NARRABRI MINE

EXTRACTION PLAN

LW 203 – LW 206

	NARRABRI MINE ENVIRONMENTAL MANAGEMENT SYSTEM	Document owner:	Environmental Superintendent
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WHC_PLN_NAR_EXTRACTION PLAN - LW 203 - LW 206

Prepared by:

Title	Name	Signature	Date
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Acronyms and abbreviations

Acronym	Description
µs/cm	microsiemens per centimetre
AoD	angle of draw
AIP	Aquifer Interference Policy
BCS	Biodiversity, Conservation & Science
BDAR	Biodiversity Development Assessment Report
CCC	Community Consultative Committee
CF	Cut and flit
CO_2-e	Carbon dioxide equivalent
Cwlth	Commonwealth
DAWE	Department of Agriculture, Water and the Environment
DCCEEW Water Group	Water Group within the NSW Department of Climate Change, Energy, the Environment and Water
DGS	Ditton Geotechnical Services Pty Ltd
DPE	NSW Department of Planning and Environment
DPHI	NSW Department of Planning, Housing and Infrastructure
EA	Environmental Assessment
EC	Electrical Conductivity
EIS	Environmental Impact Statement
EP 203-206	The Extraction Plan for LW 203 to LW 206
EP – BFMP	Extraction Plan – Buil Features Management Plan
EP - BMP	Extraction Plan – Biodiversity Management Plan
EP – HMP	Extraction Plan – Heritage Management Plan
EP - LMP	Extraction Plan – Land Management Plan
EP - WMP	Extraction Plan – Water Management Plan
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	Environmental Planning and Assessment Regulation 2021
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwlth)
EPL	environment protection licence under the POEO Act
GAB	Great Artesian Basin
GDE	Groundwater Dependant Ecosystem
GHG	Greenhouse Gases
GHGMP	Greenhouse Gas Management Plan
ha	hectare
IAPUM	Independent Advisory Panel for Underground Mining
IEA	Independent Environmental Audit

Acronym	Description
IEAPM	Independent Expert Advisory Panel for Mining
InSAR	Interferometric Synthetic Aperture Radar
km	kilometre
LiDAR	light detection and ranging
LW	longwall panel
m	metre
M^3	cubic metres
mg/L	milligram per litre
ML	mining lease
mm	millimetre
mm/m	millimetre per metre
MOD 5	Modification 5
MOD 7	Modification 7
Mt	million tonnes
Mtpa	million tonnes per annum
NCOPL	Narrabri Coal Operations Pty Ltd
NSW	New South Wales
PED	personal emergency device (communications system)
pH	Potential for Hydrogen
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
RAP	Registered Aboriginal Parties
ROM	run of mine
SoC	Statement of Commitments
SIS	Surface to In-Seam
S_{max}/T	Maximum subsidence prediction
SSGV	Site Specific Guideline Value
t	tonnes
TARP	trigger action response plan
TOC	Total Organic Carbon
TSS	Total Suspended Solids
U95%CL	upper 95 % confidence level
UIS	Underground to In-Seam
VWP	Vibrating wire piezometer
WAL	Water Access Licence
W/H	width to height (ratio)
WHC	Whitehaven Coal Limited
WSP	Water Sharing Plan

Executive Summary

The Narrabri Mine is an existing underground coal mining operation situated in the Gunnedah Coalfield. It is located approximately 25 kilometres south-east of Narrabri and approximately 60 km north-west of Gunnedah, within the Narrabri Shire Council Local Government Area in New South Wales. The Narrabri Mine includes an underground coal mine, a coal handling and preparation plant and associated rail siding and surface infrastructure.

The Project Approval (PA 08_0144) includes a series of conditions relating to the management of subsidence impacts and environmental consequences of underground coal mining. This includes the preparation and approval of a suite of management plans prior to the commencement of any longwall mining, generally referred to as second workings. The Extraction Plan for LW 203 to LW 206 has been prepared in accordance with Schedule 3 Condition 4 of the Project Approval and the NSW Department of Planning, Housing and Environment (formerly the NSW Department of Planning and Environment) *Extraction Plan Guideline* (DPE, 2022), as required under Schedule 6 Condition2.

This Extraction Plan has been prepared by a team of suitably qualified and experienced persons in accordance with the Project Approval Schedule 3 Condition 4(a). A draft (Revision A) of the Extraction Plan and all key sub-plans was submitted for consultation purposes on 8 November 2022.

The approved LW 203 to LW 206 are located south of the existing underground main headings. The four longwall panels will be between 2.89 km to 3.63 km long and extracted from south to north. The panel extraction sequence will occur from east to west. The longwall panels will cover depths ranging from 185 m to 330 m, with void widths ranging from 395.3 m to 402.8 m.

The predicted vs measured subsidence effects for LW 101 to LW 109 have been reviewed as part of the Mine Subsidence Assessment for LW 203 to LW 206 (DGS, 2022) to demonstrate the current robustness of the prediction model. The subsidence prediction model used for LW 101 to LW 105 had an estimated maximum subsidence of 2.44 m or 0.58T. Several prediction exceedances were observed above LW 101 to LW 103 that resulted in several updates to the model for LW 104 to LW 106 and LW 107 to LW 110.

Revised predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed second workings are provided in full in the Mine Subsidence Assessment Report (DGS, 2022), provided as an appendix to this Plan.

The Project Approval defines several subsidence impact performance measures for the management of natural and built features. Management measures have been developed to manage any subsidence effects and ensure the appropriate remediation and rehabilitation is conducted in response to subsidence impacts. Each key sub plan includes additional management measures to address residual environmental consequences associated with the secondary workings within the Extraction Plan Area, along with a Trigger Action Response Plan to ensure compliance with the relevant performance measures. The Subsidence Monitoring Program provides the objectives and the proposed monitoring program for monitoring subsidence impacts to natural and build features, provided as an appendix to this Plan.

The Extraction Plan for LW 203 to LW 206 also includes information pertaining to incidents, complaints, notification to agencies, plan review and roles and responsibilities.

Table of contents

Tables

Figures

1. Introduction

1.1 Background

The Narrabri Mine is an existing underground coal mining operation situated in the Gunnedah Coalfield. It is located approximately 25 kilometres (**km**) south-east of Narrabri and approximately 60 km north-west of Gunnedah, within the Narrabri Shire Council Local Government Area in NSW (Figure 1-1). The Narrabri Mine includes an underground coal mine, a coal handling and preparation plant and associated rail siding and surface infrastructure.

The Narrabri Mine is operated by Narrabri Coal Operations Pty Ltd (**NCOPL**), on behalf of the Narrabri Mine Joint Venture, which consists of Whitehaven Coal Limited (**WHC**) wholly owned subsidiaries Narrabri Coal Pty Ltd (NCPL) (70 per cent [%]) and Narrabri Coal Australia Pty Ltd (7.5%), Upper Horn Investments (Australia) Pty Ltd (7.5%), J-Power Australia Pty Limited (7.5%), Posco International Narrabri Investment Pty Ltd (5%) and Kores Narrabri Pty Limited (2.5%). The underground mine is covered by Mining Lease (**ML**) 1609 across an area of 5,298 hectares (ha) for the predominant purpose of mining for coal from the Hoskissons Coal Seam.

Stage 1 of the Narrabri Mine was approved in November 2007 under Part 3A of the *Environmental Planning and Assessment Act 1979* (**EP&A Act**). Construction of the mine and supporting infrastructure commenced in 2008, with production using a continuous miner commencing in 2010. Following the approval of the Stage 2 Environmental Assessment (R.W Corkery & Co., 2009) (the **EA**) and the issue of the Stage 2 Project Approval 08_0144 (**Project Approval**) in July 2010, and *Environmental Protection and Biodiversity Conservation Act 1999* (**EPBC Act**) approval (**2009/5003**) in January 2011, the Narrabri Mine was converted to an 8 million tonnes per annum (**Mtpa**) run of mine (**ROM**) longwall mining operation, which commenced in 2012.

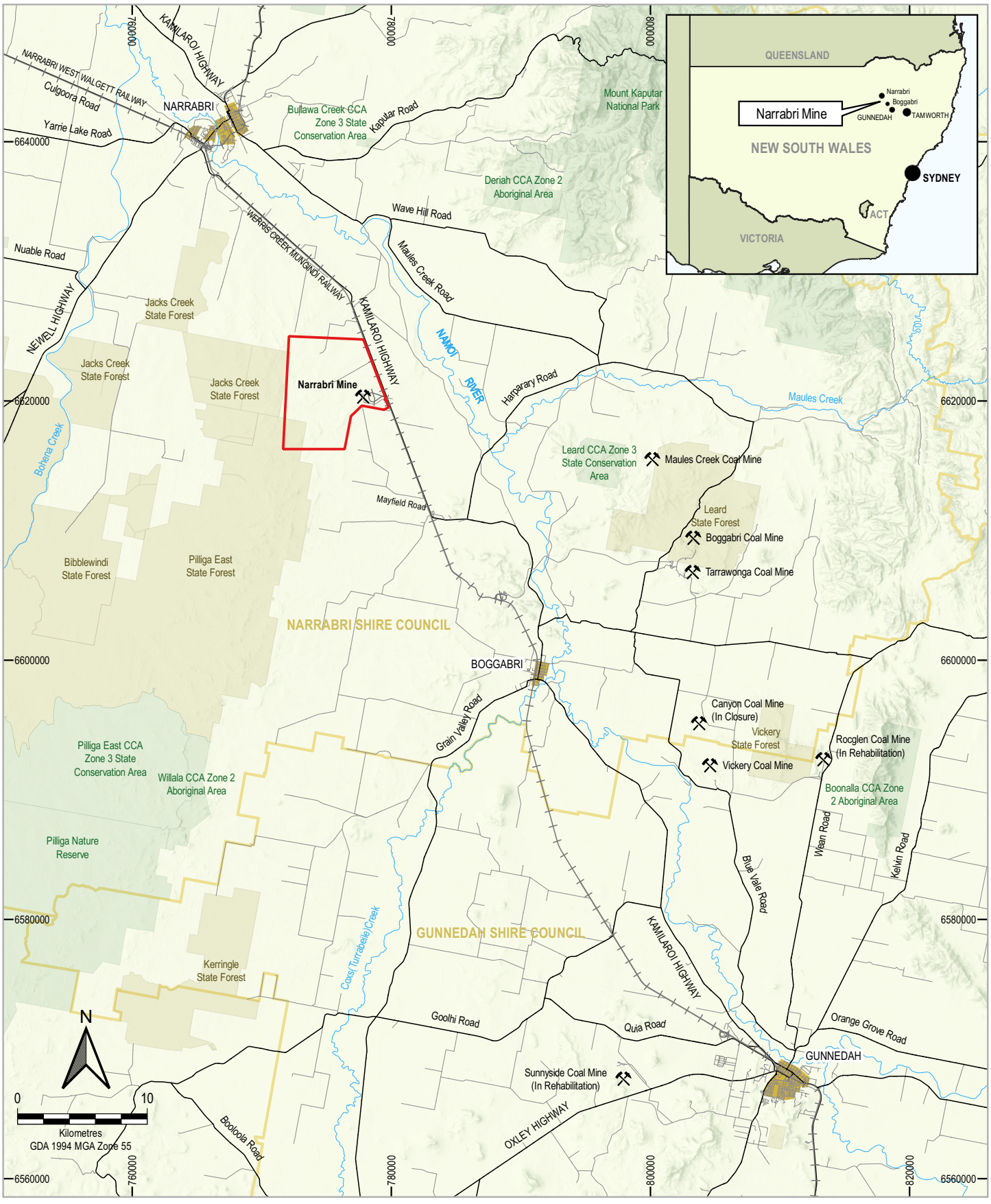
The Project Approval has subsequently been modified on a number of occasions. The environmental assessment for Modification 5 (Resource Strategies, 2015) (**MOD 5**), approved in December 2015, changed the mine geometry by reducing the number of longwall (**LW**) panels from 26 to 20, increased some LW panel widths and increased the production to 11 Mtpa of ROM coal until July 2031.

Modification 7, the most recent modification of the Project Approval, was approved on 23 November 2021. The environmental assessment for Modification 7 (Resource Strategies, 2021) (**MOD 7**) describes the change in mining method within the extent of the previously approved LW 201 and LW 202 and allows for up to 0.7 Mtpa via bord and pillar extraction at pillar reduction panels Cut and Flit (**CF**) 201 to CF 205. There is no change to the previously approved longwall panels LW 203 to LW 209. The bord and pillar mining will occur concurrently with existing longwall operations for a period of approximately five years, with the maximum ROM coal production rate remaining within the approved limit of 11 Mtpa.

Table 1-1 summarises the Project Approvals and associated modifications for the Narrabri Mine issued under the EP&A Act.

Table 1-1 Summary of Project Approvals and associated modifications

Approval	Details	Approval date
PA 05_0102	Stage 1 of the Narrabri Mine was approved under Part 3A of the EP&A Act. Stage 1 included site establishment and the construction of coal processing infrastructure, with production using continuous miner mining methods up to 2.5 Mtpa.	November 2007
PA 08_0144	Determination of the Stage 2 EA and the Narrabri Mine converted to a longwall mining operation. Increase in ROM coal production to 8.0 Mtpa. PA 05_0102 was surrendered.	July 2010
MOD 1	Updates to subsidence management conditions.	March 2011
MOD 2	Allowed for a one-off road transport of coal to WHC's Tarrawonga Coal Mine.	December 2011
MOD 3	Emergency road transport of coal (application withdrawn).	N/A
MOD 4	Extension of ROM and product coal stockpiles.	September 2015
MOD 5	Reduced the number of longwall panels from 26 to 20; increased the longwall panel widths for LW 107 to LW 120 from approximately 295 m to approximately 400 m; extended the western footprint approximately 60 m; and increased the maximum ROM coal processing rate from 8 Mtpa to 11 Mtpa.	December 2015
MOD 6	Administrative modification, aligning the reporting period of the Annual Review to a calendar reporting period.	January 2017
MOD 7	Change in mining method within the extent of the previously approved LW 201 and LW 202 and allows for up to 0.7 Mtpa via bord and pillar extraction at pillar reduction panels CF 201 to CF 205.	November 2021



Source: Geoscience Australia (2011); NSW Spatial Services (2019)

LEGEND

- NSW Major Operating Mines
- Mining Lease (ML 1609)
- Local Government Boundary
- State Forests
- State Conservation Area, Aboriginal Area

ONWARD CONSULTING

NARRABRI COAL MINE

Figure 1-1 Narrabri Mine Regional Location

1.2 Purpose and scope

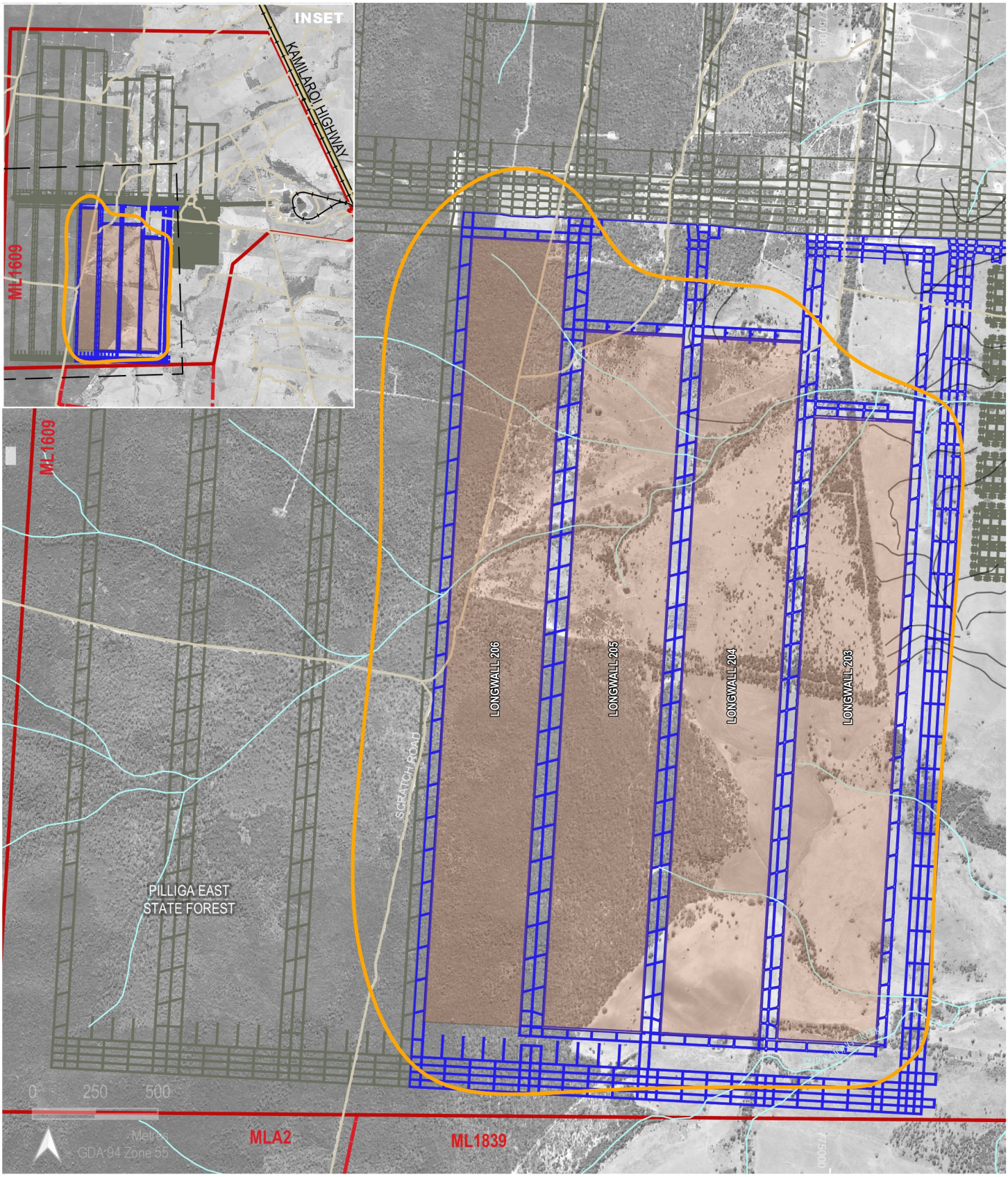
The Project Approval includes a series of conditions relating to the management of subsidence impacts and environmental consequences of underground coal mining. This includes the preparation and approval of a suite of management plans prior to the commencement of any longwall mining, generally referred to as second workings. Specifically, Schedule 3 Condition 4 of the Project Approval states that NCOPL must prepare and implement Extraction Plans for any second workings to be mined to the satisfaction of the Secretary.

The Extraction Plan for LW 203 to LW 206 (**EP 203-206** or **Plan**) has been prepared in accordance with Schedule 3 Condition 4 of the Project Approval and the NSW Department of Planning, Housing and Environment (**DPHI**) (formerly the NSW Department of Planning and Environment [**DPE**]) *Extraction Plan Guideline* (**Extraction Plan Guideline**) (DPE, 2022), as required under Schedule 6 Condition2.

As stated in the Extraction Plan Guideline, the purpose of the EP 203-206, together with the associated sub-plans listed in section 1.3, is to manage subsidence associated with the extraction of coal from LW 203 to LW 206 (herein referred to as the **Extraction Plan Area**[1]) (Figure 1-2).

The Ditton Geotechnical Services Pty Ltd (**DGS**) Mine Subsidence Assessment Report for LW 203 to LW 206 (DGS, 2022) (**Mine Subsidence Assessment Report**) has been used as a basis for developing the performance measures and management actions in response to the predicted subsidence impacts on natural and built features within the Extraction Plan Area.

[1] The area located within the 45° Angle of Draw (AoD) as shown on Figure 1-2.



WHITEHAVEN COAL

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LEGEND

- ML1609
- ML1839
- MLA2
- Underground mining layout
- Longwalls 203 to 206
- Proposed longwall voids (LW203-206)
- 45 degree angle of draw
- Road
- Watercourse
- Contour bank

NARRABRI MINE

FIGURE 1-2

Extraction Plan Area and Underground Mining Layout for LW 203 to LW 206

1.3 Plan structure

This EP 203-206 forms part of Narrabri Mine's Environmental Management System, which includes the full suite of environmental management plans related to the operation and management of the Narrabri Mine. This Plan provides an overview of the proposed mine plan, predicted subsidence and resulting environmental consequences. This Plan also provides an overview of the proposed monitoring and management measures, which are provided in detail in the relevant sub plans. In summary, this document includes the following information:

- Section 1 - Provides the background to the Narrabri Mine, including a summary of the various Project Approvals and modifications, the scope and structure of the Plan, and a description of the supporting figures required under the Extraction Plan Guideline.
- Section 2 - Summarises the relevant statutory requirements for the preparation of this Plan and the processes taken by NCOPL in its development including consultation with the relevant agencies and key stakeholders, detail on the independent consultants engaged to prepare the Plan and any supporting specialist assessments. In addition, this section includes a review of previous subsidence predictions and previous and current risk assessments conducted to assist in the development of this Plan.
- Section 3 - Summarises the results of recent subsidence assessment and outlines the predicted environmental consequences.
- Section 4 - Outlines the subsidence and environmental monitoring program to be implemented to support the predicted subsidence impacts and environmental consequences.
- Section 5 - Covers the requirements for management, mitigation, remediation, and reporting. It includes:
  - an outline of the performance measures, management and remediation activities that are proposed to mitigate predicted subsidence impacts and confirm that subsidence and its consequences are within the predicted ranges;
  - the proposed contingency response in the event that subsidence impacts exceed (or are considered likely to exceed) the adopted performance measures; and
  - details of the protocols surrounding incident and non-compliance investigation and notification, complaint management, reporting, and auditing respectively.
- Section 6 - Details the review of other management plans as well as the review and evaluation period for this Plan along with improvement measures, access to information and the responsibilities of NCOPL personnel under this EP 203-206.
- Sections 7, 8 and 9 - Provide respectively the references, glossary of terms and review history of this Plan.

The Extraction Plan also consists of a number of sub-plans and other documentation as summarised below:

- Attachment 1 - Master Trigger Action Response Plan (**TARP**)
- Appendix A - Water Management Plan
- Appendix B - Land Management Plan
- Appendix C - Biodiversity Management Plan
- Appendix D - Heritage Management Plan

- Appendix E - Built Features Management Plan
- Appendix F - Public Safety Management Plan
- Appendix G - Coal Resource Recovery Plan
- Appendix H - Plans 1-7
- Appendix I - Subsidence Risk Assessment
- Appendix J - Mine Subsidence Assessment Report
- Appendix K - Subsidence Monitoring Program

1.4 Plans of the approved development

As required by the Extraction Plan Guideline, the information contained within this Plan is supported by and presented in a series of detailed figures. These figures are presented in Appendix H (A0 format). The figures include the following information:

- 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.
- Plan 8 - Aerial image including existing and proposed workings.

