue to be undertaken by a laboratory accredited by the National Association of Testing Authorities (NATA). Field measurement of water quality parameters is undertaken using appropriate field equipment that is maintained and calibrated in accordance with the manufacturer's recommendations.

- Data collected from landholder bores, wells, and waterholes will be used in conjunction with the groundwater impact investigation procedure to determine if contingency measures are required.

### *Alluvium*

The nearest alluvium with significant groundwater supplies is associated with Oakey Creek in the south-west of the revised Project site. A new monitoring bore installed at location 2014\_GW09A (**Figure 3-1**) will monitor groundwater levels and quality in the Oakey Creek Alluvium. Groundwater levels in the coal measures between the active mine pits and the Oakey Creek Alluvium will be monitored at bores 119PGC and 116P and directly beneath the alluvium at location 2014\_GW09B.

### *Basalt*

Nine basalt bores will be monitored, including five new bores strategically located in areas of predicted drawdown and/or sensitive receptors (**Figure 3-1**). Groundwater levels will be monitored on a monthly basis and samples will be collected and submitted for the analytical suite set out in **Table 3-1** every six months.

### *Coal Measures*

The groundwater monitoring program includes 26 coal measures bores of which eight are new, strategically located in areas of predicted drawdown and/or sensitive receptors (**Table 3-1** and **Figure 3-1**). Groundwater levels will be monitored on a monthly basis and samples will be collected and submitted for the analytical suite set out in **Table 3-1** every six months.

### *Marburg Sandstone*

NAC currently possesses an allocation of 271 ML/year for the Marburg Sandstone. For the revised Project's future operation, abstraction from this aquifer will range around 10 ML/year for maintenance purposes. Three new groundwater monitoring bores will be installed in the southwest, southeast and northwest of the revised Project site, to monitor this aquifer and confirm predictions of minimal impacts. The locations of these bores have been strategically chosen in areas of predicted drawdown and/or sensitive receptors, and in conjunction with other shallower monitoring bores to allow assessment and confirmation of vertical gradients and hydraulic separation between the overlying aquifers.

### *Landholder Bores*

NAC will undertake a landholder bore assessment program to characterise each and every private bore predicted to be unduly affected by operation of the revised Project. The assessment program will collect information such as bore condition, usage, source aquifer, and water level and quality information. Following this assessment program, groundwater monitoring will be undertaken at selected landholder bores surrounding the revised Project site, following consultation with relevant landholders. Primarily this will include monitoring of groundwater levels and quality in order to assess potential impacts from mine dewatering. Landholder bores targeted for monitoring will primarily be those taking water from the coal measures and basalt but may include some bores in the Marburg Sandstone or alluvial aquifers.

## **3.3. Groundwater Impact Prediction, Validation and Review**

Chapter 6 Groundwater Resources of the revised Project's EIS (SKM 2013) included the development of a multilayer time variant groundwater flow model to simulate the effects of mining activities on the local aquifers and to estimate the potential quantity of groundwater inflow to the active mine pits and depressed landforms.

During the life of the revised Project, data collected through the groundwater monitoring program, will be used to update and refine this model and it’s predictions to reflect the actual activities undertaken on site (e.g. mine development and sump locations) and the results of regular groundwater monitoring.

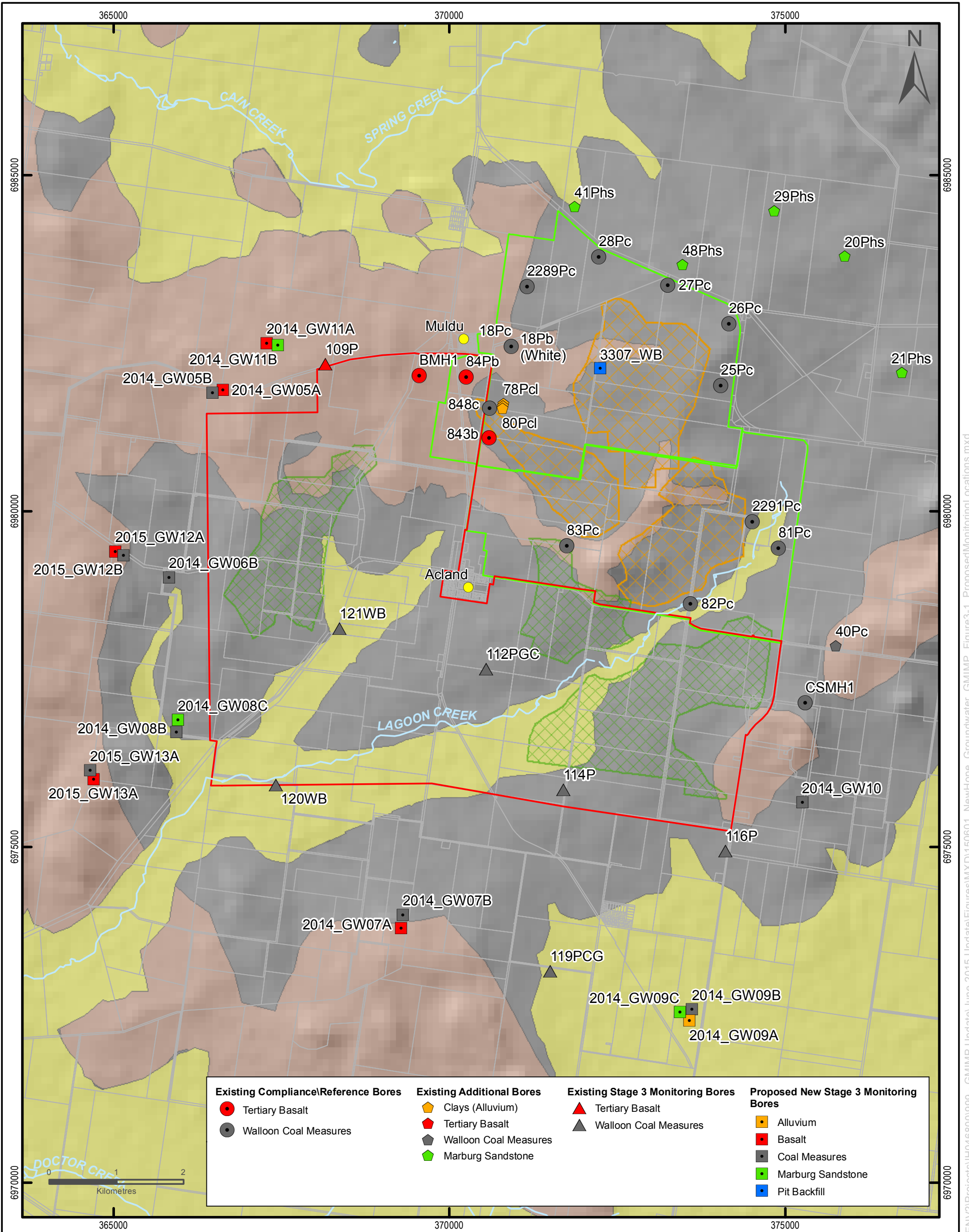
The need to review and update the revised Project’s model will depend on the stage of the revised Project’s mine development, changes in the depth of working, and availability and results of new monitoring data. For example, at the conclusion of the installation program for new monitoring bores for the revised Project, the data collected from the monitoring program will be used to immediately refine the model and produce a revised impact assessment.

**Table 3-2** presents the proposed schedule for groundwater impact prediction, validation and review. The results of any groundwater model verification and refinement, or the justification that this action is not necessary, will be documented, and as required, presented to DEHP (regulatory authority under the *Environmental Protection Act 1994*) and/or NRM (regulatory authority under the *Water Act 2000*).

**Table 3-2 Schedule for Groundwater Impact Prediction, Validation and Review**

Model Revision	Timing
Initial Review	At the conclusion of the revised monitoring network installation program
2 <sup>nd</sup> Review	After one (1) year of operation of the revised Project
3 <sup>rd</sup> and subsequent Reviews	Every three (3) years or if deemed necessary under the Groundwater Impact Investigation Procedure as described in <b>Section 4.2</b>





## 4. Groundwater Impact Triggers and Investigation Protocols

### 4.1. Groundwater Impact Criteria and Triggers

Groundwater monitoring will be undertaken for the revised Project in accordance with the groundwater monitoring program. Impact assessment criteria for groundwater levels and quality, where not already established, will be developed using statistical analysis of the baseline data and the predicted impacts presented in the revised Project's AEIS (Jacobs SKM 2014).

Triggers will be used to determine if the groundwater impact investigation procedure should be initiated.

These triggers include:

- breaching of relevant conditions of the EA;
- substantial variance from the predicted groundwater drawdown effects presented in the revised Project's AEIS (Jacobs SKM 2014) or subsequent impact assessment updates; or
- when a legitimate complaint is received from a local landholder who is a groundwater user.

#### 4.1.1. Groundwater Quality Triggers

Nine bores (18P, 27P, 28P, 843, 848, 81P, 82P, 83P and 84P) within the groundwater monitoring program have had background concentrations defined for the water quality parameters set out in **Table 4-1**. The upper and lower background concentrations were defined on the basis of six-monthly sampling over a four-year period and are reported in **Appendix A**. The groundwater monitoring requirements of the current EA EPML00335713 for the Mine sets limits for each of the water quality parameters included within the groundwater monitoring program (**Table 4-1**).

**Table 4-1 Groundwater Quality Monitoring Limits**

Parameter	Limit
Aluminium (Al) Arsenic (As) Selenium (Se) Copper (Cu) Fluoride (F) Iron (Fe) Total nitrogen (N) Manganese (Mn)	+ / - 20% of background concentration
Calcium (Ca) Chloride (Cl) Potassium (K) Magnesium (Mg) Sodium (Na)	+ / - 10% of background concentration

Parameter	Limit
Sulphate (SO4)	
Bicarbonate (HCO3)	
TDS	

Groundwater quality monitoring limits for new monitoring bores (including all Stage 3 monitoring bores) will be established and used following collection of a minimum of three years of data and appropriate analysis. As groundwater quality limits are established, they will be used in reporting requirements.

4.1.2. Groundwater Level Triggers

The current groundwater level trigger set out in EA EPML00335713 – C26 for current mining operations will continue to apply. The EA states:

“..on lease groundwater levels must be monitored and compared with two bores located off-lease and within the same aquifer. The difference in the variation of drawdown from on-lease bores compared to the variation in off-lease bores within any one month sampling period should be no greater than one metre. Where a difference of more than one metre is identified and that difference is not the result of pumping of licensed bores, the administering authority must be notified within 14 days of completion of monitoring”.

Five off lease Tertiary Basalt aquifer monitoring bores and eleven off lease Walloon Coal Measures aquifer monitoring bores will form an essential component of the 40 monitoring bores included in the groundwater monitoring program.

Groundwater level triggers will also be set on the basis of predicted drawdown in the Tertiary Basalt, Walloon Coal Measures and Marburg Sandstone aquifers. The selection of key monitoring bores will be based on at least two years of monthly groundwater level monitoring data. Modelled predictions of drawdown in the Walloon Coal Measures and Tertiary Basalt aquifers at these locations will be defined. When 75% of the predicated drawdown at these monitoring bores has been observed for three consecutive monthly monitoring events, the groundwater impact investigation protocol will be triggered.

4.1.3. Landholder Complaints

In the event that a legitimate groundwater-related complaint is received from a local landholder, the relevant data will be reviewed by an appropriately qualified person who will determine if the groundwater impact investigation protocol should be initiated. Each new complaint will be compiled into a register and updated as required based on the management actions completed. The complaints register will be maintained for audit purposes.

4.2. Groundwater Impact Investigation Procedure

The groundwater impact investigation procedure will be implemented in response to an exceedence of a relevant trigger (groundwater quality or groundwater level) or a legitimate complaint from a landholder (groundwater related). The relevant data set will be reviewed by an appropriately qualified environmental specialist who will determine if further investigation is necessary. The groundwater impact investigation procedure will follow the following framework.



- If a trigger or trend is identified in a data set, the first step will be to verify the data if it appears anomalous. A resample/re-test/re-measure will be conducted where appropriate.
- Where monitoring results indicate that a groundwater level has breached the reporting trigger, the administering authority must be notified within 14 days of completion of monitoring or as otherwise stated in the revised Project's EA.
- In relation to groundwater quality triggers, if the groundwater contaminant trigger levels defined in Table 2 are exceeded then an investigation into the potential for environmental harm will be completed and sent to the administering authority within 3 months of receiving the analysis results (Condition C29 EPML00335713).
- Once the validity of the breach in groundwater level triggers or a landholder complaint has been verified, a preliminary assessment will be undertaken by an appropriately qualified specialist involving the evaluation of the monitoring results/complaint in conjunction with mining activities being undertaken at the time, baseline groundwater monitoring results, groundwater data for surrounding locations, local use of groundwater, the prevailing and preceding meteorological conditions, and other factors affecting the local hydrogeological regime.
- The preliminary investigation may deem that further additional investigation and monitoring is required to determine the cause of the 'activation' of the trigger and whether or not it is directly related to mining activities.
- If the investigations deem that triggers have been 'activated' as a result of mining activities, contingency measures may need to be implemented.
- Additional monitoring may be implemented to measure the effectiveness of contingency measures (i.e. if deemed necessary).
- In the event that trigger levels or impact assessment criteria continue to be exceeded, further investigations may be undertaken (i.e. a process of continual improvement or adjustment of the relevant triggers if warranted).
- The results of any breaches of trigger levels and investigations will be documented for reporting and audit purposes.
- If a definite case of material or serious environmental harm or the potential for material or serious environmental harm is clearly established by a groundwater investigation into an exceedance of a relevant trigger (groundwater quality or groundwater level) or a legitimate complaint, NAC will ensure the notification requirements of Section 320 of the *Environmental Protection Act 1994* are fully addressed.

### 4.3. Mitigation

In the event that a formal groundwater investigation conclusively identifies that the revised Project's mining operations have adversely impacted a neighbouring groundwater user (affected groundwater user), NAC will attempt in 'good faith' to negotiate suitable mitigation measures in a timely manner to rectify the identified groundwater problem. NAC may involve an appropriately qualified environmental specialist to assist with development of the mitigation measures. The development of suitable mitigation measures will be based on the outcomes of an appropriate scientific investigation.

Possible mitigation measures that may be applied by NAC include:

- the refurbishment of an existing groundwater bore;

- the installation of a new groundwater bore;
- the establishment of an alternative water supply arrangement; and/or
- the use of another mutually agreed form of mitigation.

NAC will ensure as a minimum that the proposed mitigation measures are acceptable to the affected groundwater user, and if acceptable, will enter into a legal agreement for the installation of the proposed mitigation measures at NAC's expense. NAC will also ensure the proposed mitigation measures are commensurate with the identified groundwater loss.

NAC may be required to install interim mitigation measures until the permanent mitigation measures have been developed and installed. As required, NAC will seek agreement with the affected groundwater user and pay all reasonable cost for the use of any interim mitigation measures.

If agreement cannot be reached with the affected groundwater user in relation to the proposed mitigation measures, NAC will facilitate some form of legal disputes resolution for the matter.

NAC will ensure the administering authority is fully advised about the details and progress of these types of groundwater matters.

NAC is committed to rectifying all groundwater problems that are legitimately attributed to the revised Project's mining operations through proper scientific evaluation, in an appropriate timeframe, using accepted and practical mitigation measures, and to the satisfaction of the affected groundwater user.

#### **4.4. Groundwater Complaints Management Process**

Groundwater complaints that are believed to be attributed to the operation of New Acland Coal Mine (Mine) should be immediately reported to NAC. Groundwater complaints may be reported verbally by telephone (1 800 882 142 or Oakey Community Office: 07 4691 3445) or in writing using e-mail ([community@newhopegroup.com.au](mailto:community@newhopegroup.com.au)) or letter (New Acland Coal Pty Ltd, PO Box 47, Ipswich, Qld 4305). NAC has provided its near neighbours with general and special 24 hour contact numbers. NAC will continue this practice for the revised Project.

The general details of the groundwater complaint need to be provided at the time of reporting the complaint to NAC. NAC will make all reasonable efforts to ensure the reported groundwater complaint is managed in a timely and appropriate manner. NAC's Environmental Officer (EO) is responsible for environmental complaints management at the Mine.

NAC will record the details of the groundwater complaint in the Mine's complaint database (register) and review this information. As required, NAC will re-contact the complainant about the groundwater complaint to obtain all the necessary details to decide the next course of action. Depending on the severity of the groundwater complaint, NAC as a courtesy may also advise the Toowoomba Office of the DEHP about the matter. As required, the New Hope Group's Corporate Environmental Team may assist with management of the groundwater complaint.

NAC's investigation of the groundwater complaint is designed to establish the legitimacy of the complaint, and if legitimate, whether the Mine is directly or indirectly responsible for the complaint. If current evidence or further scientific investigation establishes NAC is responsible for the groundwater complaint, NAC will advise the complainant, the Toowoomba Office of the DEHP and follow the mitigation strategy outlined in Section 4.4 of this Plan. If



current evidence or further scientific investigation establishes NAC is not responsible for the groundwater complaint, NAC will advise the complainant in a timely manner, and depending on circumstances, the Toowoomba Office of the DEHP.

At the cessation of the complaint investigation process, NAC will record all the relevant details about the groundwater complaint in the Mine's complaint database, including all management actions undertaken, the final outcomes of the complaint investigation process, the details of any required follow-up or on-going management actions, and whether the complaint is 'closed off' to the satisfaction of the complainant. NAC maintains the Mine's complaint database for issue analysis, regulatory and audit purposes.

Importantly, NAC is committed to working with its near neighbours to resolve genuine issues as they arise in relation to the operation of the Mine.

## 5. Review and Improvement Process

### 5.1. Review of the Groundwater Monitoring and Impact Management Plan

NAC will conduct an annual review of the environmental performance of the revised Project. The annual review will address the performance of the GMIMP and will:

- include a comprehensive review of the monitoring results and complaints records for the revised Project over the year, including a comparison of these results against the:
- relevant statutory requirements, limits or performance measures/criteria,
- monitoring results of previous years, and
- relevance to the revised Project's EA;
- identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- identify any trends in the monitoring data over the life of the revised Project;
- identify any discrepancies between the predicted and actual impacts of the revised Project, and analyse the potential cause of any significant discrepancies (validate model);
- describe mitigation measures that have or are being implemented to address breaches of any groundwater impact triggers; and
- review the condition and extent of the groundwater monitoring network in the context of meeting its objectives.

Over the lifespan of the revised Project (approximately 16 years of working) and the post closure monitoring period, it is inevitable that groundwater monitoring bores will become unserviceable and need to be replaced. NAC will proactively maintain the groundwater monitoring network, replacing bores as necessary, and use the regular review of monitoring data to inform the location of additional monitoring bores, if required.

As required, NAC may update or revise the GMIMP based on the outcomes of the annual review process. The DEHP will be consulted in relation to any significant changes to the GMIMP and as necessary will be re-issued any new versions of the document.

## **Appendix A     Waste Solutions Australia (2012) - Establishment of Groundwater Quality Background Limits**

# ESTABLISHMENT OF GROUNDWATER QUALITY BACKGROUND LIMITS (2012)



**NEW ACLAND COAL PTY LTD**  
**RN12 / W316-14 / 01**  
**December 2012**

## Document Control Summary Sheet

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## List of Acronyms/Abbreviations

NAC	New Acland Coal Pty Ltd
BOM	Bureau of Meteorology
DERM	Department of Environment and Resource Management (formerly EPA)
DEHP	Department of Environment and Heritage Protection (formerly DERM)
EA	Environmental Authority
EC	Electrical Conductivity
LOR	Limit of Reporting
mBTOC	meters Below Top Of Casing
NATA	National Association of Testing Authorities
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percent Difference
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
WSA	Waste Solutions Australia Pty Ltd

## 1 INTRODUCTION

Waste Solutions Australia Pty Ltd (WSA) was commissioned by New Acland Coal Pty Ltd (NAC) to set background limits for monitoring bores within their compliance borefield network. This report includes background limits for monitoring bore CSMH1, with background limits for monitoring bores 2289, 2291, and BMH1 determined in the July 2012 revision of this report. It was determined following field investigations in the October 2012 routine monitoring round that bailing is the only suitable method to purge and sample CSMH1. Therefore data collected up to date from this bore can be considered acceptable and background values can be established for this bore as three years of data has been obtained (as stipulated in condition C31 in the site EA).

