



**NARRABRI MINE
ENVIRONMENTAL
MANAGEMENT SYSTEM**

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WHC_PLN_NAR_EXTRACTION PLAN LW107 to LW110

Extraction Plan LW107 to LW110

Name of Operation	Narrabri Mine
Name of Applicant Company	Narrabri Coal Operations Pty Ltd
Development consent / Project Approval #	Project Approval 08_0144
Mining lease #	ML 1609
Title	Narrabri Mine Extraction Plan LW107 to LW110
Date	3 March 2017
Reference #	NM EP LW107-LW110
Name of Authorised Representative	Owen Salisbury
Title of Authorised Reporting Officer	Technical Services Manager – Narrabri Mine
Signature	
Date	3/3/17
Name of Mine Manager	Gerald Linde
Signature	
Date	3/3/17



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ABBREVIATIONS

ACHMP	Aboriginal and Cultural Heritage Management Plan
AQMP	Air Quality Management Plan
AR	Annual Review
BFMP	Built Features Management Plan
CHPP	Coal Handling and Preparation Plant
DGS	Ditton Geotechnical Services
DoE	Commonwealth Department of the Environment
DP&E	Department of Planning and Environment
DPI	Department of Primary Industries
DPI Water	Department of Primary Industries – Water
DRE	Division of Resources & Energy
EA	Environmental Assessment
EMP	Environmental Management Plan
EMS	Environmental Management Strategy
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
EPL	Environmental Protection Licence
ESAP	Energy Savings Action Plan
km	kilometres
LandMP	Land Management Plan
LMP	Landscape Management Plan
LW	Longwall (e.g. LW104)
m	metres
MCP	Mine Closure Plan
MG	maingate (i.e. MG1 = maingate 1)



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ML	Mining Lease
mm	millimetres
MOP	Mining Operations Plan
Mtpa	Million tonnes per annum
NCOPL	Narrabri Coal Operations Pty Ltd
NM	Narrabri Mine
NMP	Noise Management Plan
NSC	Narrabri Shire Council
OEH	Office of Environment and Heritage
PA	Project Approval
PED	Personnel Emergency Device (communications system)
RMP	Rehabilitation Management Plan
RMS	Roads and Maritime Services
RRP	Resource Recovery Plan
SMP	Subsidence Monitoring Program
TG	tailgate (i.e. TG1 = tailgate 1)
WCL	Whitehaven Coal Limited
WMP	Water Management Plan



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GLOSSARY

Angle of Draw	The angle between the vertical and the line joining the edge of the mining void with the limit of vertical subsidence, usually taken as 20mm.
Cover depth	The depth of coal seam from the ground surface (metres).
Environmental consequences	The environmental consequences of subsidence impacts including: damage to built features; loss of surface flows to the subsurface; loss of standing pools; adverse water quality impacts; development of iron bacterial mats; cliff falls; rock falls; damage to Aboriginal heritage sites; impacts to aquatic ecology; ponding.
Far-field subsidence	Mining-induced movements of the ground surface in areas where vertical subsidence is less than 20mm.
First workings	Development headings created by a continuous mining machine - designed to remain stable during development and longwall extraction. Provide ventilation and services, access for staff and materials, and allow for transportation of raw coal out of the mine (i.e. also referred to as mains headings, gate roads, maingate, tailgate).
Goaf	The mined-out area into which the immediate roof strata breaks.
Project Approval	Development consent (DA_08_0144) issued on 26th July 2010 under Section 75J of the Environmental Planning and Assessment Act 1979 by the Department of Planning & Infrastructure (and as modified).
Second Workings	Extraction of coal from longwall panels, mini-wall panels, or pillar extraction.
Subsidence	The totality of subsidence effects, subsidence impacts and environmental consequences of subsidence impacts.
Subsidence effects	Deformation of the ground mass due to mining, including all mining-induced ground movements, including both vertical and horizontal displacement, tilt, strain and curvature.
Subsidence impacts	Physical changes to the ground and its surface caused by subsidence effects, including tensile and shear cracking of the rock mass, localised buckling of strata caused by valley closure and upsidence and surface depressions or troughs.
Upsidence	Relative vertical upward movements of the ground surface associated with subsidence.
Vertical subsidence	Vertical downward movements of the ground surface caused by underground coal mining.



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1 **INTRODUCTION**

1.1 **Background**

The Narrabri Mine is located approximately 28km southeast of Narrabri and approximately 70km northwest of Gunnedah in New South Wales (NSW) (refer to Figure 1). The project includes an underground longwall coal mine, a Coal Handling and Preparation Plant (CHPP) and associated rail siding and surface infrastructure.

The Narrabri Mine is operated by Narrabri Coal Operations Pty Limited (NCOPL), a wholly-owned subsidiary of Whitehaven Coal Limited (WCL). The Narrabri Mine has been designed as an underground mine using retreating longwall methods, consisting of 20 longwall panels, recovering up to 4.3 metres (m) of coal from the lower part of the Hoskissons Coal Seam. The total underground mine has an approximate footprint of 3,630 hectares (ha) and is covered by Mining Lease (ML) 1609.

The Narrabri Mine was granted project approval for Stage 1, by the NSW Minister for Planning in November 2007 under Part 3A of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act). This included the development of a continuous-miner underground operation, a crushing and sizing plant and loading of product coal into train wagons for transportation to the Port of Newcastle.

Construction works of the surface facilities commenced under the Stage 1 approval at the site in January 2008. Development of the underground mine commenced in 2010.

In late 2008, NCOPL applied under the EP&A Act to increase production at the Narrabri Mine through the introduction of longwall mining ("Stage 2"). The Stage 2 Project Application included the commencement of longwall mining operation ("secondary extraction"), and the installation of additional CHPP infrastructure to increase the annual production rate from 2.5 million tonnes per annum (Mtpa) to 11 Mtpa, in accordance with PA 08_0144 Modification 5, approved during December 2015. Modification 5 also allowed for mining wider longwall panels beyond LW106.

Stage 2 was approved by the Minister in July 2010, and the consolidated Project Approval (PA) 08_0144, as modified, includes a series of consent conditions regarding the management of subsidence impacts and environmental consequences of longwall mining. This includes the preparation and approval of a suite of management plans, i.e. the Extraction Plan, prior to the commencement of longwall mining (also referred to hereafter as second workings or secondary extraction).

1.2 **Scope**

Prior to undertaking longwall operations proposed as part of Stage 2 works, the Narrabri Mine Project Approval, (Schedule 3, Condition 4), requires that inter alia:

"The proponent shall prepare and implement Extraction Plans for any second workings to be mined to the satisfaction of the Secretary."

Therefore, this Extraction Plan sets out the proposed monitoring, management, and reporting activities developed to address the predicted subsidence impacts from the secondary extraction of Longwalls (LW) 107 to 110 in the Hoskissons Seam at the Narrabri



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Mine and has been prepared in accordance with Schedule 3, Condition 4 of PA 08_0144. Where required, aspects of the previous Extraction Plan, covering LW101 to LW106, have been included in this plan, e.g. subsidence monitoring.

1.3 **Objective**

The objective of this Extraction Plan is to provide for the adequate protection of important natural and built features from direct and indirect subsidence impacts associated with LW107 to LW110.

This objective will be achieved by:

- Implementing the proposed monitoring and management measures to reduce the identified subsidence risks; and
- Implementing a review and auditing process to provide possible feedback on the proposed monitoring and management measures and to allow for continual improvement.

1.4 **Risk Assessment**

A subsidence risk assessment has been undertaken to identify the risks associated with subsidence at the Narrabri Mine. The initial risk assessment was undertaken during February 2012 for LW101 to LW105, was revised for LW106 and has subsequently been updated for to LW107 to LW110, refer to Appendix K.

The updated risk assessment for LW107 to LW110 extraction has not identified any high risk items. As a result, risks associated with subsidence above LW107 to LW110 for the Narrabri Mine have been assessed as low to moderate.



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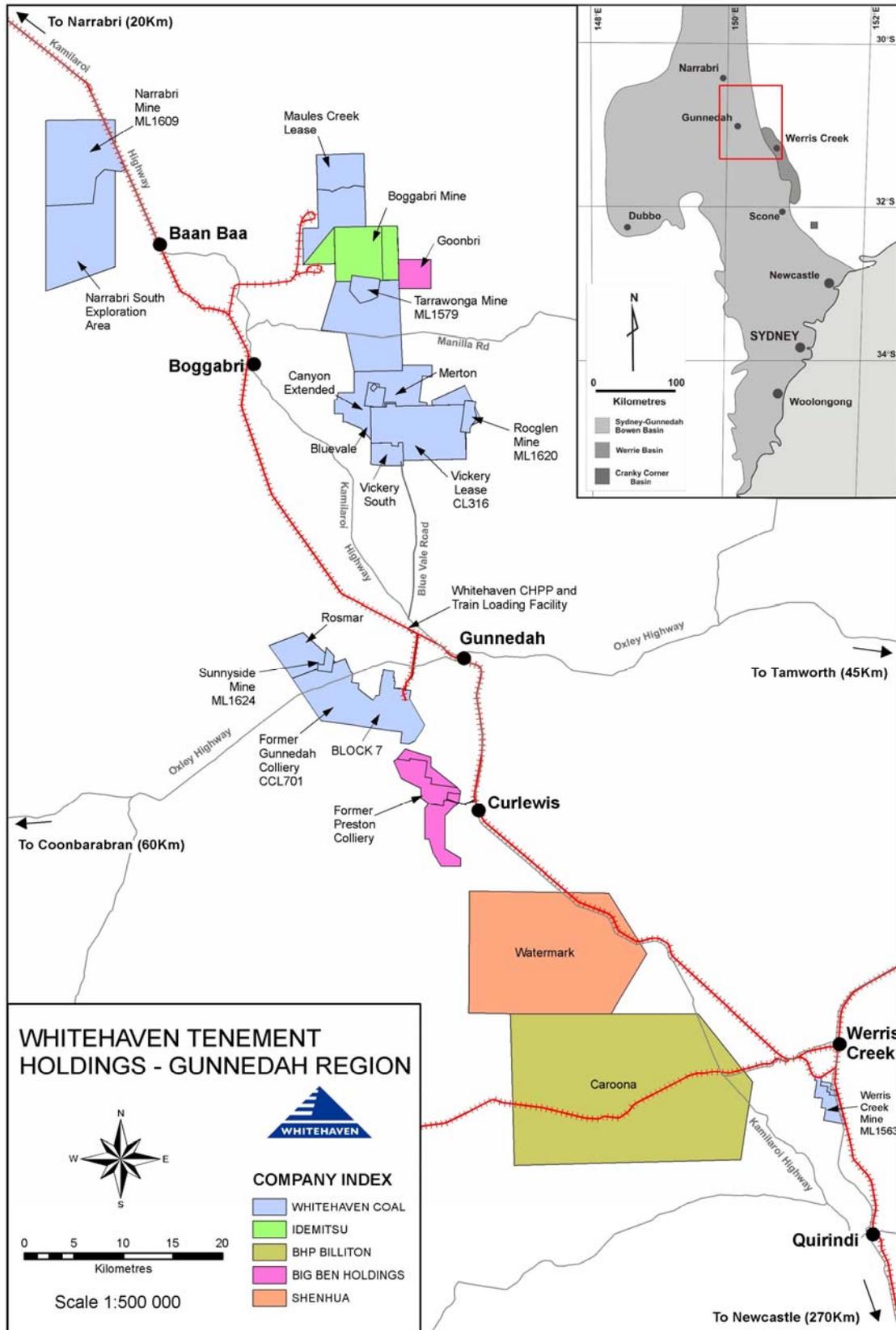


Figure 1: Narrabri Mine Locality Plan



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1.5 Site Description

Longwall panels at the Narrabri Mine are oriented in a north-south layout and radiate out from the mains headings “West Mains” or “100 panel” (refer to Plan 1). Longwall panels vary in length, but are 408.9m wide (void width), with depth of cover ranging from approximately 230m to 350m. The longwall will recover the lower 4.3m of the Hoskissons Seam, which ranges from around 5m to 9.8m total thickness. A detailed description of the mine plan, anticipated extraction schedule, along with local geology, overburden description and resource recovery is provided in the Coal Resource Recovery Plan (Appendix A).

The footprint of Longwalls LW107 to LW110 covers approximately 900 ha on land owned by NCOPL. Small portions of these landholdings have been historically used for cereal cropping and livestock grazing with the majority heavily vegetated. The surface terrain is generally undulating with slopes between 2° and 5°, with localised increases in the vicinity of the ephemeral tributaries to Pine Creek of up to 15°, which drains the Extraction Plan area to the north east, and a few ridges with steep slopes between 15° and 25° above longwalls LW110.