2. Plan development and consultation

2.1 Statutory requirements

2.1.1 Project Approval

As previously stated in section 1.2, this Plan has been developed in accordance with Schedule 3 Condition 4 of the Project Approval which requires NCOPL to prepare an Extraction Plan for all second workings within the area of the Approved Mine Plan (Appendix H) to the satisfaction of the Secretary.

Project Approval Schedule 6 Condition 2 lists the requirements for the preparation of management plans which must be prepared in accordance with any relevant guidelines (section 1.2) and include details of the relevant approval, licence, or lease conditions. Attachment 2, Table A2-1 provides a summary of the Project Approval conditions relevant to this Plan and outlines the section of the EP 203-206 in which each of these conditions have been addressed.

In accordance with Schedule 3 Condition 4(b) of the Project Approval, this EP 203-206 must be approved by the Secretary prior to NCOPL carrying out any second workings under this Plan. In accordance with Schedule 3 Condition 4(a) of the Project Approval, the EP 203-206 must be prepared by a team of suitably qualified and experienced persons whose appointment has been endorsed by the Secretary (section 2.2.1 and Attachment 3).

2.1.2 Statement of Commitments

The Statement of Commitments (**SoCs**) for site operations and management is contained as Appendix 3 to the Project Approval, combining all revised environmental commitments from the EA, dated May 2010. Table A2-2 in Attachment 2 details the SoCs relating to subsidence with a cross reference to where these SoCs have been addressed.

2.1.3 EPBC Act approval

The Narrabri Mine is subject to EPBC 2009/5003 issued under the EPBC Act. Approval Condition 2 of EPBC 2009/5003 requires the development and implementation of an Extraction Plan according to the NSW Secretary's Assessment Report and approval conditions.

In accordance with Condition 3 of EPBC 2009/5003, a copy of the Extraction Plan will be provided to the Commonwealth Department of Climate Change, Energy, the Environment and Water (formerly the Commonwealth Department of Agriculture, Water and Environment), once approved.

Table A2-3 in Attachment 2 details the condition, along with a cross reference to where this condition has been addressed.

2.1.4 Mining lease

NCOPL are the holder of ML 1609 (issued in January 2008 and varied 19 August 2022).

2.1.5 Environment Protection Licence

'Coal works' and 'Mining for coal' are scheduled activities listed in Schedule 1 of the NSW *Protection of the Environment Operations Act 1997* (**POEO Act**). Under Section 48 of this Act, all premise-based scheduled activities are required to hold an Environment Protection Licence (**EPL**). EPL 12789 is held for coal works and mining for coal to >5 tonne annual handling capacity and more than 5 tonne annual production capacity. There are no conditions in EPL 12789 that apply specifically to the Extraction Plan or any of the sub-plans. The EPL conditions and requirements predominantly relate to the suite of environmental management plans required under Schedule 4 of the Project Approval, including but not limited to the management of noise, soil and water, air quality, heritage, waste, transport, and visual amenity. These management plans do not form part of this Plan.

2.1.6 Coal Mine Subsidence Compensation Act 2017

The NSW *Coal Mine Subsidence Compensation Act 2017* provides for a fair, efficient and sustainable compensation framework for dealing with the impacts of coal mine subsidence. The object of the Act is to provide a scheme for the provision of compensation for damage caused by subsidence resulting from coal mine operations, and the assessment and management of risks associated with subsidence resulting from coal mine operations.

Compensation required under Schedule 3 Condition 2 of the Project Approval includes any compensation payable under this Act.

2.1.7 Work health and safety legislation

This Plan has been developed to comply with the NSW work health and safety legislation including but not limited to:

- *Work Health and Safety Act 2011*;
- Work Health and Safety Regulation 2017;
- *Work Health and Safety (Mines and Petroleum Sites) Act 2013*; and
- Work Health and Safety (Mines and Petroleum Sites) Regulation 2022.

2.2 Specialist assessments

2.2.1 Consultant suitability and endorsement

In accordance with Schedule 3 Condition 4(a), the EP 203-206 was prepared by a team of suitably qualified and experienced persons whose appointment has been endorsed by the Secretary (Attachment 3). Table 2-1 details the suitably qualified and experienced persons and their relevant experience. The appropriate signatures are provided at the beginning of this Plan and within each key sub plan as part of the document completion process.

Table 2-1 Extraction Plan development team

Company	Key personnel	Qualifications	Years of experience	Tasks
Onward Consulting	Mike Gale	Bachelor of Engineering (Environmental) (Hons) (UON)	20	Preparation of the main Extraction Plan document and non-specialist management and monitoring plans including: • Coal Resource Recovery Plan Management of other specialist consultants to prepare management plans.
	Servaes van der Meulen	Master of Science (Env. Tech) (WUR, The Netherlands)	25	
	Linden Burch	• Bachelor of Natural Resources (Hons1) / Bachelor of Urban and Regional Planning (UNE) • Graduate Diploma in Rural Science (UNE) • Master of Science in Agriculture (UNE) (In Prep)	5	Preparation of the main Extraction Plan document and non-specialist management and monitoring plans including: • Biodiversity Management Plan • Built Features Management Plan • Land Management Plan • Public Safety Management Plan • Subsidence Monitoring Program
	Carmen Osborne	• Bachelor of Applied Science (QUT) • Master of Environmental Management and Sustainability (UON)	9	
Ditton Geotechnical Services	Steven Ditton	Bachelor of Engineering (Civil/Hons), 1990 (UNSW)	30+	Subsidence predictions for LW 203-LW 206 and proposed monitoring.
Australasian Groundwater and Environmental Consultants (AGE)	Keith Phillipson	• Bachelor of Science (Geography) with Honours, University of Bristol, UK • Master of Science (Water Resource Systems Engineering), University of Newcastle, UK	25+	Extraction Plan - Water Management Plan (groundwater).
	Pieter Labuschagne	• MSc in Hydrogeology (Cum Laude) • BSc Honours in Hydrogeology and Hydrology • Master of Environmental	20+	

Company	Key personnel	Qualifications	Years of experience	Tasks
		Management • Bachelor in Geography and Business Economics, University of the Free State, South Africa.		
ATC Williams	Anthony Marszalek	• Master of Engineering Science (UQ) • Bachelor of Engineering (Civil) (Hons 1) (UQ)	35	Extraction Plan - Water Management Plan (surface water).
	Dr Camilla West	• PhD Environmental Engineering, (UQ) • Bachelor of Environmental Science (Hons), (GU)	16	
	Lee Rigley	• Bachelor of Environmental Engineering (Hons), (UQ) • Master of Engineering Studies, (UQ)	24	
	Kimberley McNamara	BEng (Agriculture) (Hons)	13	
Whincop Archaeology	Dr Matthew Whincop	• Doctor of Philosophy (PhD) Archaeology • Master of Arts (UMelb) Archaeology (Hons 1) • Bachelor of Arts (B.A.) Classics and Archaeology (Hons 1)	12	Extraction Plan - Heritage Management Plan.

2.2.2 Review of previous subsidence predictions

As described in the Mine Subsidence Assessment Report, the predicted vs measured subsidence effects for LW 101 to LW 109 have been reviewed as part of the Mine Subsidence Assessment for LW 203 to LW 206 (DGS, 2022) to demonstrate the current robustness of the prediction model. The subsidence prediction model used for LW 101 to LW 105 had an estimated maximum subsidence of 2.44 m or 0.58T. Several prediction exceedances were observed above LW 101 to LW 103 that resulted in several updates to the model for LW 104 to LW 106 and LW 107 to LW 110.

The changes were made to ensure the actual Upper 95% Confidence Limits (**U95%CLs**) of the predictions were consistent with the statistical definitions. In regard to the maximum subsidence predictions, the following changes were made to the original model:

- Single maximum S_{max}/T has been increased from 0.58 to 0.60.

- First maximum S_{max}/T has been increased from 0.58 to 0.63.
- Final maximum S_{max}/T has been increased from 0.58 to 0.64.

The results from review work indicate that the measured maximum subsidence effect values have been increasing as mining has progressed. This is especially apparent as the wider longwalls were introduced after LW 101 to LW 106 with several significant strain, angle of draw and crack width prediction exceedances above LW 107 to LW 109.

The outcome of the review work was that it was considered necessary to update the maximum subsidence, curvature, strain and angle of draw models for future mining areas to the south (i.e. LW 203 to LW 206). The latest version of the model developed for the LW 203 to LW 206 assessment includes adjustments made where considered necessary as presented in Appendix J.

2.3 Risk assessment

A subsidence risk assessment has been undertaken to identify the risks associated with subsidence at the Narrabri Mine. It builds on previous risk assessments completed for LW 101 to LW 110 and Panels 201 to 202 and is presented as Appendix I. The updated risk assessment for LW 203 to LW 206 assessed all risks identified within the Extraction Plan Area as either low or moderate.

The potential subsidence impacts and environmental consequences are summarised in section 3 and detailed within each key sub plan.

2.4 Preparation and consultation

In accordance with the Project Approval Schedule 3 Condition 4(h), the Water Management Plan (Appendix A), Land Management Plan (Appendix B), Biodiversity Management Plan (Appendix C), and Heritage Management Plan (Appendix D) have been prepared in consultation with one or more NSW Government departments and/or agencies. The Built Features Management Plan (Appendix E) has been prepared following consultation with the owner/s of potentially affected features. Remaining sub plans, including the Public Safety Management Plan (Appendix F), Coal Resource Recovery Plan (Appendix G), and the Subsidence Monitoring Program (Appendix K) do not require specific consultation with Government departments and/or agencies, as per Schedule 3 Condition 4(g) of the Project Approval. Applicable consultation records and comment reconciliation tables are provided in each sub-plan to this EP 203-206, where relevant.

A draft (Revision A) of the Extraction Plan and sub plans was submitted for consultation on 8 November 2022 to the respective NSW Government departments and/or agencies. NCOPL also held briefing sessions with the Independent Advisory Panel for Underground Mining (**IAPUM**) on 30 November 2022 (Attachment 3 provides evidence of this consultation with a cross reference table [Table A3-1] in response to the Request for Information dated 16 December 2022) and the Resources Regulator on 2 December 2022 (Attachment 3 of this Plan provides evidence of the consultation process). There were no specific actions required by the Resources Regulator to update the EP 203-206 or sub plans following the briefing session on 2 December 2022.

The EP 203-206 (Revision 0) was submitted to DPE for approval on 13 February 2023. NCOPL received post submission recommendations from the Independent Expert Advisory Panel for Mining (IEAPM [formerly IAPUM]) on 14 February 2023 and 30 March 2023 and from DPE Water on 30 March 2023, 7 September 2023 and 17 November 2023.

Due to the timeframe required for NCOPL to adequately respond to the post submission recommendations from IEAPM and DPE Water, and to prevent a discontinuation of mining, NCOPL submitted a request to obtain progressive approval in accordance with Schedule 2 Condition 11 of the Project Approval. NCOPL received progressive approval from DPE (now DPHI) on 7 May 2023 to continue mining in LW 203 only subject to conditions.

Table 2-2 provides further detail describing how the conditions of the progressive approval have been met, relevant to this revision of the EP 203-206.

Table 2-2 Progressive approval conditions

	Progressive approval condition	Condition addressed by
1	Prior to commencing secondary extraction in LW 203, Narrabri Coal must update section 6.2.4 of the extraction plan to remove the rainfall trigger (Panel conclusion 4(v)) and remove section 5.3 and Appendix J (greenhouse gas emissions management) (Panel conclusion 5(i)).	Revision 0A of the Extraction Plan LW 203-206 and Revision 0A of the Extraction Plan (EP 203-206) – Water Management Plan submitted to DPHI on 9 May 2023 (MP08_0144-PA-48).
2	Within 3 months of this approval, apart from the installation of additional monitoring bores (Panel recommendation 6(ii)), Narrabri Coal must provide a detailed response to the Panel and DPE Water recommendations in relation to groundwater, surface water and groundwater dependent ecosystems.	Letter titled '*Narrabri Underground Mine Stage 2 Project – Condition 2 of Progressive Approval of Extraction Plan LW 203 - LW206'* dated 7 August 2023. The detailed responses are also provided in Attachment 4 of this Plan.
3	Within 6 months of this approval, Narrabri Coal must provide a detailed response to the Panel's recommendations in relation to Aboriginal heritage.	Letter titled '*Narrabri Underground Mine Stage 2 Project – Condition 3 of Progressive Approval of Extraction Plan LW 203 - LW 206'* dated 30 November 2023 and the Extraction Plan (EP 203-206) – Heritage Management Plan (Appendix D of this Plan). A detailed response is also provided in Attachment 4 of this Plan.
4	Within 6 months of this approval, Narrabri Coal must install and commission the additional monitoring bores (Panel recommendation 6(ii)).	NCOPL installed and commissioned the additional monitoring bores outlined in Attachment 1 of the letter titled '*Narrabri Underground Mine Stage 2 Project – Condition 4 of Progressive Approval of Extraction Plan LW 203 - LW 206'* dated 28 November 2023.
5	Narrabri Coal must submit a revised Greenhouse Gas Minimisation Plan, including consideration of the Panel's recommendations, prior to 30 June 2023.	The Greenhouse Gas Minimisation Plan (Revision 2A) was submitted via the Major Projects portal on 6 July 2023. Revision 2B was approved by DPE on 21 December 2023.
6	At least three months prior to the commencement of secondary extraction in LW 204, Narrabri Coal must provide a revised extraction plan that consolidates responses to the Panel and DPE Water recommendations.	This Plan (EP 203-206 Revision 0C).

	Progressive approval condition	Condition addressed by
7	Condition 22 Schedule 4 of the Stage 2 project approval (MP08_0144) applies to grinding groove site Mayfield GG1 – that is "the Proponent shall not destroy, damage or deface any known Aboriginal objects (as defined in the National Parks and Wildlife Act 1974) without the written approval of the Secretary." To be clear, the approval of this extraction plan does not constitute approval under Condition 22 Schedule 4 in relation to site Mayfield GG1.	Extraction Plan (EP 203-206) – Heritage Management Plan (Appendix D of this Plan).

Revision 0B of EP 203-206 was revised in accordance with Condition 6 of the progressive approval to consolidate responses to IEAPM and DPE Water (now DCCEEW Water Group) recommendations and was submitted to the DPHI on 1 October 2024.

On 19 November 2024 and 5 December 2024, NCOPL received information requests from DCCEEW Water group and IEAPM, respectively, regarding revision 0B. Revision 0C of EP 203-206 (this Plan) has been revised based on these additional requests.

Attachment 4 of the EP 203-206 provides cross referencing tables detailing the section of the EP 203-206 or it's sub-plans where each of IEAPM and DCCEEW Water group recommendations have been addressed.

The Extraction Plan Guideline also prescribe consultation with other key stakeholders, such as the owners and/or operators of both publicly and privately-owned land and infrastructure, and with the community through the mine's Community Consultative Committee (**CCC**). Considering the Extraction Plan Area encompasses land exclusively owned by NCOPL, there are no other public or private landholders that need to be consulted.

3. Subsidence assessment

3.1 Description of underground mining

The approved LW 203 to LW 206 are located south of the existing underground main headings. The four longwall panels will be between 2.89 km to 3.63 km long and extracted from south to north. The panel extraction sequence will occur from east to west. The cover depths over the proposed longwall panels will range from 185 m to 330 m, with void widths[2] ranging from 395.3 m to 402.8 m.

Three heading gate-roads are planned to be formed between LW 203 and LW 206 with two rows of diamond-shaped chain pillars with an acute rib-rib angle of 70º. The pillars will have minimum 'solid' widths ranging from 29.4 m to 39.5 m with lengths of 144.3 m. The distance between the pillar reduction panels to the east of the proposed longwall panels will be 266 m where the cover depth is 200 m. Gate roads will be approximately 3.7 m high and 5.4 m wide. Main headings roadways will be approximately 5.4 m or 6.0 m, wide depending on operational requirements.

The proposed chain pillar geometries[3] will be squat with width to height ratios (**w/h**) ranging from 7.9 to 10.7. The W/H at the centre of the panels would range from 1.27 to 2.01, indicating supercritical subsidence behaviour. The end-of-panel barriers for LW 203 to LW 206 will be effectively 159 m at the starting ends and range from 103 m to 770 m wide at the finishing ends. The barriers are designed to protect the main headings from abutment loading conditions adjacent to the longwall goaf. The finishing end barriers for LW 203 to LW 205 are significantly wider than LW 206 due to geological structure.

3.2 Subsidence predictions

In accordance with Schedule 3 Condition 4(e) of the Project Approval, revised predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed second workings are provided in the Mine Subsidence Assessment Report, presented in full in Appendix J.

The Mine Subsidence Assessment Report has been used as a basis for developing the performance measures and management actions in response to the predicted impacts from subsidence within the Extraction Plan Area, and provides an assessment on the following:

- Pre-mining condition of natural surface features and existing development within the Extraction Plan Area.
- Overview of the local landscape (including geomorphology and geology).
- Predicted mine subsidence effects for the proposed mining areas, based on measured subsidence data for LW 101 to LW 109.
- Predicted impacts on:
  - surface features (e.g. cracking, heaving, ponding, gradient changes and erosion/sedimentation);
  - natural features (e.g. topography, creek beds/banks, steep slopes);
  - built features (e.g. dwellings, buildings, farm dams, powerlines, roads, fences, contour banks and other rural infrastructure);
  - Aboriginal heritage (e.g. grinding groves); and

[2] Width is inclusive of the nominal gate road width of 5.4 m.

[3] Pillar geometries are expressed as lower case 'w' for width and 'h' for height, whereas upper case 'W' and 'H' refer to panel void width and cover depth.

  - water supply and groundwater (e.g. casing and screens), and
- Impact remediation and adaptative management strategies to limit the long-term degradation of the environment.

The main findings and conclusions are provided within the each of the relevant sub plans (Appendix A to Appendix F).

3.3 Potential environmental consequences

The environmental consequences of subsidence effects on natural and built features are detailed within each of the relevant sub plans (Appendix A to Appendix F).

4. Subsidence monitoring and management

4.1 Subsidence monitoring program

The Subsidence Monitoring Program presented as Appendix K to this Plan provides the objectives and the proposed subsidence monitoring program. The Subsidence Monitoring Program is a collation of the monitoring programs documented in each relevant sub plan which include detailed information including:

- detailed performance measures and indicators;
- monitoring methods, parameters, location, timing, and frequency;
- proposed procedures to record and report on the monitoring results; and
- the capacity of the program to detect early warning of deviations from the performance measures and associated performance indicators.

Key features requiring monitoring are detailed within the following sub plans:

- Surface water flows and quality - Water Management Plan (Appendix A);
- Groundwater flows and quality - Water Management Plan (Appendix A);
- Landforms - Land Management Plan (Appendix B);
- Biodiversity - Biodiversity Management Plan (Appendix C);
- Heritage features - Heritage Management Plan (Appendix D); and
- Infrastructure and other built features - Built Features Management Plan (Appendix E) and Public Safety Management Plan (Appendix F).

4.2 Baseline data

Light detection and ranging (**LiDAR**) data has been collected over the Narrabri approved mining area and used to identify the extent of steep slopes and cliffs and subsidence contours for all previously extracted longwalls to-date. The measured subsidence contours were derived from the December 2019 and December 2020 LiDAR level surveys.

Subsidence monitoring lines have been installed above LW 101 to LW 109 and have been used to calibrate the subsidence model for the Extraction Plan Area. The subsidence lines consist of star pickets driven to refusal at 10 m spacing. The star pickets are surveyed using total station with static point control before and after mining effects. The surveys to-date indicate systematic errors between surveys ranging from -20 millimetres (**mm**) to +45 mm, which are mainly due to seasonal clayey soil moisture changes.

Ground truthing of the LiDAR-based subsidence contours was conducted from the survey lines. Observed surface cracking was recorded with GPS and plotted to obtain baseline data for the LW 203 to LW 206 prediction model. Surface monitoring to-date has been conducted in relatively cleared grazing areas above the eastern portion of the Narrabri Mine. Future mining will be extended below natural woodland areas that would require clearing to install survey monitoring lines over LW 206.

A transverse subsidence line across the longwall panels is proposed to be installed along an existing access track above LW 203 to LW 205. The line will be installed into the next adjacent longwall before mining occurs and will be discontinued in areas where movement has ceased. It is also proposed to install a longitudinal line extending in-bye and out-bye from the longwall panel starting points where it is feasible (i.e. does not require

clearing of native vegetation) for a minimum distance equal to the cover depth, both at starting and finishing points. Plan 7 of Appendix H details the location of the proposed survey lines.

Where the longitudinal lines cannot be installed due to native vegetation clearing restrictions, the lines will be monitored via remote sensing only.

Visual inspections and mapping of surface impacts will continue to be conducted before and after each longwall is extracted. Non-conventional monitoring techniques such as cliff line reflectometry and/or drone surveys of minor cliff faces and crack location detection above the woodland areas may be implemented as required.

The proposed Subsidence Monitoring Program (Appendix K) has been designed to collect sufficient baseline data for future Extraction Plans.

5. Management, mitigation, remediation and reporting measures

5.1 Performance measures and indicators

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 key sub plans.

The performance measures listed under Schedule 3 Condition 1 and Condition 2 of the Project Approval 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.

The performance measures listed above are documented in the relevant sub plans along with applicable performance indicators and any additional performance measures and indicators as defined by NCOPL.

5.2 Subsidence management measures

In accordance with Schedule 2 Condition 1 of the Project Approval, NCOPL will implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation activities at the Narrabri Mine.

Management measures have been developed to mitigate subsidence effects and manage any subsidence impacts. NCOPL will ensure the appropriate remediation and rehabilitation is conducted in response to subsidence impacts.

The relevant sub plans include specific management measures to address the environmental consequences associated with second workings within the Extraction Plan Area, including measures for surface cracking, sub-surface cracking, steep slopes, erosion, valley closure and uplift, and ponding.

5.3 Trigger Action Response Plan

Each key sub plan includes a TARP to ensure compliance with the relevant performance measures under the Project Approval and specific performance measures set by NCOPL. Each TARP is presented in table form and includes:

- relevant performance measures and performance indicators;
- multilevel triggers;
- containment and remediation measures; and

- actions that will be implemented in response to any triggers (including adaptive management measures).

The TARPs specific to each key sub plan are presented in Attachment 1 (Table A1-1 to Table A1-6).

5.4 Adaptive management

NCOPL will implement the following adaptive management strategies for the Extraction Plan Area:

- Ongoing review of predicted subsidence impacts against observed impacts.
- Conservative longwall setback distances in lieu of uncertain monitoring data outcomes.
- Ongoing crack mapping to improve predictions for cracking areas above future longwalls.

5.5 Contingency planning

In the event that a non-compliance against a specific performance measure has occurred, or is likely to occur, NCOPL will:

- Report the non-compliance as soon as practicable to the relevant agencies in accordance with section 5.6.
- Identify and implement an appropriate course of action with respect to the non-compliance in consultation with a suitably qualified person/s and the relevant Government agencies.
- Review the effectiveness of the relevant management measures in accordance with section 6.1.