Setting of these background limits was conducted in accordance with sections C21 to C33 (specifically C31) of the Department of Environment and Heritage Protection (DEHP, formally DERM) Environmental Authority (EA #MIN100550507) effective 22 July 2011. It should be noted that the off-lease groundwater monitoring bores (BMH1 and CSMH1) are not required to have background limits set as stipulated in the NAC's EA (refer to C31), NAC are setting values for these bores at their own initiative.

Background limits have been set for all monitoring bores within the compliance network, with the exception of 25P (limited field data available as this bore regularly goes dry) and 26P (this bore has been historically dry during each monitoring round). Setting of these background limits was reported in *Establishment of Groundwater Quality Background Limits (WSA September 2008 and July 2012)*. This report will include the analysis and results outlined in these reports and will be a compendium of all results. The results from the WSA 2008 report were rechecked for the July 2012 revision and six errors were detected, these have now been corrected. Modification of these values has not resulted in any additional exceedances of routine monitoring results prior to and including the April 2012 monitoring round.

The location of the bores on-site is shown in Figure 1 Compliance Borefield Plan.

## 2 SCOPE OF WORK

The scope of works comprised of the following:

- Document the previous background limit determinations and historical correspondence with Department of Environment and Heritage Protection (DEHP) pertaining to these values.
- Compilation of analytical results and tabulation of new background limits for monitoring bore CSMH1. The background limits determined in WSA 2008 and those for 2289, 2291, and BMH1, determined in the July 2012 revision of this report, will remain unchanged.
- An encompassing report will be produced incorporating the data from WSA 2008 and 2012 and will include tabulation of new background limits results for monitoring bore CSMH1. This report will also be suitable for submission to DEHP. This data will be incorporated into the next round of routine groundwater monitoring at the NAC site (October 2012) for comparison with the new sampling data.

### 3 DEVELOPMENT OF BACKGROUND LIMITS

Background limits were developed for the following monitoring bores in WSA 2008: 16P (now decommissioned and replaced by 2291, with the first sampling in June 2009), 18P Coal, 27P, 28P, 81P, 82P, 83P, 84P, 843, and 848. 15P was decommissioned (due to inundation with water from the nearby environmental dam) and replaced by 2289 (with the first sampling in April 2009). The WSA 2008 derived background limits statistically analysed five years of data obtained from the compliance bores across the site. Background limits were developed for 2289, 2291, and BMH1 determined in the July 2012 revision of this report using data collected from 2008/2009 to April 2012.

This review has included the statistical assessment of information to identify trends and establish background limits for water quality parameters. The following sections describe the data used and the methodology chosen for derivation of the background limits.

#### 3.1 Data Collection and Analysis

Data for the 2008 derived background limits was obtained principally from routine (6 monthly) groundwater sampling performed by WSA. Simmonds & Bristow Pty Ltd conducted laboratory analyses over this period. Data for the 2012 derived background limits was obtained from in-house sampling by NAC up to December 2010 when WSA undertook groundwater sampling; the only exception was the April 2008 sampling of BMH1 and CSMH1, which was undertaken by WSA. BMH1 and CSMH1 were not sampled over the period sampling was undertaken by NAC. As this bore is not required to have background limits determined, the smaller sample set for statistical analysis is not considered significant. Simmonds & Bristow Pty Ltd was used for sample analysis up to December 2010, and then from June 2011, Australian Laboratory Services (ALS) was used for sample analysis. Background limit values for 2289, 2291, and BMH1 were determined following the April 2012 routine groundwater monitoring round and values for CSMH1 were determined following the October 2012 routine groundwater monitoring round.

#### 3.2 Statistical Analysis Methodology

A statistical analysis was performed using boxplots to analyse the variance of the data. Boxplots are used to highlight the centre and the symmetry of data sets as well as any outliers. Boxplots were generated from data collected at each compliance bore. The boxes shown on the plots for individual boreholes surround the area on the graph occupied by 80% of the sample results for each ion. This was done to help highlight any data points that are anomalously large or small, as they lie outside the box range. The generic boxplot is broken up into quartiles, with 50% of the data outlying the box area. With some of the sample ranges in these data sets only consisting of a small number of points then only three points would be left in the box. This small amount of data is not enough to establish a trend in the results. It was decided to select 80% as the cut-off value for the plotting of the data due to the limited size of the smaller data sets. However, the cut-off value is still high enough to highlight the extreme outliers on the graphs and remove them from the box without excluding relevant results. If values for all the data sets over time were below the laboratory limit of reporting (LOR), the LOR value has been adopted for the analyte value in absence of data.

Each background upper and lower limit nominated (refer to **Appendix A**) was determined by selecting the maximum (90<sup>th</sup> percentile) and minimum (10<sup>th</sup> percentile)



values in the box from each boxplot. These values, based on the statistical analysis, were selected as they provided the most conservative estimate of a value that is representative of the borehole location whilst not being an outlier. These are more realistic values than the mean or median value for the site. If the mean or median value had been taken as the baseline amount then there would be regular exceedances because half of the data that has been obtained at each bore location is over that value. This method discounts extreme outliers that are anomalous and are far too high to be used in generating a realistic background limit.

To produce these boxplots the median and lower and upper percentile cut-off values had to be calculated for each test parameter. As mentioned above, the majority of the lower and upper 10 percent of the data lie outside of the boxes. When the variation in data sets is very low, it is possible that the minimum and the bottom 10th percentile value are the same. The minimum and maximum 10th percentile values are used to determine the boundaries of the boxplots. The boxplots for all of the compliance bores can be seen in **Appendix B**. Individual box plots were generated for each borehole for the following parameters:

- pH<sup>1</sup>;
- Electrical conductivity (EC);
- Total Dissolved Solids (TDS);
- Major ions: calcium (Ca), , sodium (Na), potassium (K), chlorine (Cl), sulphate (SO<sub>4</sub>), bicarbonate (HCO<sub>3</sub>),
- Minor ions: Total Nitrogen (Total N), fluorine (F);
- Dissolved metals: aluminium (Al), arsenic (As), copper (Cu), iron (Fe), magnesium (Mg), manganese (Mn) and selenium (Se).

All of the data contained within the boxes is considered to be representative for that analyte for that compliance bore. It can be seen in the boxplots that these values vary from bore to bore for the same analyte. Variability in each parameter was considered too high when comparing multiple bore locations and was deemed to be unusable in establishing aquifer specific values. For this reason it was decided that the establishment of borehole specific data sets would be more appropriate. The historical data tables used to generate these statistics and the boxplots data are shown in **Appendix C**.

The size of the boxes are indicative of the amount of variation in the data set, the larger the size of the box on the graph, the greater the variation in the values. The background limit ranges for each analyte in the compliance bores is determined to be between 10% less than to 10% greater than the box boundary values for the major ions. For the minor ions and metals the background limit ranges extends to 20% less than to 20% greater than the box boundary values for each analyte. These values were considered to reflect the individual hydrochemistry at each bore and provide an indicator if there is change in groundwater chemistry.

### 3.3 Correspondence with DEHP

After submission of Establishment of Groundwater Quality Background Limits (WSA

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<sup>1</sup> Note that pH, as well as standing water level, do not require baseline limit determinations as stipulated in Schedule C – Table 7 in the EA. However, for completeness baseline limits have been determined for the analytical parameter pH.

September 2008), DEHP (then the Environmental Protection Agency) responded to NAC with comments on the derivation of the background limits as stated in the WSA 2008 report. This correspondence is provided in **Appendix D**. WSA responded to these comments in two letters, dated 26<sup>th</sup> November 2008 and 8<sup>th</sup> January 2009 to NAC as provided in **Appendix E**. These letters aimed to justify the statistical methodology used and no further correspondence was received from DEHP and has therefore been considered to have provided resolution to comments offered by the DEHP (former Environmental Protection Agency).

## 4 DISCUSSION

Most of the bores show elevated levels of aluminium and iron, as compared to other dissolved metal concentrations such as arsenic, copper and selenium. Levels of these parameters can become elevated following the field filtration process as very fine clay particles carrying metal ions pass through the standard 0.45-micron filter into the sample, skewing the concentration observed. Therefore, the concentration of these two parameters is likely controlled by physical processes (i.e. the level of sediment in the sample resulting from borehole purging), it was recommended in WSA 2008 that no background limits be placed on these two parameters, however for report completeness values, they have been derived.

At the time of compiling this report, two compliance bores (25P and 26P) listed in Schedule C Table 5: On-Lease Groundwater Monitoring Locations and Frequency within Environmental Authority # MIM800317705, have not yielded sufficient data to successfully generate background limits. This was due to the limited amount of samples collected from compliance bores 25P and 26P.

## 5 CONCLUSION & RECOMMENDATIONS

WSA has reviewed the appropriate sampling data for the compliance bores at the site and implemented a statistical assessment to produce background limits for each compliance bore. The compendium of the baseline limits, including the newly derived limits for monitoring bore CSMH1, are shown in **Appendix A**. The technique of using boxplots to highlight the spread and symmetry of data sets is recognised and accepted. It is a commonly used method for statistical analysis.

The method of chemical data analysis yields both a 'lower' and 'higher' background value. With the exception of pH (which does not require determination of a background limit, however has been included for data completeness), any increase in concentration above the 'higher' value should be investigated. If concentrations decrease below the 'lower' background value, quality of water will be improving and hence should not be of concern.

After assessing the variation in the data from bore to bore, it was concluded that there was no possibility of having only one baseline limit per analyte for each aquifer across the whole site. It was decided that limits would be set for each individual bore.

## 6 LIMITATIONS

Waste Solutions Australia Pty Ltd has prepared this report for the use of New Acland Coal Pty Ltd and the Department of Environment and Heritage Protection in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. This report may not contain sufficient information for purposes other than for the client and its respective consulting advisers.

The accuracy of the assessment made in this report is dependent upon the accuracy and reliability of evidence drawn together from a number of sources. The field investigations on which this report is based were restricted to a level of detail appropriate for the project.

Waste Solutions Australia Pty Ltd has taken steps to ensure the accuracy and reliability of field observations and investigations. It is important, however, that the limitations of the assessment be clearly recognised when the findings of this study are being interpreted. This report is based on information derived partly from others over which Waste Solutions Australia Pty Ltd had no control.


Prepared by:



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Reviewed by:




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**Director & Principal Consultant**





**Legend:**

 Bore Location and name, "c" refer to coal aquifer monitoring bore

Map courtesy of New Acland Coal



New Acland Coal Pty Ltd

Compliance Borefield Map

Establishment of Groundwater Quality Background Limits  
(2012)

Drawn by: PM

Approved: PS

Date: December 2012

Job: W 316-14

Figure 1

## APPENDIX A

# GROUNDWATER QUALITY BACKGROUND LIMITS



<b>Borehole 18P (Coal)</b>				
<b>Analyte</b>	<b>Units</b>	<b>Statistically Derived Background Limits</b>	<b>Actual Background Limits*</b>	<b>Monitoring Frequency</b>
pH		7.28 - 10% to 8.61 + 10%	6.6 – 9.5	Half Yearly
EC	µS/cm	593 - 10% to 841 + 10%	534 – 925	Half Yearly
TDS	mg/L	333.8 - 10% to 961 + 10%	300 – 1057	Half Yearly
Ca	mg/L	6.7 - 10% to 18.1 + 10%	6 – 20	Half Yearly
Mg	mg/L	1.86 - 10% to 3.22 + 10%	1.7 – 3.5	Half Yearly
Na	mg/L	90.7 - 10% to 151 + 10%	82 – 166	Half Yearly
K	mg/L	2.64 - 10% to 5.24 + 10%	2.4 – 5.8	Half Yearly
Cl	mg/L	92 - 10% to 385 + 10%	83 – 424	Half Yearly
HCO <sub>3</sub>	mg/L	64 - 10% to 152.9 + 10%	58 – 168	Half Yearly
SO <sub>4</sub>	mg/L	5.45 - 10% to 18.4 + 10%	4.9 – 20	Half Yearly
F	mg/L	0.1 - 20% to 0.42 + 20%	0.08 – 0.51	Half Yearly
Al	µg/L	18.7 - 20% to 1350 + 20%	15 – 1620	Half Yearly
As	µg/L	2.59 - 20% to 9 + 20%	2.1 – 11	Half Yearly
Cu	µg/L	1.68 - 20% to 35.2 + 20%	1.3 – 42	Half Yearly
Fe	µg/L	108.9 - 20% to 1620 + 20%	87 – 1944	Half Yearly
Mn	µg/L	4.76 - 20% to 68.6 + 20%	3.8 – 82	Half Yearly
Se	µg/L	2 - 20% to 5.9 + 20%	1.6 – 7.1	Half Yearly
Total N	mg/L	0.434 - 20% to 3.26 + 20%	0.35 – 3.9	Half Yearly

\* Please note that the Actual Background Limit values have been rounded. For values below 1 they are rounded to 2 decimal places, for values below 10 they are rounded to 1 decimal place and for values above 10 they are rounded to the nearest integer.

<b>Borehole 27P (Coal)</b>				
<b>Analyte</b>	<b>Units</b>	<b>Statistically Derived Background Limits</b>	<b>Actual Background Limits*</b>	<b>Monitoring Frequency</b>
pH		7 - 10% to 7.6 + 10%	6.3 – 8.4	Half Yearly
EC	µS/cm	9080 - 10% to 10010 + 10%	8172 – 10110	Half Yearly
TDS	mg/L	5035 - 10% to 6412.2 + 10%	4532 – 7053	Half Yearly
Ca	mg/L	388 - 10% to 507 + 10%	349 – 558	Half Yearly
Mg	mg/L	190 - 10% to 230 + 10%	171 – 257	Half Yearly
Na	mg/L	1390 - 10% to 1600 + 10%	1251 – 1760	Half Yearly
K	mg/L	19.9 - 10% to 36.8 + 10%	18 – 41	Half Yearly
Cl	mg/L	2480 - 10% to 2880 + 10%	2232 – 3168	Half Yearly
HCO <sub>3</sub>	mg/L	289 - 10% to 461 + 10%	260 – 507	Half Yearly
SO <sub>4</sub>	mg/L	578 - 10% to 713 + 10%	520 – 784	Half Yearly
F	mg/L	0.1 - 20% to 0.203 + 20%	0.08 – 0.24	Half Yearly
Al	µg/L	14.2 - 20% to 151600 + 20%	11 – 181920	Half Yearly
As	µg/L	18.2 - 20% to 129.2 + 20%	15 – 155	Half Yearly
Cu	µg/L	3.98 - 20% to 335 + 20%	3.2 – 402	Half Yearly
Fe	µg/L	1400 - 20% to 163920 + 20%	1120 – 196704	Half Yearly
Mn	µg/L	88.9 - 20% to 956 + 20%	71 – 1147	Half Yearly
Se	µg/L	7.95 - 20% to 157.7 + 20%	6.4 – 189	Half Yearly
Total N	mg/L	1.38 - 20% to 4.18 + 20%	1.1 – 5	Half Yearly

\* Please note that the Actual Background Limit values have been rounded. For values below 1 they are rounded to 2 decimal places, for values below 10 they are rounded to 1 decimal place and for values above 10 they are rounded to the nearest integer.

<b>Borehole 28P (Coal)</b>				
<b>Analyte</b>	<b>Units</b>	<b>Statistically Derived Background Limits</b>	<b>Actual Background Limits*</b>	<b>Monitoring Frequency</b>
pH		7.28 - 10% to 7.9 +10%	6.6 – 8.7	Half Yearly
EC	µS/cm	8520 - 10% to 9300 + 10%	7668 – 10230	Half Yearly
TDS	mg/L	4808.8 - 10% to 6060 +10%	4327 – 6666	Half Yearly
Ca	mg/L	210 - 10% to 312 + 10%	189 – 343	Half Yearly
Mg	mg/L	204 - 10% to 278 + 10%	184 – 306	Half Yearly
Na	mg/L	1280 - 10% to 1720 + 10%	1152 – 1892	Half Yearly
K	mg/L	17.4 - 10% to 46.8 + 10%	16 – 52	Half Yearly
Cl	mg/L	2080 - 10% to 2720 + 10%	1872 – 2992	Half Yearly
HCO <sub>3</sub>	mg/L	689.6 - 10% to 992 + 10%	621 – 1091	Half Yearly
SO <sub>4</sub>	mg/L	366 - 10% to 630 + 10%	329 – 693	Half Yearly
F	mg/L	0.1 - 20% to 0.1 + 20%	0.08 – 0.12	Half Yearly
Al	µg/L	18.4 - 20% to 360576 + 20%	15 – 432691	Half Yearly
As	µg/L	16.1 - 20% to 179.7 + 20%	13 – 216	Half Yearly
Cu	µg/L	3.18 - 20% to 484.2 + 20%	2.5 – 581	Half Yearly
Fe	µg/L	952 - 20% to 306240 +20%	762 – 367488	Half Yearly
Mn	µg/L	6 - 20% to 1616 +20%	4.8 – 1939	Half Yearly
Se	µg/L	11.6 - 20% to 235 + 20%	9.3 – 282	Half Yearly
Total N	mg/L	0.93 - 20% to 2.76 + 20%	0.74 – 3.3	Half Yearly

\* Please note that the Actual Background Limit values have been rounded. For values below 1 they are rounded to 2 decimal places, for values below 10 they are rounded to 1 decimal place and for values above 10 they are rounded to the nearest integer.

<b>Borehole 843 (Basalt)</b>				
<b>Analyte</b>	<b>Units</b>	<b>Statistically Derived Background Limits</b>	<b>Actual Background Limits*</b>	<b>Monitoring Frequency</b>
pH		7.29 -10% to 7.9 + 10%	6.6 – 8.6	Half Yearly
EC	µS/cm	3290 - 10% to 4210 + 10%	2961 – 4631	Half Yearly
TDS	mg/L	1799.6 - 10% to 2600 + 10%	1620 – 2860	Half Yearly
Ca	mg/L	129 - 10% to 290 +10%	116 – 319	Half Yearly
Mg	mg/L	167 - 10% to 203 + 10%	150 – 223	Half Yearly
Na	mg/L	239 - 10% to 332 + 10%	215 – 365	Half Yearly
K	mg/L	1.1 - 10% to 4.93 + 10%	0.99 – 5.4	Half Yearly
Cl	mg/L	642 - 10% to 943 + 10%	578 – 1037	Half Yearly
HCO <sub>3</sub>	mg/L	544 - 10% to 828.9 + 10%	490 – 912	Half Yearly
SO <sub>4</sub>	mg/L	100 - 10% to 151 + 10%	90 – 166	Half Yearly
F	mg/L	0.39 - 20% to 0.9 + 20%	0.31 – 1.1	Half Yearly
Al	µg/L	13.5 - 20% to 36162 + 20%	11 – 79556	Half Yearly
As	µg/L	4.96 - 20% to 46 + 20%	3.9 – 55	Half Yearly
Cu	µg/L	2.32 - 20% to 136.8 + 20%	1.9 – 164	Half Yearly
Fe	µg/L	400 - 20% to 40020 + 20%	320 – 48024	Half Yearly
Mn	µg/L	8.8 - 20% to 1772 + 20%	7 – 2126	Half Yearly
Se	µg/L	5.6 - 20% to 162.8 + 20%	4.5 – 195	Half Yearly
Total N	mg/L	4.5 - 20% to 14.1 + 20%	3.6 – 17	Half Yearly

\* Please note that the Actual Background Limit values have been rounded. For values below 1 they are rounded to 2 decimal places, for values below 10 they are rounded to 1 decimal place and for values above 10 they are rounded to the nearest integer.