In summary, existing natural and built surface features across the surface area of LW107 to LW110 include:

- Pine Creek including tributaries, and remnant riparian vegetation corridors;
- Low quality sub-surface groundwater aquifers at depths ranging from 5m to 50m;
- Aboriginal heritage sites;
- Agricultural land holdings (grazing, limited cropping);
- Unsealed access roads and property fences;
- Earth embankment water storage dams;
- Soil conservation works (contour banks);
- Two vacated rural-residential buildings and associated infrastructure (owned by NCOPL); and
- PED Cable, surface to in-seam gas drainage bores, and other associated mining infrastructure.

Potentially affected surface features are shown in Plan 2. A full description of the pre-mining environment is contained in the Environmental Assessment (EA) for the Narrabri Coal Mine, Stage 2 Longwall Project (RW Corkery & Co. Pty Ltd, 2009) and the Environmental Assessment for the Narrabri Mine increased longwall width and production rates (Resource Strategies, 2015).

1.6 Plans 1-8

Information contained in this report is supported / presented in a series of detailed drawings as required by the Department of Planning and Environment (DP&E) ‘*Guidelines for the Preparation of Extraction Plans*’ in A0 size. Reduced-size (A3) versions are attached as Attachment 1 to this Extraction Plan. The plans include the following information:



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- Plan 1: Existing, proposed and future workings, including dimensions of all voids and pillars;
- Plan 2: All natural and man-made surface features that may be affected by the proposed mining operations and surface contours;
- Plan 3: Overburden thickness, seam thickness, and any known geological structures;
- Plan 4: Existing and/or planned future workings in seams above and/or below the proposed workings;
- Plan 5: Details of mining titles and land ownership;
- Plan 6: Representative geological sections and/or borehole illustrations of the overburden strata;
- Plan 7: Details the subsidence monitoring network, authorised by the registered mine surveyor; and
- Plan 8: Existing, proposed and future workings with an aerial background.

These plans are referenced in the sub-plans to this Extraction Plan.

1.7 **Project Team**

The project team responsible for the preparation of this Extraction Plan and supporting documents is listed in Table 1. In accordance with Schedule 3, Condition 4(a), the project team was endorsed by a delegate of the Secretary for DP&E on 15 September 2016.

Table 1: Project Team

Name	Company	Technical Area / Document
Steve Farrar Tony Dwyer	Whitehaven Coal Limited	Non-expert / administrative changes within the Extraction Plan, Coal Resource Recovery Plan, Subsidence Monitoring Program, Built Features Management Plan and Public Safety Management Plan
Amanda Kerr Luke Kirkwood	AECOM	Water Management Plan Heritage Management Plan
Steve Ditton	DGS	Subsidence Predictions
Paul Frasier Nathalie van der Veer	Eco Logical Australia	Biodiversity and Land Management Plans Revisions to the Landscape Management Plan including the Rehabilitation Management Plan
Andrew Hutton	SLR Consulting	Revisions to the Landscape Management Plan – Mine Closure Plan

1.8 **Document Structure**

This Extraction Plan forms part of Narrabri Mine’s Environmental Management Strategy (EMS), which includes a suite of environmental management plans. This Extraction Plan provides a brief overview of the proposed mine plan, associated subsidence and resulting environmental consequences. This Extraction Plan also briefly outlines the proposed



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monitoring and management measures, which are provided in greater details in the Appendices. In summary, this document includes the following information:

- Section 2 – Summarises the relevant statutory requirements for the preparation of this document and the management of subsidence impacts, providing cross-referencing to the appropriate section or appendices where each requirement is addressed;
- Section 3 – Summarises the results of recent subsidence modelling and outlines the predicted environmental consequences;
- Section 4 – Outlines the performance measures, management and monitoring activities that are proposed to mitigate predicted subsidence impacts and confirm that subsidence and its consequences are within predicted ranges. The section also sets out the proposed contingency response in the event that subsidence impacts exceed (or are considered likely to exceed) the adopted performance indicator; and
- Section 5 – Details the responsibilities of NCOPL personnel under this Extraction Plan and sets out the reporting, auditing and review requirements.

The Extraction Plan includes this main document and a number of sub-plans which form appendices to the Extraction Plan. These are included at the end of this document and described in Table 2.

Table 2: Extraction Plan Structure

Plan/ Report Name (author)	Location	Description
Coal Resource Recovery Plan (WCL)	Appendix A	Provides an analysis of the expected coal recovery from the mining operations associated with LW107 – LW110.
Subsidence Predictions (DGS)	Appendix B	Revised subsidence predictions for LW107 – LW110.
Subsidence Monitoring Program (WCL, based off of the DGS report)	Appendix C	Provides a subsidence monitoring program to validate the predicted subsidence impacts, and analyse the relationship between subsidence effects and impacts.
Built Features Management Plan (WCL)	Appendix D	Provides analysis and management of potential subsidence consequences on the built features of the mining area.
Public Safety Management Plan (initial by AECOM, revised by WCL)	Appendix E	Provides for the management of public safety to ensure the safety of the public in the mining area.
Landscape Management Plan (Eco Logical Australia and SLR Consulting)	Appendix F	Revision of the Landscape Management Plan (including the Rehabilitation Management Plan and Mine Closure Plan) in response to the revised subsidence predictions.
Water Management Plan (AECOM)	Appendix G	Provides for the management of surface and groundwater issues within the mining area including watercourse consequences and water management features.



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Plan/ Report Name (author)	Location	Description
Biodiversity Management Plan (Eco Logical Australia)	Appendix H	Analysis of the potential impacts to, and the required management of, the aquatic and terrestrial flora and fauna.
Land Management Plan (Eco Logical Australia)	Appendix I	Provides analysis and management of impacts to the landscape (ground movement, stability, cracking etc) on the landscape.
Heritage Management Plan (AECOM)	Appendix J	Provides for the management of the potential environmental consequences of mining and subsidence on the heritage sites and values.
Risk Assessment	Appendix K	Assesses risks associated with the extraction of LW107 to LW110.



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2 STATUTORY REQUIREMENTS

2.1.1 Project Approval

This document has been prepared in accordance with Schedule 3 of Project Approval (PA) 08_0144. In addition, Schedule 6, Condition 2 of PA 08_0144 is relevant to the preparation of management plans under the approval. This Extraction Plan has also been prepared in accordance with the Department of Planning and Environment (DP&E) 'Guidelines for the Preparation of Extraction Plans'.

The PA requirements and relevant reference for this information within the Extraction Plan is provided in Table 3.

Table 3: Management Plan Requirements

Project Approval Condition	EP Reference
<p>Schedule 3, Condition 4</p> <p>4. The Proponent shall prepare and implement Extraction Plans for any second workings to be mined to the satisfaction of the Secretary. Each Extraction Plan must:</p>	Section 1.7
<p>(a) be prepared by a team of suitably qualified and experienced persons whose appointment has been endorsed by the Secretary;</p>	
<p>(b) be approved by the Secretary before the Proponent carries out any of the second workings covered by the plan;</p>	<i>No second workings will be commenced in LW107 until approval of this Extraction Plan is granted.</i>
<p>(c) include detailed plans of the proposed first and second workings and any associated surface development;</p>	Appendix A – Coal Resource Recovery Plan
<p>(d) include detailed performance indicators for each of the performance measures in Tables 1 and 2;</p>	Appendix G – Water Management Plan, Appendix G – Biodiversity Management Plan, Appendix D – Built Features Management Plan, and Appendix E – Public Safety Management Plan
<p>(e) provide revised predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed second workings, incorporating any relevant information obtained since this approval;</p>	Appendix B – Subsidence Predictions
<p>(f) describe the measures that would be implemented to ensure compliance with the performance measures in Tables 1 and 2, and manage or remediate any impacts and/or environmental consequences;</p>	Appendices C to J
<p>(g) include the following to the satisfaction of DRE:</p> <ul style="list-style-type: none"> ▪ a Coal Resource Recovery Plan that demonstrates effective recovery of the available resource; 	Appendix A



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Project Approval Condition	EP Reference
<ul style="list-style-type: none"> ▪ a Subsidence Monitoring Program to: <ul style="list-style-type: none"> ○ provide data to assist with the management of the risks associated with subsidence; ○ validate the subsidence predictions; and ○ analyse the relationship between the subsidence effects and impacts under the plan and any ensuing environmental consequences; 	Appendix C
<ul style="list-style-type: none"> ▪ a Built Features Management Plan to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings, and which: <ul style="list-style-type: none"> ○ addresses in appropriate detail all items of public infrastructure and all classes of other built features; and ○ has been prepared following appropriate consultation with the owner/s of potentially affected feature/s; 	Appendix D
<ul style="list-style-type: none"> ▪ a Public Safety Management Plan to ensure public safety in the mining area; and 	Appendix E
<ul style="list-style-type: none"> ▪ appropriate revisions to the Landscape Management Plan required under condition 3 of Schedule 5; and 	Appendix F
(h) include a: <ul style="list-style-type: none"> ▪ Water Management Plan, which has been prepared in consultation with EPA and DPI Water, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on surface water resources, groundwater resources and flooding, and which includes: <ul style="list-style-type: none"> ○ surface and groundwater impact assessment criteria, including trigger levels for investigating any potentially adverse impacts on water resources or water quality; ○ a program to monitor and report groundwater inflows to underground workings; and ○ a program to manage and monitor impacts on groundwater bores on privately-owned land; 	Appendix G
<ul style="list-style-type: none"> ▪ Biodiversity Management Plan, which has been prepared in consultation with OEH and DRE, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on flora and fauna; 	Appendix H
<ul style="list-style-type: none"> ▪ Land Management Plan, which has been prepared in consultation with any affected public authorities, to manage the potential impacts and/or environmental consequences of the proposed second workings on land in general; 	Appendix I
<ul style="list-style-type: none"> ▪ Heritage Management Plan, which has been prepared in consultation with OEH and relevant stakeholders for Aboriginal heritage, to manage the potential environmental consequences of the proposed second workings on heritage sites or values; and 	Appendix J
(i) include a program to collect sufficient baseline data for future Extraction Plans.	Appendix C (provides summary of all subsidence and relevant environmental monitoring)
Schedule 3, Condition 5 5. The Proponent shall ensure that the management plans required under condition 4(h) above include:	Potential environmental



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Project Approval Condition	EP Reference
<p>(a) an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval;</p> <p>(b) a detailed description of the measures that would be implemented to remediate predicted impacts; and</p> <p>(c) a contingency plan that expressly provides for adaptive management.</p>	<p>consequences were considered in detail in the recently approved EA Modification 5.</p> <p>Proposed measures and contingency plan are contained within each management plan, and the mines EMS.</p>
<p>Schedule 6, Condition 2</p> <p>2. The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:</p> <p>(a) detailed baseline data;</p> <p>(b) a description of:</p> <ul style="list-style-type: none"> ▪ the relevant statutory requirements (including any relevant approval, licence or lease conditions); ▪ any relevant limits or performance measures/criteria; ▪ the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures; <p>(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;</p> <p>(d) a program to monitor and report on the:</p> <ul style="list-style-type: none"> ▪ impacts and environmental performance of the project; ▪ effectiveness of any management measures (see c above); <p>(e) a contingency plan to manage any unpredicted impacts and their consequences;</p> <p>(f) a program to investigate and implement ways to improve the environmental performance of the project over time;</p> <p>(g) a protocol for managing and reporting any:</p> <ul style="list-style-type: none"> ▪ incidents; ▪ complaints; ▪ non-compliances with statutory requirements; and ▪ exceedances of the impact assessment criteria and/or performance criteria; and <p>(h) a protocol for periodic review of the plan.</p>	<p>See Appendices C to J</p> <p>See also: Section 4.2</p> <p>See also: Section 4.1</p> <p>See also: Section 4.3</p> <p>See also: Section 5.2</p> <p>See also: Section 5.3</p>

2.1.2 Mining Lease

Narrabri Mine’s Mining Lease (ML) 1609 has been amended to include a reference to Extraction Plans, removing the requirements for a Subsidence Management Plan. The Mining Lease includes a number of requirements of relevance to the management of subsidence. These are summarised in Table 4, along with a brief summary of where they are addressed in this Extraction Plan and associated sub-plans.