5.6 Incidents, complaints, exceedances and non-compliances

5.6.1 Incident notification

An incident is defined under the Project Approval as *a set of circumstances that causes or threatens to cause material harm, and/or breaches or exceeds the limits of performance measures/criteria*. Material harm to the environment is defined under the Project Approval as *involving actual or potential harm to the health or safety of human beings or to the environment that is not trivial.* This definition excludes “harm” that is authorised under the Project Approval or any other statutory approval (e.g. EPL).

In the event of any exceedance of the performance criteria, NCOPL will advise the Secretary and any other relevant agencies as soon as practicable after becoming aware of the incident, in accordance with Schedule 6 Condition 4. Within 7 days of the event, NCOPL will also provide the Secretary and any relevant agencies a detailed report which will:

- describe the date, time and nature of the exceedance/incident;
- identify the cause (or likely cause) of the exceedance/incident;
- describe what action has been taken to date; and
- describe the proposed measures to address the exceedance/incident.

Notifications to the NSW Environment Protection Authority will be made by contacting the Environment Line on 131 555 and written details of the notification will be provided within 7 days of the date on which the incident occurred.

Incident reporting and emergency response is further described in NCOPLs Environmental Management Strategy.

5.6.2 Non-compliance notification

In accordance with Schedule 6 Condition 2, where a non-compliance with a statutory requirement/s or an exceedance of the relevant criteria or performance measures has occurred, NCOPL will, at the earliest opportunity, take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur. Once this has been achieved, all reasonable and feasible options for remediation (where relevant) will be considered.

In accordance with Schedule 6 Condition 4, within seven days of becoming aware of a non-compliance, NCOPL will notify DPHI of the non-compliance[4]. The notification will be made in writing via the Major Projects website and identify the development (including the development application number and name), set out the condition or requirement that the development is non-compliant with, why it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance.

NCOPL will implement any reasonable remediation measures as directed by the Secretary, to the satisfaction of the Secretary.

5.6.3 Complaints management

Any complaints received in relation to Extraction Plan Area will be managed in accordance with the complaints management protocol as follows:

- Publicly advertised telephone complaints line, 1800WHAVEN, will be in place to receive complaints.
- Each complaint received will be recorded in a Complaints Register, which will include the following details:
  - date and time of complaint;
  - method by which a complaint was made;
  - personal details the complainant wishes to provide or, if no such details are provided, a note to that effect;
  - nature of the incident that led to the complaint;
  - action taken by NCOPL in relation to the complaint (i.e., any required remedial actions), including any follow-up contact with the complainant; and
  - if no action was taken, the reason why no action was taken.
- The Environmental Superintendent will be responsible for ensuring that an initial response is provided within 24 hours of receipt of a complaint (except in the event of complaints recorded when the mine is not operational or outside of usual business hours).
- Once the identified measures are undertaken, the Environmental Superintendent will sign off on the relevant complaint within the Complaints Register.

[4] A non-compliance which has been notified as an incident under section 5.7.1 does not need to also be notified as a non-compliance under section 5.7.2.

- If necessary, follow-up monitoring will take place to confirm the source of the complaint is adequately mitigated.
- A summary of the complaints will be maintained by NCOPL and made available to the Community Consultative Committee, the complainant (on request) and on the WHC website. A summary of complaints received every 12 months will be provided in the Annual Review.

In the event that any complainant considers that NCOPL has not adequately addressed their concerns, the NCOPL representative will convene additional meetings with the complainant.

5.7 Reporting, review and auditing

5.7.1 Annual review

In accordance with Project Approval Schedule 6 Condition 6, an Annual Review will be prepared and submitted to the Secretary that reviews the environmental performance of the Narrabri Mine. Relevant to this Extraction Plan and to the 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 Narrabri Mine;

(e) identification of any discrepancies between predicted and actual impacts of the Narrabri Mine 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 Narrabri Mine.

The Annual Review will be made available on the WHC website.

5.7.2 Independent environmental audits

Prior to 13 September 2010, and every 3 years thereafter, unless the Secretary directs otherwise, NCOPL will commission and pay the full cost of an Independent Environmental Audit (**IEA**) of the development (Stages 1 and 2), to be conducted in accordance with the requirements of Schedule 6 Condition 7.

The audit team will be led by a suitably qualified auditor and the IEA will be conducted by suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary.

5.7.3 Improvement measures

Project Approval Schedule 6 Condition 2(f) requires this Plan to include a program to investigate and implement ways to improve the environmental performance of the development over time. Improvement measures may be investigated through review of the following:

- monitoring data, and any assessment of trends;

- audit outcomes, including audits of the subsidence management measures; and
- incident reports, including any community complaints.

Reasonable and feasible improvement measures will be implemented and documented as a management measure in a revision to the Plan as described in section 6.1.

In accordance with Schedule 6 Condition 2(g) a protocol for periodic review of this Plan has been addressed under section 6.1.

6. Plan administration and responsibilities

6.1 Review of management plans

The EP 203-206 and all other site environmental management plans approved under the Project Approval will be reviewed and updated as required by Schedule 6 Condition 3, within three months of any of the following:

- completion of an IEA (as required by Schedule 6 Condition 7);
- submission of an Incident Report (as required by Schedule 6 Condition 4);
- submission of an Annual Review (as required by Schedule 6 Condition 6); and
- any modification to the conditions of the Project Approval (unless the conditions require otherwise).

NCOPL will then review, and if necessary, revise this EP 203-206 and its sub plans to ensure that the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the Narrabri Mine operations.

Condition 3 of Schedule 6 further states that if the review determines that this EP 203-206 requires revision, then this will be completed to the satisfaction of the Secretary. A dedicated review register will be maintained which will provide the details of the review of all relevant strategies, plans and programs that need to be reviewed as required under Schedule 6 Condition 3 of the Project Approval. The revision status of this EP 203-206 is indicated in section 9.

6.2 Access to information

In accordance with Schedule 6 Condition 5 of the Project Approval, NCOPL will provide regular reporting on the environmental performance of the project on the WHC website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of the Project Approval, and to the satisfaction of the Secretary.

In accordance with Schedule 6 Condition 10 of the Project Approval, NCOPL will:

- make copies of the following publicly available on its website:
  - the documents referred to in Condition 2 of Schedule 2;
  - all current statutory approvals for the project;
  - all approved strategies, plans and programs required under the conditions of this approval;
  - a comprehensive summary of the monitoring results of the project, reported in accordance with the specifications in any conditions of this approval, or any approved plans and programs;
  - a complaints register, updated on a monthly basis;
  - minutes of CCC meetings;
  - the annual reviews of the project;
  - any independent environmental audit of the project, and the Proponent's response to the recommendations in any audit;
  - any other matter required by the Secretary; and
- keep this information up-to-date, to the satisfaction of the Secretary.

Note that any printed copies of this EP 203-206 are uncontrolled.

6.3 Key responsibilities

During the operational phases of the development, the Narrabri Mine will be managed by the General Manager who will have overall responsibility for ensuring contractors, employees and service providers comply with all laws, regulations, licences, approvals. Table 6-2 outlines the roles and responsibilities associated with this EP 203-206.

Table 6-2 Roles and responsibilities

Roles	Responsibilities
General Manager	• Ensure that adequate resources are available to NCOPL personnel to facilitate the completion of their responsibilities under this EP 203-206.
Mining Engineering Manager	• Ensure all contractors, sub-contractors and service-personnel are appropriately qualified, competent, and licensed to undertake the required work under this EP 203-206.
Environmental Manager	• Review and authorisation of changes to this EP 203-206 • Responsible for decision making in relation to the activation of TARP responses and/or contingency planning. • Manage incident, non-compliance and other reporting requirements. • Communicate with statutory agencies and departments, public authorities, and the community.
Environmental Superintendent	• Ensure that all environmental monitoring and reporting is undertaken in accordance with this EP 203-206 and various approval requirements, and is checked, processed, and filed appropriately. • Advise on matters identified in all approval, permit, licence, and consent documents and ensure all operations are conducted in compliance with those conditions, and all other environmental obligations.
Surface Operations Manager	• Provides notification to all mine personnel advising of potential subsidence hazards and impacts. • Maintains access to critical surface infrastructure and facilitates inspections and remedial works.
Civil Services Coordinator	• Inspect and monitor the condition and safety of roads and tracks around the mine site. • Remediates subsidence impacts to maintain trafficability of access roads and tracks.
Technical Services Manager	• Provide technical advice to support decision making in relation to the activation of TARP responses and/or contingency planning. • Liaise with stakeholders regarding subsidence impact management. • Decommission mining infrastructure prior to subsidence impacts.
Registered Mine Surveyor	• Ensure the subsidence monitoring program is implemented and adhered to.

7. References

Australasian Groundwater and Environmental Consultants Pty Ltd (2020) *Groundwater Assessment Narrabri Mine Stage 3 Extension Project.* Prepared for Narrabri Coal Operations Pty Ltd.

Department of Planning and Environment (October 2022). *Extraction Plan Guideline*

Ditton Geotechnical Services (2022) *Mine Subsidence Assessment for Longwalls LW203 to LW206 at the Narrabri Underground Mine.* Prepared for Narrabri Coal Operations Pty Ltd.

NSW Department of Planning, Industry and Environment (November 2021). *Project Approval Narrabri Coal Project – Stage 2*

Palaris (2022). *Gas Emission Review for Longwall 203 to Longwall 206*. Prepared for Narrabri Coal Operations Pty Ltd.

Resource Strategies (2015) *Narrabri Mine Modification 5 - Environmental Assessment*. Prepared for Narrabri Coal Operations Pty Ltd.

Resource Strategies (2021) *Narrabri Mine Modification 7 - Environmental Assessment*. Prepared for Narrabri Coal Operations Pty Ltd.

RW. Corkery & Co. Pty. Limited. (2009). *Environmental Assessment for the Narrabri Coal Mine Stage 2 Longwall Project.* Prepared for Narrabri Coal Operations Pty Ltd.

WRM Water and Environment (2021) *Narrabri Underground Mine Stage 3 Extension Project (SSD-10269) Response to DPIE and NRAR Information request 0189-13-L1*. Prepared for Narrabri Coal Operations Pty Ltd.

8. Glossary

Term	Definition*
Active subsidence	The period of time that movement of the ground can occur after underground mining.
Angle of draw	The angle with the vertical, made by a straight line extending away from the limits of extraction at seam level to the ground surface, spanning the horizontal distance in which subsidence may occur.
Applicant	Narrabri Coal Operations Pty Ltd.
Chain pillar	The pillar(s) of coal left between adjacent longwall panels. This forms a barrier that allows the goaf to be sealed off and facilitates tailgate roof stability.
Compressive strain	A decrease in the distance between two points on the surface. This can cause shear cracking or steps at the surface if > 3 millimetres per metre (mm/m).
Cover depth	The depth of coal seam from the ground surface (metres).
Department	Planning and Assessment Group within the NSW Department of Planning, Housing and Infrastructure (DPHI).
Development	The Stage 2 development described in the EA as modified by the Project Approval.
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.
Extraction Plan Area	The area predicted to be affected by the proposed secondary extraction of the approved longwall panels LW 203 to LW 206.
Far-field subsidence	Mining-induced movements of the ground surface in areas where vertical subsidence is less than 20mm.
First workings	Development of the main headings and gate roads to establish access to the coal in the mining area.
Goaf	The mined-out area into which the immediate roof strata breaks.
Groundwater	Water contained in the interconnected pore spaces and voids of the saturated zone of sediments and rocks.
Incident	A set of circumstances that causes or threatens to cause material harm to the environment, and/or breaches or exceeds the limits of performance measures/criteria in the Project Approval.
Material harm	Material harm to the environment is defined in section 147 of the POEO Act.
Minimise	Implement all reasonable and feasible mitigation measures to reduce the impacts of the Narrabri Mine.
Mining operations	The extraction, processing and transportation of coal on the site, including the formation of mine access drifts and associated surface infrastructure such as gas and water drainage facilities.
MOD 5	Reduced the number of longwall panels from 26 to 20; increased the longwall panel widths for LW 107 to LW 120 from approximately 295 m to approximately 400 m; extended the western footprint approximately 60 m; and increased the maximum ROM coal processing rate from 8 Mtpa to 11 Mtpa.

Term	Definition*
MOD 7	Describes the change in mining method within the extent of the previously approved LW 201 and LW 202 and allows for up to 0.7 Mtpa via bord and pillar extraction at pillar reduction panels CF 201 to CF 205.
Narrabri Mine	The development approved under the Project Approval 05_0102 and Project Approval 08_0144.
Non-compliance	An occurrence, set of circumstances or development that is a breach of the conditions of the statutory approvals.
Plan	Extraction Plan for longwalls 203-206.
Pollution incident	Has the same meaning as in the POEO Act.
Project Approval	Development consent (PA 08_0144) issued on 26th July 2010 under Section 75J of the *Environmental Planning and Assessment Act 1979* by the Department of Planning & Infrastructure (as modified).
Rehabilitation	The treatment or management of land disturbed by the project for the purpose of establishing a safe, stable and non-polluting environment including the remediation of impacts.
Second workings	Extraction of coal from longwall panels, mini-wall panels, or pillar extraction.
Secretary	Planning Secretary under the EP&A Act, or nominee
Stage 1	The project approval granted by the Minister Planning for the Narrabri Coal Project, dated 14 November 2007.
Stage 2	Narrabri Mine Stage 2 approved under Project Approval 08_0144.
Statement of Commitments	The Proponent's revised commitments in Appendix 3 of the Project Approval, dated May 2010.
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.
Tailgate	Refers to the tunnels or roadways down the side of a longwall block which provides a ventilation pathway for bad or dusty air away from the longwall face. It is usually located on the side of the longwall panel adjacent to extracted panels or goaf.
Tensile strain	An increase in the distance between two points on the surface. This is likely to cause cracking at the surface if it exceeds 2 mm/m. Tensile strains are usually associated with convex (hogging) curvatures near the sides (or ends) of the panels.
the Proponent	Narrabri Coal Operations Pty Ltd
Tilt	The rate of change of subsidence between two points (A and B), measured at set distances apart (usually 10m). Tilt is plotted at the mid-point between the points and is a measure of the amount of differential subsidence
Upsidence	Relative vertical upward movements of the ground surface associated with

Term	Definition*
	subsidence.
Valley closure	The inward (or outward) movement of valley ridge crests due to subsidence trough deformations or changes to horizontal stress fields associated with longwall mining. Measured movements have ranged between 10 mm and 400 mm in the NSW Coalfields and are usually visually imperceptible.
Valley uplift	The phenomenon of upward movements along the valley floors due to Valley Closure and buckling of sedimentary rock units. Measured movements have ranged between 10 mm and 400 mm in the NSW Coalfields and may cause surface cracking in exposed bedrock on the floor of the valley (or gorge).
Vertical subsidence	Vertical downward movements of the ground surface caused by underground coal mining.
Watercourse	A river, creek or other stream, including a stream in the form of an anabranch or tributary, in which water flows permanently or intermittently, regardless of the frequency of flow events: In a natural channel, whether artificially modified or not, or in an artificial channel that has changed the course of the stream. It also includes weirs, lakes and dams

9. Review history

Table 9-1 provides the EP 203-206 document review history.

Table 9-1 Document review history

Revision	Comments	Author	Authorised by	Date
0B	Issued for approval	Onward Consulting	B. Baker	30 September 2024
0C	Inclusion of agency recommendations	Onward Consulting	B. Baker	24 January 2025

Attachment 1 Master Trigger Action Response Plan

Table A1-1 Water Trigger Action Response Plan

<table>
<tr><th>Performance measure</th><th>Status</th><th>Trigger</th><th>Action</th><th>Response</th></tr>
<tr><td colspan="5">Water quality watercourse</td></tr>
<tr><td rowspan="2">Surface water quality does not exceed the SSGVs
Sites:
• KC1TOP, KC1US, KCTOP, KCUS.

Parameters:
• Field - EC, pH
• Laboratory - TSS, TOC

Frequency:
• Quarterly.
• During flow event (as practical).

Analysis:
• Comparison of water quality records during operations with the SSGVs for KCUS and KC1US.</td><td>Normal</td><td>The water quality trigger levels are not exceeded and performance measures met.</td><td>None required.</td><td>• Continue to implement surface water management measures in accordance with this Plan.
• Continue routine surface water monitoring and evaluation of results.</td></tr>
<tr><td>Level 1</td><td>• Less than pH 6.5 or greater than pH 8.0 for one monitoring event.
• EC, TSS and TOC exceeding Stage 1 trigger for one monitoring event.
<table>
<tr><th rowspan="2">Parameter</th><th rowspan="2">Trigger</th><th colspan="4">Monitoring location</th></tr>
<tr><th>KCUS</th><th>KC1US</th><th>KCTOP</th><th>KC1TOP</th></tr>
<tr><td>EC (µs/cm)</td><td>Stage 1</td><td>649</td><td>207</td><td rowspan="3">N/A</td><td rowspan="3">N/A</td></tr>
<tr><td>Total suspended solids (mg/L)</td><td>Stage 1</td><td>652</td><td>479</td></tr>
<tr><td>Total organic carbon (TOC)</td><td>Stage 1</td><td>15</td><td>16</td></tr>
</table>
Note:
The TSS concentration limit may be exceeded for water discharged provided that:
• the discharge occurs solely as a result of rainfall measured at the premises that exceeds 38.4 mm over any consecutive 5-day period immediately prior to the discharge occurring; and
• all practical measures have been implemented to dewater all sediment dams within 5 days of rainfall such that they have sufficient capacity to store run off from a 38.4 mm, 5-day rainfall event.</td><td>Conduct preliminary quality assurance of data to confirm an exceedance.</td><td>For a single exceedance, the exceedance will be recorded, with no further contingency or notification measures required. If pH or a Stage 1 trigger is exceeded at the same location for three consecutive sampling events, then the actions required for Level 2 will be implemented.</td></tr>
</table>

<table>
<tr><th>Performance measure</th><th>Status</th><th>Trigger</th><th>Action</th><th>Response</th></tr>
<tr><td></td><td>Level 2</td><td>

Less than pH 6.5 or greater than pH 8.0 for three consecutive monitoring events.
EC, TSS and TOC exceeding Stage 1 trigger for the same parameter exceeded at the same location for three consecutive monitoring events.
EC, TSS and TOC exceeding Stage 2 trigger for one monitoring event.

<table>
<tr><th>Parameter</th><th>Trigger</th><th colspan="4">Monitoring location</th></tr>
<tr><th></th><th></th><th>KCUS</th><th>KC1US</th><th>KCTOP</th><th>KC1TOP</th></tr>
<tr><td rowspan="2">EC (µs/cm)</td><td>Stage 1</td><td>649</td><td>207</td><td rowspan="6">N/A</td><td rowspan="6">N/A</td></tr>
<tr><td>Stage 2</td><td>798</td><td>217</td></tr>
<tr><td rowspan="2">Total suspended solids (mg/L)</td><td>Stage 1</td><td>652</td><td>479</td></tr>
<tr><td>Stage 2</td><td>870</td><td>957</td></tr>
<tr><td rowspan="2">Total organic carbon (TOC)</td><td>Stage 1</td><td>15</td><td>16</td></tr>
<tr><td>Stage 2</td><td>17</td><td>17</td></tr>
</table>
Note:

The TSS concentration limit may be exceeded for water discharged provided that:
the discharge occurs solely as a result of rainfall measured at the premises that exceeds 38.4 mm over any consecutive 5-day period immediately prior to the discharge occurring; and
all practical measures have been implemented to dewater all sediment dams within 5 days of rainfall such that they have sufficient capacity to store run off from a 38.4 mm, 5-day rainfall event.

</td><td>

Conduct preliminary quality assurance of data to confirm an exceedance.
Environmental Manager to implement contingency and notification measures as per section 8 of the EP-WMP.

</td><td>

Hydrologist (or similar specialist) to review sampling and climate data and compare to upstream value to confirm likely mining impact or otherwise. If mine related, undertake physical inspection of affected surface and creeks to identify potential source of water quality degradation.
Implement appropriate management or contingency response (i.e. repair of subsidence cracking, remediation of ponding, erosion control works and rehabilitation).

</td></tr>
<tr><td colspan="5">Vegetation health (ponding)</td></tr>
<tr><td rowspan="2">Surface water ponding does not result in adverse impacts to vegetation of significance.
Sites:

Ponded areas identified above LW203-206, as necessary (identified through visual inspection and survey, see ‘Changes to Watercourse Morphology’ TARP).

Parameters:

Changes in topography
Riparian vegetation health.

Frequency:

Quarterly watercourse visual inspections
Annual remote sensing

Analysis:

Comparison to baseline.

</td><td>Normal</td><td>No adverse impacts on vegetation observed.</td><td>None required.</td><td>

Continue to implement surface water management measures in accordance with this Plan.
Continue routine surface water ponding monitoring and evaluation of results.

</td></tr>
<tr><td>Level 1</td><td>Identified minor impacts to vegetation due to creation of small ephemeral ponds or minor increase or decrease in size and distribution of in-stream ponds.</td><td>Record visual observations, including photographs.</td><td>Investigate options to remediate based on risk assessment (low risk to ecological and/or agricultural function). Remediation options may include:

Re-establish any affected contour banks and revegetate.
Stabilise pond inlet and outlet using graded rock and vegetation enhancement.

</td></tr>
</table>

Performance measure	Status	Trigger	Action	Response
	Level 2	Significant impacts to vegetation identified (e.g. canopy dieback, tree death) due to creation of large semi-permanent ponds or moderate to significant increase or decrease in size and/or distribution of in-stream ponds.	Record visual observations, including photographs.	Investigate options to remediate based on risk assessment (moderate to high risk to ecological and/or agricultural function). Remediation options may include: • Construct drainage channels to create free draining areas and restore affected contour banks • Revegetate fringing areas around residual pond • Exclude stock access from riparian areas • Construct in-stream barriers or drainage channels to reduce or increase the effective size and spatial distribution of pond(s) • Stabilise pond inlet and outlet using graded rock and vegetation enhancement • Dewater ponded area • Reshape surface and infill pond • Re-establish natural drainage channel
Changes in watercourse morphology				
Subsidence due to mining does not impact on the morphology of creeks. **Sites:** • Reaches of Kurrajong Creek Tributary 1 and Kurrajong Creek which traverse the Extraction Plan Area. **Parameters:** • Identification of changes in vegetation, creek grade, bank erosion and sedimentation. **Frequency:** • Monthly visual inspections (monthly subsidence inspections) • Quarterly watercourse visual inspections • Annual remote sensing **Analysis:** • Comparison of baseline.	**Normal**	No identified impacts on water course morphology.	None required.	• Continue to implement surface water management measures in accordance with this Plan. • Continue routine creek line monitoring program and evaluation of results.
	Level 1	Changes in channel cross-section, bed erosion, incision and deposition identified	Record observations, including photographs.	• A qualified geomorphologist will be consulted to develop an action plan which may involve further monitoring or remediation (with consideration given to application of the River Style Framework for classifying channel condition and recovery). • Implement geomorphologists action plan. • Implement contingency and notification measures as per section 8 of the EP-WMP.
	Level 2	Further monitoring identifies remediation works are not performing (i.e. ineffective control measure).	Record observations, including photographs.	• As for Level 1 • If implemented erosion control measures are found to be failing, review causes and replace with like or better. Continue monitoring.
Water take				
Sufficient water entitlement is available for the operation of the Narrabri Mine and water is extracted in accordance with the Eulah Creek WAL held by NCOPL, and the rules prescribed in the WSP.	**Normal**	Annual water take indicates sufficient water entitlement (licensed take) is available.	None required.	Continue subsidence monitoring program.