<b>Borehole 848 (Coal)</b>				
<b>Analyte</b>	<b>Units</b>	<b>Statistically Derived Background Limits</b>	<b>Actual Background Limits*</b>	<b>Monitoring Frequency</b>
pH		7.28 - 10% to 8.2 + 10%	6.6 – 9.1	Half Yearly
EC	µS/cm	3270 - 10% to 5330 + 10%	2943 – 5863	Half Yearly
TDS	mg/L	2060 - 10% to 3069.6 + 10%	1854 – 3377	Half Yearly
Ca	mg/L	77.4 - 10% to 173 + 10%	70 – 190	Half Yearly
Mg	mg/L	77.9 - 10% to 181 + 10%	70 – 199	Half Yearly
Na	mg/L	427 - 10% to 694 + 10%	384 – 763	Half Yearly
K	mg/L	2.18 - 10% to 7.03 + 10%	1.9 – 7.7	Half Yearly
Cl	mg/L	644 - 10% to 1210 + 10%	580 – 1331	Half Yearly
HCO <sub>3</sub>	mg/L	582.6 - 10% to 850.7 + 10%	524 – 936	Half Yearly
SO <sub>4</sub>	mg/L	69 – 10% to 148 + 10%	62 – 163	Half Yearly
F	mg/L	0.2 - 20% to 1.01 + 20%	0.16 – 1.2	Half Yearly
Al	µg/L	8.6 - 20% to 374 + 20%	6.9 – 449	Half Yearly
As	µg/L	7.02 - 20% to 29 + 20%	5.6 – 35	Half Yearly
Cu	µg/L	1.88 - 20% to 16.2 + 20%	1.5 – 19	Half Yearly
Fe	µg/L	278 - 20% to 5460 + 20%	222 – 6552	Half Yearly
Mn	µg/L	7.28 - 20% to 120 + 20%	5.8 – 144	Half Yearly
Se	µg/L	5 - 20% to 21 + 20%	4 – 25	Half Yearly
Total N	mg/L	0.99 - 20% to 8.22 + 20%	0.8 – 9.9	Half Yearly

\* Please note that the Actual Background Limit values have been rounded. For values below 1 they are rounded to 2 decimal places, for values below 10 they are rounded to 1 decimal place and for values above 10 they are rounded to the nearest integer.



<b>Borehole 81P (Coal)</b>				
<b>Analyte</b>	<b>Units</b>	<b>Statistically Derived Background Limits</b>	<b>Actual Background Limits*</b>	<b>Monitoring Frequency</b>
pH		7.35 - 10% to 8.05 + 10%	6.6 – 8.9	Half Yearly
EC	µS/cm	6150 - 10% to 6800 + 10%	5535 – 7480	Half Yearly
TDS	mg/L	3145 - 10% to 3800 + 10%	2831 – 4180	Half Yearly
Ca	mg/L	200 - 10% to 235 + 10%	180 – 259	Half Yearly
Mg	mg/L	92 - 10% to 100 + 10%	83 – 110	Half Yearly
Na	mg/L	810 - 10% to 980 + 10%	729 – 1078	Half Yearly
K	mg/L	12 - 10% to 16 + 10%	11 – 18	Half Yearly
Cl	mg/L	1600 - 10% to 1800 + 10%	1440 – 1980	Half Yearly
HCO <sub>3</sub>	mg/L	312.5 - 10% to 400 + 10%	281 – 440	Half Yearly
SO <sub>4</sub>	mg/L	230 - 10% to 265 + 10%	207 – 292	Half Yearly
F	mg/L	0.11 - 20% to 0.19 + 20%	0.09 – 0.23	Half Yearly
Al	µg/L	20.4 - 20% to 58.2 + 20%	16 – 70	Half Yearly
As	µg/L	10.08 - 20% to 17.1 + 20%	8.1 – 21	Half Yearly
Cu	µg/L	2.12 - 20% to 3.8 + 20%	1.7 – 4.6	Half Yearly
Fe	µg/L	676 - 20% to 1460 + 20%	541 – 1752	Half Yearly
Mn	µg/L	142 - 20% to 442 + 20%	114 – 530	Half Yearly
Se	µg/L	6.9 - 20% to 38.4 + 20%	5.5 – 46	Half Yearly
Total N	mg/L	1.17 - 20% to 1.95 + 20%	0.94 – 2.5	Half Yearly

\* Please note that the Actual Background Limit values have been rounded. For values below 1 they are rounded to 2 decimal places, for values below 10 they are rounded to 1 decimal place and for values above 10 they are rounded to the nearest integer.

<b>Borehole 82P (Coal)</b>				
<b>Analyte</b>	<b>Units</b>	<b>Statistically Derived Background Limits</b>	<b>Actual Background Limits*</b>	<b>Monitoring Frequency</b>
pH		7.65 - 10% to 7.9 + 10%	6.9 – 8.7	Half Yearly
EC	µS/cm	5350 - 10% to 5950 + 10%	4815 – 6545	Half Yearly
TDS	mg/L	3246.5 - 10% to 3550 + 10%	2921 – 3905	Half Yearly
Ca	mg/L	125 - 10% to 145 + 10%	113 – 160	Half Yearly
Mg	mg/L	130 - 10% to 140 + 10%	117 – 154	Half Yearly
Na	mg/L	755 - 10% to 880 + 10%	680 – 968	Half Yearly
K	mg/L	5.55 - 10% to 6.9 + 10%	4.9 – 7.6	Half Yearly
Cl	mg/L	1100 - 10% to 1200 + 10%	990 – 1320	Half Yearly
HCO <sub>3</sub>	mg/L	764.5 - 10% to 916.5 + 10%	688 – 1008	Half Yearly
SO <sub>4</sub>	mg/L	430 - 10% to 505 + 10%	387 – 556	Half Yearly
F	mg/L	0.22 - 20% to 0.525 + 20%	0.17 – 0.6	Half Yearly
Al	µg/L	10 - 20% to 78 +20%	8 – 94	Half Yearly
As	µg/L	6.66 - 20% to 11.6 + 20%	5.3 – 14	Half Yearly
Cu	µg/L	2.38 - 20% to 4.4 + 20%	1.9 – 5.3	Half Yearly
Fe	µg/L	740 - 20% to 2400 + 20%	592 – 2880	Half Yearly
Mn	µg/L	56.5 - 20% to 145 + 20%	45 – 174	Half Yearly
Se	µg/L	6.3 - 20% to 25.5 + 20%	5 – 31	Half Yearly
Total N	mg/L	0.74 - 20% to 1.55 + 20%	0.6 – 1.9	Half Yearly

\* Please note that the Actual Background Limit values have been rounded. For values below 1 they are rounded to 2 decimal places, for values below 10 they are rounded to 1 decimal place and for values above 10 they are rounded to the nearest integer.

<b>Borehole 83P (Coal)</b>				
<b>Analyte</b>	<b>Units</b>	<b>Statistically Derived Background Limits</b>	<b>Actual Background Limits*</b>	<b>Monitoring Frequency</b>
pH		7.25 - 10% to 8.15 + 10%	6.6 – 9	Half Yearly
EC	µS/cm	1070 - 10% to 1500 + 10%	963 – 1650	Half Yearly
TDS	mg/L	652.5 - 10% to 1080 + 10%	587 – 1188	Half Yearly
Ca	mg/L	50 - 10% to 113 +10%	45 – 124	Half Yearly
Mg	mg/L	28.5 - 10% to 58.5 + 10%	26 – 64	Half Yearly
Na	mg/L	99.5 - 10% to 130 +10%	90 – 143	Half Yearly
K	mg/L	2.85 - 10% to 6 + 10%	2.6 – 6.6	Half Yearly
Cl	mg/L	115 - 10% to 160 + 10%	104 – 176	Half Yearly
HCO <sub>3</sub>	mg/L	356.5 - 10% to 644.5 + 10%	321 – 709	Half Yearly
SO <sub>4</sub>	mg/L	15.6 - 10% to 26.8 + 10%	14 – 30	Half Yearly
F	mg/L	0.15 - 20% to 0.305 + 20%	0.12 – 0.36	Half Yearly
Al	µg/L	23.5 - 20% to 308 + 20%	19 – 370	Half Yearly
As	µg/L	1.42 - 20% to 1.9 + 20%	1.1 – 2.3	Half Yearly
Cu	µg/L	1.04 - 20% to 2.64 + 20%	0.83 – 3.2	Half Yearly
Fe	µg/L	410 - 20% to 935 + 20%	328 – 1122	Half Yearly
Mn	µg/L	32 - 20% to 84.5 + 20%	26 – 101	Half Yearly
Se	µg/L	3 - 20% to 3 + 20%	2.4 – 3.6	Half Yearly
Total N	mg/L	0.405 - 20% to 11.6 + 20%	0.32 – 14	Half Yearly

\* Please note that the Actual Background Limit values have been rounded. For values below 1 they are rounded to 2 decimal places, for values below 10 they are rounded to 1 decimal place and for values above 10 they are rounded to the nearest integer.

<b>Borehole 84P (Basalt)</b>				
<b>Analyte</b>	<b>Units</b>	<b>Statistically Derived Background Limits</b>	<b>Actual Background Limits*</b>	<b>Monitoring Frequency</b>
pH		7.65 - 10% to 7.9 + 10%	6.9 – 8.7	Half Yearly
EC	µS/cm	2500 - 10% to 3450 +10%	2250 – 3795	Half Yearly
TDS	mg/L	1142.5 -10% to 2100 +10%	1028 – 2310	Half Yearly
Ca	mg/L	130 -10% to 225 +10%	117 – 248	Half Yearly
Mg	mg/L	125 -10% to 195 +10%	113 – 215	Half Yearly
Na	mg/L	150 -10% to 210 +10%	135 – 231	Half Yearly
K	mg/L	2.65 - 10% to 3.6 +10%	3.2 – 3.9	Half Yearly
Cl	mg/L	420 - 10% to 765 +10%	378 – 842	Half Yearly
HCO <sub>3</sub>	mg/L	387.5 - 10% to 599 + 10%	349 – 659	Half Yearly
SO <sub>4</sub>	mg/L	88 - 10% to 220 +10%	79 – 242	Half Yearly
F	mg/L	0.16 - 20% to 0.25 + 20%	0.13 – 0.3	Half Yearly
Al	µg/L	10.85 -20% to 18.5 + 20%	8.7 – 22	Half Yearly
As	µg/L	5 - 20% to 7.9 +20%	4 – 9.5	Half Yearly
Cu	µg/L	2.08 - 20% to 3.68 + 20%	1.7 – 4.5	Half Yearly
Fe	µg/L	630 - 20% to 12000 +20%	504 – 1440	Half Yearly
Mn	µg/L	12 - 20% to 37 + 20%	9.6 – 44	Half Yearly
Se	µg/L	5.5 - 20% to 20 + 20%	4.4 – 24	Half Yearly
Total N	mg/L	2.4 - 20% to 3.25 + 20%	1.9 – 3.9	Half Yearly

\* Please note that the Actual Background Limit values have been rounded. For values below 1 they are rounded to 2 decimal places, for values below 10 they are rounded to 1 decimal place and for values above 10 they are rounded to the nearest integer.

<b>Borehole 2289 (Coal)</b>				
<b>Analyte</b>	<b>Units</b>	<b>Statistically Derived Background Limits</b>	<b>Actual Background Limits*</b>	<b>Monitoring Frequency</b>
pH		6.424 - 10% to 7.58 + 10%	5.8 – 8.3	Half Yearly
EC	µS/cm	6120 - 10% to 17400 +10%	5508 – 19140	Half Yearly
TDS	mg/L	3500 -10% to 11960 +10%	3150 – 13156	Half Yearly
Ca	mg/L	185.6 -10% to 779.2 +10%	167 – 857	Half Yearly
Mg	mg/L	6.4 -10% to 742.6 +10%	5.8 – 817	Half Yearly
Na	mg/L	706 -10% to 2578 +10%	635 – 2836	Half Yearly
K	mg/L	11.8 - 10% to 17.4 +10%	11 – 19	Half Yearly
Cl	mg/L	1700 - 10% to 5834 +10%	1530 – 6417	Half Yearly
HCO <sub>3</sub>	mg/L	159.097 - 10% to 324 + 10%	143 – 356	Half Yearly
SO <sub>4</sub>	mg/L	350 - 10% to 2358 +10%	315 – 2594	Half Yearly
F	mg/L	0.14 - 20% to 0.42 + 20%	0.11 – 0.5	Half Yearly
Al	µg/L	10.32 -20% to 236 + 20%	8.3 – 283	Half Yearly
As	µg/L	1 - 20% to 1 +20%	0.8 – 1.2	Half Yearly
Cu	µg/L	3.5 - 20% to 13.5 + 20%	2.8 – 16.2	Half Yearly
Fe	µg/L	1182 - 20% to 3540 +20%	946 – 4248	Half Yearly
Mn	µg/L	233.2 - 20% to 1012.4 + 20%	187 – 1215	Half Yearly
Se	µg/L	22.4 - 20% to 36.4 + 20%	18 – 44	Half Yearly
Total N	mg/L	1 - 20% to 4.8 + 20%	0.8 – 5.8	Half Yearly

\* Please note that the Actual Background Limit values have been rounded. For values below 1 they are rounded to 2 decimal places, for values below 10 they are rounded to 1 decimal place and for values above 10 they are rounded to the nearest integer.



<b>Borehole 2291 (Coal)</b>				
<b>Analyte</b>	<b>Units</b>	<b>Statistically Derived Background Limits</b>	<b>Actual Background Limits*</b>	<b>Monitoring Frequency</b>
pH		7.2 - 10% to 7.82 + 10%	6.5 – 8.6	Half Yearly
EC	µS/cm	7360 - 10% to 7840 +10%	6624 – 8624	Half Yearly
TDS	mg/L	4380 -10% to 4900 +10%	3942 – 5390	Half Yearly
Ca	mg/L	230 -10% to 253 +10%	207 – 278	Half Yearly
Mg	mg/L	133 -10% to 145 +10%	120 – 160	Half Yearly
Na	mg/L	1130 -10% to 1400 +10%	1017 – 1540	Half Yearly
K	mg/L	13 - 10% to 17 +10%	12 – 19	Half Yearly
Cl	mg/L	2040 - 10% to 2200 +10%	1836 – 2420	Half Yearly
HCO <sub>3</sub>	mg/L	509 - 10% to 549.323 + 10%	458 – 604	Half Yearly
SO <sub>4</sub>	mg/L	290.5 - 10% to 379 +10%	261 – 417	Half Yearly
F	mg/L	0.248 - 20% to 0.472 + 20%	0.20 – 0.57	Half Yearly
Al	µg/L	9.4 -20% to 734 + 20%	7.5 – 881	Half Yearly
As	µg/L	1 - 20% to 1 +20%	0.8 – 1.2	Half Yearly
Cu	µg/L	4.23 - 20% to 5 + 20%	3.4 – 6	Half Yearly
Fe	µg/L	2435 - 20% to 5125 +20%	1948 – 6150	Half Yearly
Mn	µg/L	48.5 - 20% to 100 + 20%	39 – 120	Half Yearly
Se	µg/L	45.2 - 20% to 62.8 + 20%	36 – 75	Half Yearly
Total N	mg/L	1.05 - 20% to 6.25 + 20%	0.84 – 7.5	Half Yearly

Arsenic results were all below the LOR, therefore the LOR value has been adopted for the analyte value in absence of data.

\* Please note that the Actual Background Limit values have been rounded. For values below 1 they are rounded to 2 decimal places, for values below 10 they are rounded to 1 decimal place and for values above 10 they are rounded to the nearest integer.

<b>Borehole BMH1 (Basalt)</b>				
<b>Analyte</b>	<b>Units</b>	<b>Statistically Derived Background Limits</b>	<b>Actual Background Limits*</b>	<b>Monitoring Frequency</b>
pH		7.811 - 10% to 8.041 + 10%	7.0 – 8.8	Half Yearly
EC	µS/cm	1295 - 10% to 1490 +10%	1166 – 1639	Half Yearly
TDS	mg/L	803.1 -10% to 1186.9 +10%	723 – 1306	Half Yearly
Ca	mg/L	88.6 -10% to 101.4 +10%	80 – 112	Half Yearly
Mg	mg/L	64 -10% to 90.2 +10%	58 – 99	Half Yearly
Na	mg/L	86.4 -10% to 181.9 +10%	78 – 200	Half Yearly
K	mg/L	1 - 10% to 1.98 +10%	0.9 – 2.2	Half Yearly
Cl	mg/L	85.6 - 10% to 95.2 +10%	77 – 105	Half Yearly
HCO <sub>3</sub>	mg/L	698.1224 - 10% to 825.3 + 10%	628 – 908	Half Yearly
SO <sub>4</sub>	mg/L	11 - 10% to 20.7 +10%	9.9 – 23	Half Yearly
F	mg/L	0.13 - 20% to 0.27 + 20%	0.1 – 0.32	Half Yearly
Al	µg/L	13 -20% to 37 + 20%	10 – 44	Half Yearly
As	µg/L	1 - 20% to 1 +20%	0.8 – 1.2	Half Yearly
Cu	µg/L	1.1 - 20% to 1.9 + 20%	0.88 – 2.3	Half Yearly
Fe	µg/L	340 - 20% to 340 +20%	272 – 408	Half Yearly
Mn	µg/L	4.2 - 20% to 71.6 + 20%	3.4 – 86	Half Yearly
Se	µg/L	10 - 20% to 10 + 20%	8 – 12	Half Yearly
Total N	mg/L	9.75 - 20% to 17.01 + 20%	7.8 – 20	Half Yearly

Arsenic results were all below the LOR, therefore the LOR value has been adopted for the analyte value in absence of data.

\* Please note that the Actual Background Limit values have been rounded. For values below 1 they are rounded to 2 decimal places, for values below 10 they are rounded to 1 decimal place and for values above 10 they are rounded to the nearest integer.

<b>Borehole CSMH1 (Coal)</b>				
<b>Analyte</b>	<b>Units</b>	<b>Statistically Derived Background Limits</b>	<b>Actual Background Limits*</b>	<b>Monitoring Frequency</b>
pH		7.58 - 10% to 7.80 + 10%	6.8 – 8.6	Half Yearly
EC	µS/cm	4280 - 10% to 5388 +10%	3852 – 5927	Half Yearly
TDS	mg/L	2660 -10% to 3580 +10%	2394 – 3938	Half Yearly
Ca	mg/L	176.4 -10% to 282.6 +10%	159 – 311	Half Yearly
Mg	mg/L	126.4 -10% to 223.2 +10%	114 – 246	Half Yearly
Na	mg/L	542.4 -10% to 631.8 +10%	488 – 695	Half Yearly
K	mg/L	9.1 - 10% to 11.2 +10%	8.2 – 12	Half Yearly
Cl	mg/L	916 - 10% to 1374 + 10%	824 – 1511	Half Yearly
HCO <sub>3</sub>	mg/L	467 - 10% to 658 + 10%	420 – 724	Half Yearly
SO <sub>4</sub>	mg/L	290.4 - 10% to 501.4 +10%	261 – 552	Half Yearly
F	mg/L	0.1 - 20% to 0.16 + 20%	0.08 – 0.19	Half Yearly
Al	µg/L	10 - 20% to 106 + 20%	8 – 127	Half Yearly
As	µg/L	1 - 20% to 1 + 20%	0.8 – 1.2	Half Yearly
Cu	µg/L	1 - 20% to 2.6 + 20%	0.8 – 3.1	Half Yearly
Fe	µg/L	54 - 20% to 438 + 20%	43 – 526	Half Yearly
Mn	µg/L	133 - 20% to 506.8 + 20%	106 – 608	Half Yearly
Se	µg/L	10 - 20% to 12.4 + 20%	8 – 15	Half Yearly
Total N	mg/L	3.62 - 20% to 11.18 + 20%	2.9 – 13	Half Yearly

Arsenic results were all below the LOR, therefore the LOR value has been adopted for the analyte value in absence of data.