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Table 4: Applicable Mining Lease Conditions

No.	Mining Lease Conditions (summary only)	Comment
2	Environmental Harm The proponent shall implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation or rehabilitation of the development.	All Extraction Plan documents
4	Environmental Management Reporting	Section 5.2
8	Extraction Plan Condition Preparation of an Extraction Plan	All Extraction Plan documents
16	Safety The lease holder shall ensure the safety of persons and stock in the vicinity of the operations.	Appendix E - Public Safety Management Plan has been prepared and aims to ensure that the safety of persons and stock is not compromised as a result of subsidence impacts.
18	Prevention of Soil Erosion and Pollution Operation must be carried out in manner that does not aggravate air pollution, water pollution, or soil contamination unless otherwise authorised by a relevant approval and in accordance with an accepted MOP.	Appendix G - Water Management Plan and Appendix I - Land Management Plan
19	Transmission Lines, Communications Lines and Pipelines Operations must not interfere with these or any other utility without the prior written approval of the Secretary	Appendix D - Built Features Management Plan
20	Fences and Gates Activities on the lease must not interfere or damage fences without the prior written approval of the owner or the Minister	Appendix D - Built Features Management Plan
21	Roads and Tracks Operations must not affect any road unless in accordance with an accepted MOP or the prior written approval of the Secretary. The lease holder is liable for any costs incurred by the appropriate road authority for fixing any damage to roads caused by operations	Appendix D - Built Features Management Plan
25	Resource Recovery Economic and efficient recovery of available resources by the lease holder	Appendix A - Coal Resource Recovery Plan
28	Trigonometrical Stations and Survey Marks	Appendix D - Built Features Management Plan

2.1.3 EPBC Approval

The Narrabri Mine is subject to an approval issued under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The conditions of this approval include the development / implementation of an Extraction Plan (of which this Extraction Plan forms part) according to NSW Secretary's Assessment Report and approval conditions (26 July



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2010). A copy of the Extraction Plan must be submitted to Department of the Environment (DoE).

2.1.4 Work Health and Safety Legislation

This Extraction Plan has been developed to comply with the Work Health and Safety legislation including but not limited to:

- *Work Health and Safety Act 2011;*
- *Work Health and Safety Regulation 2011;*
- *Work Health and Safety (Mines and Petroleum Sites) Act 2013; and*
- *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014.*

Components of this Extraction Plan will be submitted to DRE as part of the High Risk Notification, required by the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*, for LW107 to LW110.



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3 **SUBSIDENCE ASSESSMENT**

3.1 **Review of Subsidence Predictions**

3.1.1 **Overview**

Project Approval (PA) for Stage 2 was granted by the Department of Planning and Environment in 2010 for extraction of coal using longwall methods at the Narrabri Mine. The proposed mine plan is consistent with that presented and assessed as part of the Environmental Assessment (EA) for Modification 5 with some minor amendments, including:

- Shortening of LW109; and
- Increased chain pillar widths from between 35-45m.

In accordance with Schedule 3, Condition 4(e) of PA 08_0144, revised subsidence modelling and predictions have been prepared by Ditton Geotechnical Services (DGS, 2017). The subsidence modelling and predictions included with the EA for Modification 5 (DGS, 2015) have been updated. The DGS (2017) report is produced in full as Appendix B, with the conclusion reproduced below.

The subsidence prediction model has been adjusted to match measured values above LW101 to LW105. The predicted values for the proposed longwalls are as follows:

- Single maximum panel S_{max}/T of 0.6;
- Final maximum panel S_{max}/T of 0.64.
- Supercritical width appears to occur at 1.2H instead of 1.4H, based on measured tilts and strains to-date.

It is considered that the development of subsidence impacts will be not be affected by the spanning potential of the Garrawilla Volcanics, Basalt Sill or Digby Conglomerate units. Subsidence predictions have therefore only considered 'Low' SRP for the worst-case scenario.

Revised subsidence profiles and contours have been derived for LW107 to LW110. The key outcomes of the results of the study are presented below for the four panels:

- (i) First and Final maximum panel subsidence is likely to range between 2.53 m and 2.75 m (64% of the mining height).
- (ii) Maximum chain pillar subsidence is estimated to range between 0.28 m and 0.69 m above pillar width pairs ranging from 30 m to 34 m. The final vertical stress acting on the pillars are estimated to range from 18.3 to 26.2 MPa under double abutment loading conditions. Pillar FoS values range from 1.36 to 1.09 for a 3.7 m pillar height.
- (iii) Yielding of the chain pillars is not expected for the proposed mining layout (i.e. the predicted FoS values are > 1). However, strain-hardening of the pillars due to core



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confinement and goaf materials within the panels themselves will limit and result in eventual cessation of subsidence if overloading conditions were to occur.

- (v) Maximum panel tilts are estimated to range from 18 to 29 mm/m for ‘smooth’ profile subsidence, with occasional tilts from 27 mm/m to 44 mm/m due to discontinuous strata behaviour (i.e. localised block rotations). (vi) The maximum tensile and compressive strains are expected to range from 3 mm/m to 6 mm/m for ‘smooth’ profile subsidence, with occasional strains ranging from 8 mm/m to 16 mm/m due to discontinuous strata behaviour (i.e. cracking). Additional strain of up to 24 mm/m may occur above the starting ends (and within square position) due to first goafing effects.

The potential maximum subsidence predictions based on no spanning of the Garrawilla Volcanics and the upper (95th percentile) confidence limits are contained in Table 5. Resulting subsidence contours are plotted in Plan 2.

Table 5: Revised Maximum Subsidence Predictions (DGS, 2017)

Longwall Panel	Final Maximum Subsidence (S_{max})	Maximum Tilt	Maximum Strain - Tensile	Maximum Strain - Compressive
Units	m	mm/m	mm/m	mm/m
LW107	2.75	44	13	16
LW108	2.75	38	10	13
LW109	2.75	33	9	11
LW110	2.75	30	8	10

3.1.2 Surface Cracking

Based on a review of the observed surface cracking for LW101 to LW105, surface cracks have typically ranged from 50 mm to 100 mm wide, with some cracking up to 200 mm. The measured cracks have therefore been within the predicted crack width ranges of between 40 mm and 220 mm in the approved Extraction Plan for LW101 to LW106. The revised cracking width range of 30 mm to 260 mm for LW107 to LW110 is therefore likely to be conservative and crack widths are expected to decrease with cover depth increases over LW107 to LW110 (DGS, 2017).

DGS (2017), Appendix B, outlines that based on reference to ACARP, 2003, the cracks will probably have developed by the time the longwall face has retreated past a given location for a distance equal to 1 to 2 times the cover depth. Cracks will usually develop within several days after a mine has retreated beneath a given location, with some of the cracks closing in the compression zone in the middle of the fully developed subsidence trough, together with new cracks developing in the tensile zones along and inside the panel sides several weeks later.

The cracks in the tensile strain zones will probably be tapered and extend to depths ranging from 5 to 15 m, and possibly deeper in near surface rock exposures. Cracks within compressive strain zones are generally low-angle shear cracks caused by failure and shoving of near surface strata. Some tensile type cracks can also be present due to buckling and uplift of near surface rock, if it exists (DGS, 2017).



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The cracks usually develop in groups of two or three over a tensile zone of 20 m in width. Once the cracks develop, the strain is usually relieved in the adjacent ground, however, the topography and near surface geology also can influence the extent of cracking (DGS, 2017).

3.1.3 Sub-Surface Cracking

Conservative estimates by DGS (refer to Appendix B) indicate that continuous sub-surface cracking between the goaf and the surface is 'unlikely' at the cover depths that will exist during extraction of LW107 – LW110 (DGS, 2017). However discontinuous sub-surface fracturing could potentially interact with surface cracks at cover depths less than 335m.

3.1.4 Slope Instability

Based on the surface topography and geology above LW107 – LW110, the risk of landslip occurring as a result of subsidence is considered 'very unlikely' (DGS, 2017).

3.1.5 Valley Closure and Uplift

As the valleys across the mining lease are very broad between crests, and there is a lack of thick massive beds of conglomerate or sandstone units along the creeks / valleys, the development of 'upsidence' and closure along the creek beds above LW107 to LW110 is considered unlikely to exceed 150mm.

3.1.6 Far-Field Subsidence

There is a potential for far-field displacements to occur outside the longwall extraction area but would not generate significant strains or movements outside a distance equal to one cover depth from the extraction area (DGS, 2017).

3.2 Potential Environmental Consequences

As the predicted maximum subsidence (as reviewed by DGS) is consistent with the EA and Project Approval, environmental consequences are expected to be consistent with those presented in the EA. Therefore, a detailed review of environmental consequences has not been conducted for this Extraction Plan.

A summary of potential environmental consequences, the proposed performance measure and applicable management plan under this document is provided in Section 4.2.



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4 **SUBSIDENCE MONITORING AND MANAGEMENT**

4.1 **Subsidence Monitoring**

Proposed survey monitoring across the Extraction Plan area is documented in the Subsidence Monitoring Program (**Appendix C**). The purpose of the Subsidence Monitoring Program is to quantify subsidence parameters, i.e. vertical movements, ground tilts and strains. The Subsidence Monitoring Program also summarises the monitoring of environmental and built features (as documented in other sub-plans). The Subsidence Monitoring Program for LW101 to LW106 will continue until movement has ceased at which point NCOPL will seek the approval of DRE and DP&E to remove subsidence-monitoring lines.

4.2 **Subsidence Management**

The Project Approval defines several subsidence impact performance measures for the management of natural and built features. It also notes that other performance measures and performance indicators may require further definition under the relevant management plans.

These performance measures require that NCOPL ensure the following:

- Great Artesian Basin: Any loss of water flow into the Great Artesian Basin aquifers will be managed, licensed, or offset.
- Flora and Fauna: Clearing and disturbance of vegetation above the mining area is minimised.
- Built Features: any infrastructure affected by subsidence will be maintained as always safe. Where possible, serviceability will be maintained and any loss of serviceability will be compensated. Damage will be fully repaired, or else replaced or fully compensated.
- Public Safety: No additional public safety risk will be posed as a result of subsidence.

Surface and sub-surface features within the study area are listed in Table 6, along with a brief description of predicted environmental consequences and proposed performance measures. Management actions have been developed that aim to ensure these performance measures are met, and the proposed monitoring is intended to monitor subsidence impacts and confirm that they are within predicted limits. These management and monitoring actions are detailed within the relevant management plans (refer to Table 6).



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Table 6: Summary of Environmental Consequences and Performance Measures

Feature	Environmental Consequence(s)	Performance Measure / Indicator	Management Plan
Natural Features			
Pine Creek and tributaries	Change in hydrology or water quality.	Monitoring parameters are in accordance with relevant parameters within ANZECC guidelines.	Water Management Plan
Groundwater resources	Change in level or quality.	Monitoring parameters are in accordance with relevant parameters within ANZECC guidelines.	Water Management Plan
Land prone to flooding or inundation	Changes to flooding regime.	Watercourse survey. Maintain existing flow regimes.	Water Management Plan
Threatened or protected species	Impacts on woodland and riparian vegetation may reduce the habitat resources available to threatened or protected species.	Assess the health and cover of threatened populations or species.	Biodiversity Management Plan
Natural vegetation	Changes to vegetation communities' health, cover, species dominance and weed infestation in disturbance areas.	Assess the health and cover of threatened populations or species.	Biodiversity Management Plan
Farm Land and Facilities			
Agricultural utilisation or agricultural suitability of farm land	Change in agricultural suitability or capability from current level.	Maintain agricultural capability of farm land above LW106-LW110 after active subsidence.	Land Management Plan
Farm buildings or sheds	Structural or cosmetic damage to buildings.	Vacate, repair or demolish.	Built Features Management Plan
Fences	Damage or breaks in fence lines.	Functionality of fencing after active subsidence.	Built Features Management Plan
Farm dams	Changes to catchments or loss of water through surface or dam wall	Maintain capacity of existing dams. Examine for impacts to	Built Features Management Plan



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Feature	Environmental Consequence(s)	Performance Measure / Indicator	Management Plan
	cracking.	dam walls or water loss through cracking.	
Soil conservation works	Changed flow regimes impacts effectiveness of contour banks.	Examine for deformation.	Built Features Management Plan
Wells or bores	Increased or decreased water availability (aquifer interference).	Monitor water levels in bores.	Water Management Plan
Access tracks	Deformation of access track surface.	Survey access tracks for deformation.	Built Features Management Plan
Industrial, commercial and business establishments			
Mine infrastructure	Structural or cosmetic damage to mine infrastructure.		Built Features Management Plan
Other significant features			
Areas of archaeological and/or heritage significance	Movement of artefacts from existing location or damage to artefacts.	Visual observation of known and marked artefact areas	Heritage Management Plan
State Survey Mark	Loss of function	Update details once subsidence is complete	Built Features Management Plan



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4.3 Contingency Response and Adaptive Management

In the event of subsidence impacts that exceed the performance measures limits identified in the relevant management plan, the following process will be implemented:

- Report the observation/event to the Technical Services Superintendent or Environment Superintendent as soon as practicable, ideally within 24 hours;
- Assess public safety and where applicable, implement safety measures in accordance with the Public Safety Management Plan or as otherwise necessary to prevent injury or harm to any person;
- Report any event to the relevant stakeholders (as identified in each sub-plan to this Extraction Plan) as soon as practicable after NCOPL becomes aware of the event;
- Investigate, in consultation with affected stakeholders (where appropriate) to evaluate the contributing factors to the event. The investigation may include (where applicable):
 - Re-survey of the relevant subsidence monitoring lines;
 - Re-sampling or re-surveying of the applicable environmental monitoring locations (i.e. groundwater bores, surface water monitoring sites);
 - Review measured subsidence parameters against the observed impact, and latest subsidence predictions;
 - Determine appropriate remedial response; and
- Implement remedial response and adaptive management measures, dependent on the outcomes of the above investigation. Any such measures will be undertaken in consultation with the relevant stakeholder to the satisfaction of the appropriate government agency and DP&E.