Performance measure	Status	Trigger	Action	Response
Sites: • Subsidence induced surface cracks. **Parameters:** • Surface crack width, depth, and length **Frequency:** • Monthly and following a significant rainfall event*. **Analysis:** • Calculation of water volume within each crack (W x D x L / 2)	**Level 1**	Cumulative water take for the current water year reaches 95% of water entitlement (licensed take).	Develop plan to complete additional surface cracking repairs, supplementary to the existing planned rehabilitation program, with priority given to zones of surface cracking most likely to be subject to occurrence of stream flow.	• Implement supplementary surface cracking repair plan to accelerate rehabilitation in priority zones of surface cracking. • Transfer additional entitlements from other Whitehaven operations (where feasible) or obtain additional allocation on the open market in accordance with the appropriate trading rules of the relevant WSP.
Groundwater levels – non-Pilliga bores				
Impacts on aquifers are consistent with model predictions. **Sites:** • P1, P2, P3, P4, P5, P8, P9, P10, P11, P12, P13, P39B, P47, P53, WB12, and WB18. **Parameters:** • Water level. **Frequency:** • Standpipe bores - Quarterly manual monitoring of groundwater levels. • VWP bores - automatic groundwater level monitoring via telemetry – reviewed quarterly. **Analysis:** • Review of groundwater level monitoring data. Note: as baseline data is established for additional monitoring bores, where relevant, triggers will be derived and incorporated into the TARP.	**Normal**	Quarterly data review indicates no exceedances of the Tier 1 to Tier 2 trigger levels. OR Quarterly data review indicates one single exceedance of the Tier 1 trigger level. **Trigger levels are provided in Table 6-5 of the EP-WMP.**	Nil	Continue quarterly review of data including assurance and analysis. For a single exceedance of the Tier 1 trigger, the exceedance will be recorded, with no further contingency or notification measures required. If a water level trigger is exceeded at the same location for three consecutive sampling events, then the actions required for Level 1 will be implemented.
	Level 1	Quarterly data review indicates one single exceedance of the Tier 2 trigger level. OR Quarterly data review indicates three consecutive exceedances of the Tier 1 trigger level. **Trigger levels are provided in Table 6-5 of the EP-WMP.**	Conduct preliminary quality assurance and analysis of data to confirm exceedance.	For a single exceedance of the Tier 2 trigger, the exceedance will be recorded, with no further contingency or notification measures required. If a water level trigger is exceeded at the same location for three consecutive sampling events, then the actions required for Level 2 will be implemented. OR Following three consecutive exceedances of the Tier 1 trigger: • Conduct internal investigation on possible links to operational activities and external influences (e.g. climatic data) and report outcomes in the Annual Review. • Seek advice from a suitably qualified hydrogeologist as required. • Monitoring data and review outcomes to be considered in the groundwater model recalibration in accordance with Schedule 4, Condition 9 of the Project Approval.
	Level 2	Quarterly data review indicates three consecutive exceedances of the Tier 2 trigger level. **Trigger levels are provided in Table 6-5 of the EP-WMP.**	• Conduct and internal review of data quality assurance and analysis to confirm exceedance. • Implement contingency and notification measures as per section 8 of the EP-WMP. • Increase monitoring frequency to monthly for initial period of up to	• Conduct an investigation, including involvement of a suitably qualified hydrogeologist to: ▪ assess historical data and perform statistical trend procedure to remove natural variations; ▪ review groundwater model predictions and assumptions;

Performance measure	Status	Trigger	Action	Response
			three months.	▪ assess water level in nearby bores within the same aquifer; ▪ investigate links to operational activities and external influences (e.g. climatic data); ▪ review water takes against licensed allocation; ▪ investigate conceptual model for fracturing and interconnectivity between formations due to subsidence; and ▪ assess potential risk of environmental impacts to sensitive receptors. • Implement reasonable and feasible remediation measures in accordance with hydrogeologist recommendations and in consultation with DPHI. • Monitoring data and outcomes from the investigation to be considered in the groundwater model recalibration in accordance with Schedule 4, Condition 9 of the Project Approval.
Groundwater levels – Pilliga bores				
Impacts on the Pilliga Sandstone aquifer are consistent with model predictions. **Sites:** • P7, P42_90, P54_30. **Parameters:** • Water level. **Monitoring frequency:** • Standpipe bores – monthly manual monitoring of groundwater levels. • VWP bores – automatic groundwater level monitoring via telemetry – reviewed monthly. Note: as baseline data is established for additional monitoring bores, where relevant, triggers will be derived, and bores incorporated into the TARP.	**Normal**	Monthly data review indicates no exceedances of the Tier 1 to Tier 4 trigger levels. OR Monthly data review indicates one single exceedance of the Tier 1 trigger level. **Trigger levels are provided in Table 6-5 of the EP-WMP.**	Nil	Continue quarterly review of data including assurance and analysis. For a single exceedance of the Tier 1 trigger, the exceedance will be recorded, with no further contingency or notification measures required. If a water level trigger is exceeded at the same location for two consecutive sampling events, then the actions required for Level 1 will be implemented.
	Level 1	Monthly data review indicates one single exceedance of the Tier 2 trigger level. OR Monthly data review indicates two consecutive exceedances of the Tier 1 trigger level. **Trigger levels are provided in Table 6-5 of the EP-WMP.**	Conduct and internal review of data quality assurance and analysis to confirm exceedance. AND For two consecutive exceedances of the Tier 1 trigger: • Implement contingency and notification measures as per section 8 of the EP-WMP.	For a single exceedance of the Tier 2 trigger, the exceedance will be recorded, with no further contingency or notification measures required. If a water level trigger is exceeded at the same location for three consecutive sampling events, then the actions required for Level 2 will be implemented. OR Following two consecutive exceedances of the Tier 1 trigger: • Conduct internal investigation on possible links to operational activities and external influences (e.g. climatic data) and report outcomes in the Annual Review. • Seek advice from a suitably qualified hydrogeologist as required. • Monitoring data and review outcomes to be considered in the groundwater model recalibration in accordance with Schedule 4, Condition 9 of the Project Approval.

Performance measure	Status	Trigger	Action	Response
	Level 2	Monthly data review indicates one single exceedance of the Tier 3 trigger level. OR Monthly data review indicates two consecutive exceedances of the Tier 2 trigger level. **Trigger levels are provided in Table 6-5 of the EP-WMP.**	Conduct preliminary quality assurance and analysis of data to confirm exceedance. AND For two consecutive exceedances of the Tier 2 trigger: • Implement contingency and notification measures as per section 8 of the EP-WMP. • Increase monitoring frequency to monthly for initial period of up to three months.	Following two consecutive exceedances of the Tier 2 trigger: • Conduct an investigation, including involvement of a suitably qualified hydrogeologist to: ▪ assess historical data and perform statistical trend procedure to remove natural variations; ▪ review groundwater model predictions and assumptions; ▪ assess water level in nearby bores within the same aquifer; ▪ investigate links to operational activities and external influences (e.g. climatic data); ▪ review water takes against licensed allocation; ▪ investigate conceptual model for fracturing and interconnectivity between formations due to subsidence; and ▪ assess potential risk of environmental impacts to sensitive receptors. If the investigation concludes that the potential risk of environmental impact/s is high, NCOPL will: • conduct technical feasibility reviews to assess potential remediation measures (including establishment of provisional performance measures) in consultation with DPHI, which may include but not be limited to: ▪ reduction in cutting height to limit subsidence; ▪ narrowing panel widths; or ▪ limiting mining to first workings. • Assess approval pathways and considerations for the potential remediation options. • Investigations, technical feasibility, and approval reviews would be targeted for completion within a six-month period (based on an appropriate timeframe for reviewing the groundwater model) in preparation for potential deployment should a Tier 3 trigger be activated. If the investigation concludes that the risk of environmental impacts is low: • monitoring will continue in accordance with Table 6-6 and results reported in the Annual Review.

Performance measure	Status	Trigger	Action	Response
	Level 3	Two consecutive exceedances of the Tier 3 trigger level. **Trigger levels are provided in Table 6-5 of the EP-WMP.**	Conduct preliminary quality assurance and analysis of data to confirm exceedance/s. AND For two consecutive exceedances of the Tier 2 trigger: • Implement contingency and notification measures as per section 8 of the EP-WMP. • Increase monitoring frequency to monthly for initial period of up to three months.	Responses required for Level 2. AND • Revisit and validate investigations completed at Level 2 and assess risk of environmental impact/s to sensitive receptors. • If assessed risk of environmental impact is high, implement reasonable and feasible remediation measures (as assessed at Level 2) in consultation with DPHI. • Review implementation of remediation measures against performance measures to monitor the progress and success of implementation.
	Level 4	Two consecutive exceedances of the Tier 4 trigger level. **Trigger levels are provided in Table 6-5 of the EP-WMP.**	Conduct preliminary quality assurance and analysis of data to confirm exceedance/s. AND For two consecutive exceedances of the Tier 2 trigger: • Implement contingency and notification measures as per section 8 EP-WMP. • Increase monitoring frequency to monthly for initial period of up to three months.	Responses required for Level 3. AND Modify remediation and mitigation measures commenced at Level 3 and implement additional mitigation as required in consultation with DPHI.
Groundwater quality				
Groundwater quality does not exceed trigger values **Sites:** • P1, P2, P3, P4, P7, P8, P9, P10, P11, P12, P13, P16, P19, P29, P31, P32, P39A, P39B, P43, P47, P51, P52, P53, WB2, WB12, and WB18. **Parameters:** • EC and pH. **Monitoring Frequency:** • Quarterly. Note: as baseline data is established for additional monitoring bores, where relevant, triggers will be derived, and bores incorporated into the TARP.	**Normal**	Routine monitoring indicates water quality does not exceed the EC or pH trigger values.	Nil	Continue routine groundwater monitoring and evaluation of results including quality assurance.
	Level 1	Routine monitoring indicates water quality exceeds the EC or pH trigger value (single exceedance). **Trigger values are provided in Attachment 5.**	Conduct preliminary quality assurance and analysis of data to confirm exceedance.	For a single exceedance, the exceedance will be recorded, with no further contingency or notification measures required. If a water level trigger is exceeded at the same location for three consecutive sampling events, then the actions required for Level 2 will be implemented.
	Level 2	Routine monitoring indicates water quality exceeds the EC or pH trigger value over three consecutive monitoring events. **Trigger values are provided in Attachment 5.**	• Conduct preliminary quality assurance and analysis of data to confirm exceedance. • Implement contingency and notification measures as per section 8 EP-WMP.	• Engage a suitably qualified hydrogeologist to undertake an assessment and report on any identified changes/likely causes and recommendations. • Implement reasonable and feasible remediation measures in accordance with hydrogeologist recommendations and in consultation with DPHI.

Performance measure	Status	Trigger	Action	Response
Groundwater dependent ecosystem – groundwater level and quality				
• Impacts on alluvium aquifer are consistent with model predictions. • Groundwater quality does not exceed trigger values. **Sites:** • Alluvium monitoring bores (P4, P5 and P39B) **Parameters:** • Water level • pH and EC **Monitoring frequency:** • Quarterly Note: as baseline data is established for the newly constructed bores, trigger levels will be derived (including trigger levels for 10% cumulative variation in water table associated with bores within 40m of a GDE) and relevant bores incorporated into the TARP.	**Normal**	Refer to trigger levels in Groundwater levels – non-Pilliga bores and groundwater water quality TARP components.	Refer to actions in Groundwater levels – non-Pilliga bores and groundwater quality TARP components.	Refer to responses in Groundwater levels – non-Pilliga bores and groundwater quality TARP components.
	Level 1			
	Level 2			
Groundwater dependent ecosystem – surface conditions				
No adverse impacts to vegetation health (considering natural variation). **Sites:** • Visual inspection sites (VI1-VI8) **Parameters:** • Vegetation health; • Flow rates; • Water level; and • pH and EC. **Monitoring frequency:** • Quarterly Note: as baseline data is established, triggers will be derived (including trigger values for water quality) and incorporated into the TARP.	**Normal**	No adverse impacts on vegetation observed.	Nil.	Continue routine visual inspections and evaluation of results.
	Level 1	Quarterly inspection identifies adverse impacts on vegetation.	Record visual observations, including photographs.	• Continue routine visual inspections and evaluation of results. • Review nearby shallow strata monitoring bore data to determine groundwater level trends.
	Level 2	Quarterly inspection identifies significant impacts to vegetation (e.g. canopy dieback, tree death).	• Record visual observations, including photographs. • Implement contingency and notification measures as per section 8 EP-WMP.	Engage a suitably qualified hydrogeologist to assess potential risks of environmental impacts and provide contingency responses through investigation of: • historical monitoring data and trends; and • model predictions. Implement reasonable and feasible remediation measures in accordance with hydrogeologist recommendations and in consultation with DPHI

<table>
<tr><th>Performance measure</th><th>Status</th><th>Trigger</th><th>Action</th><th>Response</th></tr>
<tr><td colspan="5">Groundwater inflows</td></tr>
<tr><td rowspan="3">Groundwater inflows are consistent with model predictions.

Sites:
• Underground workings

Parameter:
• Total passive intake of aquifer water

Analysis:
• Annual groundwater forecast modelling.
• Weekly review of actual water take against the predicted water take.</td><td>Normal</td><td>No exceedance of groundwater inflows against model predictions</td><td>Nil</td><td>Continue routine groundwater monitoring and evaluation of results including quality assurance.</td></tr>
<tr><td>Level 1</td><td>Groundwater inflow exceeds predicted water take for two consecutive quarters.</td><td>Conduct preliminary quality assurance and analysis of data to confirm exceedance.</td><td>• Conduct internal investigation on possible links to operational activities and external influences (e.g. climatic data) and report outcomes in the Annual Review.
• Seek advice from a suitably qualified hydrogeologist as required.
• Monitoring data and review outcomes to be considered in the groundwater model recalibration in accordance with Schedule 4, Condition 9 of the Project Approval.</td></tr>
<tr><td>Level 2</td><td>Groundwater inflow rate 100% in excess of the predicted base case mean weekly equivalent inflow rate sustained for three consecutive weeks.

Predicted groundwater take triggers
<table><tr><th>Water year</th><th>TARP Trigger 1 [a]</th><th>TARP Trigger 2 [b]</th></tr><tr><td>2024</td><td>139.5</td><td>21.5</td></tr><tr><td>2025</td><td>156.3</td><td>24.0</td></tr><tr><td>2026</td><td>190.8</td><td>29.3</td></tr><tr><td>2027</td><td>233.5</td><td>35.9</td></tr><tr><td>2028</td><td>264.5</td><td>40.7</td></tr><tr><td>2029</td><td>291.5</td><td>44.8</td></tr><tr><td>2030</td><td>313.0</td><td>48.2</td></tr><tr><td>2031</td><td>309.5</td><td>47.6</td></tr></table>Notes: a = total predicted volume (ML/year) divided by 4 to present average quarterly threshold.
b = total predicted volume (ML/year) divided by 52 to present average weekly threshold and multiplied by 2 to represent 100 % of predicted weekly average</td><td>• Conduct and internal review of data quality assurance and analysis to confirm exceedance.
• Implement contingency and notification measures as per section 8 EP-WMP.</td><td>• Conduct an investigation, including involvement of a suitably qualified hydrogeologist to:
▪ assess historical data and perform statistical trend procedure to remove natural variations;
▪ review groundwater model predictions and assumptions;
▪ assess water level in nearby bores;
▪ investigate links to operational activities and external influences (e.g. climatic data);
▪ review water takes against licensed allocation;
▪ investigate conceptual model for fracturing and interconnectivity between formations due to subsidence; and
▪ assess potential risk of environmental impacts to sensitive receptors.
• Implement reasonable and feasible remediation measures in accordance with hydrogeologist recommendations and in consultation with DPHI.
• Monitoring data and outcomes from the investigation to be considered in the groundwater model recalibration in accordance with Schedule 4, Condition 9 of the Project Approval.</td></tr>
</table>

Note:
*Significant rainfall event defined as a rainfall event >38.4 mm over 5 consecutive days

Table A1-2 Land Trigger Action Response Plan

Aspect	Performance measure	Response	
		Trigger	**Action**
Remediation of surface cracks	Surface cracks are remediated within two months of identification or when safe to do so.	**Level 1** • Surface cracks >50 mm but <320 mm present. and/or • Erosion as a result of cracking identified.	**Level 1** • Provide safety fencing and signage if required. • Advise relevant stakeholders. • Implement remediation measures as appropriate. These may include ripping of surface cracks, filling of cracks with grout, spoil or other suitable material. • Implement appropriate erosion control measures as outlined in the site Erosion and Sediment Control Plan. • Monitor remediated surface cracks within 3 months following remediation.
		Level 2 • Surface cracks >320 mm and/or crack widths more than predicted for specific soil type or natural feature.	**Level 2** • As for Level 1 • Make area safe. • Investigate the reasons for exceedance of predictions. • Review and update predictions and assessment of potential impacts. • On-going review and appraisal of any significant changes to surface slopes such as cracking along ridges, increased erosion down slopes, foot slope seepages and drainage path adjustments observed after each longwall is extracted.
Sediment and erosion controls	No ongoing or significant erosion.	**Level 1** • Evidence of active rill erosion, gully erosion <200 mm in depth or slumping.	**Level 1** • Document occurrence. • Continue monitoring. • Summarise occurrence in relevant reports.
		Level 2 • Evidence of active rill or gully erosion >200 mm in depth or significant slumping/slope instability.	**Level 2** • As per Level 1 • Review adequacy of existing erosion and sediment controls. • Undertake repairs and implement additional controls as required. • Engage a specialist if ongoing erosion/slope instability is observed following repair and implementation of additional controls. • On-going review and appraisal of any significant changes to surface slopes such as cracking along ridges, increased erosion down slopes, foot slope seepages and drainage path adjustments observed after each longwall is extracted.
Creek line surveys	Change to overall drainage pattern is not more than predicted and detected alteration in channel dimensions or processes within normal range compared to baseline data.	**Level 1** • Field survey indicates <20% increase in length of eroding creek line. and/or • Surface drainage pattern is unchanged. • Bed and banks are stable.	**Level 1** • Document observed changes. • Continue monitoring. • Summarise occurrence in relevant reports.

Aspect	Performance measure	Response	
		Trigger	**Action**
		Level 2 • Monitoring indicates >20% increase in length of eroding creek line. and/or • Surface drainage pattern is significantly altered. • Changes in bed and bank stability.	**Level 2** • As for Level 1 • Consult with a geomorphologist or other appropriately qualified and experienced specialist to determine the extent of the impact, identify contributing factors and determine appropriate remediation measures. • Review and implement contingency measures required by other plans as relevant (e.g. the Subsidence Monitoring Program). • Review monitoring program as required. • Relevant agencies to be notified and actions discussed.
Topography and landscape morphology form	Detected alteration in channel dimensions or topography/landscape morphology within normal range compared to baseline data.	**Level 1** • Surface gradient change as detected by LiDAR is >1.5% and <3%.	**Level 1** • Document observed changes. • Continue monitoring. • Summarise occurrence in relevant reports.
		Level 2 • Surface gradient change as detected by LiDAR is >3% and <5%.	**Level 2** • As for Level 1 • Consult geomorphologist or other appropriately qualified and experienced specialist to review DEM and conduct site investigation to assess changes and provide recommendations for remediation which may include re-establishing drainage pathways with earthworks and implementation of erosion control measures. • Notify relevant agencies if in-stream works are to be undertaken.
Ponding (riparian vegetation)	Surface water ponding does not result in adverse impacts to vegetation health.	**Level 1** Identified minor impacts to vegetation due to creation of small ephemeral ponds or minor increase or decrease in size and distribution of in-stream ponds.	**Level 1** • Record visual observations, including photographs. • Investigate options to remediate based on risk assessment (low risk to ecological and/or agricultural function). Remediation options may include: ▪ Re-establish any affected contour banks and revegetate. ▪ Stabilise pond inlet and outlet using graded rock and vegetation enhancement.
		Level 2 Significant impacts to vegetation identified (e.g. canopy dieback, tree death) due to creation of large semi-permanent ponds or moderate to significant increase or decrease in size and/or distribution of in-stream ponds.	**Level 2** • Record visual observations, including photographs. • Investigate options to remediate based on risk assessment (moderate to high risk to ecological and/or agricultural function). Remediation options may include: ▪ Construct drainage channels to create free draining areas and restore affected contour banks ▪ Revegetate fringing areas around residual pond ▪ Exclude stock access from riparian areas ▪ Construct in-stream barriers or drainage channels to reduce or increase the effective size and spatial distribution of pond(s) ▪ Stabilise pond inlet and outlet using graded rock and vegetation enhancement ▪ Dewater ponded area ▪ Reshape surface and infill pond ▪ Re-establish natural drainage channel

Table A1-3 Biodiversity Trigger Action Response Plan

Aspect	Performance measure	Response	
		Trigger	**Action**
Vegetation Clearance Protocol	No vegetation clearance outside of approved areas.	**Level 1** • Clearing within the delineated area.	**Level 1** • No action required.
		Level 2 • Clearing outside the delineated area.	**Level 2** • Environmental Superintendent to inform the General Manager. • Investigate reasons for exceedance. • Relevant agencies to be notified and actions discussed.
Remediation of surface cracks	Surface cracks are remediated within two months of identification or when safe to do so.	**Level 1** • Surface cracks >50 mm but <320 mm present. And/Or • Erosion as a result of cracking identified.	**Level 1** • Provide safety fencing and signage if required. • Advise relevant stakeholders. • Implement remediation measures as appropriate. These may include ripping of surface cracks, filling of cracks with grout, spoil or other suitable material. • Implement appropriate control measures as outlined in the Extraction Plan - Water Management Plan. • Monitor remediated surface cracks within 3 months following remediation.
		Level 2 • Surface cracks >320 mm and/or crack widths more than predicted for specific soil type or natural feature.	**Level 2** • As for Level 1 • Make area safe. • Investigate the reasons for exceedance of predictions. • Review and update predictions and assessment of potential impacts.
Sediment and erosion controls	No ongoing or significant erosion.	**Level 1** • Evidence of active rill erosion, gully erosion <200 mm in depth or slumping.	**Level 1** • Document occurrence. • Continue monitoring. • Summarise occurrence in relevant reports.
		Level 2 • Evidence of active rill or gully erosion >200 mm in depth or significant slumping.	**Level 2** • As per Level 1 • Review adequacy of existing erosion and sediment controls. • Undertake repairs and implement additional controls as required. • Engage a specialist if ongoing erosion is observed following repair and implementation of additional controls.
Creek line surveys	Change to overall drainage pattern is not more than predicted and detected alteration in channel dimensions or processes within normal range compared to baseline data.	**Level 1** • Monitoring indicates <20% increase in length of eroding creek line. And/Or • Surface drainage pattern is unchanged. • Bed and banks are stable.	**Level 1** • Document observed changes. • Continue monitoring. • Summarise occurrence in relevant reports.