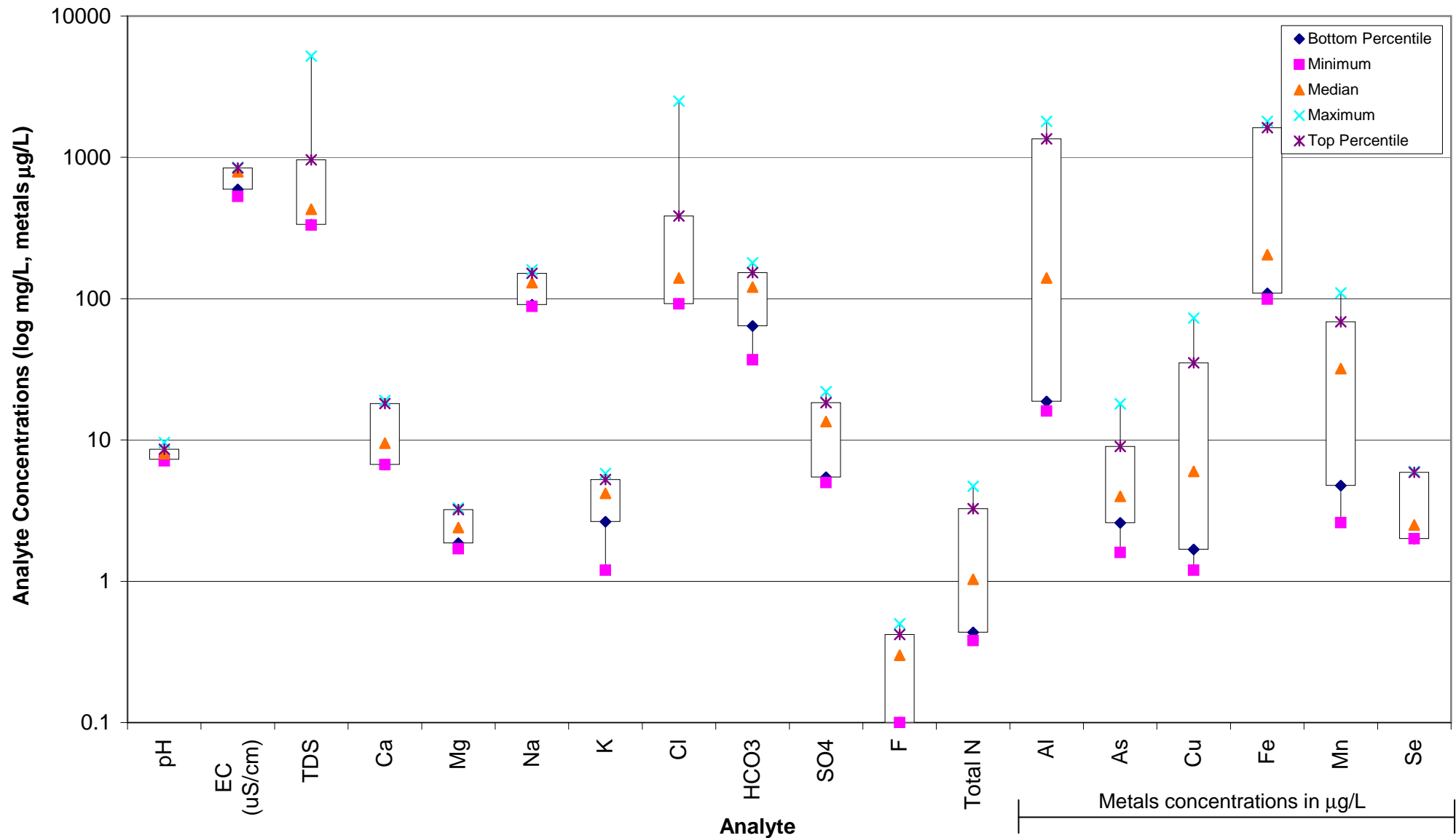
\* Please note that the Actual Background Limit values have been rounded. For values below 1 they are rounded to 2 decimal places, for values below 10 they are rounded to 1 decimal place and for values above 10 they are rounded to the nearest integer.

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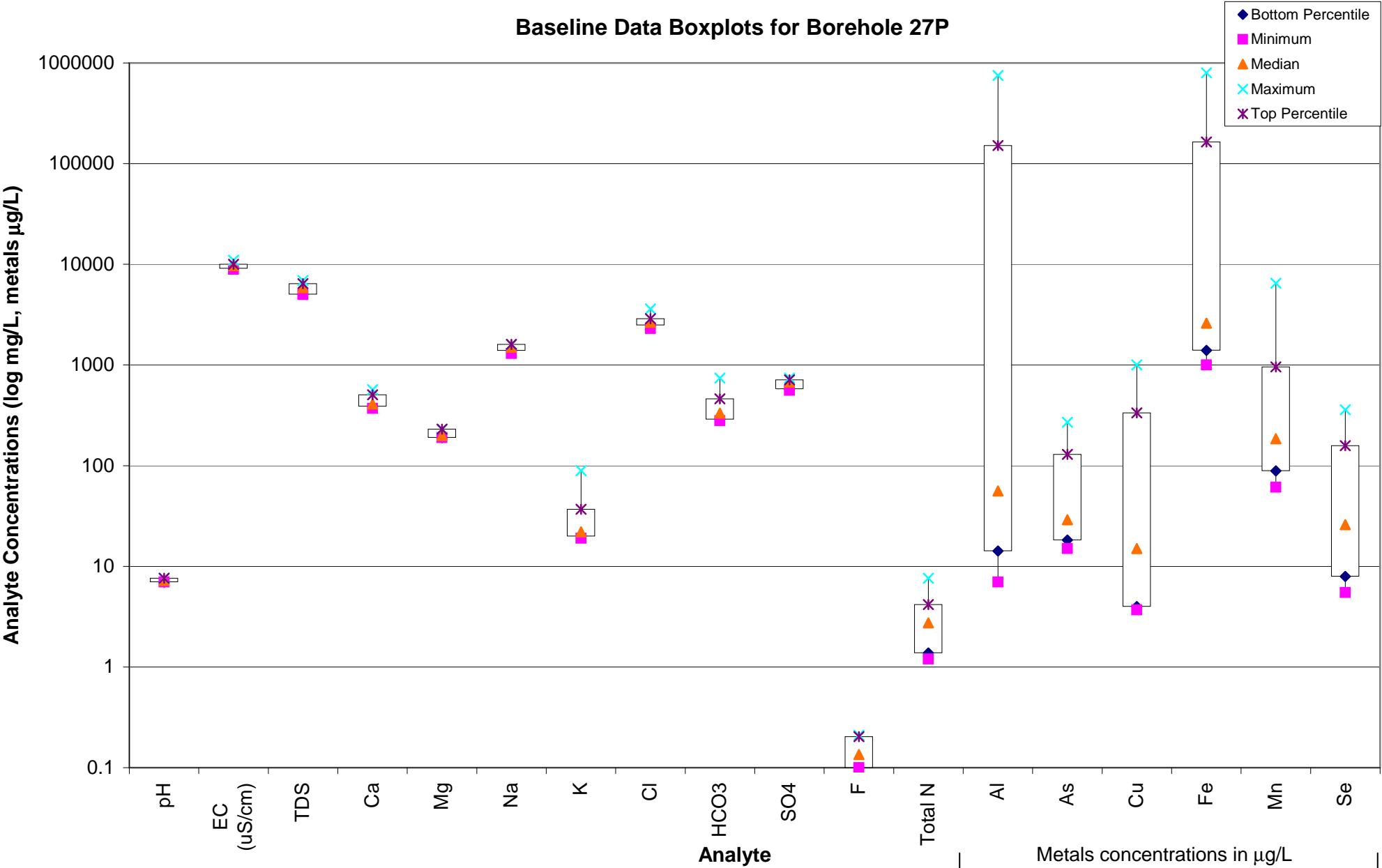
## APPENDIX B

### MONITORING BORE BOXPLOTS FOR EACH ANALYTE

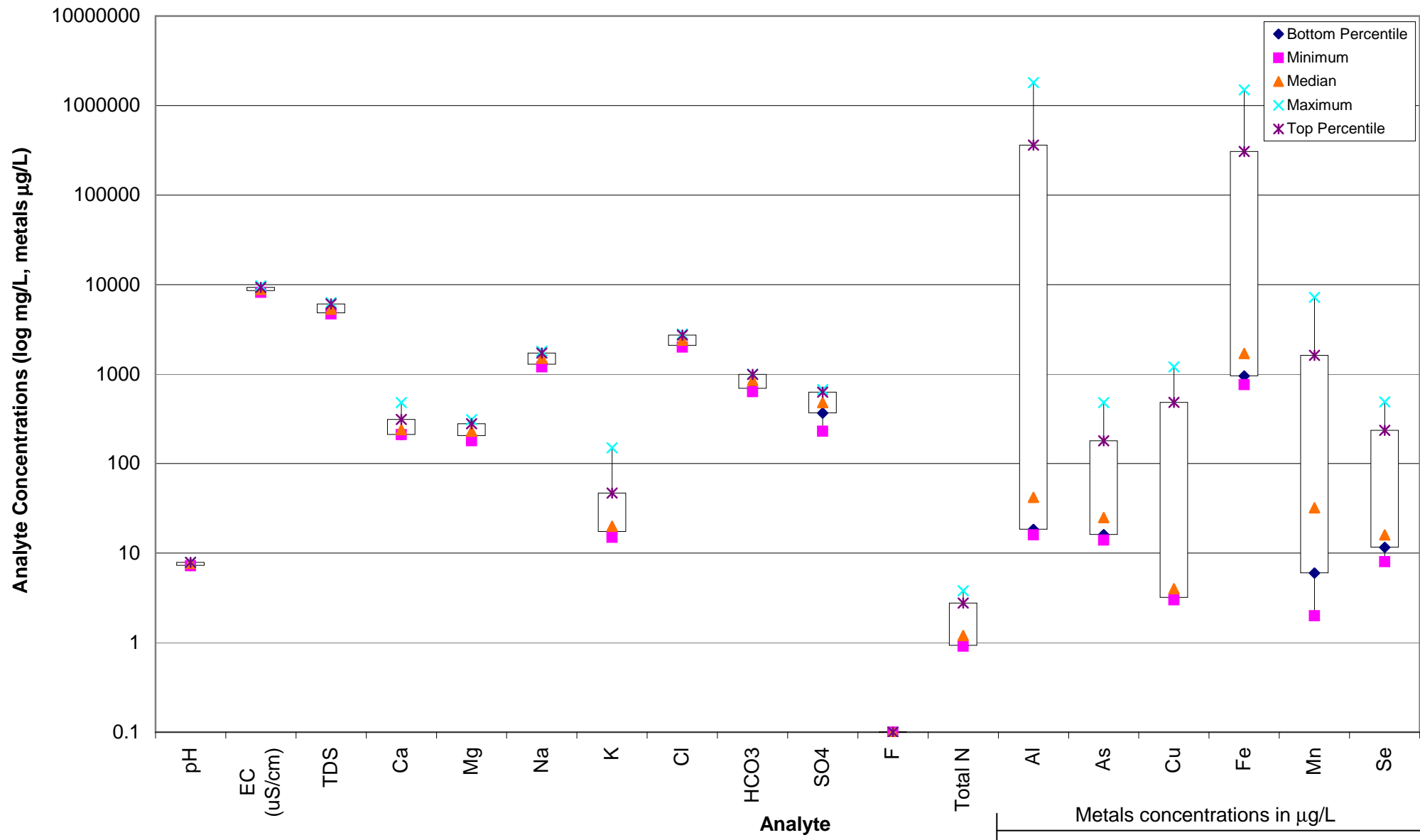
Baseline Data Boxplots for Borehole 18P (Coal)