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5 PLAN IMPLEMENTATION

5.1 Responsibilities

The General Manager has overall responsibility for ensuring contractors, employees and service providers comply with all laws, regulations, licences, approvals and conditions of the project approval. Table 7 outlines the responsibilities of personnel at Narrabri Mine under this Extraction Plan. These responsibilities are in addition to those already outlined in the Narrabri Mine EMS. Additional responsibilities may also be detailed in each of the relevant sub-plans to this document.

Table 7: Roles and Responsibilities

Role	Responsibility
General Manager	<ul style="list-style-type: none"> - Provide adequate resources to undertake the activities required by this plan; and - Communication with statutory authorities and the community.
Mine Manager	<ul style="list-style-type: none"> - Ensure all contractors, sub-contractors and service-personnel are appropriately qualified, competent and licensed to undertake the required work and have a good environmental performance record; and - Ensure all operations are undertaken in accordance with the requirements of the extraction plan approval.
Technical Services Superintendent	<ul style="list-style-type: none"> - Ensure that people under their charge who have duties and responsibilities under this EMS undergo training and assessment in those duties; - Manage / implement the subsidence management actions under this Extraction Plan; - Provide support and guidance to the Environmental Superintendent as required; and - Authorise changes to this Extraction Plan.
Group Manager – Environment	<ul style="list-style-type: none"> - In consultation with the General Manager, liaise with relevant government authorities; and - Provide support and guidance to the Environmental Officer as required.
Environment Superintendent	<ul style="list-style-type: none"> - Monitor environmental impacts as a result of subsidence activities; - Ensure all operations are undertaken in accordance with the requirements of this Extraction Plan; - Advise on matters identified in the development consent and compliance with those conditions, and other environmental matters; - Receive and respond to complaints in accordance with the EMS; - Co-ordination / management of environmental monitoring programs; - Environmental reporting; - Site rehabilitation; and - Post-induction education and contact with all site-based and contracted employees on environmental matters.
Mine Surveyor	<ul style="list-style-type: none"> - Co-ordinate the undertaking of survey monitoring as required under these plans; and - Report on any discrepancy between observed and expected data as a result of survey monitoring.



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Though retaining the responsibilities identified above, these personnel may, at their discretion, delegate specific tasks to suitably qualified and experienced operational personnel or consultants.

5.2 Reporting

5.2.1 Incident

Each of the sub-plans contained within this Extraction Plan identifies appropriate incident responses to potential incidents associated with the project.

In accordance with Schedule 6, Condition 4 of PA 08_0144, upon becoming aware of an incident, NCOPL will:

- Notify the Secretary and any other relevant agency as soon as practicable; and
- Prepare and submit a detailed report to the Secretary, and any other relevant agencies within 7 days of the date of the incident.

5.2.2 Regular

Regular reporting on the environmental performance of the project is placed on the Project website via the Community Consultative Committee – Environmental Monitoring Reports, in accordance with Schedule 6, Condition 5 of PA 08_0144. Subsidence results are also uploaded to the subsidence data portal following each survey as required by the Subsidence Monitoring Program (Appendix C).

5.2.3 Annual

In accordance with Schedule 6, Condition 6 of PA 08_0144, an Annual Review will be prepared and submitted to the Secretary that reviews the environmental performance of the project. With respect to management of subsidence, this will include:

- a) Works carried out in the past year, and works planned to be carried out in the next year;
- b) Comprehensive review of monitoring results and complaints records over the past year, including a comparison of results to:
 - Relevant statutory requirements, limits and performance measures/criteria;
 - Baseline data and monitoring results of previous years; and
 - Relevant predictions in the EA and Extraction Plan.
- c) Identification of any non-compliance and what actions are being undertaken to ensure compliance;
- d) Discussion of any trends in monitoring data over the life of the project;
- e) Identification of any discrepancies between predicted and actual impacts of the project and analyse the potential cause of any significant discrepancies; and
- f) Describe any measures to be implemented over the next year to improve the environmental performance of the project.



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5.3 Review

Schedule 6, Condition 3 of PA 08_0144 requires reviews of this Extraction Plan, and if necessary revisions, to be undertaken within three months of the following:

- Completion of an independent environmental audit required by Schedule 6, Condition 7;
- Submission of an Incident Report required by Schedule 6, Condition 4;
- Submission of an Annual Review required by Schedule 6, Condition 6; and
- Any modification to the conditions of this approval.



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6 REFERENCES

Department of Planning and Environment, Unknown, Guidelines for the Preparation of Extraction Plans

Ditton Geotechnical Services (DGS) (2009) Narrabri Coal Mine Stage 2 Longwall Project, Mine Subsidence Predictions and Impact Assessment Specialist Consultant Studies Compendium Volume 1, Part 1.

Ditton Geotechnical Services (DGS) (2015) Mine Subsidence Assessment on the Proposed 75W Modification to the Stage 2 Mining Layout at the Narrabri Mine, Narrabri.

Ditton Geotechnical Services (DGS) (2017) Mine Subsidence Assessment for the Proposed LW107 to LW110 Extraction Plan at the Narrabri Mine.

Resource Strategies (2015) Narrabri Mine Modification 5 Environmental Assessment

RW Corkery & Co. Pty Ltd (November 2009) Environmental Assessment for the Narrabri Coal Mine Stage 2 Longwall Project, Project Application No:MP08_0144.



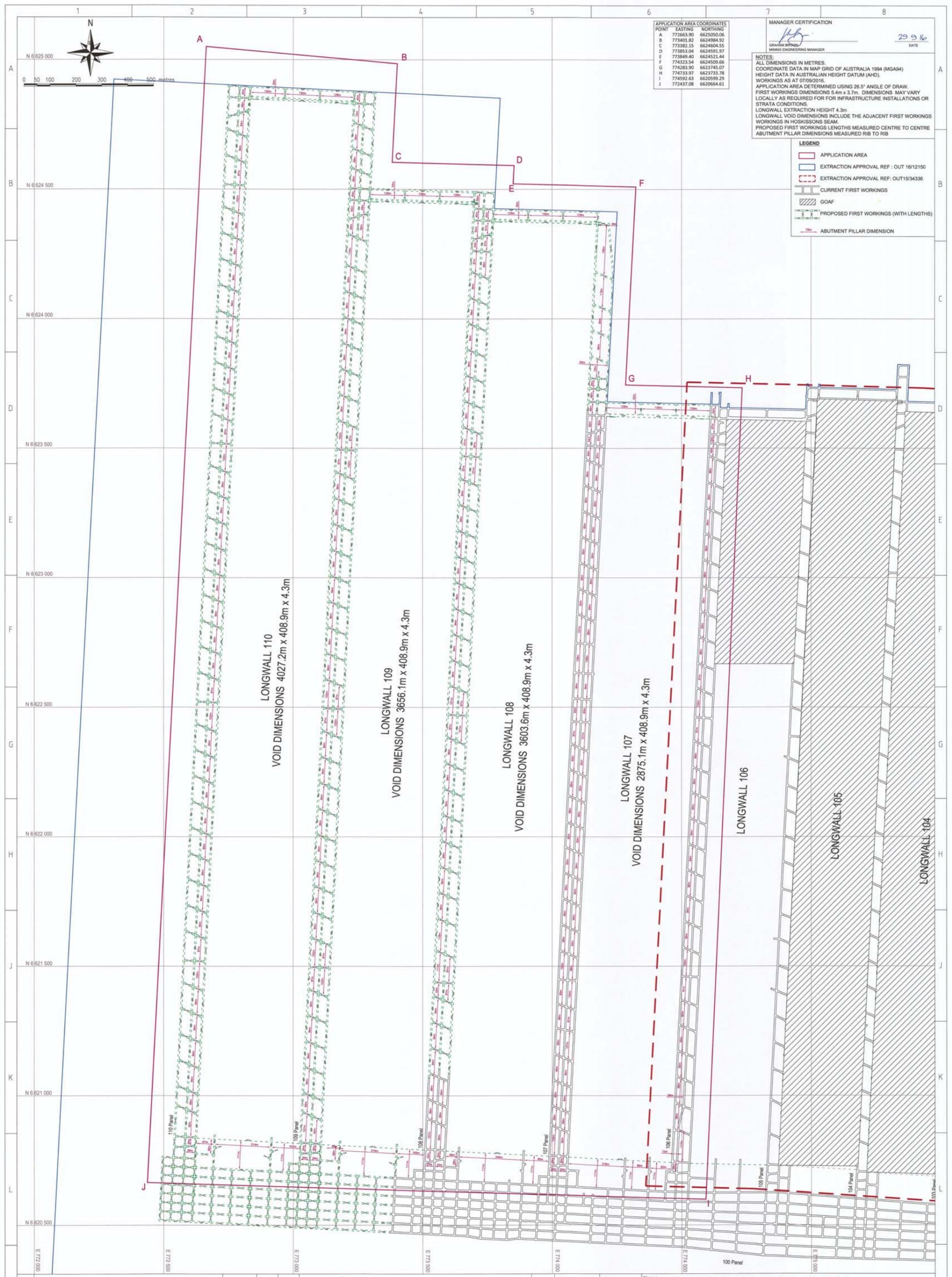
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Attachment 1

Plans 1-8



APPLICATION AREA COORDINATES		
POINT	EASTING	NORTHING
A	772663.90	6625050.06
B	773401.82	6624984.92
C	773382.15	6624604.55
D	773853.04	6624591.97
E	773849.40	6624521.44
F	774323.54	6624509.66
G	774283.90	6623745.07
H	774733.97	6623733.78
I	774592.63	6620599.29
J	772437.08	6620664.61

MANAGER CERTIFICATION

 MINING ENGINEER MANAGER
 DATE 29/09/16

NOTES:
 ALL DIMENSIONS IN METRES.
 COORDINATE DATA IN MAP GRID OF AUSTRALIA 1984 (MGA94)
 HEIGHT DATA IN AUSTRALIAN HEIGHT DATUM (AHD).
 WORKINGS AS AT 07/09/2016.
 APPLICATION AREA DETERMINED USING 26.5° ANGLE OF DRAW.
 FIRST WORKINGS DIMENSIONS 5.4m x 3.7m. DIMENSIONS MAY VARY
 LOCALLY AS REQUIRED FOR FOR INFRASTRUCTURE INSTALLATIONS OR
 STRATA CONDITIONS.
 LONGWALL EXTRACTION HEIGHT 4.3m
 LONGWALL VOID DIMENSIONS INCLUDE THE ADJACENT FIRST WORKINGS
 WORKINGS IN HOSKISSONS SEAM.
 PROPOSED FIRST WORKINGS LENGTHS MEASURED CENTRE TO CENTRE
 ABUTMENT PILLAR DIMENSIONS MEASURED RIB TO RIB

LEGEND	
	APPLICATION AREA
	EXTRACTION APPROVAL REF: OUT 16/12/150
	EXTRACTION APPROVAL REF: OUT15/34336
	CURRENT FIRST WORKINGS
	GOAF
	PROPOSED FIRST WORKINGS (WITH LENGTHS)
	15m ABUTMENT PILLAR DIMENSION