Aspect	Performance measure	Response	
		Trigger	**Action**
		Level 2 • Monitoring indicates >20% increase in length of eroding creek line. And/Or • Surface drainage pattern is significantly altered. • Changes in bed and bank stability.	**Level 2** • As for Level 1 • Consult with a geomorphologist or other appropriately qualified and experienced specialist to determine the extent of the impact, identify contributing factors and determine appropriate remediation measures. • Review and implement contingency measures required by other plans as relevant (e.g. the Subsidence Monitoring Program). • Review monitoring program as required. • Relevant agencies to be notified and actions discussed.
Topography and landscape morphology form	Detected alteration in channel dimensions or topography/landscape morphology within normal range compared to baseline data.	**Level 1** • Surface gradient change as detected by LiDAR is >1.5% and <3%.	**Level 1** • Document observed changes. • Continue monitoring. • Summarise occurrence in relevant reports.
		Level 2 • Surface gradient change as detected by LiDAR is >3% and <5%.	**Level 2** • As for Level 1 • Consult geomorphologist or other appropriately qualified and experienced specialist to review DEM and conduct site investigation to assess changes and provide recommendations for remediation which may include re-establishing drainage pathways with earthworks and implementation of erosion control measures. • Notify relevant agencies if in-stream works are to be undertaken.
Native vegetation	No ongoing or significant surface cracking, erosion, or slumping impacting native vegetation.	**Level 1** • NDVI monitoring identifies no change (i.e., within +/- 1 std dev from average) in an area that exceeds 0.1 ha. • Canopy is unchanged from that observed in baseline monitoring (with consideration given to natural variation). • No declining trend observable in comparison to control sites. • Increase in weed cover from previous monitoring event is <10%.	**Level 1** • No action required, continue monitoring.
		Level 2 • NDVI monitoring identifies change > +/- 2 std dev from average in an area that exceeds 0.1ha. • Canopy change is greater than that observed in baseline monitoring (with consideration given to natural variation). • Definable trend of decline observable in comparison to control sites. • Increase in weed cover from previous monitoring event is >10%.	**Level 2** • Conduct site investigation to determine the cause of change and appropriate management response which may include planting of endemic species, or additional weed control. • Review monitoring program as required.
Ponding (riparian vegetation)	Surface water ponding does not result in adverse impacts to vegetation health.	**Level 1** • Identified minor impacts to vegetation due to creation of small ephemeral ponds or minor increase or decrease in size and distribution of in-stream ponds.	**Level 1** • Record visual observations, including photographs. • Investigate options to remediate based on risk assessment (low risk to ecological and/or agricultural function). Remediation options may include: ▪ Re-establish any affected contour banks and revegetate. ▪ Stabilise pond inlet and outlet using graded rock and vegetation enhancement.

Aspect	Performance measure	Response	
		Trigger	**Action**
		Level 2 • Significant impacts to vegetation identified (e.g. canopy dieback, tree death) due to creation of large semi-permanent ponds or moderate to significant increase or decrease in size and/or distribution of in-stream ponds.	**Level 2** • Record visual observations, including photographs. • Investigate options to remediate based on risk assessment (moderate to high risk to ecological and/or agricultural function). Remediation options may include: ▪ Construct drainage channels to create free draining areas and restore affected contour banks ▪ Revegetate fringing areas around residual pond ▪ Exclude stock access from riparian areas ▪ Construct in-stream barriers or drainage channels to reduce or increase the effective size and spatial distribution of pond(s) ▪ Stabilise pond inlet and outlet using graded rock and vegetation enhancement ▪ Dewater ponded area ▪ Reshape surface and infill pond ▪ Re-establish natural drainage channel
Weed management	High Threat Weeds identified during monitoring have been controlled.	**Level 1** • Increase in High Threat Weeds > 20% compared to baseline dataset.	**Level 1** • Undertake additional monitoring. • Increase or review/amend weed control methods. • Undertake follow up targeted control.
		Level 2 • Increase in High Threat Weeds > 40% compared to baseline dataset.	**Level 2** • As per Level 1 • Review the weed management program to identify the key priority areas and investigate alternative methods for control of target species.
Animal pest management	Pest animals identified during monitoring have been controlled.	**Level 1** • Monitoring indicates pest animals impacting on native vegetation.	**Level 1** • Increase the frequency or extent of pest animal control based on advice from a suitably qualified person.

Table A1-4 Heritage Trigger Action Response Plan

Performance measure	Status	Trigger	Action	Response
Surface cracking, vertical displacement, or erosion				
Surface cracking, vertical displacement or erosion does not destroy, damage or deface Aboriginal objects or cultural heritage values.	**Normal**	• Surface cracks <50 mm present within 50 m of an Aboriginal cultural heritage site, and no erosion identified.	• Document occurrence of surface cracks.	• Continue monitoring in accordance with the EP-HMP.
	Level 1	• Surface cracks >50 mm present within 50 m of an Aboriginal cultural heritage site. and/or • Erosion as a result of cracking identified.	• Document occurrence of surface cracks. • Provide safety fencing and signage if required. • Advise relevant stakeholders.	As for Level 1 AND • Implement remediation measures as appropriate. These may include site salvage and surface crack remediation. • Remediation will be conducted in accordance with the *Narrabri Mine Subsidence Repair in ACH sites*. For sites of a medium or high scientific significance: • Site to be inspected by representatives of the RAPs and an appropriately qualified specialist (e.g. archaeologist, geologist, geomorphologist) to determine the nature and extent of impacts, and to provide advice on whether mitigation is required or feasible. • Mitigation measures may include further monitoring, site salvage or open area salvage excavation (if warranted).
Ponding				
Ponding does not destroy, damage or deface Aboriginal objects or cultural heritage values.	**Normal**	No ponding occurs at Aboriginal cultural heritage site.	Nil	• Continue monitoring in accordance with the EP-HMP.
	Level 1	Ponding identified within proximity of an Aboriginal cultural heritage site.	• Advise relevant stakeholders.	As for Level 1 AND Implement remediation measures as appropriate. These may include salvage of cultural heritage or remediation of ponding. For sites of a medium or high scientific significance: • Site to be inspected by representatives of the RAPs and an appropriately qualified specialist (e.g. archaeologist, geologist, geomorphologist) to determine the nature and extent of impacts, and to provide advice on whether mitigation is required or feasible. • Mitigation measures include further monitoring, surface site salvage, or open area salvage excavation (if warranted).
Mayfield GG1 Monitoring				
Surface cracking or displacement does not destroy, damage or deface Mayfield GG1	**Normal**	No subsidence impacts are identified.	Nil	Continue monitoring in accordance with the EP-HMP and Action plan.
	Level 2	Surface cracking at the Mayfield GG1 site is identified during monitoring.	• Notification provided to the DPHI. • Increase visual monitoring to daily. • Provide safety fencing and signage if required. • Advise relevant stakeholders.	• Site to be inspected by representatives of the RAPs and an appropriately qualified specialist to determine the nature and extent of impacts, and to provide advice on whether mitigation is required or feasible. • Detailed final report, as per decision protocol, to include all monitoring results and investigation into cracking. • Proceed with management of the site in consultation with DPHI and the RAPs.

Table A1-5 Built Features Trigger Action Response Plan

Monitoring	Trigger	Action
Water storage dams and soil conservation banks		
Condition		
To document pre- and post-subsidence condition and allow identification of required remedial works. **Sites:** All dams **Parameters** Obtain xyz coordinates along water storage dam embankments/spillways and along contour banks. Photographic records. **Analysis:** Pre- and post-mining comparison **Frequency:** Pre- and post-subsidence	**Level 1** • Post-subsidence survey identifies that spillway and dam wall not likely to operate as intended (i.e. spillway no longer lowest point on wall). or • Post-subsidence survey identifies that contour bank not likely to operate as intended (i.e. damaged due to cracking, areas no longer able to drain, or lengths with increased slope).	**Level 1** • Notify Environmental Superintendent. • Reduce stored water level (if not already reduced), assess and undertake repairs to wall or spillway as required. • Reconstruct or repair as required.
Dam failure		
To observe possible subsidence effects to dam wall and identify potential risk of impending dam failure. **Sites**: All dams **Parameters**: Visual inspections noting their condition, water level, cracking, or recent erosion of earth embankment. **Analysis**: Visual identification of changes. **Frequency**: Daily during undermining of structure.	**Level 1** • Minor superficial surface cracking observed – no apparent water leaking through wall.	**Level 1** • Notify Environmental Superintendent. • Continue to monitor.
	Level 2 • Sudden drop in water level noted that it is not attributable to other recent activities or use. or • Deep cracking observed and water seepage through wall is visible (i.e. damp areas or signs of increased grass growth within embankment or immediately downstream) or severe cracking and visible signs of water discharging through earth embankment.	**Level 2** • As for Level 1 • Restrict access to the area. • Reduce stored water level by pumping water out (release downstream) and maintain lowered water level until post-subsidence assessment and repairs can be carried out.
Roads and access tracks		
To note any subsidence impacts that require remediation or implementation of additional traffic controls. **Sites:** Visual monitoring of affected roads and tracks. **Parameters:** Note any damage to roads that may cause traffic hazard (i.e. cracks, compression humps, ponded water on road surface). **Analysis:** Visual identification. **Frequency:** As required whilst active subsidence is affecting the road(s) and until any required remediation works are completed.	**Level 1** • If inspections note that road is no longer trafficable or safe.	**Level 1** • Implement appropriate traffic control (may include hazard signs or temporary road closure). • Notify mine personnel. • Review potential detour options and provide alternative access (if available). • Initiate road repairs/reconstruction to restore affected section to a trafficable standard.
	Level 2 • If vehicle accident occurs.	**Level 2** • As for Level 1. • Apply appropriate emergency/first aid treatment (if required). • Record and report incident in accordance with Narrabri Mine Health and Safety protocols. • Identify cause of accident. If subsidence impact related, review the effectiveness of the management/monitoring actions under this EP-BFMP and revise accordingly (if required).
Property and livestock fences		
To note the condition and functionality of affected fences to ensure effective exclusion of stock from active subsidence area. **Sites**: All panels (LW 203 to LW 206) **Parameters**: Visual inspections of fences and gates/cattle grids within active subsidence area. **Analysis**: Visual observation. **Frequency**: On an as needed basis.	**Level 1** • Damage observed to fences that can be attributed to subsidence movements.	**Level 1** • Notify Environmental Superintendent. • Undertake repairs as required.

Monitoring	Trigger	Action
Residential dwellings and machinery sheds		
Harmful substances		
To identify the presence of potentially harmful substances that may be released as a consequence of subsidence. **Sites**: All subsidence-affected buildings and structures. **Parameters**: Hazardous materials assessment. **Analysis**: Potentially affected building(s) to identify the presence of asbestos or other hazardous building materials/substances unable to remain in situ. **Frequency**: Prior to subsidence.	**Level 1** • Survey reveals presence of asbestos or other hazardous material within the buildings or surrounds that is considered a potential risk to the environment and/or personnel health in the event of subsidence damage.	**Level 1** • Notify Surface Operations Manager. • Remove or 'make safe' (demarcate) any potentially hazardous building materials that may potentially pose a health or environmental threat as a result of subsidence impacts (i.e. damage to asbestos) prior to subsidence impacts.
Post-subsidence condition		
To assess post-subsidence condition of structure and determine if repair is practicable, cost-effective, and safe. **Sites**: All subsidence-affected buildings and structures. **Parameters**: Post-subsidence structural assessment. **Analysis**: Assessment of structural stability. **Frequency**: Post subsidence.	**Level 1** • Structure collapses or is considered to be uneconomic to repair.	**Level 1** • Notify Surface Operations Manager. • Maintain safety fencing/exclusion of property to prevent access. • Demolish structure(s) and recycle/dispose of materials to a licensed waste facility.
Mine infrastructure		
SIS gas drainage wells		
To confirm site has been decommissioned and is stable and safe.	**Level 1** • Not fully decommissioned or considered unsafe to people or livestock.	**Level 1** • Notify Technical Services Manager. • Undertake additional works as required to remove remaining structures and rehabilitate. • Repair post-subsidence cracking or identified impacts as required.
PED Cable		
Maintain communications	**Level 1** • No longer operational.	**Level 1** • Notify Technical Services Manager/Civil Services Coordinator. • Inspect to locate site of damage and replace or repair as required.
Groundwater monitoring bores		•
Reinstatement of water bores.	**Level 1** • Groundwater monitoring bores predicted to have a 'high' risk of significant impact to well casing.	**Level 1** • Reinstate groundwater monitoring bores following significant groundwater recovery has occurred after mining. • Additional monitoring bores may be required to replace the function of impacted monitoring bores (if necessary).
Survey marks		
Pre- and post-mining notifications for impacts.	**Level 1** • Notify impacts to Survey marks 14 days prior to impact.	**Level 1** • Registered Surveyor to update details following mining.

Table A1-6 Public Safety Trigger Action Response Plan

Monitoring	Trigger	Action
Roads and access tracks		
To note any subsidence impacts that require remediation or implementation of additional traffic controls. **Sites:** Visual monitoring of affected roads and tracks. **Parameters:** Note any damage to roads that may cause traffic hazard (i.e. cracks, compression humps, ponded water on road surface). **Analysis**: Visual identification **Frequency:** As required whilst active subsidence is affecting the road(s) and until any required remediation works are completed.	**Level 1** • If inspections note that road is no longer trafficable or safe.	**Level 1** • Implement appropriate traffic control (may include hazard signs or temporary road closure). • Notify mine personnel. • Review potential detour options and provide alternative access (if available). • Initiate road repairs/reconstruction to restore affected section to a trafficable standard.
	Level 2 • If vehicle accident occurs	**Level 2** • As for Level 1. • Apply appropriate emergency / first aid treatment if required. • Record and report incident in accordance with Narrabri Mine Health and Safety protocols. • Identify cause of accident. If subsidence impact related, review the effectiveness of the management/monitoring actions under this EP-PSMP and revise accordingly if required.
Water storage dams and soil conservation banks		
Condition		
To document pre- and post-subsidence condition and allow identification of required remedial works **Sites:** All dams **Parameters** Obtain xyz coordinates along of water storage dam embankments/spillways and along contour banks. Photographic records. **Analysis:** Pre- and post-mining comparison **Frequency:** Pre- and post-subsidence	**Level 1** • Post-subsidence survey identifies that spillway and dam wall not likely to operate as intended (i.e. spillway no longer lowest point on wall); or • Post-subsidence survey identifies that contour bank not likely to operate as intended (i.e. damaged due to cracking, areas no longer able to drain, or lengths with increased slope).	**Level 1** • Notify Environmental Superintendent. • Reduce stored water level (if not already reduced), assess and undertake repairs to wall or spillway as required. • Reconstruct or repair as required.
Dam failure		
To observe possible subsidence effects to dam wall and identify potential risk of impending dam failure **Sites**: All dams **Parameters**: Visual inspections noting their condition, water level, cracking or recent erosion of earth embankment. **Analysis**: Visual identification of changes **Frequency**: Daily during undermining of structure	**Level 1** • Minor superficial surface cracking observed – no apparent water leaking through wall.	**Level 1** • Notify Environmental Superintendent. • Continue to monitor.
	Level 2 • Sudden drop in water level noted that it is not attributable to other recent activities or use. or • Deep cracking observed and water seepage through wall is visible (i.e. damp areas or signs of increased grass growth within embankment or immediately downstream) or severe cracking and visible signs of water discharging through earth embankment.	**Level 2** • As for Level 1 • Restrict access to the area • Reduce stored water level by pumping water out (release downstream) and maintain lowered water level until post-subsidence assessment and repairs can be carried out.

Monitoring	Trigger	Action
Property and livestock fences		
To note the condition and functionality of affected fences to ensure effective exclusion of stock from active subsidence area. **Sites**: All panels (LW 203 to LW 206) **Parameters**: Visual inspections of fences and gates/cattle grids within active subsidence area. **Analysis**: Visual observation. **Frequency**: On an as needed basis.	**Level 1** • Damage observed to fences that can be attributed to subsidence movements.	**Level 1** • Notify Environmental Superintendent. • Undertake repairs as required.
Residential dwellings and machinery sheds		
Harmful substances		
To identify the presence of potentially harmful substances that may be released as a consequence of subsidence. **Sites**: All subsidence-affected buildings and structures. **Parameters**: Hazardous materials assessment. **Analysis**: Potentially affected building(s) to identify the presence of asbestos or other hazardous building materials/substances unable to remain in situ. **Frequency**: Prior to subsidence.	**Level 1** • Survey reveals presence of asbestos or other hazardous material within the buildings or surrounds and that is considered a potential risk to the environment in the event of subsidence damage.	**Level 1** • Notify Surface Operations Manager. • Remove or 'make safe' (demarcate) any potentially hazardous building materials that would potentially pose a health or environmental threat as a result of subsidence impacts (i.e. damage to asbestos) prior to subsidence impacts.
Post-subsidence condition		
To assess post-subsidence condition of structure and determine if repair is practicable, cost-effective and safe **Sites**: All subsidence-affected buildings and structures **Parameters**: Post-subsidence structural assessment **Analysis**: Assessment of structural stability. **Frequency**: Post-subsidence	**Level 1** • Structure collapses or is considered to be uneconomic to repair.	**Level 1** • Notify Surface Operations Manager. • Maintain safety fencing / exclusion of property to prevent access. • Demolish structure(s) and recycle/dispose of materials to a licensed waste facility.
Mine infrastructure		
Surface to inseam gas drainage wells		
To confirm site has been decommissioned and is stable and safe	**Level 1** • Not fully decommissioned or considered unsafe to people or livestock.	**Level 1** • Notify Technical Services Manager. • Undertake additional works as required to remove remaining structures and rehabilitate. • Repair post-subsidence cracking or identified impacts as required.
PED Cable		
Maintain communications	**Level 1** • No longer operational.	**Level 1** • Notify Technical Services Manager/Civil Services Coordinator. • Inspect to locate site of damage and replace or repair as required.
Unauthorised access		
Limited occurrences of unauthorised site access.	**Level 1** • Evidence of unauthorised access.	**Level 1** • Review and update site induction and security controls as required. • Review fencing and signage and undertake maintenance and improvements as required.

Attachment 2 Compliance conditions relevant to this Plan

Table A2-1 Project Approval conditions relevant to this Plan

Project Approval 08_0144 conditions		Document reference
Condition	**Requirement**	
Schedule 2 Condition 1	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 project.	Section 5.2 Section 5.3
Schedule 2 Condition 11	With the approval of the Secretary, the Proponent may submit any management plan or monitoring program required by this approval on a progressive basis. ***Note**: The conditions of this approval require certain strategies, plans, and programs to be prepared for the project. They also require these documents to be reviewed and audited on a regular basis to ensure they remain effective. However, in some instances, it will not be necessary or practicable to prepare these documents for the whole project at any one time, particularly as these documents are intended to be dynamic and improved over time. Consequently, the documents may be prepared and implemented on a progressive basis, subject to the conditions of this approval. In doing this however, the Proponent will need to demonstrate that it has suitable documents in place to manage the existing operations of the project.*	No staging of EP 203-206 proposed.
Schedule 3 Condition 1	The Proponent shall ensure that mine subsidence does not cause any exceedances of the performance measures in Table 1. *Table 1: Subsidence Impact Performance Measures* ***Water Resources*** Great Artesian Basin — The Proponent shall ensure that, within 5 years of the date of this approval, any loss of water flow into the Great Artesian Basin aquifers (equal to the maximum predicted impact, or the measured impact of the project, whichever is the greater), is managed, licensed or offset (including the possibility of injection of raffinate) to the satisfaction of DPIE Water. ***Biodiversity*** Flora and Fauna — The Proponent shall ensure that clearing and disturbance of vegetation above the mining area is minimised, to the satisfaction of the Secretary. *Note: The Proponent may be required to define other performance measures and performance indicators in management plans required under this approval (see eg condition 3 below).*	Section 5.1
Schedule 3 Condition 2	The Proponent shall ensure that the project does not cause any exceedances of the performance measures in Table 2, to the satisfaction of Resources Regulator. *Table 2: Subsidence Impact Performance Measures* ***Built Features*** All built features — Always safe. Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated. ***Public Safety*** Public Safety — No additional risk	Section 5.1

Project Approval 08_0144 conditions		Document reference
Condition	**Requirement**	
	Notes: *1) The Proponent will be required to define more detailed performance indicators for each of these performance measures in Built Features Management Plans or Public Safety Management Plan (see condition 4 below).* *2) Requirements regarding safety or serviceability do not prevent preventative or mitigatory actions being taken prior to or during mining in order to achieve or maintain these outcomes.* *3) Compensation required under this condition includes any compensation payable under the Mine Subsidence Compensation Act 1961 and/or the Mining Act 1992.*	
Schedule 3 Condition 4	NCOPL shall prepare and implement Extraction Plans for any second workings to be mined to the satisfaction of the Secretary. Each Extraction Plan must:	
	(a) be prepared by a team of suitably qualified and experienced persons whose appointment has been endorsed by the Secretary;	Section 2.2.1 Attachment 3
	(b) be approved by the Secretary before NCOPL carries out any of the second workings covered by the plan;	Section 2.1.1
	(c) include detailed plans of the proposed first and second workings and any associated surface development;	Appendix H
	(d) include detailed performance indicators for each of the performance measures in Tables 1 and 2 (as included in Schedule 3 Condition 2 of the Project Approval);	Section 5.1
	(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;	Section 3 Appendix J
	(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;	Section 5.2 Appendix A to Appendix G
	(g) include the following to the satisfaction of the Resources Regulator:	
	• a Coal Resource Recovery Plan that demonstrates effective recovery of the available resource;	Appendix G
	• a Subsidence Monitoring Program to: ▪ 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 K

Project Approval 08_0144 conditions		Document reference
Condition	**Requirement**	
	• a Built Features Management Plan to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings, and which: ▪ 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 E
	• a Public Safety Management Plan to ensure public safety in the mining area; and	Appendix F
	• appropriate revisions to the Landscape Management Plan required under Condition 3 of Schedule 5; and	No revisions to the Landscape Management proposed under this EP 203-206
	(h) include a:	
	• Water Management Plan, which has been prepared in consultation with EPA and DPE 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: ▪ 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 A
	• Biodiversity Management Plan, which has been prepared in consultation with BCS and the Resources Regulator, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on flora and fauna;	Appendix C
	• 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 B
	• Heritage Management Plan, which has been prepared in consultation with Heritage NSW and relevant stakeholders for Aboriginal heritage, to manage the potential environmental consequences of the proposed second workings on heritage sites or values; and	Appendix D