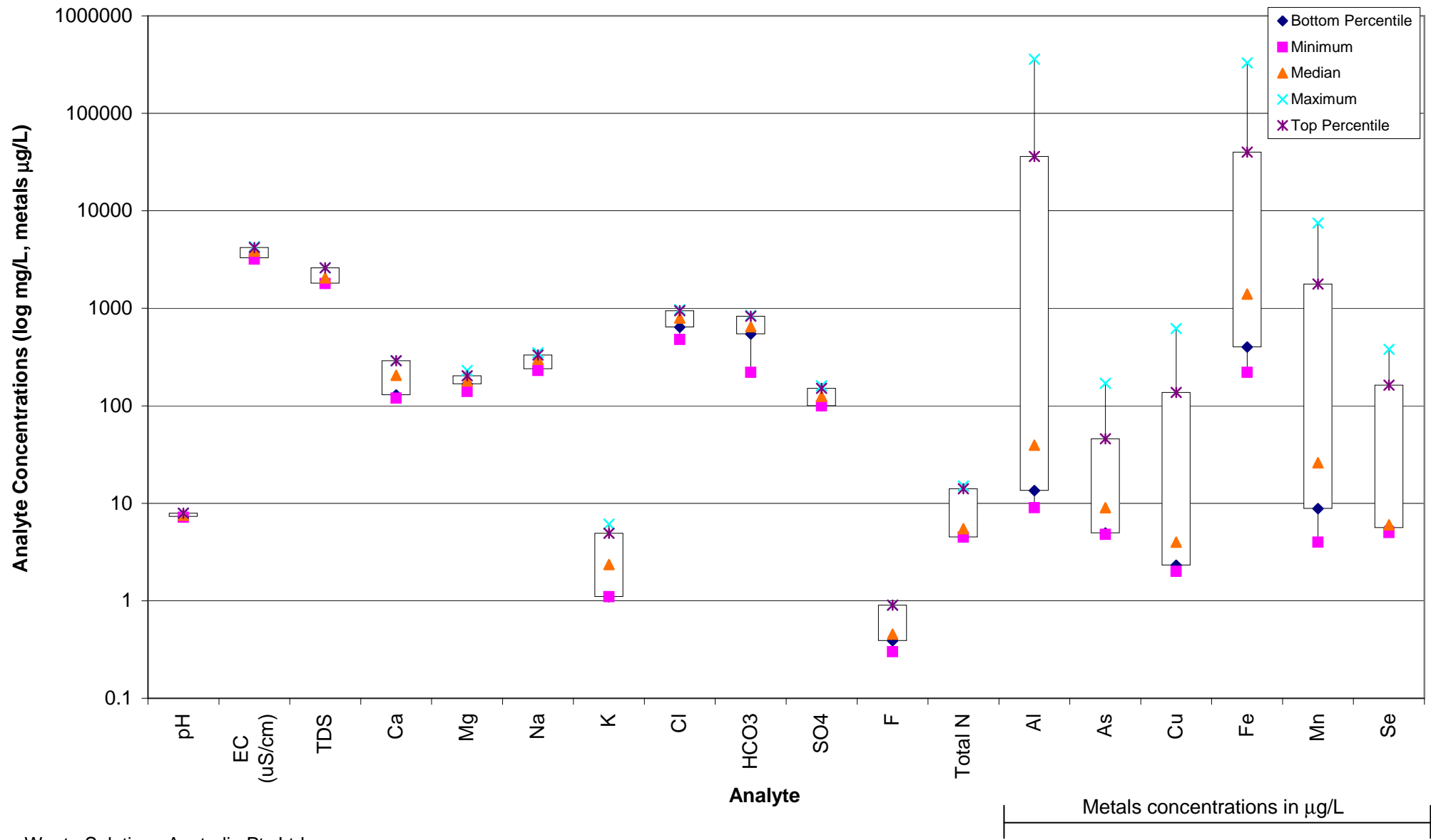


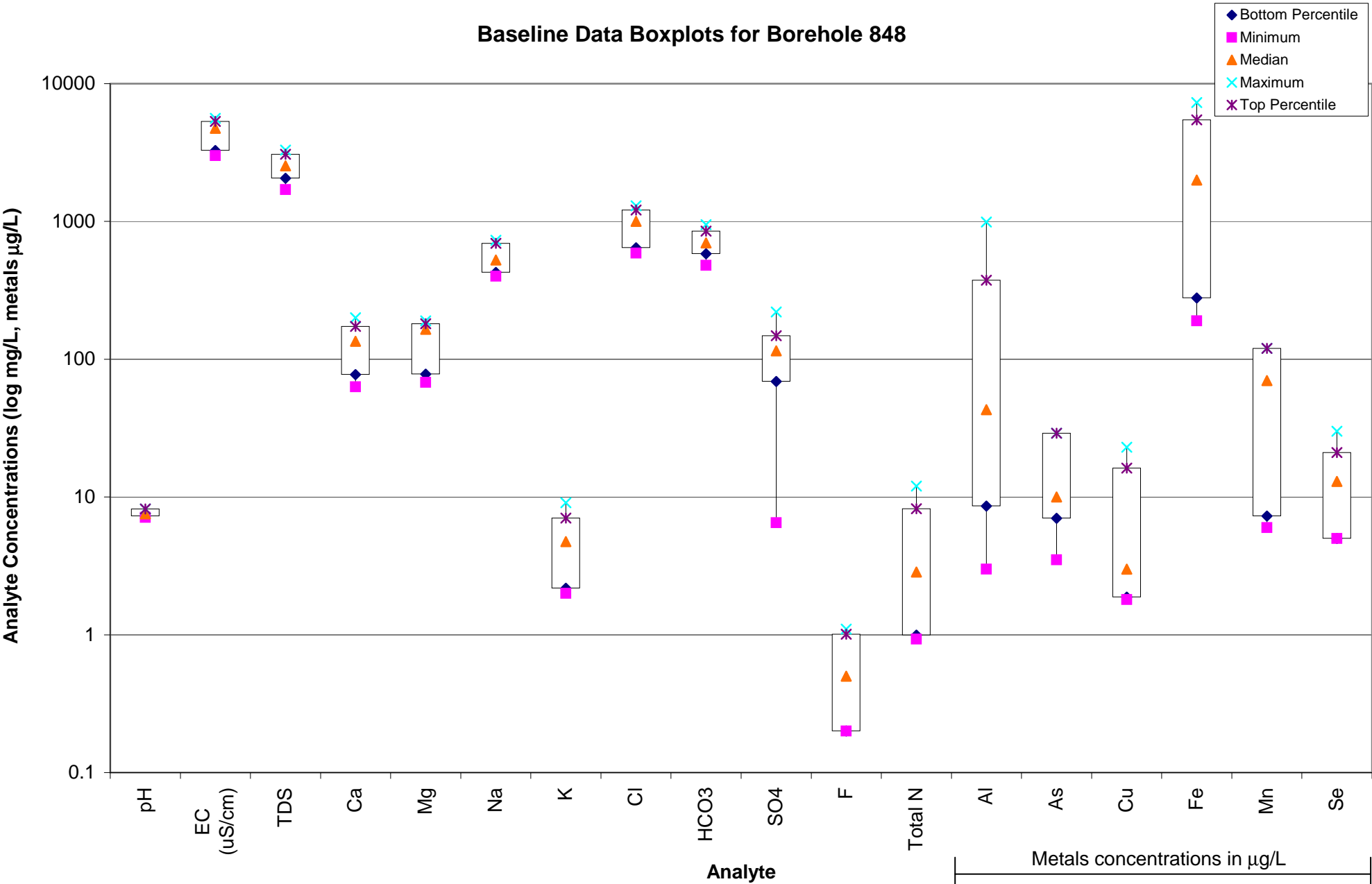


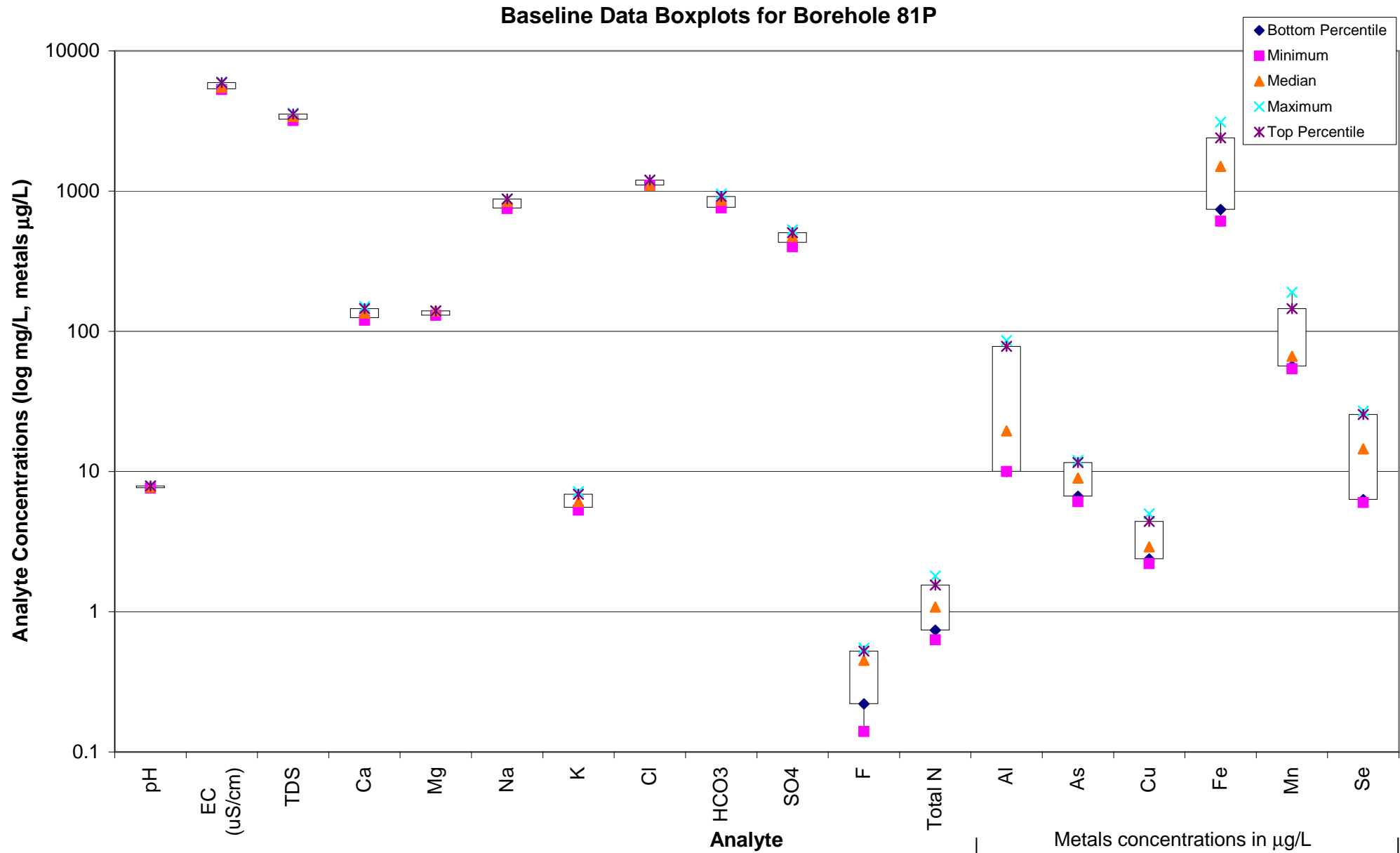
Baseline Data Boxplots for Borehole 28P



Baseline Data Boxplots for Borehole 843

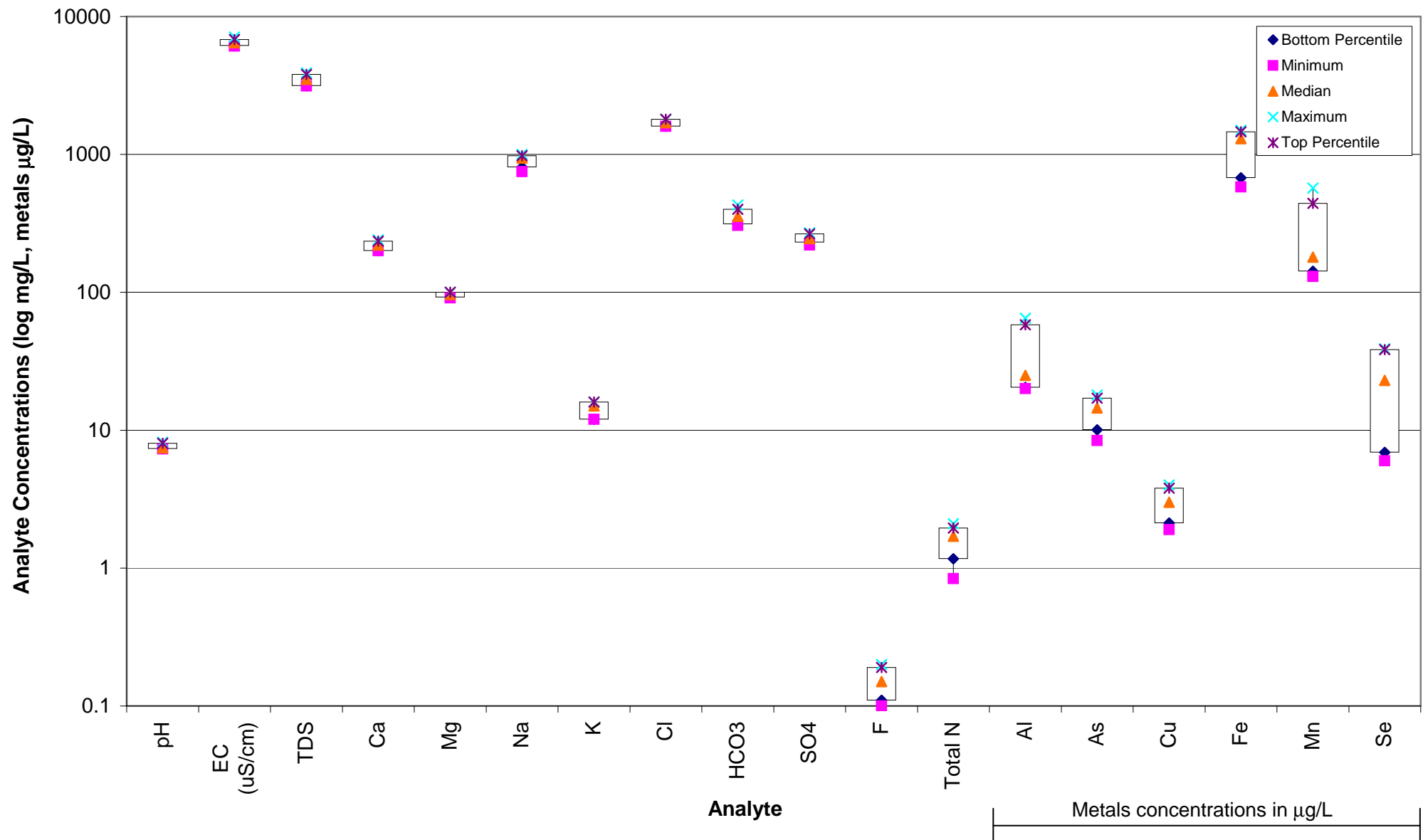




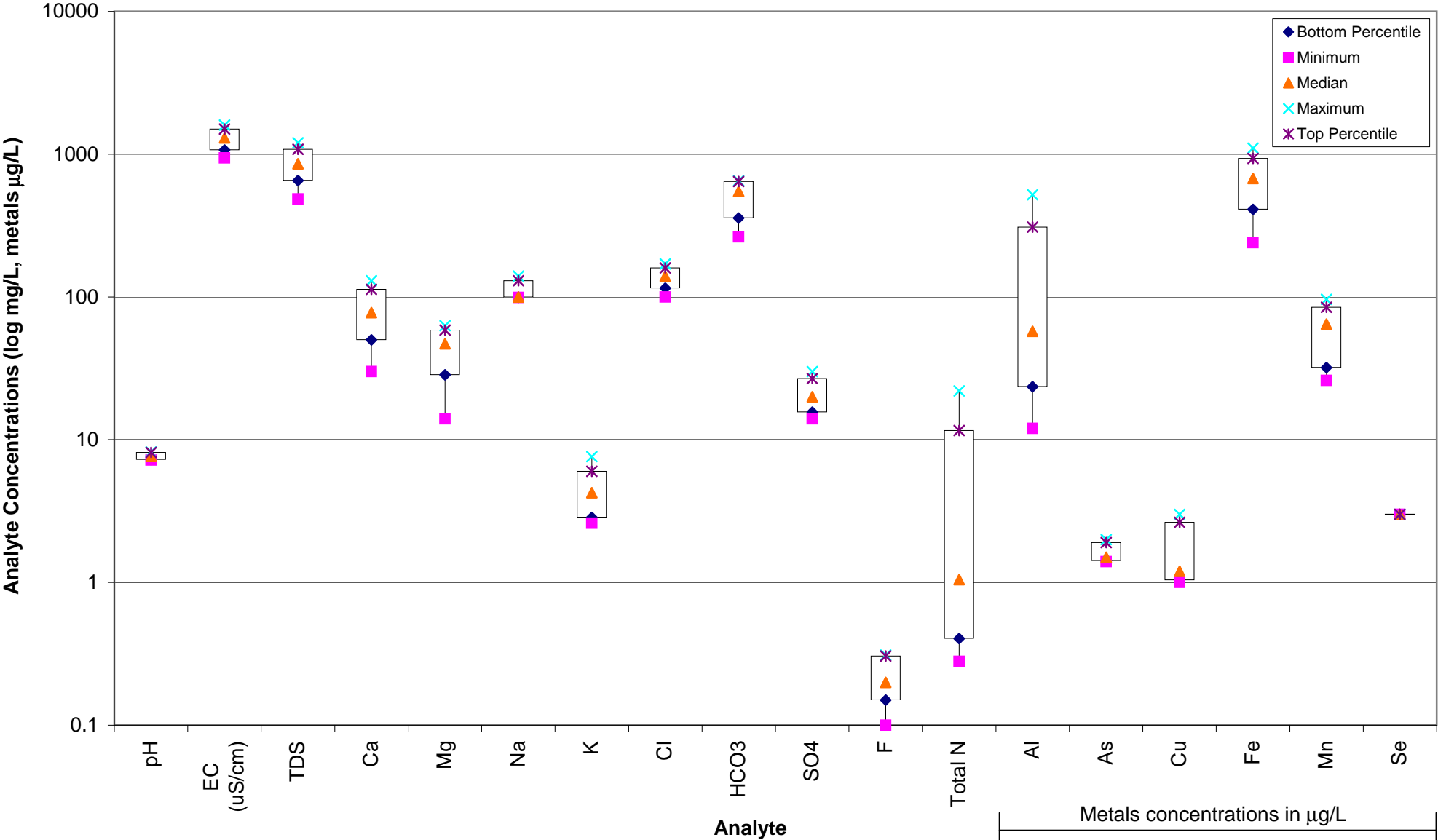




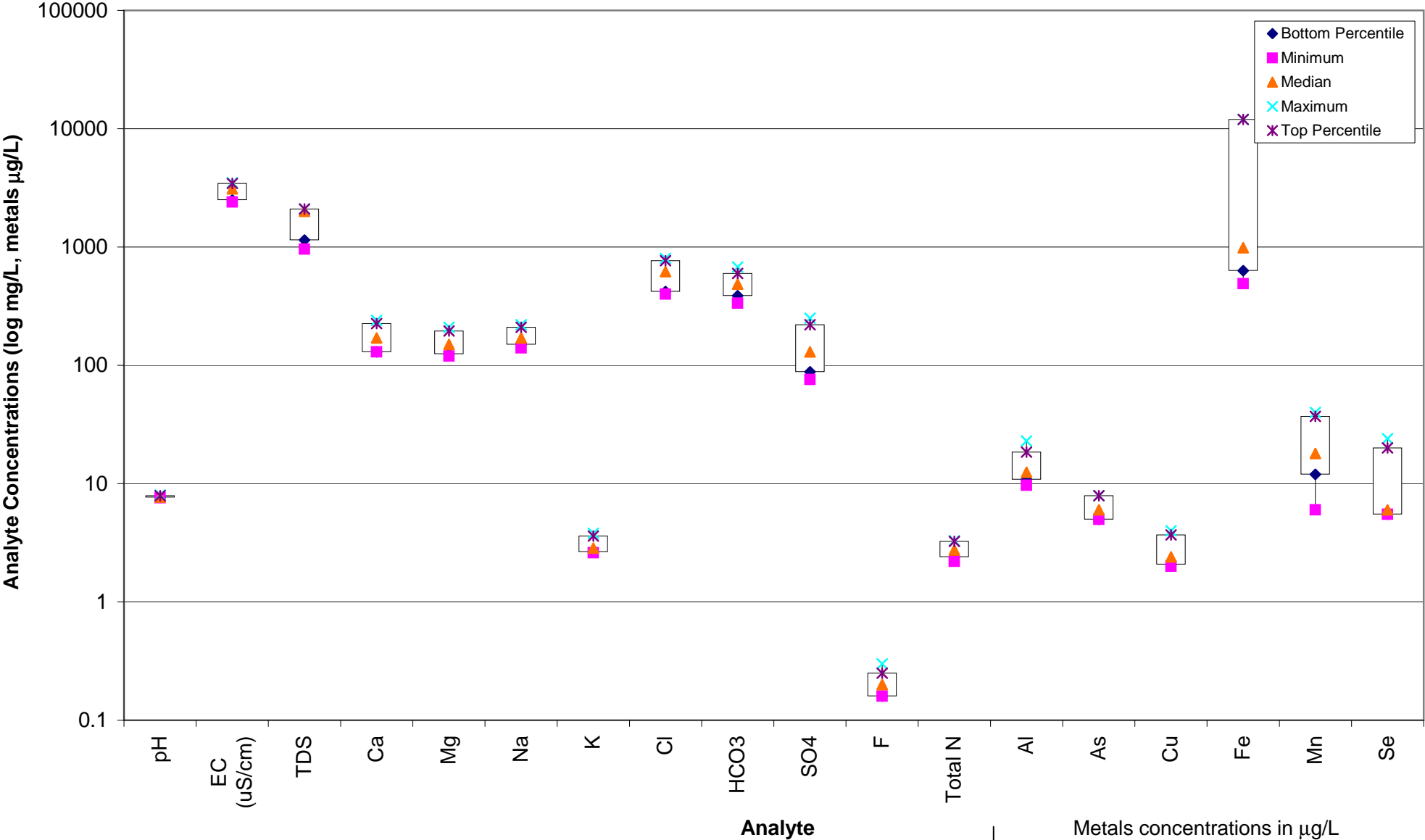
Baseline Data Boxplots for Borehole 82P



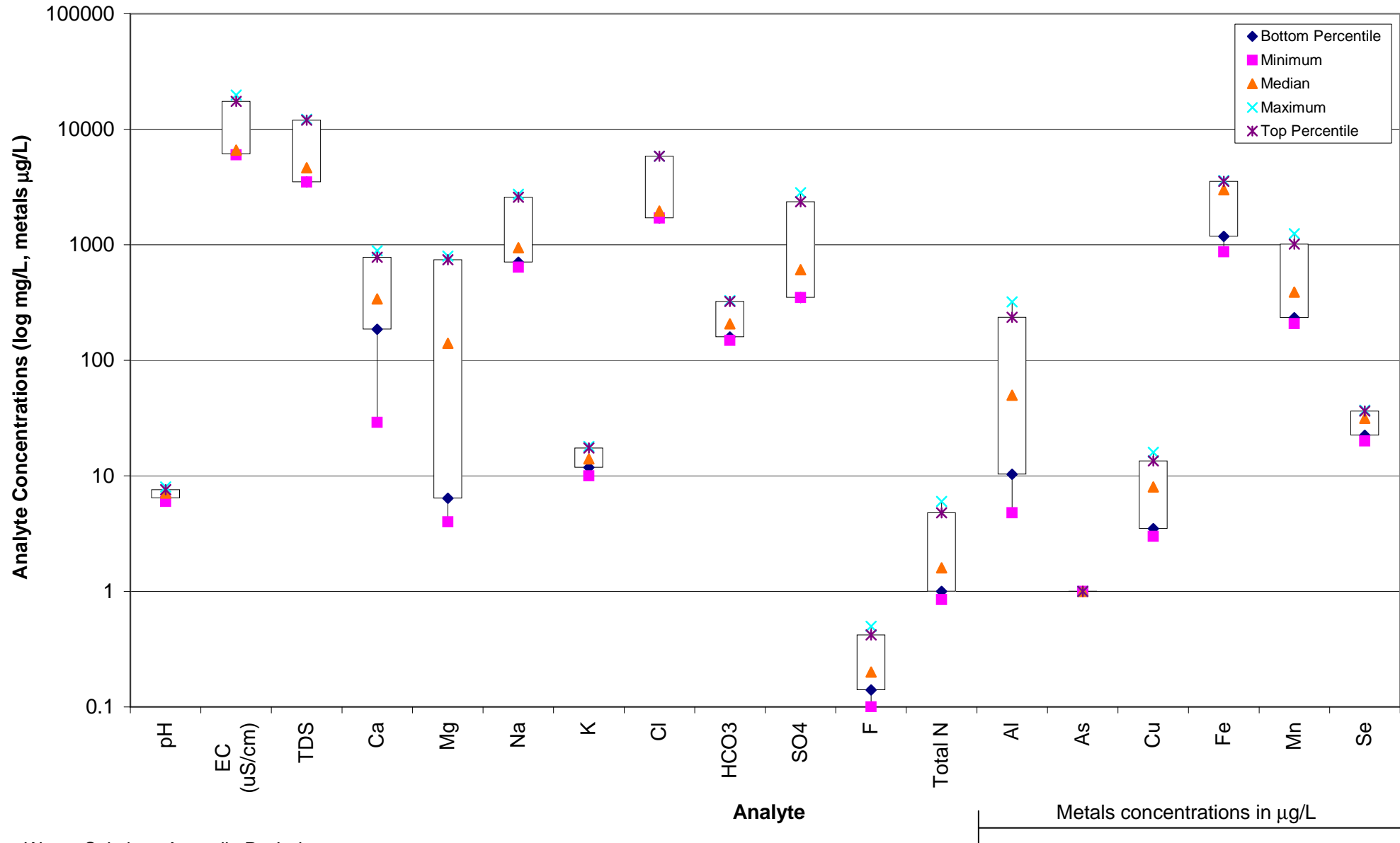
Baseline Data Boxplots for Borehole 83P

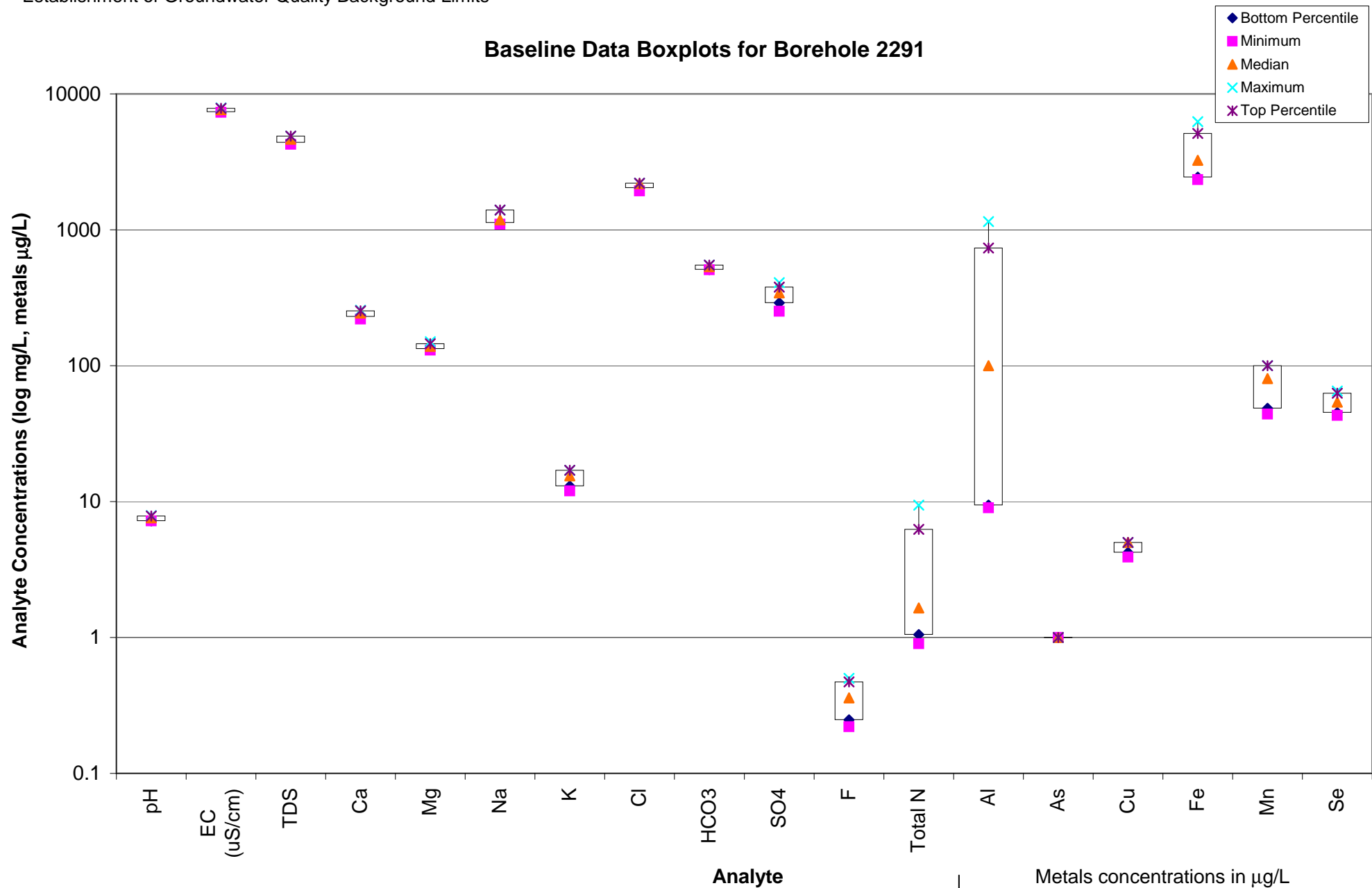


Baseline Data Boxplots for Borehole 84P



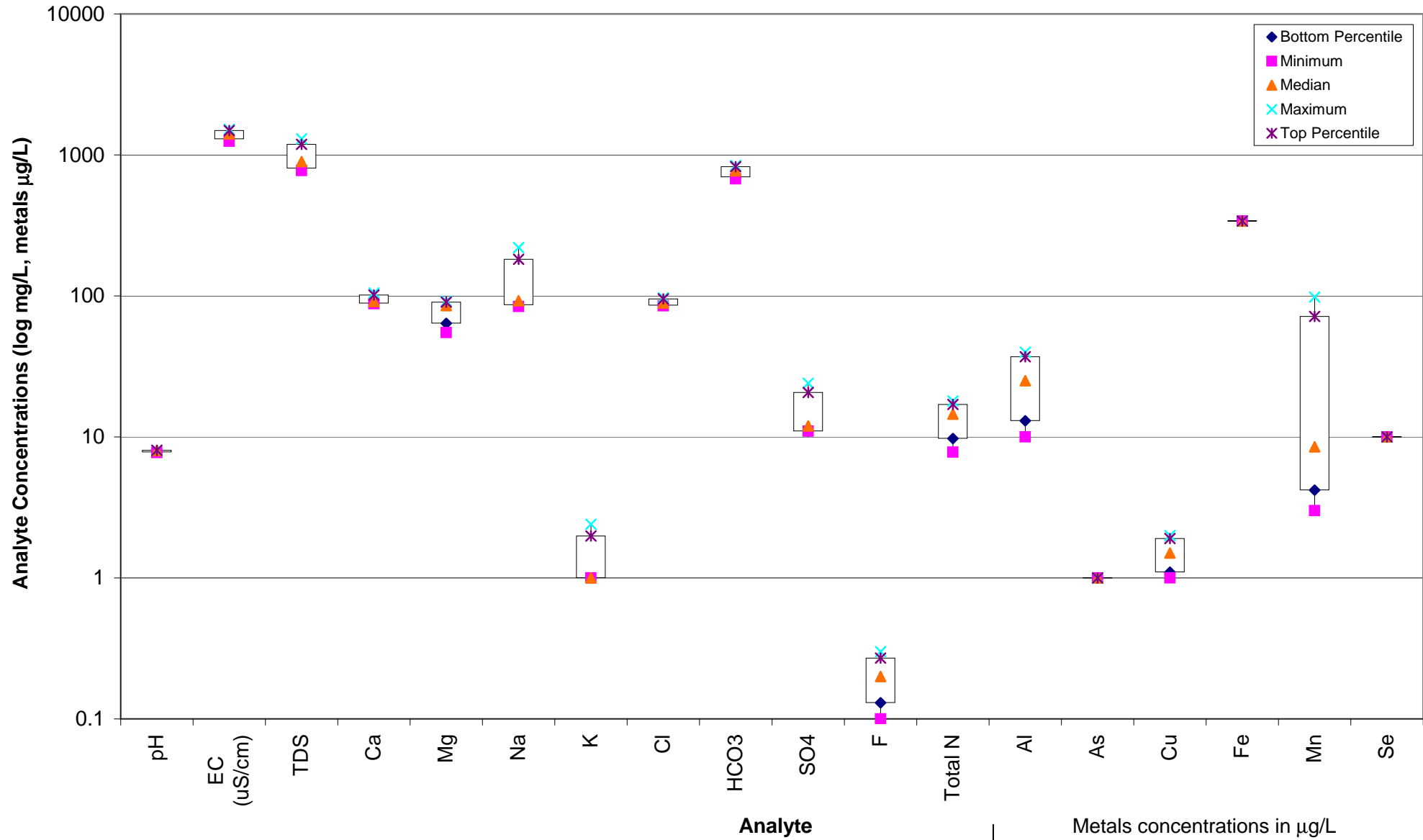
Baseline Data Boxplots for Borehole 2289



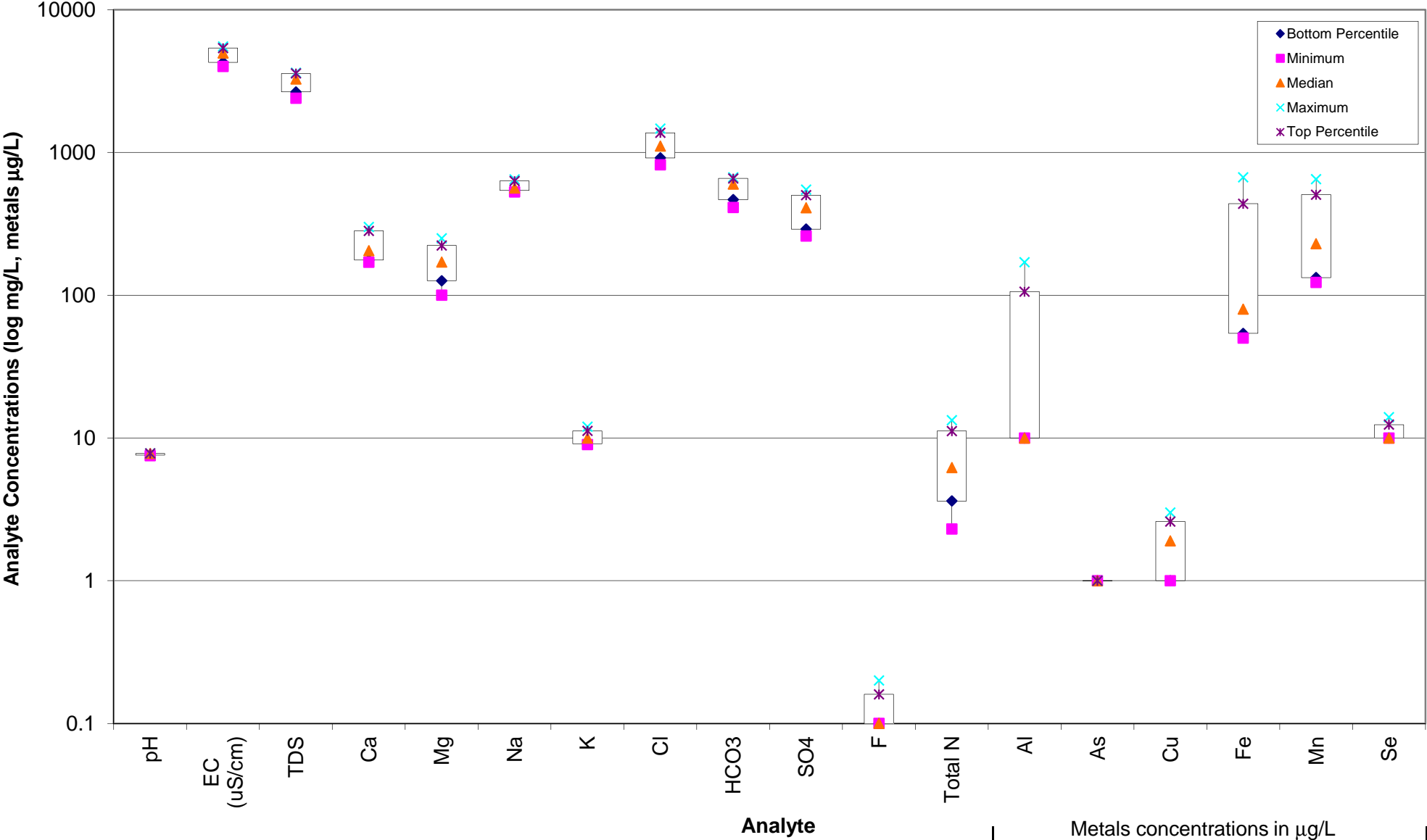




Baseline Data Boxplots for Borehole BMH1



Baseline Data Boxplots for Borehole CSMH1



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## APPENDIX C

### DATA TABLES

Groundwater Bore No. 18P (Coal)

Parameter	Units	28/08/2003	3/03/2004	8/09/2004	13/04/2005	12/10/2005	28/04/2006	25/10/2006	18/04/2007	17/10/2007	15/04/2008	Calculated Statistical Values				
												Bottom Percentile	Minimum	Median	Maximum	Top Percentile
pH	pH units	7.1	7.3	8.2	8	8.5	7.7	8.3	9.6	8	7.7	7.28	7.1	8	9.6	8.61
EC	mS/cm	600	530	810	790	820	790	850	720	770	840	593	530	790	850	841
TDS	mg/L	332	334	474	431	403	360	430	5200	430	490	333.8	332	430	5200	961
<b>Major Ions</b>																
Ca	mg/L	19	9.2	18	9.6	6.7	6.7	11	7.4	9.4	11	6.7	6.7	9.5	19	18.1
Mg	mg/L	3	1.9	3.2	2	2	1.7	3.3	<1	2.5	2.4	1.86	1.7	2.4	3.3	3.22
Na	mg/L	88	91	130	130	130	110	130	150	150	160	90.7	88	130	160	151
K	mg/L	3	1.2	5.8	5.1	4.7	3	4.1	<1	4.3	4.2	2.64	1.2	4.2	5.8	5.24
Cl	mg/L	92	92	150	140	130	120	150	2500	140	150	92	92	140	2500	385
HCO <sub>3</sub>	mg/L	122	67	179	132	117	134	120	37	120	150	64	37	121	179	152.9
SO <sub>4</sub>	mg/L	5	11	5.5	22	16	16	17	18	5.9	6	5.45	5	13.5	22	18.4
<b>Minor Ions</b>																
F	mg/L	0.3	0.3	0.4	0.1	0.5	0.4	<0.1	0.17	0.1	0.2	0.1	0.1	0.3	0.5	0.42
Total N	mg/L	3.1	0.38	0.87	1.2	1.7	0.53	0.83	0.44	1.3	4.7	0.434	0.38	1.035	4.7	3.26
<b>Dissolved Metals</b>																
Al	mg/L	1300	19	16	1800	150	750	130	77	590	24	18.7	16	140	1800	1350
As	mg/L	5	4	18	8	3	4	3.6	4.4	2.7	1.6	2.59	1.6	4	18	9
Cu	mg/L	73	5	8	10	2	6	<2	<2	<2	1.2	1.68	1.2	6	73	35.2
Fe	mg/L	110	180	1800	1600	160	800	180	99	490	230	108.9	99	205	1800	1620
Mn	mg/L	5	110	39	37	14	27	14	2.6	56	64	4.76	2.6	32	110	68.6
Se	mg/L	2	2	<1	6	3	2	<5	<5	<5	5.8	2	2	2.5	6	5.9

N.B. Values highlighted in red indicate potentially erroneous analysis readings.

Groundwater Bore No. 27P (Coal)

Parameter	Units	28/08/2003	3/03/2004	8/09/2004	13/04/2005	12/10/2005	28/04/2006	25/10/2006	18/04/2007	17/10/2007	15/04/2008	Calculated Statistical Values				
												Bottom Percentile	Minimum	Median	Maximum	Top Percentile
pH	pH units	7	7	7.4	7	7.5	7.6	7.2	7	7.6	7.3	7	7	7.25	7.6	7.6
EC	mS/cm	11000	9800	9900	9300	9700	9700	9200	9700	9100	8900	9080	8900	9700	11000	10010
TDS	mg/L	5597	6900	5040	6358	5430	4990	5900	6100	5800	5900	5035	4990	5850	6900	6412.2