REV	DESCRIPTION	DATE	DRN	CKD

WHITEHAVEN COAL

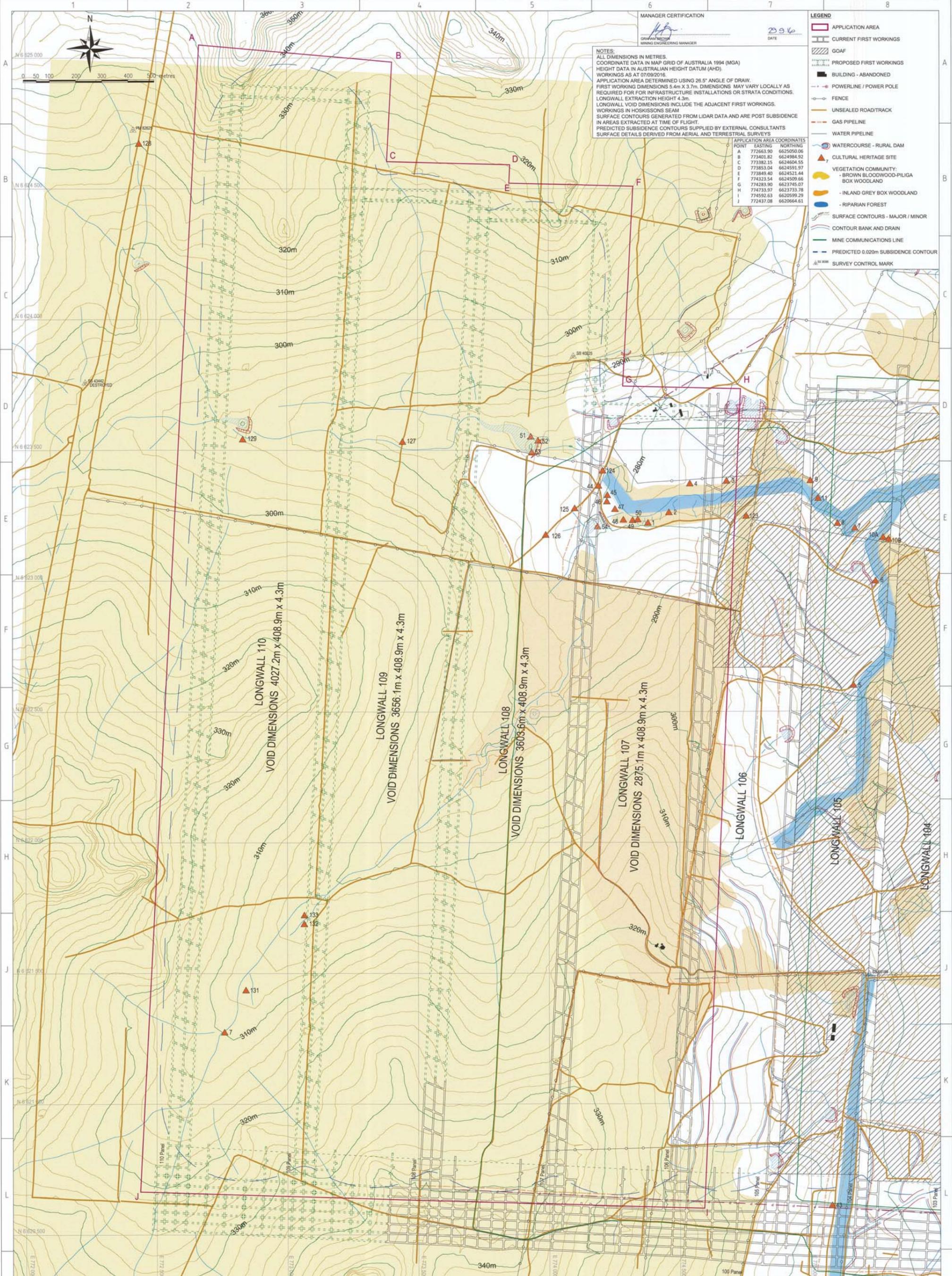
NARRABRI MINE
 Narrabri Coal Operations Pty Ltd
 Locked Bag 1002, Narrabri, NSW 2390 Australia

Name	Date
DRN PN	08/09/2016
CKD SF	23/09/16
APP GB	29/09/16

SCALE 1 : 4500 @ A0

Title **EXTRACTION PLAN - PLAN 1**
EXISTING AND PROPOSED WORKINGS
LONGWALLS 107 - 110

DRAWING NUMBER **APN_15_01** REV **0**



MANAGER CERTIFICATION
 GRIFFIN MCGOWAN
 MINING ENGINEERING MANAGER
 DATE 29/09/16

NOTES:
 ALL DIMENSIONS IN METRES.
 COORDINATE DATA IN MAP GRID OF AUSTRALIA 1994 (MGA)
 HEIGHT DATA IN AUSTRALIAN HEIGHT DATUM (AHD).
 WORKINGS AS AT 07/09/2016.
 APPLICATION AREA DETERMINED USING 26.5° ANGLE OF DRAW.
 FIRST WORKING DIMENSIONS 5.4m X 3.7m. DIMENSIONS MAY VARY LOCALLY AS
 REQUIRED FOR FOR INFRASTRUCTURE INSTALLATIONS OR STRATA CONDITIONS.
 LONGWALL EXTRACTION HEIGHT 4.3m.
 LONGWALL VOID DIMENSIONS INCLUDE THE ADJACENT FIRST WORKINGS.
 WORKINGS IN HOSKISSONS SEAM
 SURFACE CONTOURS GENERATED FROM LIDAR DATA AND ARE POST SUBSIDIENCE
 IN AREAS EXTRACTED AT TIME OF FLIGHT.
 PREDICTED SUBSIDIENCE CONTOURS SUPPLIED BY EXTERNAL CONSULTANTS
 SURFACE DETAILS DERIVED FROM AERIAL AND TERRESTRIAL SURVEYS

LEGEND

- APPLICATION AREA
- CURRENT FIRST WORKINGS
- GOAF
- PROPOSED FIRST WORKINGS
- BUILDING - ABANDONED
- POWERLINE / POWER POLE
- FENCE
- UNSEALED ROAD/TRACK
- GAS PIPELINE
- WATER PIPELINE
- WATERCOURSE - RURAL DAM
- CULTURAL HERITAGE SITE
- VEGETATION COMMUNITY:
 - BROWN BLOODWOOD-PILIGA BOX WOODLAND
 - INLAND GREY BOX WOODLAND
 - RIPARIAN FOREST
- SURFACE CONTOURS - MAJOR / MINOR
- CONTOUR BANK AND DRAIN
- MINE COMMUNICATIONS LINE
- PREDICTED 0.020m SUBSIDIENCE CONTOUR
- SURVEY CONTROL MARK

APPLICATION AREA COORDINATES

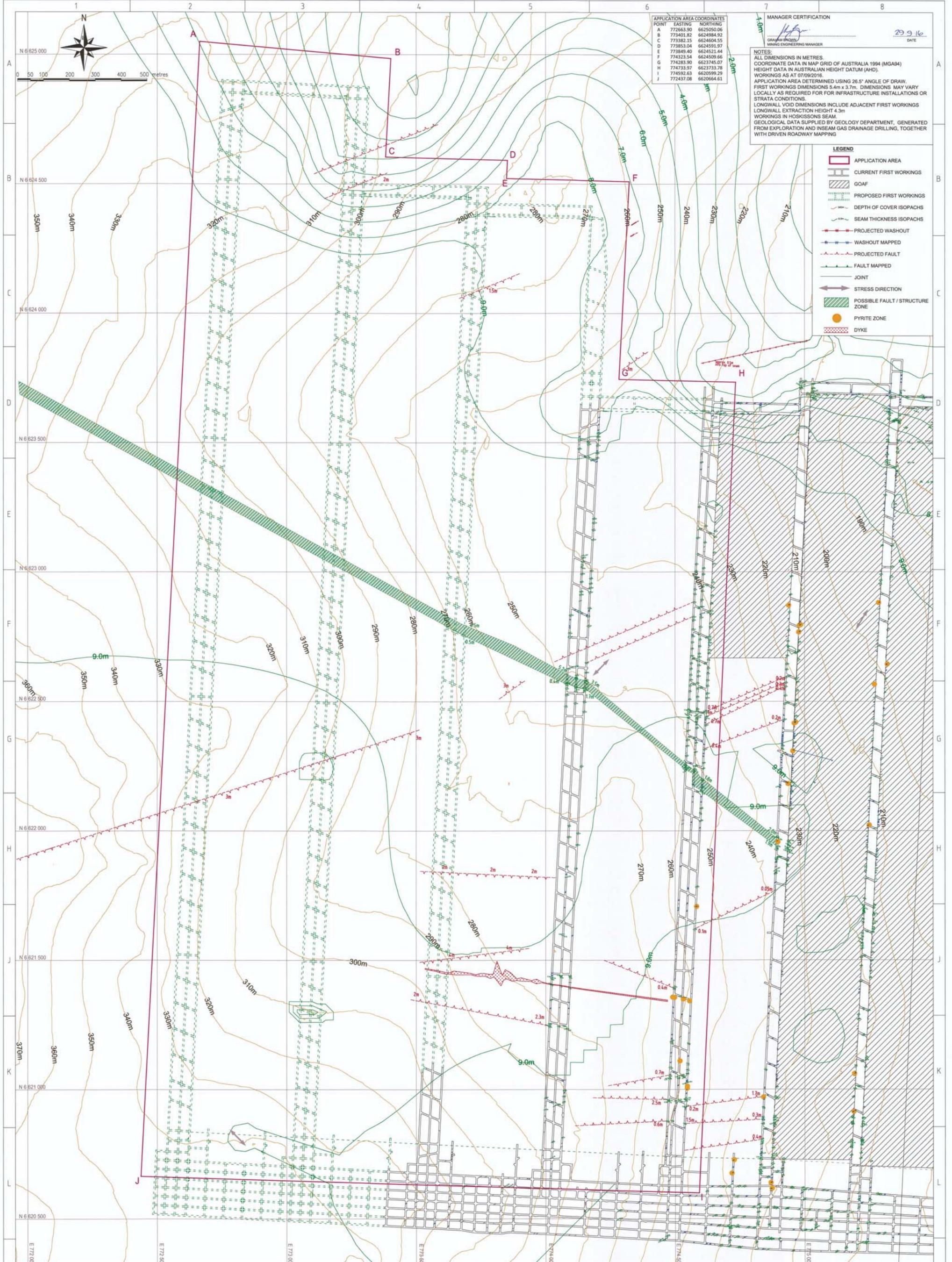
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G	774283.90	6623745.07
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J	772437.08	6620664.61

WHITEHAVEN COAL
NARRABRI MINE
 Narrabri Coal Operations Pty Ltd
 Locked Bag 1002, Narrabri, NSW 2390 Australia

Name	Date
DRN PN	08/09/2016
EKD SF	29/09/16
APP GB	29/09/16
SCALE	1 : 4500 @ A0

Title	DRAWING NUMBER	REV
EXTRACTION PLAN - PLAN 2 NATURAL AND MAN MADE FEATURES LONGWALLS 107 - 110	APN_15_02	0

REV	DESCRIPTION	DATE	DRN	CKD



POINT	EASTING	NORTHING
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B	773401.82	6624984.92
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E	773849.40	6624521.44
F	774323.54	6624509.66
G	774283.90	6623745.07
H	774733.97	6623733.78
I	774592.63	6620599.29
J	772437.08	6620664.61