Project Approval 08_0144 conditions		Document reference
Condition	**Requirement**	
	(i) include a program to collect sufficient baseline data for future Extraction Plans.	Section 4.2 Appendix K
	Notes: *Management plans prepared under condition 4(h) should address all potential impacts of proposed underground coal extraction on the relevant features. Other similar management plans required under this approval (eg under conditions 13 and 23 of schedule 4 or condition 3 of schedule 5) are not required to duplicate these plans or to otherwise address the impacts associated with underground coal extraction.*	
Schedule 3 Condition 5	NCOPL shall ensure that the management plans required under condition 4(h) above include:	
	(a) an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval;	Appendix A Appendix B Appendix C Appendix D
	(b) a detailed description of the measures that would be implemented to remediate predicted impacts; and	
	(c) a contingency plan that expressly provides for adaptive management.	
Schedule 6, Condition 2	NCOPL shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:	
	(a) detailed baseline data;	Section 4.2
	(b) a description of:	
	• the relevant statutory requirements (including any relevant approval, licence or lease conditions);	Section 2.1
	• any relevant limits or performance measures/criteria;	Section 5.1
	• 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	
	(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria:	Section 5
	(d) a program to monitor and report on the:	
	• impacts and environmental performance of the project;	Section 4.1
	• effectiveness of any management measures (see (c) above);	
	(e) a contingency plan to manage any unpredicted impacts and their consequences;	Section 5.4 Section 5.5

Project Approval 08_0144 conditions		Document reference
Condition	**Requirement**	
	(f) a program to investigate and implement ways to improve the environmental performance of the project over time;	Section 5.7.3
	(g) a protocol for managing and reporting any;	
	• incidents;	Section 5.6.1
	• complaints;	Section 5.6.3
	• non-compliances with statutory requirements; and	Section 5.6.2
	• exceedances of the impact assessment criteria and/or performance criteria; and	Section 5.6
	(h) a protocol for periodic review of the plan.	Section 6.1
Schedule 6 Condition 3	Within 3 months of the submission of an:	
	(a) audit under condition 7 of Schedule 6;	
	(b) incident report under condition 4 of Schedule 6; and	
	(c) annual review under condition 5 of Schedule 6; and	
	(d) any modification to the conditions of this approval (unless the conditions require otherwise),	
	NCOPL shall review, and if necessary revise, the strategies, plans, and programs required under this approval to the satisfaction of the Secretary.	
Schedule 6 Condition 4	The Proponent shall notify the Secretary in writing via the Major Projects website and any other relevant agencies of any incident associated with the project as soon as practicable after the Proponent becomes aware of the incident. Within 7 days of the date of the incident, the Proponent shall provide the Secretary and any relevant agencies with a detailed report on the incident.	Section 5.6
Schedule 6 Condition 5	The Proponent shall provide regular reporting on the environmental performance of the project on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this approval, and to the satisfaction of the Secretary.	Section 5.7 Section 6.2
Schedule 6 Condition 6	By the end of March each year, the Proponent must submit a review of the environmental performance of the project for the previous calendar year to the satisfaction of the Secretary.	Section 5.7.1
Schedule 6 Condition 7	Prior to 13 September 2010, and every 3 years thereafter, unless the Secretary directs otherwise, the Proponent shall commission and pay the full cost of an Independent Environmental Audit of the project (Stages 1 and 2).	Section 5.7.2

Project Approval 08_0144 conditions		Document reference
Condition	**Requirement**	
Schedule 6 Condition 10	The Proponent shall: (a) make copies of the following publicly available on its website: • the documents referred to in Condition 2 of Schedule 2; • all current statutory approvals for the project; • all approved strategies, plans and programs required under the conditions of this approval; • a comprehensive summary of the monitoring results of the project, reported in accordance with the specifications in any conditions of this approval, or any approved plans and programs; • a complaints register, updated on a monthly basis; • minutes of CCC meetings; • the annual reviews of the project; • any independent environmental audit of the project, and the Proponent's response to the recommendations in any audit; • any other matter required by the Secretary; and	Section 6.2
	(b) keep this information up-to-date, to the satisfaction of the Secretary.	Section 6.2

Table A2-2 Relevant Statement of Commitments

SoC requirements		Document Reference
SoC	**Summary of the requirement**	
5.1	Inspect the identified 'cracking zones' above each longwall panel to identify occurrence of cracks.	Section 4.1
5.2	Rip the surface over cracks not filled in by natural processes.	Section 5.2
5.3	For larger cracks for which surface ripping will not completely fill, fill with subsoil material sourced from stockpiles maintained at nearby gas drainage or ventilation sites, or within the footprint of the Reject Emplacement Area.	Section 5.2
5.4	Undertake a detailed condition assessment of the 3rd order waterways within the predicted subsidence zone to enable assessment of changes post mining.	Section 3 Appendix B Appendix K
5.5	Inspect local drainage lines above the active and completed longwall panels. Monitoring should assess any restriction of flows and hence restriction of fish passage to facilitate appropriate restorative measures.	Appendix A Appendix B Appendix K
5.6	Undertake water quality sampling from watercourses within the impact zone to determine any impacts on sediment loading and other parameters including salt loads.	Appendix A Appendix K
5.7	Note the effects of any ponding and commission a hydrologist or ecologist to recommend remedial actions should the area of ponding encroach upon sites of conservation or heritage significance.	Appendix A
5.8	Inspect areas of the Mine Site susceptible to landslip or accelerated erosion, eg. drainage lines and steeply sloped areas of exposed Purlawaugh Formation derived subsoils.	Appendix B Appendix K
5.9	(In the event of large-scale slope instability), undertake appropriate stabilisation works, eg. installation of deep sub-surface drainage trenches or construction of strategic catch drains along slope crests.	Appendix B
5.10	(In the event of erosion within Mine Site watercourses), stabilise the damaged or eroded banks (in accordance with an Erosion and Sediment Control Plan for the Longwall Project).	Appendix B
5.11	Establish survey lines along ephemeral drainage gullies and along gully crests and monitor during and after mining of each longwall panel to identify any signs of cracking or 'upsidence'.	Section 4.2 Appendix B Appendix K
5.12	Review predictions of 'upsidence' and valley crest movements after each longwall is completed.	Section 2.2.2 Section 3 Appendix J
5.13	(In the event that 'upsidence' results in surface cracking or erosion), undertake remedial works identified by Commitments 6.1 to 6.8.	Appendix B
5.14	Sample ponded water to determine if there is any increase in salinity.	Appendix A
5.15	Inspect the watercourses over the subsidence zone to identify the location and extent of ponding.	Section 4.1 Appendix A Appendix K
5.16	For ponding where there is little or no vegetation of conservation significance) monitor the location and extent of ponding. (If ponded area continues to increase in area, encroaches on vegetation of conservation significance or there is an increase in water salinity), excavate a channel to reduce the gradient change over the retained chain pillars. The excavation will be undertaken in accordance with an Aboriginal Cultural Heritage Management Plan and vegetation clearing procedures.	Appendix A Appendix K
5.17	Monitor surface features (such as culverts) within 800m of the eastern edge and 1.5km of the western edge of the Mining Area.	Appendix E Appendix K

SoC requirements		Document Reference
SoC	**Summary of the requirement**	
5.18	(In the event of damage to surface structures such as pipes, culverts, water tanks, dams or other soil or water conservation structures), repair the damaged infrastructure or provide appropriate compensation.	Appendix E
5.19	Commission a dilapidation survey and inspection of all structures on non-project related land within the Mine Site by a qualified building consultant.	Appendix E
5.20	Use the dilapidation survey and subsequent report in an individual property subsidence management plans (IPSMP) prepared for each property to be impacted (to provide fair and reasonable outcomes between the affected property owner and the Proponent).	Appendix E
5.21	Each IPSMP will address the following issues. • Timing and scale of predicted impacts. • Monitoring on the affected property during mining. • Timing for any remaining disconnection of services. • Post-mining inspection and reporting.	Appendix E
5.22	Prepare a Subsidence Monitoring Program which includes the following elements. • A transverse subsidence line across the northern and southern panels. The lines will be installed to at least the middle of the next adjacent longwall before undermining occurs. • A longitudinal line extending in-bye and out-bye from the starting and finishing point of each panel, for a minimum distance equal to the cover depth. • A survey line along the riparian management zone of Kurrajong and Pine Creeks and their tributaries over the Mine Site. • A minimum of three monitoring pegs spaced 10m apart in a line or triangle at any feature of interest, eg. dam walls, archaeological sites, to measure subsidence, tilt and strain. • Visual inspections and mapping of damage before, during and after mining.	Appendix K
5.23	Place monitoring survey pegs between 10m and 20m apart with a minimum of two baseline surveys of subsidence and strain completed before mine subsidence effects occur.	Section 4.2 Appendix K
5.24	Prepare and implement an Extraction Management Plan to manage subsidence impact to the satisfaction of the DII and DoP	Section 1.2

Table A2-3 Relevant EPBC 2009/5003 requirements

EPBC 2009/5003 conditions		Document reference
Condition	**Requirement**	
Condition 3	In order to minimise potential impacts on EPBC Act listed threatened species and communities within the mine site, prior to any Works commencing and in accordance with the NSW Director General's Assessment Report and approval conditions (26 July 2010), NCOPL must develop and implement an Extraction Plan. The final version of this plan must be submitted to DAWE.	Section 2.1.3

Attachment 3 DPHI endorsement and consultation correspondence

Department of Planning and Environment

Our ref: 08_0144-PA-38

Mr Brent Baker
Environmental Superintendent
Narrabri Coal Operations

07/11/2022

Subject: Appointment of Experts – Extraction Plan for Longwalls 203-206

Dear Mr Baker

I refer to your request for the endorsement of a suitably qualified and experienced team to prepare the Extraction Plan for Longwalls 203-206 for Narrabri Coal Mine Stage 2, in accordance with Condition 4(a), Schedule 3 of project approval 08_0144.

The Department has reviewed the nominations and information you have provided and is satisfied that these experts are suitably qualified and experienced. Accordingly, I can advise that the Planning Secretary approves the appointment of the following team:

- Mr Mike Gale, Mr Servaes van der Meulen, of Onward Consulting to prepare the main extraction plan document and coal resource recovery plan as well as the administrative and non-specialist management and monitoring plans;
- Ms Linden Burch and Ms Carmen Osborne of Onward Consulting to prepare the subsidence monitoring program, built features, land, public safety and biodiversity management plans, as well as the main extraction plan document and administrative and non-specialist management and monitoring plans;
- Mr Steven Ditton of Ditton Geotechnical Services to undertake subsidence modelling and predictions;
- Mr Keith Phillipson and Mr Pieter Labuschagne of Australasian Groundwater and Environmental Consultants to prepare the ground water component of the Water Management Plan;
- Mr Anthony Marszalek, Dr Camilla West, Mr Lee Rigley and Ms Kimberley McNamara of ATC Williams to prepare the surface water component of the Water Management Plan; and
- Dr Matthew Whincop of Whincop Archaeology to prepare the Aboriginal Heritage Management Plan.

Further, given that commencement of Stage 3 has been delayed and that you will be commencing longwall extraction in the southern panels, the Department requests that the Extraction Plan includes further consideration/ update of minimisation of fugitive emissions in accordance with Schedule 3 Conditions 31 and 32 – Gas Drainage, and Schedule 3 Condition7 – implementation of reasonable and feasible measures to miniise the release of greenhouse gas emissions. You should utiise the services of suitably qualified and experienced persons to provided advice in this respect.

If you wish to discuss the matter further, please contact Philip Nevill on 82751036.

Yours sincerely

Stephen O'Donoghue
Director
Resource Assessments
As nominee of the Planning Secretary

MINUTES

Narrabri Coal Extraction Plan LW 203-206 Resources Regulator Briefing

Date	2 December 2022
Time	11:00am
Venue	Videoconference
Attendees	Brent Baker (NCOPL), Shane Rily (NCOPL), Mark Vile (Onward Consulting), Carmen Osborne (Onward Consulting), Matthew Newton (Resources Regulator), Christine Fawcett (Resources Regulator), Steve Ditton (Ditton Geotechnical Services)
Apologies	Ray Ramage (Resources Regulator), Mark Buchan (Resources Regulator)
Distribution	NCOPL, Resources Regulator (RR), Onward

A draft (Revision A) of the Extraction Plan and all key sub-plans was submitted to the Resources Regulator on the 8 November 2022 for review and comment in accordance with Schedule 3 Condition 4(g) and Condition 4(h) of the Stage 2 Project Approval (PA 08_0144). The Resources Regulator noted the submission of the draft Extraction Plan (9 November 2022) and stated that they will review and comment on the Extraction Plan when it is formally submitted as a final copy to the Department of Planning and Environment for approval.

There were no specific actions required by the Resources Regulator to update the EP 203-206 or its sub plans as part of this consultation held on 2 December 2022.

Item	Agenda	Comments
Briefing presentation given by Brent Baker (NCOPL)		
1.	**Portal document lodgement**	MN advised NCOPL to lodge EP 203-206 via the Planning Portal and noted that the RR are not resourced to review the draft and final plan. The RR appreciate the consultation via a briefing meeting for the draft plan. The final plan will be received by the RR once with DPE via the Planning Portal.
2.	**Consultation**	
2.1	Plans provided to NSW Local and State Government agencies for consultation: – Narrabri Shire Council – Registered Aboriginal Parties – Heritage NSW – Biodiversity & Conservation Division – DPE Water – Resources Regulator – Environment Protection Agency	Nil

Item	Agenda	Comments
2.2	Resources Regulator are required to review the following plans in accordance with Schedule 3 Condition 4(g) and Condition 4(h) of PA 08_0144: – Extraction Plan for LW 203-206: ▪ Coal Resource Recovery Plan ▪ Subsidence Monitoring Program ▪ Built Features Management Plan ▪ Public Safety Management Plan ▪ Biodiversity Management Plan	Nil
3.	**Coal Resource Recovery Plan**	
3.1	Coal resource at the Narrabri Mine consists of the Hoskissons Seam, which strikes generally north south and dips gently to the west. Thickness ranges from 4.5 to 9.5 m with coal extraction from the lower 4.3 m.	MN requested the length of time required to extract from each longwall. BB advised that each longwall would take approximately 12 months to extract. NCOPL are currently completing extraction from LW 110 with a 6-week longwall miner move to LW 203. Mining of LW 203 is expected to commence in April 2023.
4.	**Risk Assessment**	
4.1	The risk assessment for LW 203 to LW 206 did not identify any high-risk items. Risks associated with subsidence impacts were assessed as low to moderate.	RR did not raise any significant issues regarding the risk assessment during the briefing presentation. BB advised that the risk assessment builds on previous risk assessments developed for LW 101 to LW 110 and cut and flit panels 201 and 202.
5.	**Subsidence Assessment**	
	Ditton Geotechnical Services Pty Ltd provided subsidence modelling and predictions in the Subsidence Assessment Report for LW 203-206.	
	Summary of subsidence impacts to natural features such as steep rocky slopes and built features such as gravel access tracks, NCOPL owned dwellings, farm dams, fencing, groundwater bores and bridges and culverts.	MN asked if subsidence has been within predicted limits for previous longwalls. BB advised that subsidence has been less than predicted. SD advised that subsidence is minimal and has been within the modelled predictions. The modelling for LW 203-206 is considered to be conservative. RR asked for information on any built features that will be impacted. BB advised that surveys have been completed on the NCOPL owned dwellings and that these. dwellings are inhabitable. BB advised that all utility infrastructure is NCOPL owned and that an application to damage or remove is to be submitted to the Surveyor General in relation to a single State Survey Mark located in the Extraction Plan area.

Item	Agenda	Comments
		MN asked how long the application process is expected to take. BB was not familiar of the specific timeframe for the application process. CO advised that the required submission must be made a minimum of 14 days prior to impact. BB advised that NCOPL groundwater monitoring bores would be reinstated within 3 months of subsidence impact to ensure continuation of monitoring program. BB advised that no publicly owned surface features are located within the zone of subsidence.
6.	**Built Features Management Plan**	
	– Water storage dams and soil conservation contour banks, roads, access tracks, power, and telecommunications – Survey marks – Property and livestock fences – Dwellings and machinery sheds – Mine infrastructure	BB noted that all property within the EP area is NCOPL owned. MN asked about impacts to farm dams and the process for reinstatement. BB advised that some land is leased for cattle grazing And that NCOPL assess each farm dam prior to mining to determine need to drain (fully or partially). and determine if any modifications or remediation works are required following subsidence. NCOPL reconstruct contour banks (if required). BB emphasised the following: – access is restricted to NCOPL personnel only within mining area – signage and road repairs are undertaken to remediate subsidence – applications will be made to Surveyor General in relation to a single State Survey Mark – stock are excluded from active subsidence areas
7.	**Public Safety Management Plan**	
	Management controls consistent with the Built Features Management Plan	Nil
8.	**Biodiversity Management Plan**	
	– Negligible impact on flora and fauna – Erosion and sediment control plan – Weed and pest animal monitoring and control program – Floristic based subsidence monitoring program in place including riparian vegetation – Six potential ponding locations	MN asked if the EP includes a description on surface disturbance / clearing. BB advised that NCOPL have a vegetation clearing protocol for surface vegetation clearing required for gas drainage, telecommunications etc. No impact other than the occasional tree fall is expected. MN asked about management of ponding. BB/CO/SD advised that five of the potential ponding areas already exist along the watercourses and dams. Existing ponds are expected to extend laterally from the

Item	Agenda	Comments
		watercourses for distances ranging from 50 m to 410 m. Existing ponded areas extend up to 270 m, indicating a potential lateral increase of up to 140 m.
9.	**Subsidence Management Measures**	
	– Surface cracks – Sub-surface cracking – Ponding	BB advised that visual inspections are conducted and surface cracks greater than 50 mm repaired following active subsidence. BB/SD/CO advised that a subsidence calibration borehole, VWPs and extensometer are proposed over LW 203. CO advised that contingency plans are outlined within all management plans e.g. trigger for specialist assessment in ponded areas if vegetation or flows are affected. BB advised that NCOPL conduct remotes sensing over subsidence zone to detect changes in vegetation cover or erosion and a creek line monitoring program is established to assess changes to creek morphology and gully erosion.
10.	**Subsidence Monitoring Program**	
	– Built features and public safety – Surface water – Groundwater – Biodiversity – Land – Heritage	BB confirmed the continuation of previous subsidence monitoring programs. SD noted that subsidence monitored to date has been within predicted limits and is typically less impact than predicted.

NCOPL to distribute briefing presentation to the Resources Regulator for any additional feedback.

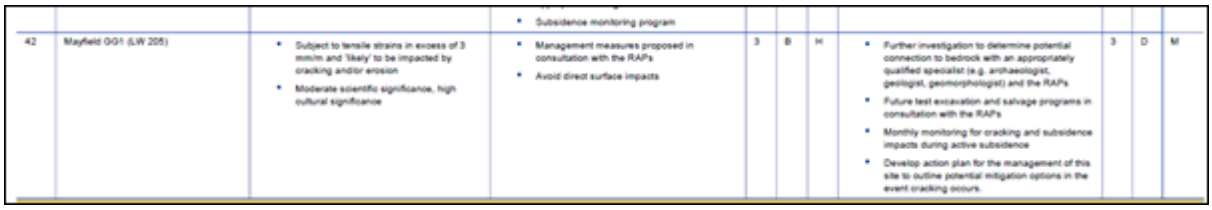
Questions for Whitehaven – Narrabri Underground Longwalls 203-206

Groundwater – Rae Mackay

1. Can you please provide detailed information on how exceedance of triggers for groundwater level declines occurring beyond the end of mining will be managed given the long time delays in predicted peak groundwater level declines and changing groundwater conditions due to climate variability?
2. When will the installation of the new monitoring VWP borehole above longwall 203 take place relative to the completion of mining of longwall 203?
3. Please provide the available data to show the relationship between the monitoring of the Namoi aquifer upstream of the key monitoring boreholes in the Namoi aquifer and how it has been demonstrated that comparisons of water level variations upstream of the Namoi aquifer monitoring locations with the key monitoring locations are adequate to assess impacts of mining on the aquifer relative to other impacts such as extraction and climate variations.

Subsidence – Jim Galvin

1. Can NCOPL please provide the Panel with photographs of Aboriginal cultural heritage site Mayfield GG1 (AHIMS 19-6-0192 - the site of 48 grinding grooves)?
2. What performance measures have been endorsed and by whom for Mayfield GG1?
3. When will it be established if the grinding grooves are located in bedrock or on 'loose' boulders?
4. Re the following extract from Appendix I – Risk Assessment.



			• Subsidence monitoring program								
42	Mayfield GG1 (LW 205)	• Subject to tensile strains in excess of 3 mm/m and 'likely' to be impacted by cracking and/or erosion • Moderate scientific significance, high cultural significance	• Management measures proposed in consultation with the RAPs • Avoid direct surface impacts	3	B	H	• Further investigation to determine potential connection to bedrock with an appropriately qualified specialist (e.g. archaeologist, geologist, geomorphologist) and the RAPs • Future test excavation and salvage programs in consultation with the RAPs • Monthly monitoring for cracking and subsidence impacts during active subsidence • Develop action plan for the management of this site to outline potential mitigation options in the event cracking occurs.	3	D	M

   a. What specific additional controls cause the likelihood rating of cracking of the grinding grooves to decrease from 'B (likely)' to 'D (unlikely)'?
   b. How are these ratings influenced by whether the grinding grooves are located in bedrock or on 'loose' boulders?

Surface Water – Neil McIntyre

1. p23 of Water Management Plan: What is the expected total net increase in surface water ponding area for LW203-206? If this is different from that estimated in the Stage 3 EIS for LW203-206, what is the reason?
2. p29 of the Water Management Plan: What types of remedial action will be considered for ponding on vegetated areas? What is meant by "in areas with no vegetation" (from available images, vegetation of some type is present almost everywhere, so is this a moot point or are some types of vegetation excluded)? What type of remedial actions are available if ponding significantly alters or affects flows?

3. p32 of the Water Management Plan: Is continuous monitoring of water levels, pH and EC in one or more ponds practicable (i.e. in periods when a significant pond exists)?
4. p33 of the Water Management Plan: What methods of measuring and/or predicting creek flows will be under consideration, and will any baseline period measurements be required? When will the channel geomorphology baseline surveys and proposed locations for 100m reaches be available?
5. In Table 6.3 of the Water Management Plan, a significant rainfall event is defined as "a rainfall event >38.4 mm over 5 consecutive days" What is the average recurrence interval (ARI) of such an event; and why is this specific definition used rather than allowing for alternative durations of events of the same ARI?