<b>Major Ions</b>																
Ca	mg/L	390	400	370	500	390	420	570	430	410	410	388	370	410	570	507
Mg	mg/L	190	210	200	230	200	200	230	190	190	200	190	190	200	230	230
Na	mg/L	1400	1500	1500	1600	1600	1500	1300	1600	1500	1600	1390	1300	1500	1600	1600
K	mg/L	22	20	21	89	23	19	31	21	22	24	19.9	19	22	89	36.8
Cl	mg/L	2600	2300	2600	3600	2800	2500	2500	2700	2700	2700	2480	2300	2650	3600	2880
HCO <sub>3</sub>	mg/L	414	390	327	328	314	337	740	430	290	280	289	280	332.5	740	461
SO <sub>4</sub>	mg/L	580	580	590	740	690	690	560	670	710	680	578	560	675	740	713
<b>Minor Ions</b>																
F	mg/L	<0.1	0.1	0.2	<0.1	0.1	0.1	0.21	0.17	0.2	0.1	0.1	0.1	0.135	0.21	0.203
Total N	mg/L	1.2	1.8	2.5	7.6	3.7	3.8	3	3	1.4	2.4	1.38	1.2	2.75	7.6	4.18
<b>Dissolved Metals</b>																
Al	mg/L	640		7	750000	46	56	2000	140	16	25	14.2	7	56	750000	151600
As	mg/L	29	94	54	270	33	21	19	25	15	<1	18.2	15	29	270	129.2
Cu	mg/L	35	20	50	1000	10	8	<2	4.1	<2	3.7	3.98	3.7	15	1000	335
Fe	mg/L	2600		4200	800000	2100	2600	2700	4900	1000	1500	1400	1000	2600	800000	163920
Mn	mg/L	160	330	200	6500	170	98	340	300	92	61	88.9	61	185	6500	956
Se	mg/L	16	36	<10	360	15	9	5.5	<5	71	58	7.95	5.5	26	360	157.7

Groundwater Bore No. 28P (Coal)

Parameter	Units	28/08/2003	3/03/2004	8/09/2004	13/04/2005	12/10/2005	28/04/2006	25/10/2006	18/04/2007	17/10/2007	15/04/2008	Calculated Statistical Values				
												Bottom Percentile	Minimum	Median	Maximum	Top Percentile
pH	pH units	7.5	N/S	7.7	7.7	7.9	7.8	7.2	7.9	7.3	7.3	7.28	7.2	7.7	7.9	7.9
EC	mS/cm	9200	N/S	8700	9100	8800	8600	9700	8200	9100	8700	8520	8200	8800	9700	9300
TDS	mg/L	4836	N/S	5301	5836	5129	5051	5400	4700	6000	6300	4808.8	4700	5301	6300	6060
<b>Major Ions</b>																
Ca	mg/L	230	N/S	240	480	210	210	260	230	260	270	210	210	240	480	312
Mg	mg/L	180	N/S	210	310	220	230	220	230	230	270	204	180	230	310	278
Na	mg/L	1200	N/S	1400	1800	1500	1700	1300	1500	1500	1500	1280	1200	1500	1800	1720
K	mg/L	20	N/S	20	150	19	15	19	21	18	20	17.4	15	20	150	46.8
Cl	mg/L	2000	N/S	2700	2800	2400	2100	2300	2500	2400	2500	2080	2000	2400	2800	2720
HCO <sub>3</sub>	mg/L	968	N/S	769	636	703	897	850	770	990	1000	689.6	636	850	1000	992
SO <sub>4</sub>	mg/L	230	N/S	400	440	490	480	430	610	620	670	366	230	480	670	630
<b>Minor Ions</b>																
F	mg/L	0.1	N/S	0.1	<0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.1	0.1	0.1	0.1
Total N	mg/L	2.5	N/S	1.2	3.8	1.9	1.2	1.1	0.93	0.91	1.7	0.926	0.91	1.2	3.8	2.76
<b>Dissolved Metals</b>																
Al	mg/L	400	N/S	16	1800000	23	71	720	42	19	42	18.4	16	42	1800000	360576
As	mg/L	19	N/S	51	480	27	17	26	24	14	<1	16.1	14	25	480	179.7
Cu	mg/L	<1	N/S	6	1200	4	7	<2	3.8	3.3	3	3.18	3	4	1200	484.2
Fe	mg/L	1500	N/S	7800	1500000	1700	1500	1000	760	4300	5800	952	760	1700	1500000	306240
Mn	mg/L	140	N/S	2	7200	8	7	220	19	32	33	6	2	32	7200	1616
Se	mg/L	16	N/S	<5	490	14	8	14	<5	65	45	11.6	8	16	490	235

Groundwater Bore No. 843 (Basalt)