MANAGER CERTIFICATION
 29/9/16
 DATE

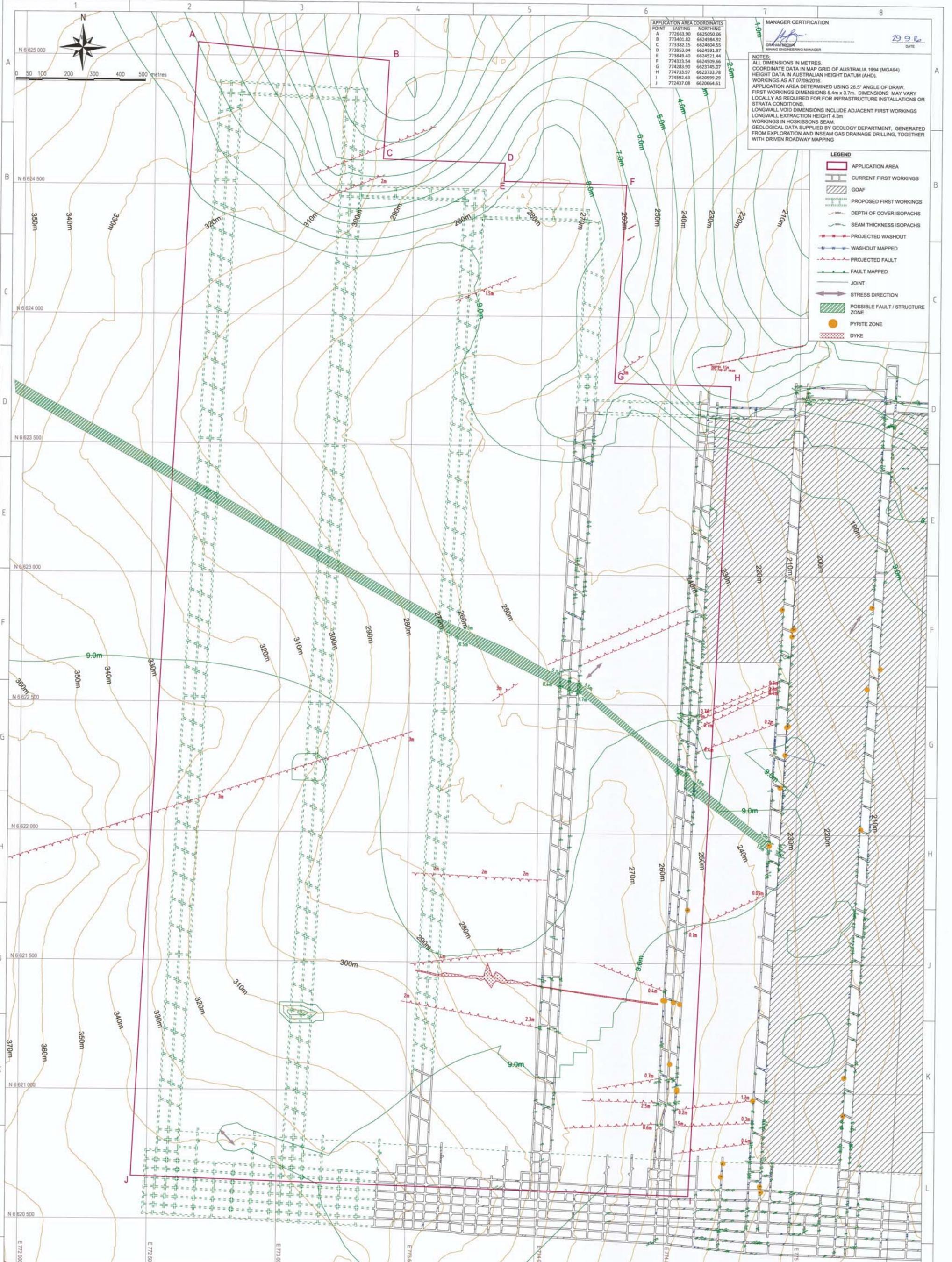
NOTES:
 ALL DIMENSIONS IN METRES.
 COORDINATE DATA IN MAP GRID OF AUSTRALIA 1994 (MGA94)
 HEIGHT DATA IN AUSTRALIAN HEIGHT DATUM (AHD).
 WORKINGS AS AT 07/09/2016.
 APPLICATION AREA DETERMINED USING 26.5° ANGLE OF DRAW.
 FIRST WORKINGS DIMENSIONS 5.4m x 3.7m. DIMENSIONS MAY VARY
 LOCALLY AS REQUIRED FOR FOR INFRASTRUCTURE INSTALLATIONS OR
 STRATA CONDITIONS.
 LONGWALL VOID DIMENSIONS INCLUDE ADJACENT FIRST WORKINGS
 LONGWALL EXTRACTION HEIGHT 4.3m
 WORKINGS IN HOSKISSONS SEAM.
 GEOLOGICAL DATA SUPPLIED BY GEOLOGY DEPARTMENT, GENERATED
 FROM EXPLORATION AND INSEAM GAS DRAINAGE DRILLING, TOGETHER
 WITH DRIVEN ROADWAY MAPPING

LEGEND	
[Red outline]	APPLICATION AREA
[Cross-hatch]	CURRENT FIRST WORKINGS
[Diagonal lines]	GOAF
[Dashed lines]	PROPOSED FIRST WORKINGS
[Brown lines]	DEPTH OF COVER ISOPACHS
[Green lines]	SEAM THICKNESS ISOPACHS
[Red dashed line]	PROJECTED WASHOUT
[Blue dashed line]	WASHOUT MAPPED
[Red dashed line]	PROJECTED FAULT
[Green dashed line]	FAULT MAPPED
[Green line]	JOINT
[Arrow]	STRESS DIRECTION
[Green shaded area]	POSSIBLE FAULT / STRUCTURE ZONE
[Yellow circle]	PYRITE ZONE
[Red dashed line]	DYKE

WHITEHAVEN COAL
NARRABRI MINE
 Narrabri Coal Operations Pty Ltd
 Locked Bag 1002, Narrabri, NSW 2390 Australia

Name	Date	Title
DRN PN	08/09/2016	EXTRACTION PLAN - PLAN 3 HOSKISSONS SEAM GEOLOGICAL DATA LONGWALLS 107 - 110
CKD SF	23/09/16	
APP GB	29/09/16	
SCALE	1 : 4500 @ A0	
DRAWING NUMBER		APN_15_03
REV		0

REV	DESCRIPTION	DATE	DRN	CKD



POINT	EASTING	NORTHING
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B	773401.82	6624984.92
C	773382.15	6624604.55
D	773853.04	6624591.97
E	773849.40	6624521.44
F	774323.54	6624509.66
G	774283.90	6623745.07
H	774733.97	6623733.78
I	774592.63	6620599.29
J	774337.08	6620664.61

MANAGER CERTIFICATION
 29 9 16
 DATE

NOTES:
 ALL DIMENSIONS IN METRES.
 COORDINATE DATA IN MAP GRID OF AUSTRALIA 1994 (MGA94)
 HEIGHT DATA IN AUSTRALIAN HEIGHT DATUM (AHD).
 WORKINGS AS AT 07/09/2016.
 APPLICATION AREA DETERMINED USING 28.5° ANGLE OF DRAW.
 FIRST WORKINGS DIMENSIONS 5.4m x 3.7m. DIMENSIONS MAY VARY
 LOCALLY AS REQUIRED FOR INFRASTRUCTURE INSTALLATIONS OR
 STRATA CONDITIONS.
 LONGWALL VOID DIMENSIONS INCLUDE ADJACENT FIRST WORKINGS
 LONGWALL EXTRACTION HEIGHT 4.3m
 WORKINGS IN HOSKISSONS SEAM
 GEOLOGICAL DATA SUPPLIED BY GEOLOGY DEPARTMENT, GENERATED
 FROM EXPLORATION AND INSEAM GAS DRAINAGE DRILLING, TOGETHER
 WITH DRIVEN ROADWAY MAPPING

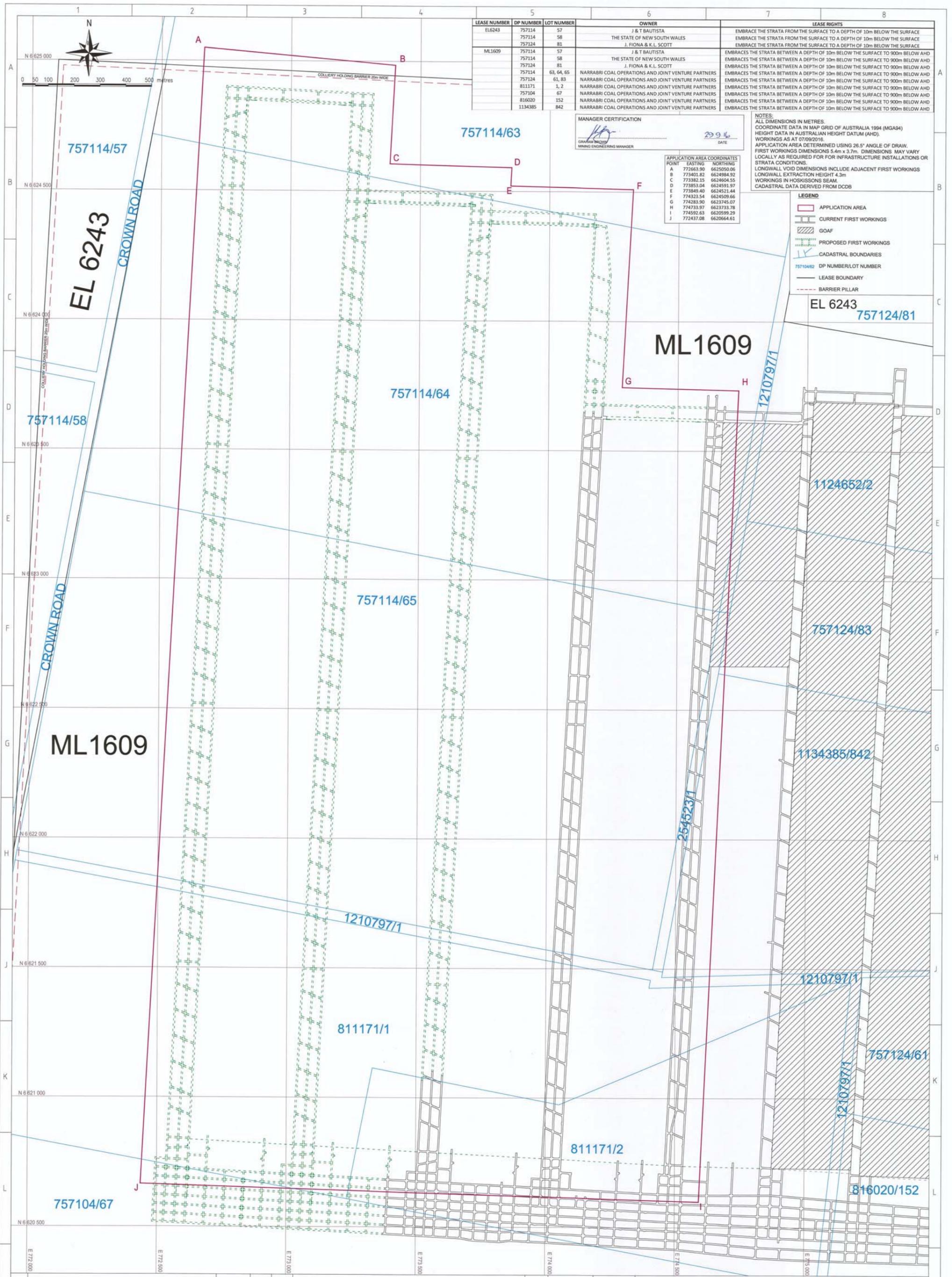
LEGEND	
[Red Outline]	APPLICATION AREA
[Hatched Box]	CURRENT FIRST WORKINGS
[Dashed Box]	PROPOSED FIRST WORKINGS
[Brown Line]	DEPTH OF COVER ISOPACHS
[Green Line]	SEAM THICKNESS ISOPACHS
[Red Dashed Line]	PROJECTED WASHOUT
[Blue Dashed Line]	WASHOUT MAPPED
[Red Dotted Line]	PROJECTED FAULT
[Green Dotted Line]	FAULT MAPPED
[Black Arrow]	JOINT
[Black Arrow]	STRESS DIRECTION
[Green Shaded Box]	POSSIBLE FAULT / STRUCTURE ZONE
[Yellow Circle]	PYRITE ZONE
[Red Dotted Box]	DYKE

REV	DESCRIPTION	DATE	DRN	CKD
1				
2				
3				
4				
5				
6				
7				
8				

WHITEHAVEN COAL
 NARRABRI MINE
 Narrabri Coal Operations Pty Ltd
 Locked Bag 1002, Narrabri, NSW 2390 Australia

Name	Date
DRN PN	08/09/2016
CKD SF	23/09/16
APP GB	29/09/16
SCALE	1 : 4500 @ A0

Title	DRAWING NUMBER	REV
EXTRACTION PLAN - PLAN 4 GEOLOGICAL AND SEAM DATA LONGWALLS 107 - 110	APN_15_04	0



LEASE NUMBER	DP NUMBER	LOT NUMBER	OWNER	LEASE RIGHTS
EL6243	757114	57	J & T BAUTISTA	EMBRACE THE STRATA FROM THE SURFACE TO A DEPTH OF 10m BELOW THE SURFACE
	757114	58	THE STATE OF NEW SOUTH WALES	EMBRACE THE STRATA FROM THE SURFACE TO A DEPTH OF 10m BELOW THE SURFACE
	757124	81	J. FIONA & K.L. SCOTT	EMBRACE THE STRATA FROM THE SURFACE TO A DEPTH OF 10m BELOW THE SURFACE
ML1609	757114	57	J & T BAUTISTA	EMBRACES THE STRATA BETWEEN A DEPTH OF 10m BELOW THE SURFACE TO 900m BELOW AHD
	757114	58	THE STATE OF NEW SOUTH WALES	EMBRACES THE STRATA BETWEEN A DEPTH OF 10m BELOW THE SURFACE TO 900m BELOW AHD
	757124	81	J. FIONA & K.L. SCOTT	EMBRACES THE STRATA BETWEEN A DEPTH OF 10m BELOW THE SURFACE TO 900m BELOW AHD
	757114	63, 64, 65	NARRABRI COAL OPERATIONS AND JOINT VENTURE PARTNERS	EMBRACES THE STRATA BETWEEN A DEPTH OF 10m BELOW THE SURFACE TO 900m BELOW AHD
	757124	61, 83	NARRABRI COAL OPERATIONS AND JOINT VENTURE PARTNERS	EMBRACES THE STRATA BETWEEN A DEPTH OF 10m BELOW THE SURFACE TO 900m BELOW AHD
	811171	1, 2	NARRABRI COAL OPERATIONS AND JOINT VENTURE PARTNERS	EMBRACES THE STRATA BETWEEN A DEPTH OF 10m BELOW THE SURFACE TO 900m BELOW AHD
	757104	67	NARRABRI COAL OPERATIONS AND JOINT VENTURE PARTNERS	EMBRACES THE STRATA BETWEEN A DEPTH OF 10m BELOW THE SURFACE TO 900m BELOW AHD
	816020	152	NARRABRI COAL OPERATIONS AND JOINT VENTURE PARTNERS	EMBRACES THE STRATA BETWEEN A DEPTH OF 10m BELOW THE SURFACE TO 900m BELOW AHD
1134385	842	NARRABRI COAL OPERATIONS AND JOINT VENTURE PARTNERS	EMBRACES THE STRATA BETWEEN A DEPTH OF 10m BELOW THE SURFACE TO 900m BELOW AHD	