Greenhouse Gas – Ray Williams

1. Further Report Requests
    a. Moreby, 2009a, *Narrabri Project – Greenhouse Gas Emission Mitigation Strategy*, Roy Moreby, March 2009.
    b. Moreby et al, 2010, *Strategic Review Of Gas Management Options For Reduced GHG Emissions*, Roy Moreby et al, May 2010
    c. Palaris report WHC4940-1 on LW109 modelling
    d. NGE reports for 2018/19, 2019/20, 2020/21, 2021/22
    e. Latest GHG Management Plan
2. Recent Mining
    a. Gas make data in EXCEL form for LW108, LW109 showing breakdown between return gas in ventilation and goaf well gas (if any goaf wells). Also breakdown between CH_4 and CO_2. Average gas values on a daily basis including tonnes of coal mined.
    b. Plan showing existing predrainage borehole plots for both UIS and SIS
    c. Are UIS boreholes drilled downdip? If so are they actively dewatered?
    d. Selection of predrainage boreholes in LW108, 109, 110 showing gas flow rates tracking CO_2, CH_4 gas composition over time.
    e. Is there currently any goaf well production? If so, plan showing locations of numbered goaf wells drilled. Also schematic of goaf well design showing diameter, section cemented, section perforated casing, distance above HSK seam working horizon. Goaf well production data including gas composition (CO_2, CH_4, O_2, N_2).
    f. Any data on the gas content and composition of the coal as it exits the mine and the site?
    g. How evenly is gas predrainage across the height of the HSK seam. Does banding inhibit predrainage of the upper section of the seam? In achieving a quoted 3.5 m^3/t remaining gas, does this value apply to the whole seam or just the lower half?
    h. The forward predictions (Palaris WHC5175) appear to assign gas to the Digby Conglomerate and Arkarula Formation (included in history matching LW108/109). Can Palaris provide of pie chart or table listing the gas reservoir sizes of the stratigraphic elements and their respective degrees of emission. Does the Arkarula and Digby Conglomerate need to be included to model the level of gas observed?
3. For LW203-206
    a. Are any goaf wells planned? If so locations and design.
    b. Provide a map showing planned location of pre-drainage boreholes (SIS and UIS). Is the whole of the HSK seam predrained to 3.5 m3/t in the modelling.

c. The predrainage stream is a relatively small proportion of the total GHG emissions. Although CO_2 is challenging to pre-drain especially at low gas contents, does the mine see any scope to optimise predrainage operations – eg improved well completion, dewatering, well operation, application of higher negative pressure at the well head, tighter well spacing? Would a higher level of predrainage take out higher CH_4 quantities from the ventilation stream?
d. As per point h. previous section but showing the modelled contributions of the various stratigraphic elements for LW203-206.

Greenhouse Gas - Dianne Wiley

* Please provide the following reports:

- WHC 5733-01 Narrabri Gas Flare Position report.

- WHC-PLN-NAR-Outburst Principal Hazard Management Plan

- JCM, 2011 Energy Savings Action Plan

* In the various reports provided to date, is it correct to assume that 'emissions' should be interpreted as 'emissions to atmosphere'? If not, please clarify the difference preferably with graphs over time for the different types of emissions.

• For the Gas Reservoir and Emission Assessment WHC5175 dated 14 Feb 2020, the appendices show emission for CH4. Is there similar data for CO2?

* Are there any updates to the Greenhouse Gas Minimisation Plan 601.11062-R1 dated 7 June 2012? If so please provide all updated versions.

* In relation to the 2012 GHGMP:

- Which options for minimising GHG emissions are being progressed further? Please provide details across all of the categories in the different categories in Section 4 including a current status for actual or planned implementation.

- Similarly for the research program presented in section, please provide details of current status for different aspects of the research plan.

* What consideration has been given to minimising CO2 emissions during Stage 2? Please provide copies of any reports or plans for this.

* Please provide a figure similar to figure 7.2 in the Greenhouse Gas Emissions Forecast (Appendix B) of the Stage 3 extension project, showing anticipated reduction in GHG emissions to atmosphere (both CH4 and CO2) for the Stage 2 project on an annual basis over the anticipated time frame of the project.

* What measures are planned to minimise GHG measures on mine closure and how the performance of these measures will be monitored over time? (not sure if this is relevant for now).

Table A3-1 IAPUM RFI responses

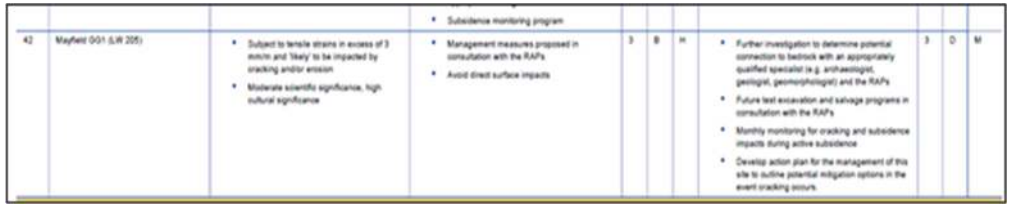
Consultation feedback	Outcome	Document reference
Groundwater – Rae Mackay		
1. Can you please provide detailed information on how exceedance of triggers for groundwater level declines occurring beyond the end of mining will be managed given the long time delays in predicted peak groundwater level declines and changing groundwater conditions due to climate variability?	Table 6-5 in the Extraction Plan 203-206 Water Management Plan (EP-WMP) (Appendix A) details the groundwater level triggers to 2031 (i.e. mine life approved under the Stage 2 Project Approval PA 08_0144) for those bores associated with LW 203 to LW 206. The trigger action response plan for groundwater in Table 7-2 of the EP-WMP outlines the response actions to be carried out in the event of groundwater level triggers being exceeded during the Extraction Plan period. Management of groundwater level declines occurring beyond the end of mining is included in the latest revision of the Site WMP (not yet approved) which includes the following key aspects: • <u>Water licensing for post-mining water take:</u> The groundwater model will be updated every five years to provide more accurate predictions of groundwater drawdown and water take, including beyond the end of mining. NCOPL will maintain appropriate water access license entitlement for post-mining water take. • <u>Impacts on privately-owned water supply bores:</u> The current groundwater model for the Narrabri Mine identifies nine private landholder bores that are predicted to exceed the AIP 2 m minimal impact criterion. NCOPL has committed to make good measures at all nine privately owned bores where the	EP-WMP (Appendix A)

Consultation feedback	Outcome	Document reference
	AIP's 2 m minimal impact criterion may be exceeded. Make good provisions and contingency measures will be applied in accordance with the terms of any formal make-good agreement. The above aspects are outside the scope of this Extraction Plan. Management of post-mining groundwater impacts will also be addressed in the Mine Closure Plan.	
2. When will the installation of the new monitoring VWP borehole above longwall 203 take place relative to the completion of mining of longwall 203?	The purpose of this new VWP (i.e. subsidence calibration borehole) is to assess actual vs predicted sub surface fracturing impacts. As presented in section 6.2.1 and Table 6-4 of the EP-WMP, there will be two boreholes drilled, one for the multi-level VWP (for monitoring water level) and the other for a deep wireline extensometer (for monitoring displacement). The requirements for monitoring of these new boreholes will also be incorporated in the Site WMP following their construction. The additional groundwater monitoring bores will be installed prior to the commencement of secondary workings to obtain sufficient baseline data.	EP-WMP (Appendix A)
3. Please provide the available data to show the relationship between the monitoring of the Namoi aquifer upstream of the key monitoring boreholes in the Namoi aquifer and how it has been demonstrated that comparisons of water level variations upstream of the Namoi aquifer monitoring locations with the key monitoring locations are adequate to assess impacts of mining on the aquifer relative to other impacts such as extraction and climate variations.	As presented in section 9.3 of the EP-WMP, NCOPL will engage a suitably qualified expert hydrogeologist to collate and review monitoring data collected for the previous calendar year. The Narrabri Coal Mine Annual Groundwater Review 2021 (Groundwater Exploration Services Pty Ltd, 2022) (provided to IAPUM as part of the request for documentation) provides an assessment of the impacts from mining on the alluvium. The key monitoring bores located within the alluvium associated with the Namoi River are:	EP-WMP (Attachment A)

Consultation feedback	Outcome	Document reference
	• WB3a and WB3b – located approximately 7 km northeast of the NM lease. • WB4 – located approximately 5 km northeast of the NM lease. • WB5a and WB5b – located approximately 9.5 km east of the NM lease. • WB6a and WB6b – located approximately 11 km southeast of the NM lease. • WB7 – located approximately 6.5 km east of the NM lease. There has been no observed impact on these bores from mining activities during the reporting period. Bores WB3a and b, WB4, WB5a and b, and WB6a all show gradual groundwater level decline within the three years between 2017 and 2020 and this can be correlated with below average rainfall trends. During the past two years, the above average rainfall trends have resulted in groundwater level recoveries. Hydrographs are shown in Figure 5 of the review (Groundwater Exploration Services Pty Ltd, 2022) along with the rainfall residual mass curve. Monitoring results of the Namoi aquifer upstream of the key monitoring bores are also presented in section 5.1 and section 5.2 of the review (Groundwater Exploration Services Pty Ltd, 2022). In addition, NCOPL have committed to installing additional primary early warning monitoring bores (P62 to P64, P68 to P70, P71 to P73 and P74 to P76) located upstream and downstream of the mine on Pine Creek, Kurrajong Creek, and Tulla Mullen/Sandy Creeks (section 6.2.1 of the EP-WMP). Trigger levels will be established for these bores according to the maximum	

Consultation feedback	Outcome	Document reference
	predicted drawdown at these locations and following the collection of baseline data over six to eight monitoring events. Monitoring data from these additional bores will also be incorporated in the Narrabri Coal Mine annual groundwater review (section 9.3 of the EP-WMP).	
Subsidence – Jim Galvin		
1. Can NCOPL please provide the Panel with photographs of Aboriginal cultural heritage site Mayfield GG1 (AHIMS 19-6-0192 - the site of 48 grinding grooves)?	Current photographs of Mayfield GG1 have been provided to IAPUM as part of the request for documentation.	N/A
2. What performance measures have been endorsed and by whom for Mayfield GG1?	NCOPL received endorsement from DPE (letter dated 7 November 2022) for the Extraction Plan - Heritage Management Plan (EP-HMP) (p.g. i) to be prepared by Dr Matthew Whincop of Whincop Archaeology. The EP-HMP developed by Matthew Whincop includes the specific performance measure 'Surface cracking, vertical displacement or erosion does not compromise Aboriginal objects or cultural heritage values' as presented in the TARP (Table 6-1 of the EP-HMP). This performance measure has also been included in Table 4-1 of the EP-HMP. The EP-HMP also includes management measures for protecting Mayfield GG1 from the impacts of subsidence as stated in section 4.5 of the plan. These measures include: • undertaking further investigation prior to mining to determine the potential connection to bedrock with an appropriately qualified specialist (e.g. archaeologist, geologist, geomorphologist) and the RAPs. • If the investigations determine that the site is connected to bedrock, additional management measures will be determined in consultation with the appropriately qualified specialist and the RAPs. Measures may include:	EP-HMP (Attachment D)

Consultation feedback	Outcome	Document reference
	○ use of electronic monitoring equipment ○ regular inspections by the RAPs, and/or ○ potential relocation of the grinding grooves to a suitable location. The *Mine Subsidence Assessment for Longwalls LW203 to LW206 at the Narrabri Underground Mine* (DGS, 2022) (Appendix J of EP 203-206) suggests that partial soil excavation around each slab with hand tools may reduce strain transfer into the slabs during subsidence and reduce the potential for cracking. This measure has been added to section 4.5 of the EP-HMP. In addition, an action plan will be developed for the management of this site within 6 months of approval of the EP-HMP which will include the outcomes of the investigation as stated above and will outline the mitigation options determined in consultation with the RAPs (section 4.5 of EP-HMP). NCOPL will monitor Mayfield GG1 on a monthly basis to assess potential cracking and subsidence impacts. The measures stated above have been reviewed by the RAPs via the formal consultation process as stated in section 1.6 of the EP-HMP. One comment was received in relation to the grinding grooves as follows: "With the grinding grooves they are very significant as it shows where people would use areas of significance, this area should be protected as due to the rarity of the site. Once it is fully assessed a decision will be made by all RAPS." As previously stated, this has been addressed in section 4.5 of the plan which reads "NCOPL will undertake	

Consultation feedback	Outcome	Document reference
	further investigation prior to mining to determine the potential connection to bedrock with an appropriately qualified specialist (e.g. archaeologist, geologist, geomorphologist) and the RAPs. If the investigations determine that the site is connected to bedrock, additional management measures will be determined in consultation with the appropriately qualified specialist and the RAPs." "An action plan will be developed for the management of this site within 6 months of approval of this EP-HMP which will include the outcomes of the investigation and will outline the mitigation options determined in consultation with the RAPs."	
3. When will it be established if the grinding grooves are located in bedrock or on 'loose' boulders?	As stated in section 4.5 of the EP-HMP, NCOPL will undertake further investigation within 6 months of approval of the EP-HMP (and prior to the commencement of secondary workings) to determine the potential connection to bedrock with an appropriately qualified specialist (e.g. archaeologist, geologist, geomorphologist) and the RAPs.	Section 4.5 of the EP-HMP
4. Re the following extract from Appendix I – Risk Assessment.  a. What specific additional controls cause the likelihood rating of cracking of the grinding grooves to decrease from 'B (likely)' to 'D (unlikely)'? b. How are these ratings influenced by whether the grinding grooves are located in bedrock or on 'loose' boulders?	The Mine Subsidence Assessment Report (DGS, 2022) (Appendix J of EP 203-206) assessed Mayfield GG1 as being located on sandstone bedrock or possibly partially buried 'loose' boulders which could be prone to cracking. The predicted mean and worst-case final subsidence, tilt and horizontal strain (U95%CL values) were derived from the predicted subsidence effect contours. It was assessed that Mayfield GG1 is expected to be subject to transient tensile strains of up to 5 mm/m and final compressive strains of 5 mm/m. It is 'possible' to 'likely' that the grooves may be impacted by cracking in their current location. Based on the above assessment, and the existing and additional controls, the residual risk for Mayfield GG1 has	Section 1.5 of the EP-HMP Section 4 of the Risk Assessment (Appendix I)

Consultation feedback	Outcome	Document reference
	been amended to a likelihood rating of 'B' making this a 'high' risk item (section 4 of the Risk Assessment [Appendix I to EP 203-206]). Section 1.5 of the EP-HMP has been updated to reflect the amendment.	
Surface Water – Neil McIntyre		
1. p23 of Water Management Plan: What is the expected total net increase in surface water ponding area for LW203-206? If this is different from that estimated in the Stage 3 EIS for LW203-206, what is the reason?	The Mine Subsidence Assessment Report (DGS, 2022) (Appendix J of EP 203-206) predicted the maximum changes in pond area (where positive represents an increase in pond area) to range from -0.42 ha to 2.92 ha. The Stage 3 EIS does not provide predictions of surface water ponding area, however does include predictions of post-mining pond depths. For surface water ponding areas within the LW 203-206 panels, the Stage 3 EIS predicts post-mining pond depths will range from 0.4 m to 1.7 m, which correspond to a maximum change (where positive represents an increase in pond depth) ranging from 0.1 m to 0.5 m (average of 0.22 m). The Mine Subsidence Assessment Report for EP 203-206 (DGS, 2022) predicts post-mining pond depths will range from 0.1 m to 1.3 m, which correspond to a maximum change (where positive represents an increase in pond depth) ranging from -0.04 m to 1.3 m (average of 0.47 m). These predictions are based on a refinement of the subsidence prediction model. The EP 203-206 has therefore been developed using the latest subsidence assessment predictions for these panels (section 3.2.2 of the EP-WMP). In addition, the mining dimensions have been refined since the Stage 3 EIS assessment, meaning the total net increase in surface water ponding	Section 3.2.2 of the EP-WMP

Consultation feedback	Outcome	Document reference
	area will be slightly different to the predictions presented in the EIS. **Note**: the EP 203-206 has been developed as a Stage 2 (PA 08_0144) plan and has only included information from the Stage 3 EIS where relevant.	
2. p29 of the Water Management Plan: What types of remedial action will be considered for ponding on vegetated areas? What is meant by "in areas with no vegetation" (from available images, vegetation of some type is present almost everywhere, so is this a moot point or are some types of vegetation excluded)? What type of remedial actions are available if ponding significantly alters or affects flows?	The first bullet point in section 5.1.2 of the EP-WMP has been amended to state: "ponding located in areas where vegetation is not affected, will be allowed to self-correct". The above measure has also been amended in all other relevant EP sub plans. Section 7 of the EP-WMP details a contingency plan that expressly provides for adaptive management in respect to ponding in vegetated areas. Remedial actions include: • Investigate options to dewater the ponded area to limit further impacts on vegetation health and implement identified adaptive management measures (TARP Level 1). • If vegetation will be at risk, undertake a geomorphological assessment to determine options to have the subsidence ponded area freely drain (TARP Level 2). • Undertake survey to identify vegetation community and impacted area. The disturbance will be recorded in the site clearing register (TARP Level 2). If ponding significantly alters or affects flows, the ponding will be assessed, and remedial actions (that present the lowest environmental impact) developed in consultation with a geomorphologist. Ponding that significantly alters	Section 5.1.2 and section 7 of the EP-WMP

Consultation feedback	Outcome	Document reference
	or affects flows is managed under the contingency plan (section 7 of EP-WMP) for changes in watercourse morphology. Remedial actions include: **Level 1:** • Contract a qualified geomorphologist to develop an action plan which may involve further monitoring or remediation (with consideration given to application of the River Style Framework for classifying channel condition and recovery). • Implement geomorphology action plan. • Implement contingency measures and notify relevant stakeholders. **Level 2:** • As for Level 1 • If implemented erosion control measures are found to be ineffective, identify cause and rectify or replace with effective measures. Continue monitoring.	
3. p32 of the Water Management Plan: Is continuous monitoring of water levels, pH and EC in one or more ponds practicable (i.e. in periods when a significant pond exists)?	NCOPL are not proposing to conduct continuous monitoring of water levels, pH and EC in ponds. The surface water monitoring program as detailed in section 6.1.3 of the EP-WMP (Table 6-2) proposes to collect grab samples from the nominated surface water monitoring points (KC1TOP, KC1US, KCTOP, KCUS) each quarter provided there is flow during the quarter. NCOPL will also record streamflow characteristics at each monitoring point at the time the grab samples are collected.	EP-WMP (Attachment A)
4. p33 of the Water Management Plan: What methods of measuring and/or predicting creek flows will be under consideration, and will any baseline period measurements be required? When will the channel geomorphology baseline surveys and proposed locations for 100m reaches be available?	Currently, there is no established method for measuring creek flows due to the nature of the creeks being ephemeral. Therefore, NCOPL are proposing to investigate alternatives to measuring or predicting creek flows for the purpose of supporting water take licensing, to improve understanding of the hydrology, and to	EP-WMP (Attachment A)

Consultation feedback	Outcome	Document reference
	interpret water quality and erosion observations (section 6.1.4 of the EP-WMP). Section 6.1.4 of the EP-WMP has been amended to state, “An assessment will be conducted by a surface water specialist prior to any surface cracking occurring (within the Extraction Plan Area) to consider alternative methodologies to measure and/or predict creek flows. Following the assessment, the appropriate method (if feasible) for formally recording creek flow conditions, and contingency measures will be incorporated into the Site WMP”. The channel geomorphology baseline surveys and proposed locations for the 100m reaches will be conducted prior to the commencement of secondary workings (section 6.1.5 of the EP-WMP).	
5. In Table 6.3 of the Water Management Plan, a significant rainfall event is defined as “a rainfall event >38.4 mm over 5 consecutive days” What is the average recurrence interval (ARI) of such an event; and why is this specific definition used rather than allowing for alternative durations of events of the same ARI?	The definition of a rainfall event >38.4 mm over 5 consecutive days under Condition L2.5 of EPL 12789 equates to the 5-day 90th %ile rainfall depth for Gunnedah sourced from Table 6.3a *Managing Urban Stormwater: Soils and Construction Volume 1: 4th edition*, March 2004. This is also referenced in the Stage 3 EIS and forms the basis of surface water management at the Narrabri Mine. This definition has been adopted across multiple management plans to maintain consistency (section 6.1.5, Table 6-3 of the EP-WMP). There is no equivalent ARI corresponding to this significant rainfall event criteria. The onsite weather monitoring station recognised under EPL12789 as W1 has been set up to send an automatic	EP-WMP (Attachment A)

Consultation feedback	Outcome	Document reference
	alarm via SMS and email (when this rainfall event occurs) to a specific contact list to trigger additional management actions.	
Greenhouse Gas – Ray Williams		
1. Further Report Requests: a. Moreby, 2009a, *Narrabri Project – Greenhouse Gas Emission Mitigation Strategy,* Roy Moreby, March 2009. b. Moreby et al, 2010, *Strategic Review of Gas Management Options for Reduced GHG Emissions,* Roy Moreby et al, May 2010. c. Palaris report WHC4940-1 on LW109 modelling. d. NGE reports for 2018/19, 2019/20, 2020/21, 2021/22. e. Latest GHG Management Plan	The following reports have been provided to IAPUM as part of the request for documentation: a. Moreby, 2009a, *Narrabri Project – Greenhouse Gas Emission Mitigation Strategy,* Roy Moreby, March 2009 b. Unknown and cannot be located c. 200428 WHC4940-01 *Narrabri LW109 Modelling* FINAL d. (i) WHC EERS FY19 Report_NCO (ii) WHC EERS FY20 Report_NCO (iii) WHC EERS FY21 Report_NCO (iv) WHC EERS FY22 Report_NCO e. WHC_PLN_NAR_*Greenhouse Gas Minimisation Plan* (2017) Please note that NCOPL are currently updating the Greenhouse Gas Minimisation Plan (GHGMP) with the assistance of Palaris for the continuation of mining under the Stage 2 Project Approval (08_0144).	N/A