Parameter	Units	28/08/2003	3/03/2004	8/09/2004	13/04/2005	12/10/2005	28/04/2006	25/10/2006	18/04/2007	17/10/2007	15/04/2008	Calculated Statistical Values				
												Bottom Percentile	Minimum	Median	Maximum	Top Percentile
pH	pH units	7.2	7.4	7.7	7.6	7.9	7.8	7.5	7.5	7.9	7.3	7.29	7.2	7.55	7.9	7.9
EC	mS/cm	3200	3500	3700	4000	4100	4300	4200	4200	3700	3300	3290	3200	3850	4300	4210
TDS	mg/L	1912	2205	1796	1990	2040	2070	2600	2600	2100	1800	1799.6	1796	2055	2600	2600
<b>Major Ions</b>																
Ca	mg/L	130	290	270	290	240	290	170	170	160	120	129	120	205	290	290
Mg	mg/L	140	230	180	190	180	200	170	170	170	180	167	140	180	230	203
Na	mg/L	230	270	240	300	330	300	310	310	300	350	239	230	300	350	332
K	mg/L	2	3.4	6.1	4.8	2.7	2.6	1.1	1.1	2.1	1.9	1.1	1.1	2.35	6.1	4.93
Cl	mg/L	480	660	810	940	970	910	780	780	740	870	642	480	795	970	943
HCO <sub>3</sub>	mg/L	827	691	603	580	587	846	700	700	600	220	544	220	647	846	828.9
SO <sub>4</sub>	mg/L	100	100	130	160	140	150	120	120	130	120	100	100	125	160	151
<b>Minor Ions</b>																
F	mg/L	0.6	0.9	0.8	0.3	0.4	0.9	0.41	0.41	0.5	0.4	0.39	0.3	0.455	0.9	0.9
Total N	mg/L	5.2	4.5	5.8	14	10	15	5.2	5.2	4.5	7.1	4.5	4.5	5.5	15	14.1
<b>Dissolved Metals</b>																
Al	mg/L	180	9	23	360000	20	14	56	56	70	18	13.5	9	39.5	360000	36162
As	mg/L	5	9	15	170	13	11	6.4	6.4	4.8	<1	4.96	4.8	9	170	46
Cu	mg/L	2	16	7	620	4	4	2.4	2.4	<2	3.3	2.32	2	4	620	136.8
Fe	mg/L	790	220	7800	330000	1900	1600	1400	1400	420	510	400	220	1400	330000	40020
Mn	mg/L	120	340	<1	7500	4	10	26	26	27	17	8.8	4	26	7500	1772
Se	mg/L	6	5	<50	380	6	6	<5	<5	18	14	5.6	5	6	380	162.8



Groundwater Bore No. 848 (Coal)

Parameter	Units	28/08/2003	3/03/2004	8/09/2004	13/04/2005	12/10/2005	28/04/2006	25/10/2006	18/04/2007	17/10/2007	15/04/2008	Calculated Statistical Values				
												Bottom Percentile	Minimum	Median	Maximum	Top Percentile
pH	pH units	7.3	7.1	7.8	7.4	7.6	7.5	7.5	8.1	8.2	8.2	7.28	7.1	7.55	8.2	8.2
EC	mS/cm	5600	5200	5300	4700	4800	4500	5100	3300	3000	3700	3270	3000	4750	5600	5330
TDS	mg/L	3044	3300	2802	2567	2313	2228	2600	2100	1700	2500	2060	1700	2533.5	3300	3069.6
<b>Major Ions</b>																
Ca	mg/L	90	140	130	200	170	160	160	79	63	87	77.4	63	135	200	173
Mg	mg/L	160	170	170	190	180	170	160	79	68	120	77.9	68	165	190	181
Na	mg/L	730	670	690	540	430	510	440	450	400	600	427	400	525	730	694
K	mg/L	2	4.5	5	9.1	6.8	6.6	6.4	3.9	4.1	2.2	2.18	2	4.75	9.1	7.03
Cl	mg/L	1000	1100	1300	1200	1100	910	1000	650	590	790	644	590	1000	1300	1210
HCO <sub>3</sub>	mg/L	947	732	697	594	641	810	700	660	480	840	582.6	480	698.5	947	850.7
SO <sub>4</sub>	mg/L	110	140	6.5	220	130	130	120	77	76	84	69.05	6.5	115	220	148
<b>Minor Ions</b>																
F	mg/L	1.1	0.6	1	0.2	0.2	0.2	0.23	0.74	0.4	1	0.2	0.2	0.5	1.1	1.01
Total N	mg/L	7.8	1	3.7	2.1	1.8	0.93	1	5.6	3.6	12	0.993	0.93	2.85	12	8.22
<b>Dissolved Metals</b>																
Al	mg/L	190		3	990	220	54	18	43	42	10	8.6	3	43	990	374
As	mg/L	11	29	29	18	10	9	8.3	7.9	3.5	<1	7.02	3.5	10	29	29
Cu	mg/L	<1	<1	6	23	2	3	<2	<2	<2	1.8	1.88	1.8	3	23	16.2
Fe	mg/L	460		5000	7300	3900	4100	1300	2000	190	300	278	190	2000	7300	5460
Mn	mg/L	6	70	<1	120	110	120	99	39	27	7.6	7.28	6	70	120	120
Se	mg/L	13	7	<5	30	5	5	<5	<5	15	15	5	5	13	30	21

Groundwater Bore No. 81P (Coal)

Parameter	Units	28/08/2003	3/03/2004	8/09/2004	13/04/2005	12/10/2005	28/04/2006	25/10/2006	18/04/2007	17/10/2007	15/04/2008	Calculated Statistical Values				
												Bottom Percentile	Minimum	Median	Maximum	Top Percentile
pH	pH units	N/S	N/S	N/S	N/S	8.2	7.9	7.4	7.3	7.5	7.4	7.35	7.3	7.45	8.2	8.05
EC	mS/cm	N/S	N/S	N/S	N/S	6400	6500	7100	6200	6100	6500	6150	6100	6450	7100	6800
TDS	mg/L	N/S	N/S	N/S	N/S	3129	3161	3400	3900	3600	3700	3145	3129	3500	3900	3800
<b>Major Ions</b>																
Ca	mg/L	N/S	N/S	N/S	N/S	230	230	240	200	200	210	200	200	220	240	235
Mg	mg/L	N/S	N/S	N/S	N/S	97	91	100	93	96	100	92	91	96.5	100	100
Na	mg/L	N/S	N/S	N/S	N/S	750	1000	870	960	940	940	810	750	940	1000	980
K	mg/L	N/S	N/S	N/S	N/S	12	16	16	14	12	16	12	12	15	16	16
Cl	mg/L	N/S	N/S	N/S	N/S	1800	1600	1600	1800	1700	1700	1600	1600	1700	1800	1800
HCO <sub>3</sub>	mg/L	N/S	N/S	N/S	N/S	305	361	430	320	350	370	312.5	305	355.5	430	400
SO <sub>4</sub>	mg/L	N/S	N/S	N/S	N/S	250	240	220	240	270	260	230	220	245	270	265
<b>Minor Ions</b>																
F	mg/L	N/S	N/S	N/S	N/S	0.1	0.2	<0.1	<0.1	<0.1	<0.1	0.11	0.1	0.15	0.2	0.19
Total N	mg/L	N/S	N/S	N/S	N/S	1.5	1.7	1.7	2.1	0.84	1.8	1.17	0.84	1.7	2.1	1.95
<b>Dissolved Metals</b>																
Al	mg/L	N/S	N/S	N/S	N/S	20	21	<1	48	65	25	20.4	20	25	65	58.2
As	mg/L	N/S	N/S	N/S	N/S	18	14	<1	15	8.4	<1	10.08	8.4	14.5	18	17.1
Cu	mg/L	N/S	N/S	N/S	N/S	3	4	<2	<2	<2	1.9	2.12	1.9	3	4	3.8
Fe	mg/L	N/S	N/S	N/S	N/S	1500	1400	<5	580	820	1300	676	580	1300	1500	1460
Mn	mg/L	N/S	N/S	N/S	N/S	570	130	<1	250	180	160	142	130	180	570	442
Se	mg/L	N/S	N/S	N/S	N/S	9	6	<5	<5	37	39	6.9	6	23	39	38.4

Groundwater Bore No. 82P (Coal)

Parameter	Units	28/08/2003	3/03/2004	8/09/2004	13/04/2005	12/10/2005	28/04/2006	25/10/2006	18/04/2007	17/10/2007	15/04/2008	Calculated Statistical Values				
												Bottom Percentile	Minimum	Median	Maximum	Top Percentile
pH	pH units	N/S	N/S	N/S	N/S	7.7	7.6	7.8	7.7	7.9	7.9	7.65	7.6	7.75	7.9	7.9
EC	mS/cm	N/S	N/S	N/S	N/S	5900	5600	6000	5400	5300	5400	5350	5300	5500	6000	5950
TDS	mg/L	N/S	N/S	N/S	N/S	3185	3308	3400	3400	3600	3500	3246.5	3185	3400	3600	3550
<b>Major Ions</b>																
Ca	mg/L	N/S	N/S	N/S	N/S	140	130	130	120	150	140	125	120	135	150	145
Mg	mg/L	N/S	N/S	N/S	N/S	140	140	140	130	130	140	130	130	140	140	140
Na	mg/L	N/S	N/S	N/S	N/S	750	880	760	850	840	880	755	750	845	880	880
K	mg/L	N/S	N/S	N/S	N/S	6.4	5.3	5.8	5.8	7.2	6.6	5.55	5.3	6.1	7.2	6.9
Cl	mg/L	N/S	N/S	N/S	N/S	1200	1100	1100	1200	1100	1100	1100	1100	1100	1200	1200
HCO <sub>3</sub>	mg/L	N/S	N/S	N/S	N/S	759	953	880	770	880	840	764.5	759	860	953	916.5
SO <sub>4</sub>	mg/L	N/S	N/S	N/S	N/S	460	530	400	480	470	480	430	400	475	530	505
<b>Minor Ions</b>																
F	mg/L	N/S	N/S	N/S	N/S	0.5	0.4	0.14	0.55	0.3	0.5	0.22	0.14	0.45	0.55	0.525
Total N	mg/L	N/S	N/S	N/S	N/S	1.3	1.8	0.63	0.85	0.86	1.3	0.74	0.63	1.08	1.8	1.55
<b>Dissolved Metals</b>																
Al	mg/L	N/S	N/S	N/S	N/S	10	86	70	15	10	24	10	10	19.5	86	78
As	mg/L	N/S	N/S	N/S	N/S	11	9	7.5	12	6.1	<1	6.66	6.1	9	12	11.6
Cu	mg/L	N/S	N/S	N/S	N/S	3	5	<2	2.2	<2	2.8	2.38	2.2	2.9	5	4.4
Fe	mg/L	N/S	N/S	N/S	N/S	870	3100	1600	1700	610	1400	740	610	1500	3100	2400
Mn	mg/L	N/S	N/S	N/S	N/S	54	60	59	73	190	100	56.5	54	66.5	190	145
Se	mg/L	N/S	N/S	N/S	N/S	7	6	<5	<5	27	22	6.3	6	14.5	27	25.5

Groundwater Bore No. 83P (Coal)

Parameter	Units	28/08/2003	3/03/2004	8/09/2004	13/04/2005	12/10/2005	28/04/2006	25/10/2006	18/04/2007	17/10/2007	15/04/2008	Calculated Statistical Values				
												Bottom Percentile	Minimum	Median	Maximum	Top Percentile
pH	pH units	N/S	N/S	N/S	N/S	8.2	8.1	7.3	7.8	7.5	7.2	7.25	7.2	7.65	8.2	8.15
EC	mS/cm	N/S	N/S	N/S	N/S	940	1200	1600	1400	1300	1300	1070	940	1300	1600	1500
TDS	mg/L	N/S	N/S	N/S	N/S	485	830	1200	880	820	960	652.5	485	855	1200	1080
<b>Major Ions</b>																
Ca	mg/L	N/S	N/S	N/S	N/S	30	70	130	82	73	96	50	30	77.5	130	113
Mg	mg/L	N/S	N/S	N/S	N/S	14	44	63	54	43	50	28.5	14	47	63	58.5
Na	mg/L	N/S	N/S	N/S	N/S	100	100	120	140	99	100	99.5	99	100	140	130
K	mg/L	N/S	N/S	N/S	N/S	2.6	3.1	7.6	4.4	4.2	4.3	2.85	2.6	4.25	7.6	6
Cl	mg/L	N/S	N/S	N/S	N/S	100	140	170	150	130	140	115	100	140	170	160
HCO <sub>3</sub>	mg/L	N/S	N/S	N/S	N/S	263	639	650	550	450	550	356.5	263	550	650	644.5
SO <sub>4</sub>	mg/L	N/S	N/S	N/S	N/S	14	<50	30	22	20	18	15.6	14	20	30	26.8
<b>Minor Ions</b>																
F	mg/L	N/S	N/S	N/S	N/S	0.2	0.1	0.2	0.31	0.2	0.3	0.15	0.1	0.2	0.31	0.305
Total N	mg/L	N/S	N/S	N/S	N/S	1.2	1.1	0.53	22	0.28	0.99	0.405	0.28	1.045	22	11.6
<b>Dissolved Metals</b>																
Al	mg/L	N/S	N/S	N/S	N/S	35	74	520	96	12	41	23.5	12	57.5	520	308
As	mg/L	N/S	N/S	N/S	N/S	<1	2	1.4	1.5	<1	<1	1.42	1.4	1.5	2	1.9
Cu	mg/L	N/S	N/S	N/S	N/S	1	3	<2	<2	<2	1.2	1.04	1	1.2	3	2.64
Fe	mg/L	N/S	N/S	N/S	N/S	240	580	1100	770	690	660	410	240	675	1100	935
Mn	mg/L	N/S	N/S	N/S	N/S	26	38	96	59	70	73	32	26	64.5	96	84.5
Se	mg/L	N/S	N/S	N/S	N/S	3	3	<5	<5	<5	<5	3	3	3	3	3

Groundwater Bore No. 84P (Basalt)

Parameter	Units	28/08/2003	3/03/2004	8/09/2004	13/04/2005	12/10/2005	28/04/2006	25/10/2006	18/04/2007	17/10/2007	15/04/2008	Calculated Statistical Values				
												Bottom Percentile	Minimum	Median	Maximum	Top Percentile
pH	pH units	N/S	N/S	N/S	N/S	8	7.6	7.7	7.7	7.8	7.7	7.65	7.6	7.7	8	7.9
EC	mS/cm	N/S	N/S	N/S	N/S	2400	2600	3100	3100	3400	3500	2500	2400	3100	3500	3450
TDS	mg/L	N/S	N/S	N/S	N/S	961	1324	2100	2100	2000	2000	1142.5	961	2000	2100	2100
<b>Major Ions</b>																
Ca	mg/L	N/S	N/S	N/S	N/S	130	130	170	170	210	240	130	130	170	240	225
Mg	mg/L	N/S	N/S	N/S	N/S	120	130	150	150	180	210	125	120	150	210	195
Na	mg/L	N/S	N/S	N/S	N/S	140	220	170	170	160	200	150	140	170	220	210
K	mg/L	N/S	N/S	N/S	N/S	3	2.6	2.7	2.7	3.4	3.8	2.65	2.6	2.85	3.8	3.6
Cl	mg/L	N/S	N/S	N/S	N/S	400	440	620	620	730	800	420	400	620	800	765
HCO <sub>3</sub>	mg/L	N/S	N/S	N/S	N/S	335	678	520	520	450	440	387.5	335	485	678	599
SO <sub>4</sub>	mg/L	N/S	N/S	N/S	N/S	76	100	130	130	190	250	88	76	130	250	220
<b>Minor Ions</b>																
F	mg/L	N/S	N/S	N/S	N/S	0.3	0.2	0.16	0.16	0.2	0.2	0.16	0.16	0.2	0.3	0.25
Total N	mg/L	N/S	N/S	N/S	N/S	3.2	2.9	2.6	2.6	2.2	3.3	2.4	2.2	2.75	3.3	3.25
<b>Dissolved Metals</b>																
Al	mg/L	N/S	N/S	N/S	N/S	23	13	12	12	14	9.7	10.85	9.7	12.5	23	18.5
As	mg/L	N/S	N/S	N/S	N/S	5	6	7.9	7.9	5	<1	5	5	6	7.9	7.9
Cu	mg/L	N/S	N/S	N/S	N/S	2	4	<2	<2	<2	2.4	2.08	2	2.4	4	3.68
Fe	mg/L	N/S	N/S	N/S	N/S	970	1000	12000	12000	490	770	630	490	985	12000	12000
Mn	mg/L	N/S	N/S	N/S	N/S	6	34	18	18	18	40	12	6	18	40	37
Se	mg/L	N/S	N/S	N/S	N/S	6	6	5.5	5.5	24	16	5.5	5.5	6	24	20

Groundwater Bore No. 2289 (Coal)

Parameter	Units	1/04/2009	1/12/2009	1/06/2010	13/12/2010	22/06/2011	14/12/2011	16/04/2012				Calculated Statistical Values				
												Bottom Percentile	Minimum	Median	Maximum	Top Percentile
pH	pH units	8	7.3	7.1	6.7	6.01	7.01	7.2				6.424	6.01	7.1	8	7.58
EC	mS/cm	6600	6000	6200	6200	19800	15800	7150				6120	6000	6600	19800	17400
TDS	mg/L	3500	3500	3700	5700	12200	11800	4650				3500	3500	4650	12200	11960
<b>Major Ions</b>																
Ca	mg/L	340	290	400	29	889	706	309				185.6	29	340	889	779.2
Mg	mg/L	140	130	8	4	799	705	182				6.4	4	140	799	742.6
Na	mg/L	640	780	750	1100	2740	2470	944				706	640	944	2740	2578
K	mg/L	14	17	13	18	17	10	14				11.8	10	14	18	17.4
Cl	mg/L	1700	1700	1700	2100	5830	5840	1960				1700	1700	1960	5840	5834
HCO <sub>3</sub>	mg/L	290	330	320	207.3	166	172	149				159	149	207.3	330	324
SO <sub>4</sub>	mg/L	350	350	370	660	2820	2050	609				350	350	609	2820	2358
<b>Minor Ions</b>																
F	mg/L	<0.1	<0.1	0.5	0.1	0.2	0.3	0.2				0.14	0.1	0.2	0.5	0.42
Total N	mg/L	1.6	1.1	0.85	2.2	6	4	1.2				1	0.85	1.6	6	4.8
<b>Dissolved Metals</b>																
Al	mg/L	4.8	180	14	320	50	30	80				10.32	4.8	50	320	236
As	mg/L	<1	<1	<1	<1	1	1	<1				1	1	1	1	1
Cu	mg/L	<1	7	3	11	16	9	4				3.5	3	8	16	13.5
Fe	mg/L	3000	3500	3600	3000	2250	870	1390				1182	870	3000	3600	3540
Mn	mg/L	390	270	390	250	1250	854	208				233.2	208	390	1250	1012.4
Se	mg/L	28	35	37	20	<10	<10	<10				22.4	20	31.5	37	36.4

N.B. Values highlighted in red indicate potentially erroneous analysis readings. Values in blue indicate calculated TDS.