MANAGER CERTIFICATION
 GRAHAM MCGEE
 MINING ENGINEERING MANAGER
 29/9/16
 DATE

POINT	EASTING	NORTHING
A	772663.90	6625050.06
B	773401.82	6624984.92
C	773382.15	6624664.55
D	773853.04	6624591.97
E	773849.40	6624521.44
F	774323.54	6624509.66
G	774283.90	6623745.07
H	774733.97	6623733.78
I	774592.63	6620599.29
J	772437.08	6620664.61

NOTES:
 ALL DIMENSIONS IN METRES.
 COORDINATE DATA IN MAP GRID OF AUSTRALIA 1994 (MGA94)
 HEIGHT DATA IN AUSTRALIAN HEIGHT DATUM (AHD).
 WORKINGS AS AT 07/09/2016.
 APPLICATION AREA DETERMINED USING 26.5° ANGLE OF DRAW.
 FIRST WORKINGS DIMENSIONS 5.4m x 3.7m. DIMENSIONS MAY VARY
 LOCALLY AS REQUIRED FOR FOR INFRASTRUCTURE INSTALLATIONS OR
 STRATA CONDITIONS.
 LONGWALL VOID DIMENSIONS INCLUDE ADJACENT FIRST WORKINGS
 LONGWALL EXTRACTION HEIGHT 4.3m
 WORKINGS IN HOSKISSONS SEAM.
 CADASTRAL DATA DERIVED FROM DCCDB

LEGEND
 APPLICATION AREA
 CURRENT FIRST WORKINGS
 GOAF
 PROPOSED FIRST WORKINGS
 CADASTRAL BOUNDARIES
 DP NUMBER/LOT NUMBER
 LEASE BOUNDARY
 BARRIER PILLAR

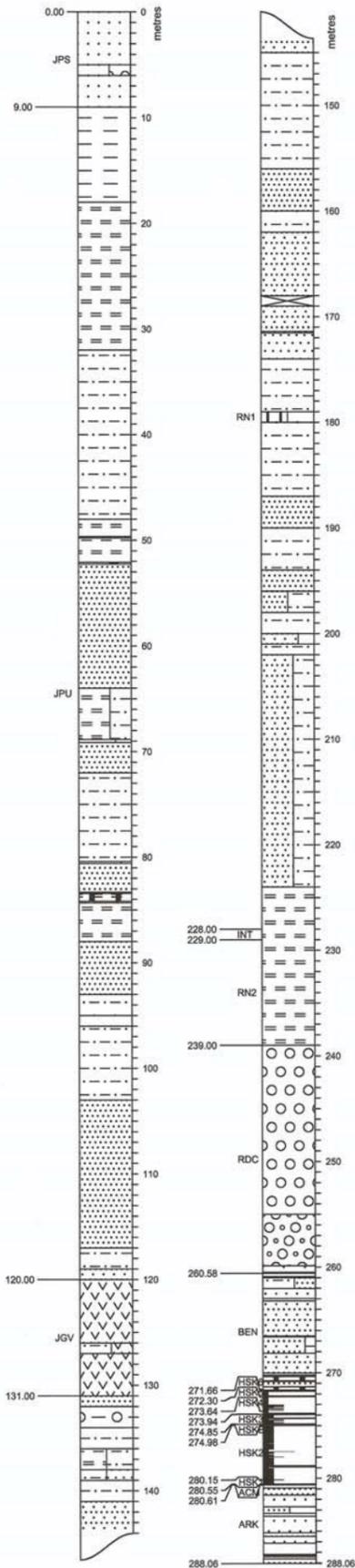
WHITEHAVEN COAL
NARRABRI MINE
 Narrabri Coal Operations Pty Ltd
 Locked Bag 1002, Narrabri, NSW 2390 Australia

Name	Date	Title
DRN PN	08/09/2016	EXTRACTION PLAN - PLAN 5 MINING TITLES AND LAND OWNERSHIP LONGWALLS 107 - 110
CKD SF	23/09/16	
APP GB	29/09/16	

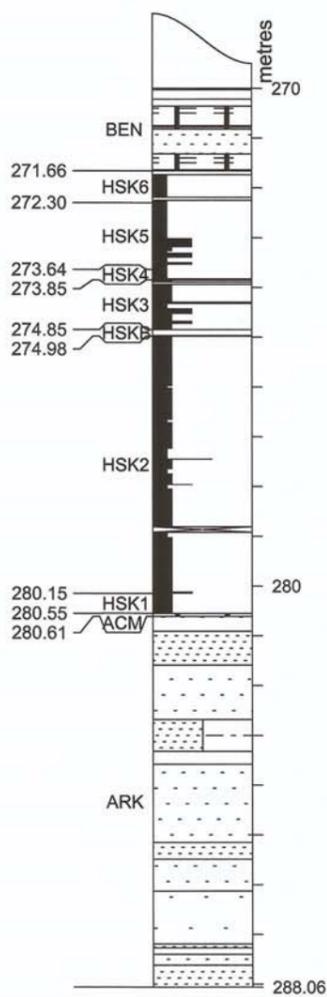
DRAWING NUMBER **APN_15_05** REV **0**
 SCALE **1 : 4500**

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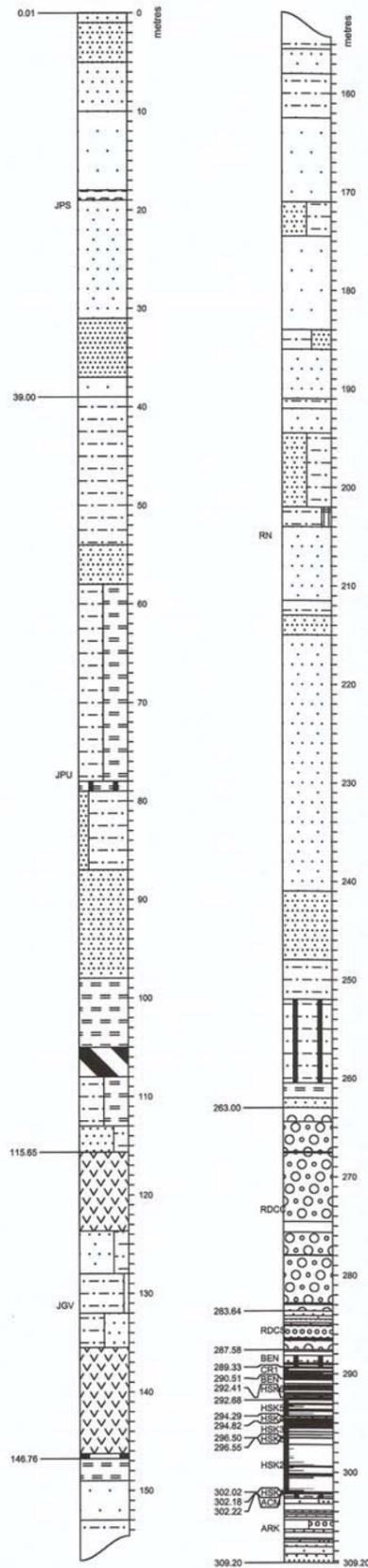
SECTION OF STRATA
AT E 773907.89
N 6622452.20
BORE HOLE NC578C



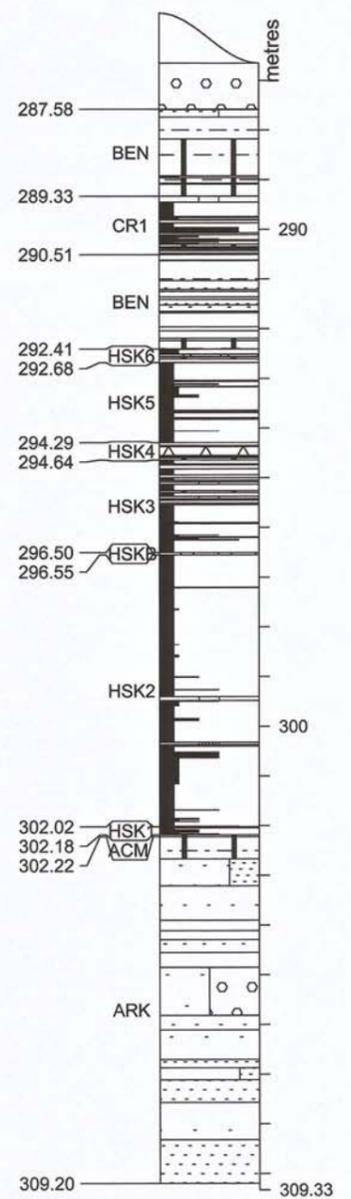
SECTION OF STRATA
AND WORKING SECTION
AT E 773907.89
N 6622452.20
BORE HOLE NC578C



SECTION OF STRATA
AT E 772848.23
N 6623818.56
BORE HOLE NC621C



SECTION OF STRATA
AND WORKING SECTION
AT E 772848.23
N 6623818.56
BORE HOLE NC621C



LEGEND

	Soil
	Clay
	Basalt
	Siltstone
	Sandstone
	Conglomerate
	Dolerite
	Core Loss
	COAL Dull with Minor Bright
	Stony COAL
	COAL Dull with Bright Bands
	Tuff
	COAL Dull
	COAL Bright Banded
	COAL Bright and Dull
	COAL Bright
	Mudstone

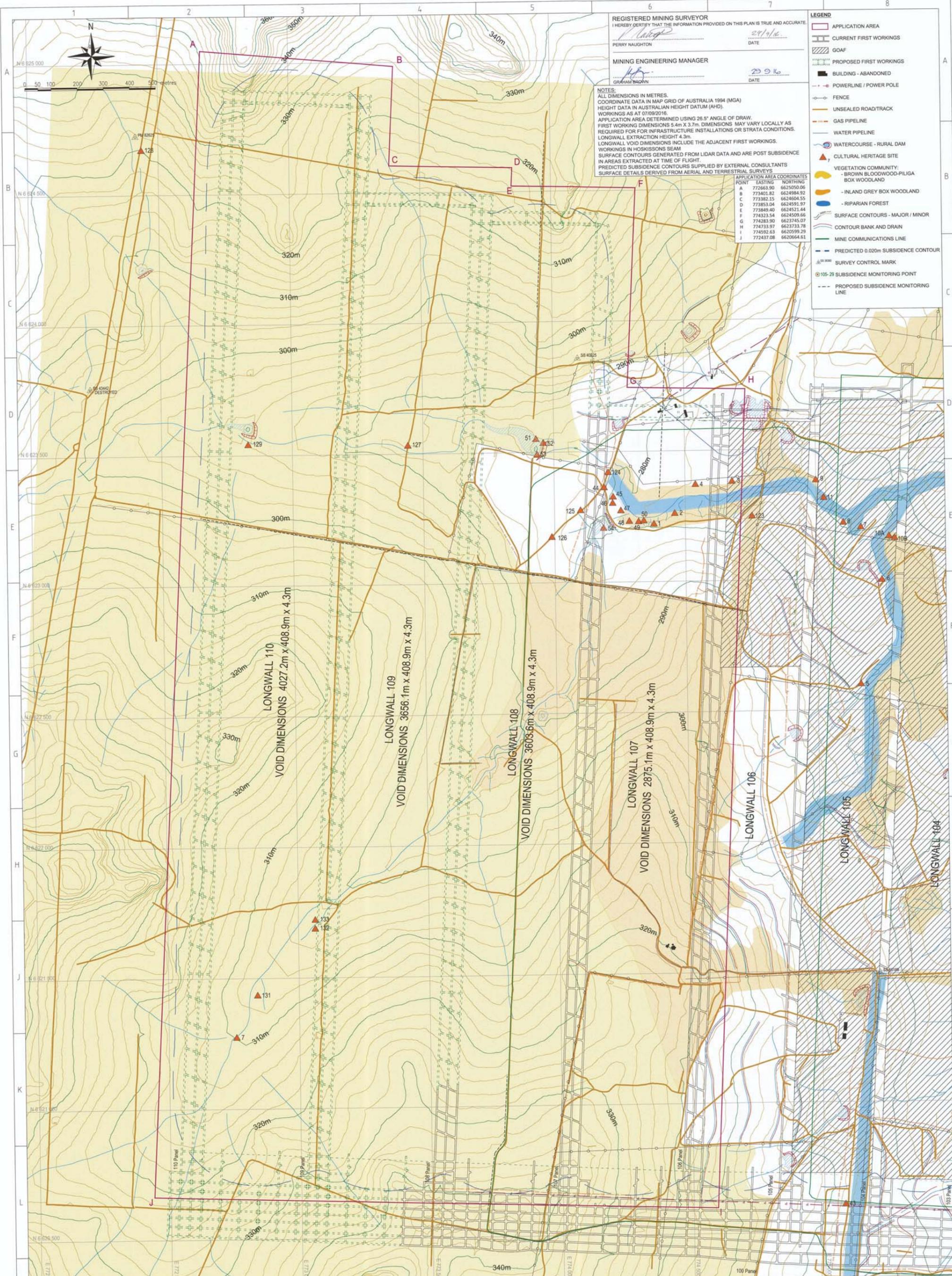
MANAGER CERTIFICATION

GRAHAM BROWN
MINING ENGINEERING MANAGER
DATE 29/9/16

WHITEHAVEN COAL
NARRABRI MINE
Narrabri Coal Operations Pty Ltd
Locked Bag 1002, Narrabri, NSW 2390 Australia