Groundwater Bore No. 2291 (Coal)

Parameter	Units	9/06/2009	17/12/2009	1/07/2010	23/06/2011	13/12/2011	17/04/2012					Calculated Statistical Values				
												Bottom Percentile	Minimum	Median	Maximum	Top Percentile
pH	pH units	7.6	7.2	7.2	7.61	7.9	7.74					7.2	7.2	7.605	7.9	7.82
EC	mS/cm	7900	7400	7700	7780	7320	7630					7360	7320	7665	7900	7840
TDS	mg/L	4700	4900	4600	4250	4510	4900					4380	4250	4650	4900	4900
<b>Major Ions</b>																
Ca	mg/L	220	240	250	256	247	240					230	220	243.5	256	253
Mg	mg/L	140	150	130	136	137	140					133	130	138.5	150	145
Na	mg/L	1400	1400	1100	1200	1160	1170					1130	1100	1185	1400	1400
K	mg/L	15	14	12	17	16	17					13	12	15.5	17	17
Cl	mg/L	2200	2200	2200	1930	2150	2180					2040	1930	2190	2200	2200
HCO <sub>3</sub>	mg/L	510	540	550	508	530	549					509	508	535	550	549
SO <sub>4</sub>	mg/L	330	350	340	346	251	408					290.5	251	343	408	379
<b>Minor Ions</b>																
F	mg/L	<0.1	0.5	0.22	<0.1	<0.1	<0.1					0.248	0.22	0.36	0.5	0.472
Total N	mg/L	9.4	0.9	1.2	1.5	1.8	3.1					1.05	0.9	1.65	9.4	6.25
<b>Dissolved Metals</b>																
Al	mg/L	100	110	9	<10	1150	10					9.4	9	100	1150	734
As	mg/L	<1	<1	1	<1	<1	<1					1	1	1	1	1
Cu	mg/L	3.9	5	5	<1	5	<1					4.23	3.9	5	5	5
Fe	mg/L	3200	3300	4000	2340	6250	2530					2435	2340	3250	6250	5125
Mn	mg/L	100	76	85	44	100	53					48.5	44	80.5	100	100
Se	mg/L	43	65	54	<10	<10	<10					45.2	43	54	65	62.8

Groundwater Bore No. BMH1 (Basalt)

Parameter	Units	16/04/2008	22/06/2011	14/12/2011	17/04/2012							Calculated Statistical Values				
												Bottom Percentile	Minimum	Median	Maximum	Top Percentile
pH	pH units	8	8.02	8.05	7.73							7.811	7.73	8.01	8.05	8.041
EC	mS/cm	1400	1520	1250	1420							1295	1250	1410	1520	1490
TDS	mg/L	1300	871	774	923							803.1	774	897	1300	1186.9
<b>Major Ions</b>																
Ca	mg/L	88	105	93	90							88.6	88	91.5	105	101.4
Mg	mg/L	55	92	85	86							64	55	85.5	92	90.2
Na	mg/L	220	92	84	93							86.4	84	92.5	220	181.9
K	mg/L	2.4	1	1	1							1	1	1	2.4	1.98
Cl	mg/L	85	91	97	87							85.6	85	89	97	95.2
HCO <sub>3</sub>	mg/L	840	791	675	751							698	675	771	840	825
SO <sub>4</sub>	mg/L	11	13	11	24							11	11	12	24	20.7
<b>Minor Ions</b>																
F	mg/L	0.1	0.3	0.2	0.2							0.13	0.1	0.2	0.3	0.27
Total N	mg/L	18	14.7	7.8	14.3							9.75	7.8	14.5	18	17.01
<b>Dissolved Metals</b>																
Al	mg/L	40	<10	10	<10							13	10	25	40	37
As	mg/L	<1	<1	<1	<1							1	1	1	1	1
Cu	mg/L	1	2	<1	<1							1.1	1	1.5	2	1.9
Fe	mg/L	340	<50	<50	<50							340	340	340	340	340
Mn	mg/L	98	7	10	3							4.2	3	8.5	98	71.6
Se	mg/L	<5	<10	<10	<10							10	10	10	10	10

N.B. Values in blue indicate calculated TDS.

Groundwater Bore No. CSMH1 (Coal)

Parameter	Units	16/04/2008	23/06/2011	12/12/2011	18/04/2012	16/10/2012						Calculated Statistical Values				
												Bottom Percentile	Minimum	Median	Maximum	Top Percentile
pH	pH units	7.5	7.79	7.7	7.8	7.79						7.58	7.50	7.79	7.80	7.80
EC	mS/cm	4000	5190	5520	4980	4700						4280	4000	4980	5520	5388
TDS	mg/L	2400	3050	3620	3520	3270						2660	2400	3270	3620	3580
<b>Major Ions</b>																
Ca	mg/L	170	255	301	205	186						176.4	170	205	301	282.6
Mg	mg/L	100	171	250	183	166						126.4	100	171	250	223.2
Na	mg/L	530	609	647	565	561						542.4	530	565	647	631.8
K	mg/L	9.3	10	12	10	9						9.1	9.0	10.0	12.0	11.2
Cl	mg/L	820	1110	1470	1230	1060						916	820	1110	1470	1374
HCO <sub>3</sub>	mg/L	550	670	640	601	412						467	412	601	670	658
SO <sub>4</sub>	mg/L	260	410	336	430	549						290.4	260	410	549	501.4
<b>Minor Ions</b>																
F	mg/L	0.1	0.2	0.1	<0.1	<0.1						0.1	0.1	0.1	0.2	0.16
Total N	mg/L	2.3	13.3	6.2	5.6	8						3.62	2.3	6.2	13.3	11.18
<b>Dissolved Metals</b>																
Al	mg/L	170	<10	<10	<10	<10						10	10	10	170	106
As	mg/L	<1	<1	<1	<1	<1						1	1	1	1	1
Cu	mg/L	1.9	<1	<1	2	3						1	1	1.9	3	2.6
Fe	mg/L	670	<50	60	80	90						54	50	80	670	438
Mn	mg/L	650	292	230	148	123						133	123	230	650	506.8
Se	mg/L	14	<10	<10	<10	<10						10	10	10	14	12.4



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## APPENDIX D

### DEHP RESPONSE TO WSA 2008 REPORT



Queensland  
Government

Enquiries Sarah Horton  
Telephone (07) 4699 4354  
Your reference  
Our reference TWB741 vol 19

14 November 2008

Mr Paul Statham  
New Acland Coal Pty Ltd  
PO Box 47  
IPSWICH QLD 4305

Environmental Protection Agency

Incorporating the  
Queensland Parks and Wildlife Service

CIRC				
CC				
REC'D	17 NOV 2008			
FILE	/	/	/	/

Dear Paul

I refer to your letter dated 8 September 2008 and attached report "Establishment of Groundwater Quality Background Limits" prepared by Waste Solutions Australia Pty Ltd. The Environmental Protection Agency (EPA) has reviewed this report and provides the following comment.

The report states that the first objective of the study was to review, statistically analyse and interpret groundwater quality information generated from monitoring and sampling of ten (10) compliance bores within the monitoring bore field. The second objective of the study was to generate and recommend a set of groundwater quality background limits where sufficient groundwater data sets were available. It is understood that Waste Solutions Australia Pty Ltd reviewed four years of monitoring data with most analytes required to be tested half yearly which constitutes eight (8) data points for most quality characteristics.

Condition C24 of your environmental authority (EA) requires the establishment of background contaminant limits for a set of quality characteristics as shown below –

- (C24) Conduct monitoring and keep records of groundwater quality for the relevant bores of compliance for the aquifers. All determinations of groundwater quality must be:
- (i) conducted for the water quality characteristics and at the minimum frequency stated in **Schedule C – Table 7**;
  - (ii) taken from sufficient monitoring points and / or well to obtain representative samples of groundwater both up-gradient and down-gradient of the potential influence;
  - (iii) carried out with sufficient regularity and spatial and temporal replication to make statistically valid conclusions about the presence or absence of contamination or other impact.
  - (iv) carried out with sufficient number of sampling events to determine ambient groundwater quality and level prior to any development of the site occurring.
  - (v) followed by an assessment of whether or not there has been any statistically significant adverse change compared to background values at locations hydraulically down gradient of the potential sources of contamination for each quality characteristic in **Schedule C – Table 7**.

**Schedule C - Table 7: Groundwater Monitoring Limits and Frequencies**

Quality Characteristic	Units	Contaminant Limits and Groundwater level	Monitoring Frequency
Al	mg/L	+/- 20% of background	Half Yearly
As	mg/L	+/- 20% of background	Half Yearly
Ca	mg/L	+/- 10% of background	Half Yearly
Se	mg/L	+/- 20% of background	Half Yearly
Cl	mg/L	+/- 10% of background	Half Yearly
Cu	mg/L	+/- 20% of background	Half Yearly
F	mg/L	+/- 20% of background	Half Yearly
Fe	mg/L	+/- 20% of background	Half Yearly
Total N	mg/L	+/- 20% of background	Half Yearly
K	mg/L	+/- 10% of background	Half Yearly
Mg	mg/L	+/- 10% of background	Half Yearly
Mn	mg/L	+/- 20% of background	Half Yearly
Na	mg/L	+/- 10% of background	Half Yearly
SO <sub>4</sub>	mg/L	+/- 10% of background	Half Yearly
HCO <sub>3</sub>	mg/L	+/- 10% of background	Half Yearly
TDS	mg/L	+/- 10% of background	Half Yearly
EC	µS/cm	+/- 0.5 for coal measures aquifers +/- 1 for basalt aquifers	Quarterly
pH	unit		Quarterly
Standing water level	cm		Monthly

The report states that due to large variations in data from bore to bore there was no possibility of having only one baseline ('Background') limit per analyte for all aquifers but it suggested that specific data sets for each borehole for each quality characteristic be set. This recommendation is supported with box plots for the baseline data. The report also suggests that no background limits be placed on aluminium and iron because of elevated levels of these analytes in results that could possibly be caused by very fine clay particles carrying metal ions passing through the standard 0.45 micron filter that are generated during the purging of boreholes.

The report provides no discussion demonstrating there is sufficient amount of data for each borehole upon which to make any statistically valid conclusions for appropriate setting of background limits. Nor does the report comment on whether the existing bores are located within the same confined aquifer and at appropriate distance/s from potential sources of impact from mining activities to provide representative groundwater samples from the aquifers potentially affected.



It is understood based on your advice that two off lease reference bores were drilled at the beginning of this year and will be tested half yearly for variation in drawdown. Also these bores will not be monitored for quality characteristics listed in Schedule C Table 7 as this is not required by the EA.

In order to set meaningful background limits for groundwater quality, the requirements of condition C24(in particular ii – iv) should be addressed by demonstrating that groundwater quality has been determined by obtaining a representative number of samples both up-gradient and down-gradient of the potential influence i.e. mining activities. The report should have discussed whether there is sufficient regularity and spatial and temporal replication of data to make statistically valid conclusions about the presence or absence of contamination or other impact and to determine ambient groundwater quality and level prior to any development of the site occurring.

### **EA Amendment for Stage 3**

Given that NAC has applied for an amendment of the existing EA for Stage 3 Environmental Impact Statement (EIS) relating to mining lease application 50232, it would be an opportune time to review the EA conditions for groundwater quality and for NAC to provide more meaningful information on the mine sites groundwater regime and potential vulnerability from mine activities.

Assuming there was currently sufficient data available, the use of time series plots of water parameters and groundwater levels would help determine how much variation in water quality parameters over time are due to recharge and water level variations i.e. is it trending up/down, are there random fluctuations or are the variations linked to changes in water levels. Also comparisons over time (e.g. pre-mine, mine life and post mine) could illustrate any affect of mine activities while monitoring of water quality in more distant bores might show effects of climate/recharge.

In order to address the potential for greater impacts on groundwater from Stage 3 and provide more meaningful interpretation of monitoring results it is envisaged that the amended EA will have additional conditions addressing relevant impacts and may take a different approach to setting background values for groundwater quality. A more appropriate method of assessing potential impact on groundwater from mining activities could be the setting of 'groundwater investigation trigger levels' for certain parameters that if exceeded would trigger an investigation into the potential for environmental harm as a result of the exceedance. These groundwater trigger levels would be based on monitoring results considered to be sufficient to assess natural variations in quality versus possible releases from mining activities.

To provide some interim assessment for Stage 3 the EIS should at least provide cross sections showing natural topography, future mine depths and tailings and water storages versus the various aquifers being monitored (now and in the future). Three-dimensional (3D) visualisation would assist but cross sections and plans would suffice.

In the interim it would seem reasonable to consider the application of some interim trigger values until sufficient data is available. This should be considered in light of the fact that Stage 3 will result in a much larger mine footprint and more potential sources of impact on groundwater. Therefore more on and off lease bores (up and down gradient of the potential source of contaminants) will need to be drilled and monitored over time. The addition of these monitoring bores should assist in gathering more data on the groundwater regime and the effect of variations in flow and climate on groundwater quality. It is expected that the draft EIS document for Stage 3 will address potential impacts on groundwater and include the

location of a number of additional on and off lease boreholes that will be monitoring for the relevant parameters.

With only eight data points collected for each borehole and quality characteristic, it is considered that an insufficient number of data points have been collected to date to allow the setting of scientifically valid background limits. A minimum of eighteen (18) data points should be collected before any valid limits/trigger levels can be set. The amended EA could include a quarterly monitoring frequency for parameters. Once sufficient data has been collected to allow finalisation of groundwater contaminant trigger levels, New Acland Coal could apply for the frequency of monitoring to be reduced.

It is suggested that a meeting be held to discuss these issues to determine a way forward for conducting and assessing future groundwater monitoring and determining appropriate background limits or trigger values for ambient groundwater quality.

If you have any queries regarding the above matters please contact Sarah Horton on 4699 4354.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Chris Hill', written in a cursive style.

Chris Hill  
**Regional Manager**  
**Western Region**  
**Environmental Services**



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## **APPENDIX E**

### **WSA RESPONSE TO NAC (2 LETTER REPORTS)**



26 November 2008

Mr Paul Statham  
New Acland Coal Pty Ltd  
PO Box 47  
Ipswich Qld 4305

Dear Mr Statham,

**WASTE SOLUTIONS AUSTRALIA RESPONSE TO COMMENTS FROM  
THE EPA**

1. The EPA made the comment that there was no discussion about whether or not there was a sufficient amount of data available to perform a statistical analysis. The baseline values report was produced by WSA for NAC in compliance with Condition C31 of the NAC Environmental Authority (EA). This condition states that the baseline value for the groundwater contaminant limits is to be determined by sampling for a period of three years from the reference bores listed in Schedule C-Table 5. This has been completed. The method chosen was deemed to be the most suitable considering the limited data available. It showed the symmetry of the data as well as any trends and highlighted the majority of the data while excluding outliers (anomalous readings). With the small size of the sample set available to use for each bore there is some variance in the data. This indicates that a larger sample set size would be better for the optimal accuracy of results. As the baseline values were an EA requirement after 3 years of sampling, more data was not available at the time of completing the report.
2. The baseline values report describes whether the two sets of monitoring bores are located in the basalt or the coal measures aquifers. These bores match Table 5 in Schedule C of the New Acland EA. The monitoring bores are located generally on the lease boundary so as to be able to quantify any impact of mining activity moving off-site. This is considered to be an appropriate monitoring strategy.
3. With regard to the EPA comments about the off-lease bores in Schedule C Table 6 Off Lease Groundwater Monitoring Locations and Frequency. WSA is offering to commence monitoring the bores for groundwater contamination if required by the EPA.

4. In response to the comments regarding the accuracy of determining the groundwater quality by sampling up gradient and down gradient of the mining activity, the 6 monthly sampling regime was agreed by the EPA. This is described in Schedule C-Table 7. Due to the fact that samples were taken every 6 months and the EA required a baseline value to be determined after 3 years of sampling, only 8-10 samples were available for each bore at the time of submitting the report. The monitoring bores are located both up gradient and down gradient of the mining activity.
5. The statistical accuracy of the report is inhibited by the EA requirement to produce a baseline values report after 3 years of the commencement of sampling the bores of compliance. The spatial location of the bores and the sampling schedule were agreed to by the EPA is included in the EA. This led to the conclusion that the EPA agreed to the validity of the data that would be produced and that there was a suitable amount of data available to produce a baseline values study. Otherwise this would have been mentioned in the EA and a more rigorous sampling schedule required. The existing sampling regime has been set up to sample at the end of both the wet and dry seasons to provide representative results based on the seasonal variation of the groundwater chemistry.
6. The baseline values produced by WSA based on analysis of the available sample data should be used as interim trigger values for the mine site until more data is generated.
7. There were 8-10 data points collected for each borehole in six-monthly intervals. This sampling frequency is regarded as adequate throughout the industry and was the amount agreed to by the EPA in this timeframe.
8. Why have 18 data points been suggested? It is known that the sample size is linked to the amount of variance (standard deviation) in the data set. The more variance, the greater the sample size required to ensure accuracy. The mathematical formula to deem sample size is:

$$S_{\bar{x}} = \frac{S_x}{\sqrt{N}}$$

Where  $S_x$  is the standard deviation,  $N$  is the sample size and  $S_{\bar{x}}$  is the critical value and is dependent on the confidence level that is desired. The higher the confidence level required, the larger the sample set needed. Has the EPA set a particular confidence level and margin of error for the baseline values? This is required before a sample set size can be determined. WSA performed a power analysis using the above equation, with the standard deviation from the samples taken so far. For a confidence level of 1% (very low confidence), the results of the power analysis indicate that over 1000 samples would be required to characterise the background levels of all desired analytes. To

achieve a 95% confidence level (statistical standard) using this method, a sample size in excess of 100,000 data sets, which is driven by the standard deviations that currently exceeds 3,000 for some of the test parameters (Fe, Mn and EC in particular).

## References

Park, H. M. (2008) Hypothesis Testing and Statistical Power of a Test, The Trustees of Indiana University,  
<http://www.indiana.edu/~statmath/stat/all/power/power.pdf>, Accessed 26/11/2008.

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Qld 4060 Australia



8 January 2009

Mr Paul Statham  
New Acland Coal Pty Ltd  
PO Box 47  
Ipswich Qld 4305

Dear Mr Statham,

**Re. Condition (C31) New Acland Coal Pty Ltd Environmental Authority  
MIM800317705**

Waste Solutions Australia Pty Ltd (WSA) has compiled the following summary note at the request of Paul Statham (New Acland Coal Pty Ltd). The content of this note summarises the reasoning behind two recommendations that were made following submission of a report addressing the requirements of condition (C31) entitled, '*Establishment of Groundwater Quality Background Limits*' to the Environmental Protection Agency (EPA). The recommendations were made following a meeting between Paul Statham, Paul Smith (WSA) and the Environmental Protection Agency (EPA) on Friday 19<sup>th</sup> December 2009.

The first recommendation states that no 'contaminant trigger levels' should be placed on iron (Fe) and aluminium (Al) due to physical processes driving considerable fluctuations in recorded concentrations. Levels of these parameters can become elevated in very turbid groundwater samples following field filtration as very fine clay particles carrying metal ions pass through the standard 0.45-micron filter into the sample, skewing the observed concentration. The variability of these parameters was considered too high to statistically generate reliable 'background limits'. In the absence of specific 'background limits' for Fe and Al, it is recommended that these parameters continue to be analysed for in the routine monitoring, so that compliance with Schedule C is maintained.



The second recommendation states that if concentrations decrease below the 'lower' background value, the quality of water would be considered to be improving and therefore would not constitute non-compliance. The reasoning behind this stems from the method of statistical analysis chosen. The use of boxplots highlights the spread and symmetry of data sets that yields both a 'lower' and 'higher' background value (minimum and maximum 10<sup>th</sup> percentile). With the exception of pH, only increases in concentrations above the 'higher' value should constitute an environmental non-compliance. However, it is recommended that although the lower limits will not be 'actioned' the concentrations observed from the routine monitoring will still be compared to these values so that progressive trends within the data sets can be identified.

If you have any questions about the above recommendation, please contact WSA.

**Yours Sincerely,**



.....

**Christopher Gill**

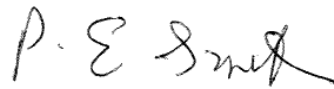
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