Name	Date	Title	REV
DRN PN	08/09/2016	EXTRACTION PLAN - PLAN 6 GEOLOGICAL SECTIONS LONGWALLS 107 - 110	0
CKD SF	23/09/16		
APP GB	29/09/16		
SCALE	AS SHOWN	DRAWING NUMBER	
		APN_15_06	

REV	DESCRIPTION	DATE	DRN	CKD



REGISTERED MINING SURVEYOR
 I HEREBY CERTIFY THAT THE INFORMATION PROVIDED ON THIS PLAN IS TRUE AND ACCURATE.
 PERRY NAUGHTON
 DATE 29/9/16

MINING ENGINEERING MANAGER
 GRAHAM BROWN
 DATE 29/9/16

NOTES:
 ALL DIMENSIONS IN METRES.
 COORDINATE DATA IN MAP GRID OF AUSTRALIA 1994 (MGA)
 HEIGHT DATA IN AUSTRALIAN HEIGHT DATUM (AHD).
 WORKINGS AS AT 07/09/2016.
 APPLICATION AREA DETERMINED USING 26.5° ANGLE OF DRAW.
 FIRST WORKING DIMENSIONS 5.4m X 3.7m. DIMENSIONS MAY VARY LOCALLY AS
 REQUIRED FOR INFRASTRUCTURE INSTALLATIONS OR STRATA CONDITIONS.
 LONGWALL EXTRACTION HEIGHT 4.3m.
 LONGWALL VOID DIMENSIONS INCLUDE THE ADJACENT FIRST WORKINGS.
 WORKINGS IN HOSKISSONS SEAM
 SURFACE CONTOURS GENERATED FROM LIDAR DATA AND ARE POST SUBSIDENCE
 IN AREAS EXTRACTED AT TIME OF FLIGHT.
 PREDICTED SUBSIDENCE CONTOURS SUPPLIED BY EXTERNAL CONSULTANTS
 SURFACE DETAILS DERIVED FROM AERIAL AND TERRESTRIAL SURVEYS

APPLICATION AREA COORDINATES

POINT	EASTING	NORTHING
A	772663.90	6625050.06
B	773401.82	6624984.92
C	773382.15	6624604.55
D	773853.04	6624591.97
E	773849.40	6624521.44
F	774323.54	6624509.66
G	774383.90	6623745.07
H	774733.97	6623733.78
I	774592.63	6620599.29
J	772437.08	6620664.61

- LEGEND
- APPLICATION AREA
 - CURRENT FIRST WORKINGS
 - GOAF
 - PROPOSED FIRST WORKINGS
 - BUILDING - ABANDONED
 - POWERLINE / POWER POLE
 - FENCE
 - UNSEALED ROAD/TRACK
 - GAS PIPELINE
 - WATER PIPELINE
 - WATERCOURSE - RURAL DAM
 - CULTURAL HERITAGE SITE
 - VEGETATION COMMUNITY:
 - BROWN BLOODWOOD-PILIGA BOX WOODLAND
 - INLAND GREY BOX WOODLAND
 - RIPARIAN FOREST
 - SURFACE CONTOURS - MAJOR / MINOR
 - CONTOUR BANK AND DRAIN
 - MINE COMMUNICATIONS LINE
 - PREDICTED 0.020m SUBSIDENCE CONTOUR
 - SURVEY CONTROL MARK
 - 105-29 SUBSIDENCE MONITORING POINT
 - PROPOSED SUBSIDENCE MONITORING LINE

REV	DESCRIPTION	DATE	DRN	CKD

WHITEHAVEN COAL
NARRABRI MINE
 Narrabri Coal Operations Pty Ltd
 Locked Bag 1002, Narrabri, NSW 2390 Australia

Name	Date	Title
DRN PN	08/09/2016	EXTRACTION PLAN - PLAN 7 SUBSIDENCE MONITORING NETWORK LONGWALLS 107 - 110
CKD SF	29/09/16	
APP GB	29/09/16	
SCALE	1 : 4500 @ A0	DRAWING NUMBER
		APN_15_07
		REV
		0



POINT	EASTING	NORTHING
A	772663.90	6625050.06
B	773401.82	6624984.92
C	773382.15	6624604.55
D	773853.04	6624591.97
E	773849.40	6624521.44
F	774323.54	6624509.66
G	774383.90	6623745.07
H	774733.97	6623733.78
I	774592.63	6620599.29
J	772437.08	6620664.61

MANAGER CERTIFICATION
 [Signature]
 GAVIN BROWN
 MINING ENGINEERING MANAGER
 DATE 23/9/16

NOTES:
 ALL DIMENSIONS IN METRES.
 COORDINATE DATA IN MAP GRID OF AUSTRALIA 1994 (MGA94)
 HEIGHT DATA IN AUSTRALIAN HEIGHT DATUM (AHD).
 WORKINGS AS AT 07/09/2016.
 APPLICATION AREA DETERMINED USING 28.5° ANGLE OF DRAW.
 FIRST WORKINGS DIMENSIONS 5.4m x 3.7m. DIMENSIONS MAY VARY
 LOCALLY AS REQUIRED FOR FOR INFRASTRUCTURE INSTALLATIONS OR
 STRATA CONDITIONS.
 LONGWALL EXTRACTION HEIGHT 4.3m
 LONGWALL VOID DIMENSIONS INCLUDE THE ADJACENT FIRST WORKINGS
 WORKINGS IN HOSKISSONS SEAM.

LEGEND

[Red Outline]	APPLICATION AREA
[Solid Black Line]	CURRENT FIRST WORKINGS
[Diagonal Hatching]	GOAF
[Dashed Green Line]	PROPOSED FIRST WORKINGS

LONGWALL 110
 VOID DIMENSIONS 4027.2m x 408.9m x 4.3m

LONGWALL 109
 VOID DIMENSIONS 3656.1m x 408.9m x 4.3m

LONGWALL 108
 VOID DIMENSIONS 3603.6m x 408.9m x 4.3m

LONGWALL 107
 VOID DIMENSIONS 2875.1m x 408.9m x 4.3m

LONGWALL 106

LONGWALL 105

LONGWALL 104

110 Panel

109 Panel

108 Panel

107 Panel

106 Panel

105 Panel

104 Panel

REV	DESCRIPTION	DATE	DRN	CKD

WHITEHAVEN COAL
 NARRABRI MINE
 Narrabri Coal Operations Pty Ltd
 Locked Bag 1002, Narrabri, NSW 2390 Australia

Name	Date
DRN PN	08/09/2016
CKD SF	23/09/16
APP GB	29/09/16
SCALE	1 : 4500 @ A0

Title **EXTRACTION PLAN - PLAN 8 - AERIAL PHOTOGRAPH WITH EXISTING AND PROPOSED WORKINGS - LONGWALLS 107 - 110**
 DRAWING NUMBER **APN_15_08**
 REV **0**



**NARRABRI MINE
ENVIRONMENTAL
MANAGEMENT SYSTEM**

Document Owner:	Technical Services Manager
Revision Period:	3 Years
Issue:	1
Last Revision Date:	3/03/2017
Date Printed:	03/03/2017

WHC_PLN_NAR_EXTRACTION PLAN LW107 to LW110

Appendix A

Coal Resource Recovery Plan



**NARRABRI MINE
ENVIRONMENTAL
MANAGEMENT SYSTEM**

Document Owner:	Technical Services Manager
Revision Period:	3 Years
Issue:	1
Last Revision Date:	3/03/2017
Date Printed:	03/03/2017

WHC_PLN_NAR_EXTRACTION PLAN LW107 to LW110

Appendix B

Subsidence Predictions



**NARRABRI MINE
ENVIRONMENTAL
MANAGEMENT SYSTEM**

Document Owner:	Technical Services Manager
Revision Period:	3 Years
Issue:	1
Last Revision Date:	3/03/2017
Date Printed:	03/03/2017

WHC_PLN_NAR_EXTRACTION PLAN LW107 to LW110

Appendix C

Subsidence Monitoring Program



**NARRABRI MINE
ENVIRONMENTAL
MANAGEMENT SYSTEM**

Document Owner:	Technical Services Manager
Revision Period:	3 Years
Issue:	1
Last Revision Date:	3/03/2017
Date Printed:	03/03/2017

WHC_PLN_NAR_EXTRACTION PLAN LW107 to LW110

Appendix D

Built Features Management Plan



**NARRABRI MINE
ENVIRONMENTAL
MANAGEMENT SYSTEM**

Document Owner:	Technical Services Manager
Revision Period:	3 Years
Issue:	1
Last Revision Date:	3/03/2017
Date Printed:	03/03/2017

WHC_PLN_NAR_EXTRACTION PLAN LW107 to LW110

Appendix E

Public Safety Management Plan



**NARRABRI MINE
ENVIRONMENTAL
MANAGEMENT SYSTEM**

Document Owner:	Technical Services Manager
Revision Period:	3 Years
Issue:	1
Last Revision Date:	3/03/2017
Date Printed:	03/03/2017

WHC_PLN_NAR_EXTRACTION PLAN LW107 to LW110

Appendix F

Landscape Management Plan



**NARRABRI MINE
ENVIRONMENTAL
MANAGEMENT SYSTEM**

Document Owner:	Technical Services Manager
Revision Period:	3 Years
Issue:	1
Last Revision Date:	3/03/2017
Date Printed:	03/03/2017

WHC_PLN_NAR_EXTRACTION PLAN LW107 to LW110

Appendix G

Water Management Plan



**NARRABRI MINE
ENVIRONMENTAL
MANAGEMENT SYSTEM**

Document Owner:	Technical Services Manager
Revision Period:	3 Years
Issue:	1
Last Revision Date:	3/03/2017
Date Printed:	03/03/2017

WHC_PLN_NAR_EXTRACTION PLAN LW107 to LW110

Appendix H

Biodiversity Management Plan



**NARRABRI MINE
ENVIRONMENTAL
MANAGEMENT SYSTEM**

Document Owner:	Technical Services Manager
Revision Period:	3 Years
Issue:	1
Last Revision Date:	3/03/2017
Date Printed:	03/03/2017

WHC_PLN_NAR_EXTRACTION PLAN LW107 to LW110

Appendix I

Land Management Plan



**NARRABRI MINE
ENVIRONMENTAL
MANAGEMENT SYSTEM**

Document Owner:	Technical Services Manager
Revision Period:	3 Years
Issue:	1
Last Revision Date:	3/03/2017
Date Printed:	03/03/2017

WHC_PLN_NAR_EXTRACTION PLAN LW107 to LW110

Appendix J

Heritage Management Plan



**NARRABRI MINE
ENVIRONMENTAL
MANAGEMENT SYSTEM**

Document Owner:	Technical Services Manager
Revision Period:	3 Years
Issue:	1
Last Revision Date:	3/03/2017
Date Printed:	03/03/2017

WHC_PLN_NAR_EXTRACTION PLAN LW107 to LW110

Appendix K

Subsidence Risk Assessment