Consultation feedback	Outcome	Document reference
2. Recent Mining a. Gas make data in EXCEL form for LW108, LW109 showing breakdown between return gas in ventilation and goaf well gas (if any goaf wells). Also breakdown between CH4 and CO2. Average gas values on a daily basis including tonnes of coal mined. b. Plan showing existing predrainage borehole plots for both UIS and SIS c. Are UIS boreholes drilled downdip? If so are they actively dewatered? d. Selection of predrainage boreholes in LW108, 109, 110 showing gas flow rates tracking CO2, CH4 gas composition over time. e. Is there currently any goaf well production? If so, plan showing locations of numbered goaf wells drilled. Also schematic of goaf well design showing diameter, section cemented, section perforated casing, distance above HSK seam working horizon. Goaf well production data including gas composition (CO2, CH4, O2, N2). f. Any data on the gas content and composition of the coal as it exits the mine and the site? g. How evenly is gas predrainage across the height of the HSK seam. Does banding inhibit predrainage of the upper section of the seam? In achieving a quoted 3.5 m3/t remaining gas, does this value apply to the whole seam or just the lower half? h. The forward predictions (Palaris WHC5175) appear to assign gas to the Digby Conglomerate and Arkarula Formation (included in history matching LW108/109). Can Palaris provide of pie chart or table listing the gas reservoir sizes of the stratigraphic elements and their respective degrees of emission. Does the Arkarula and Digby Conglomerate need to be included to model the level of gas observed?	a. Refer to the document titled '*WHC6420-03 RFI Responses Narrabri Underground Longwalls 203-206 Narrabri Coal - Final'* (Palaris, January 2023) and the Excel spreadsheet titled '*GHG 2a - Longwall 108 and 109 Gas Make Data 17Jan23*' b. Refer to drawing titled '*GHG 2b. Predrainage boreholes UIS and SIS LW 101 to LW 206'* c. UIS boreholes are drilled down dip. There is no active dewatering (no conduit in holes). In the northern mine panels, SIS gas drainage was conducted on the adjacent gate road and this acted to dewater on the down dip side. d. Refer to the document titled '*WHC6420-03 RFI Responses Narrabri Underground Longwalls 203-206 Narrabri Coal - Final'* (Palaris, January 2023) e. No active goaf wells f. There is no available data on the gas content and composition of the extracted coal. g. Refer to the document titled '*WHC6420-03 RFI Responses Narrabri Underground Longwalls 203-206 Narrabri Coal - Final'* (Palaris, January 2023) h. Refer to the document titled '*WHC6420-03 RFI Responses Narrabri Underground Longwalls 203-206 Narrabri Coal - Final'* (Palaris, January 2023)	N/A
3. For LW203-206 a. Are any goaf wells planned? If so locations and design. b. Provide a map showing planned location of pre-drainage boreholes (SIS and UIS). Is the whole of the HSK seam predrained to 3.5 m^3/t in the modelling. c. The predrainage stream is a relatively small proportion of the total GHG emissions. Although CO2 is challenging to pre-drain especially at low gas contents, does the mine see any scope to optimise predrainage operations – eg improved well completion, dewatering, well operation, application of higher negative pressure at the well head, tighter well spacing?	a. No goaf wells planned. b. Refer to drawing titled '*GHG 3b. Predrainage boreholes (SIS and UIS) LW203-LW206'* and as provided in the EP 203-206 as Attachment 4 b. All modelling completed for Longwall 203-206 assumes that the entire Hoskissons Seam is pre-drained to 3.5 m^3/t (Refer to the document titled '*WHC6420-03 RFI Responses Narrabri Underground Longwalls 203-206 Narrabri Coal - Final'* (Palaris, January 2023)	N/A

Consultation feedback	Outcome	Document reference
c. Would a higher level of predrainage take out higher CH4 quantities from the ventilation stream? d. As per point h. previous section but showing the modelled contributions of the various stratigraphic elements for LW203-206.	c. NCOPL are currently working with Palaris to develop a Decarbonisation Pathway. c. Refer to the document titled '*WHC6420-03 RFI Responses Narrabri Underground Longwalls 203-206 Narrabri Coal - Final*' (Palaris, January 2023) d. Refer to the document titled '*WHC6420-03 RFI Responses Narrabri Underground Longwalls 203-206 Narrabri Coal - Final*' (Palaris, January 2023) ***Response above has been superseded in Rev 0A (dated 9 May 2023) with the removal of background information and management measures relating to greenhouse gas emissions.*** Section 2.2.3, Section 5.3 and Appendix J [Gas Emission Review for Longwall 203 to Longwall 206 (Palaris, 2022)] have been removed.	
Greenhouse Gas - Dianne Wiley		
* Please provide the following reports: - WHC 5733-01 Narrabri Gas Flare Position report. - WHC-PLN-NAR-Outburst Principal Hazard Management Plan - JCM, 2011 Energy Savings Action Plan	The following reports have been provided to IAPUM as part of the request for documentation: • WHC5733-01 Narrabri Gas Flare Position Paper Report 9feb21 final • WHC-PLN-NAR-OUTBURST PRINCIPAL MINING HAZARD • NAR-MP-Energy Savings Action Plan (Advitech, 2014)	N/A
* In the various reports provided to date, is it correct to assume that 'emissions' should be interpreted as 'emissions to atmosphere'? If not, please clarify the difference preferably with graphs over time for the different types of emissions.	Emissions is referenced as 'fugitive emissions' throughout the Extraction Plan for LW 203-206 which corresponds to 'emissions to atmosphere'.	N/A
For the Gas Reservoir and Emission Assessment WHC5175 dated 14 Feb 2020, the appendices show emission for CH4. Is there similar data for CO2?	Refer to the document titled '*WHC6420-03 RFI Responses Narrabri Underground Longwalls 203-206 Narrabri Coal - Final*' (Palaris, January 2023).	N/A

Consultation feedback	Outcome	Document reference
* Are there any updates to the Greenhouse Gas Minimisation Plan 601.11062-R1 dated 7 June 2012? If so please provide all updated versions.	The GHGMP was updated in 2017 and has been provided to IAPUM as part of the request for documentation: • WHC_PLN_NAR_*Greenhouse Gas Minimisation Plan* (2017) Please note that NCOPL are currently updating the GHGMP with the assistance of Palaris for the continuation of mining under the Stage 2 Project Approval (08_0144).	N/A
* In relation to the 2012 GHGMP: - Which options for minimising GHG emissions are being progressed further? Please provide details across all of the categories in the different categories in Section 4 including a current status for actual or planned implementation. - Similarly for the research program presented in section, please provide details of current status for different aspects of the research plan.	• Pending update to the GHGMP. • Section 5.3 of EP 203-206 details the decarbonisation pathway (research program) which is currently being addressed by Palaris. This pathway will identify GHG emissions abatement measures for all fugitive emissions. Details of the outcomes of the decarbonisation pathway will be included in the revised GHGMP. ***Response above has been superseded in Rev 0A (dated 9 May 2023) with the removal of background information and management measures relating to greenhouse gas emissions.*** Section 2.2.3, Section 5.3 and Appendix J [Gas Emission Review for Longwall 203 to Longwall 206 (Palaris, 2022)] have been removed.	N/A
* What consideration has been given to minimising CO2 emissions during Stage 2? Please provide copies of any reports or plans for this.	Section 5.3 of the EP 203-206 outlines all current reasonable and feasible measures implemented at the Narrabri Mine to minimise the release of GHGE. Section 5.3 also details the decarbonisation pathway and abatement measures and technologies currently being investigated.	N/A

Consultation feedback	Outcome	Document reference
	The Stage 2 GHGMP has also been provided to IAPUM as part of the request for documentation: • WHC_PLN_NAR_*Greenhouse Gas Minimisation Plan* (2017) Please note that NCOPL are currently updating the GHGMP with the assistance of Palaris for the continuation of mining under the Stage 2 Project Approval (08_0144).	
	Response above has been superseded in Rev 0A (dated 9 May 2023) with the removal of background information and management measures relating to greenhouse gas emissions. Section 2.2.3, Section 5.3 and Appendix J [Gas Emission Review for Longwall 203 to Longwall 206 (Palaris, 2022)] have been removed.	
* Please provide a figure similar to figure 7.2 in the Greenhouse Gas Emissions Forecast (Appendix B) of the Stage 3 extension project, showing anticipated reduction in GHG emissions to atmosphere (both CH4 and CO2) for the Stage 2 project on an annual basis over the anticipated time frame of the project.	Please refer to the document titled '*WHC6420-03 RFI Responses Narrabri Underground Longwalls 203-206 Narrabri Coal - Final'* (Palaris, January 2023) which provides a yearly breakdown of each emission stream for the period of the project (i.e. the Extraction Plan period).	N/A
* What measures are planned to minimise GHG measures on mine closure and how the performance of these measures will be monitored over time? (not sure if this is relevant for now).	Measures to minimise GHG emissions on mine closure and monitoring required will be documented in the Mine Closure Plan. These measures are not relevant to the EP 203-206.	N/A

Attachment 4 Post submission agency review

Table A4-1 IAPUM post submission review

Agency feedback	NCOPL response	Document reference
IAPUM 14/02/2023 - Subsidence Related Questions		
Appendix J - Mine Subsidence Assessment of the Extraction Plan for LW203-LW206 describes the quality of the Mayfield GG1 grinding grooves as 'excellent' and regionally rare for the size of the groove cluster. It predicts that the site could be subjected to transient tensile strains of up to 3 mm/m and final compressive strains of 5 mm/m and that it is therefore 'possible' to 'likely' that the site may be impacted by cracking. Appendix D – Heritage Management Plan, which is required to be prepared in consultation with Heritage NSW and relevant stakeholders for Aboriginal Heritage, includes a Trigger Action Response Plan (TARP) that is based on a performance measure of 'Surface cracking, vertical displacement or erosion does not compromise Aboriginal objects or cultural heritage values' - see extract of Table 6-1 below. Further, Level 2 triggers are based on surface cracks >50mm in width within 50 m of a cultural heritage site. **Table 6-1 Trigger Action Response Plan** **Aspect:** Surface cracking, vertical displacement, or erosion **Performance measure:** Surface cracking, vertical displacement or erosion does not compromise Aboriginal objects or cultural heritage values. **Response – Trigger / Action** **Level 1** – Surface cracks <50 mm present within 50 m of a cultural heritage site, and no erosion identified. **Level 1 Action:** • Document occurrence of surface cracks. • Continue monitoring. • Summarise occurrence in relevant reports. **Level 2** – Surface cracks >50 mm present within 50 m of a cultural heritage site. and/or Erosion as a result of cracking identified. **Level 2 Action:** • As for Level 1 • Provide safety fencing and signage if required. • Advise relevant stakeholders. • Implement remediation measures as appropriate. These may include salvage of cultural heritage (section 4.7), ripping of surface cracks, filling of cracks with grout, spoil or other suitable material (section 4.6). 1. What are the criteria for determining that Aboriginal objects or cultural heritage values have not been compromised by mining impacts, especially cracking? 2. Why does the TARP have no regard to the consequences of surface cracks less than 50 mm in width? 3. Why are Aboriginal objects or cultural heritage values not compromised by any cracking, irrespective of its width? 4. What is the point (value) of the TARP when it does not contain any provision for the avoidance of cracking of Mayfield GG1?	As per the impact potential criteria detailed in Table 3-3 of the EP-HMP, the probability of cracking damage is categorised as 'possible' between 3-5 mm/m for tensile strains and 4-6 mm/m for compressive strains. The strain predictions for Mayfield GG1 are within these ranges. A conservative rating of 'possible' to 'likely' for cracking damage potential has been adopted as stated in section 3.2.2.	EP-HMP including Attachment 3 (Appendix D)
	Q1) Section 5 of the EP-HMP provides the subsidence monitoring program to monitor the potential for impacts to Aboriginal objects or cultural heritage values. NCOPL conduct monthly visual subsidence inspections to identify areas of surface cracking following longwall mining, which includes an inspection of any in situ cultural heritage sites. NCOPL also perform documented visual inspections (including photographs) to record the current condition of each site above a given longwall panel prior to, and within six months following, the cessation of mining. This monitoring is undertaken by a suitably qualified archaeologist in consultation with the RAPs, who will also provide advice on additional mitigation measures that may be required (e.g. monitoring, surface collection, or area salvage excavation).	EP-HMP (Appendix D)
	Q2) Table 4-1 of the EP-HMP details the specific performance measures, success indicators and assessment considerations for managing Aboriginal objects and cultural heritage values. Measures to protect Aboriginal objects or cultural heritage values include salvaging Aboriginal objects prior to impact (i.e. surface cracking/erosion) and assessing new and existing (in-situ) sites for risk of impact and implementing appropriate measures to reduce the risk. These measures are applicable for all cultural heritage regardless of impact risk level (e.g. for surface cracks less than 50 mm in width). The TARP (Table 6-1 of the EP-HMP) includes a Level 1 trigger which states "Surface cracks <50 mm present within 50 m of a cultural heritage site, and no erosion identified". The response action for the Level 1 trigger is as follows: • Document occurrence of surface cracks. • Continue monitoring. • Summarise occurrence in relevant reports. The response action for the Level 1 trigger is commensurate with the level of risk. Section 5.1 of the EP-Land Management Plan (EP-LMP) states that "Minor cracks (i.e. less than 50 mm wide) are not expected to require remediation as geomorphological processes will likely result in these cracks filling naturally over time." Therefore, the risk of impact to Aboriginal objects or cultural heritage values is low.	EP-HMP (Appendix D) and EP-LMP (Appendix B)
	Q3) NCOPL will implement management measures to protect all Aboriginal objects or cultural heritage values irrespective of the potential for impact (e,g, width of surface cracks)Based on extensive monitoring, NCOPL have adopted the < 50 mm and > 50 mm criteria for surface cracking to provide an indication that remediation will be likely for any crack > 50mm. Minor cracks (i.e. less than 50 mm wide) are not expected to require remediation as geomorphological processes will likely result in these cracks filling naturally over time. If there is a risk of impact to any Aboriginal object or cultural heritage values, mitigation actions will be implemented to mitigate the risk in accordance with the EP-HMP, which may include site salvage by the RAPs. In addition, a procedure for Subsidence Repair in Aboriginal Cultural Heritage Sites has been prepared in consultation with the RAPs to develop a methodology for conducting surface crack repair and other subsidence impacts within identified Aboriginal cultural heritage sites (section 4.6.1 of the EP-HMP). The procedure aims to enable rehabilitation activities which avoid and/or minimise any potential adverse impacts to Aboriginal cultural heritage values.	EP-LMP (Appendix B) and EP-HMP (Appendix D)
	Q4) The avoidance of cracking at the Mayfield GG1 site is a management measure as detailed in section 4.5 of the EP-HMP. An investigation will be conducted within 6 months of approval of the EP-HMP (prior to secondary workings) to determine the potential connection to bedrock. If the site is	EP-HMP including Attachment 3 (Appendix D)

Agency feedback	NCOPL response	Document reference
	connected to bedrock, additional management measures will be put in place in consultation with the RAPs and a suitably qualified specialist. One of the additional measures includes the potential to relocate the site. An Action Plan will be developed following the investigation to manage this site which will outline the most reasonable and feasible mitigation options. Frequent monitoring of the Grinding Grooves will occur if the site is not relocated to assess the potential for cracking. The TARP remains applicable to this site for the purpose of requiring response actions following identification of surface cracks greater than 50 mm in width, however the Action Plan will specify additional response actions in the event that cracking occurs (if the site is left in situ).	
IAPUM 16/02/2023 - Surface Water (from Neil)		
In the Water Management Plan, the Site Specific Guideline Values for EC for KCUS are 721 and 847 us/cm. This is well above the values for KC1US and also above the values that can be derived from KCUS data in the 2020 and 2021 Annual Reports. Can you confirm the values for KCUS are correct, and if so can you justify why higher EC SSGVs should be used for KCUS than for KC1US.	In order to reflect local conditions, SSGVs were derived from historical monitoring data commencing from 2007 for monitoring sites KCUS and KC1US. The monitoring data recorded for KCUS shows fluctuating measured levels for EC with the highest level recoded at 1280 µS/cm in September 2016 (corresponding to a period of significant rainfall). The average EC measurement is 307 µS/cm and a median measurement of 195 µS/cm out of a count of 67 data entries. The SSGVs (i.e. trigger values) for KCUS have been defined as the 90th (referred to as Stage 1) and 95th percentile (referred to as Stage 2) of the baseline water quality data recorded at these sites.	EP-WMP (Appendix A)
IAPUM March 2023 - groundwater recommendations (section 7.4* of advice document) and surface water recommendations (NCOPL response letter dated 7 August 2023)		
Surface Water Recommendation 3(i) A method proposal for estimating surface water losses should be submitted by NCOPL to the Department prior to surface subsidence impacts being observed.	The estimated maximum annual volume of surface water take due to subsidence related surface fracturing across the southern longwalls has been estimated to be 3.5 ML for the first and second order watercourses and 0.7 ML for the third order watercourses (WRM, 2021). This methodology for predicting potential take from surface cracking has been reevaluated and remains unchanged from the previous assessment. NCOPL propose to rely on its harvestable right entitlement defined in the Water Management Act 2000 for the take of water from the first and second order watercourses. Given that the predicted annual volume of take from first and second order watercourses was calculated to be less than 1% of the entitlement and can be adequately accommodated within the available harvestable rights entitlement, monitoring of the potential surface take is not considered warranted. NCOPL will obtain a suitable licence issued under the *Water Sharing Plan for the Namoi and Peel Unregulated Rivers Water Sources 2012* for the expected take from third order watercourses. A monitoring method has been developed to estimate the actual annual take for the purpose of complying with water licensing requirements. The crack location, depth, width, and length will be monitored in accordance with the watercourse subsidence monitoring program outlined in Table 6-3 of the Extraction Plan - Water Management Plan (EP-WMP). If the cracks are repaired in accordance with the Extraction Plan - Land Management Plan (EP-LMP) before a runoff event occurs, then a crack volume calculation would not need to be made. If a runoff event occurs prior to the repair of the cracks, then measurements of each crack depth and crack width at the recently subsided waterway crossing are to be made and the potential capture volume for each crack is to be estimated and compared to the licensed volume obtained from the Water Sharing Plan for the Namoi and Peel Unregulated Rivers Water Sources 2012. This estimation process will be repeated if a second runoff event occurs prior to repair. An estimate of the actual annual take and reported in accordance with water licensing requirements. Further detail associated with this monitoring method will be outlined in the next revision of the EP-WMP for EP 203-206. Water captured in the in-stream surface depressions associated with subsidence is not considered to be a take of water, as the ponded water remains in-stream. This position was accepted by DPE Water in an extraction plan technical matters meeting chaired by the DPE on 29 June 2023 and will be clearly stated within the EP-WMP.	**Response updated since Rev 0 (dated 10 February 2023) in relation to harvestable rights – refer to NCOPLs response to DPE Water (OUT23/14639) recommendation 1.1 in Table A4-2.**
Surface Water Recommendation 3(iii) More information should be provided in the EP about available subsidence pond remediation options and criteria for determining the best option.	As documented in the EP-WMP, there is potential for subsidence ponds to develop along Kurrajong Creek and associated tributaries as a result of mining induced subsidence.	EP-WMP (Appendix A)

Agency feedback	NCOPL response	Document reference
	Remediation measures would be selected and implemented with consideration to the number and extent of subsidence ponds and the associated potential impact to ecological or agricultural function. The proposed approach to selection and implementation of subsidence pond management and/or remediation measures, is based on the existing EP-WMP, as follows: • ponding located in areas where vegetation is not affected, will be allowed to self-correct; • ponding located in areas with affected vegetation, or if ponding significantly alters or affects flows, will be assessed and remedial actions (that present the lowest environmental impact) developed in consultation with technical input where required (e.g. geomorphologist, hydrologist) which may include dewatering of the ponded area, or the ponded area be freely drained; and • if Endangered Ecological Communities are impacted, or downstream water quality analysis indicates a change in electrical conductivity trends, the ponding will be assessed, and remediation options will be developed to afford the maximum practical protection to the affected feature. A set of criteria for management and remediation options to support this approach is presented in Table A1-1 (in NCOPL response letter date 7 August 2023). These measures will be integrated into the EP-WMP.	
Surface Water Recommendation 3(iv) and 3(viii) and Groundwater Recommendation 4(vi) 3(iv) Water management TARPs at the highest trigger levels should include consideration of interruption to mining to allow corrective management actions to be proposed and approved by the Department. 3(viii) The actions associated with the highest level triggers in the TARPs should incorporate definitive actions towards ensuring that performance measures are achieved (in cases where the TARP is associated with a performance indicator and performance measure). 4(vi) The TARPs for groundwater should be improved. Improvements are required to the operational approaches used for the TARPs as well as to the triggers that are adopted.	NCOPL will further develop the EP-WMP TARPs to guide implementation of appropriate response actions in the event of trigger levels being activated. Activation of trigger levels will initiate preliminary quality assurance and analysis of data, which will include checks for anomalous data and review of raw data. There are a number of relevant considerations that guide the implementation of response actions in the event of trigger levels being activated, including: • compliance with performance measures and environmental assessment predictions; • identification of changes in observed/predicted groundwater inflow to underground workings considering natural variation; and • level of potential environmental risk to sensitive receptors. The actions and responses in the TARPs will initially involve investigations in consultation with suitably qualified experts to review historical data and trends, model predictions and assumptions, links to operations activities and external influence (e.g. climatic data) and an assessment of the potential risk of environmental harm. In relation to the groundwater TARP, where investigations identify that the risk of environmental harm is high, NCOPL would commence technical feasibility reviews into potential remedial measures (including establishment of provisional performance measures) in consultation with DPE, which may include but not be limited to: • re-pressurisation using water injection; and • reduction in cutting height to limit subsidence. NCOPL would aim to complete investigations and technical feasibility reviews within a six-month period. On completion of technical feasibility reviews and where risk of environmental harm is high, NCOPL would then implement reasonable and feasible measures upon activation of the highest trigger levels in consultation with DPE. This risk assessment is proposed for the purpose of confirming selection of reasonable and feasible measures rather than constituting a re-assessment of the impacts the Stage 2 project. Implementation of remedial measures would be actively reviewed against performance measures to monitor the progress and success of implementation. NCOPL will revise the EP-WMP TARPs to include implementation of reasonable and feasible measures upon activation of the highest trigger levels to ensure performance measures are achieved. The methodology for establishing groundwater level triggers has been revised and is presented in Table B1-	**Response updated since Rev 0 (dated 10 February 2023) – refer to NCOPLs response to DPE Water (OUT23/14639) recommendation 2.1 in Table A4-2.**

Agency feedback	NCOPL response	Document reference
	1 (in NCOPL response letter date 7 August 2023). The revision of the groundwater level triggers involved the selection of an appropriate baseline groundwater level. A tiered approach has been established for the purpose of implementation of the groundwater level TARP. Additional tiered levels have been added for the Pilliga Sandstone bores. Note that proposed monitoring bores will not have trigger values until sufficient baseline data is available (6 to 24 months after establishment). The hydrograph for Pilliga Sandstone bore P7 showing the tiered trigger levels is shown in Figure A1-1 (in NCOPL response letter date 7 August 2023). Trigger levels for groundwater monitoring bores subject to triggers will be outlined in the next revision of the EP-WMP for EP 203206. Table A1-3 (in NCOPL response letter date 7 August 2023) provides a summary of the action/response approach to be taken when each tier of groundwater level triggers is reached. The groundwater inflow TARP is discussed further in response to Groundwater Recommendation 4(iii), and the GDEs and springs TARP discussed further in response to Surface Water Recommendation 3(v).	
Surface Water Recommendation 3(v) and Groundwater Recommendation 4(v) 3(v) The EP WMP should be revised to include a clear statement on how consequences for high priority groundwater dependent ecosystems (GDE) will be managed (this applies irrespective of whether operations are under Stage 2 or Stage 3). 4(v) Performance indicators and a TARP for the Mayfield Spring and high priority GDEs needs to be developed. Specific high priority GDEs monitoring sites should be proposed based on ground surveys. Monitoring should include shallow groundwater levels.	NCOPL propose to update the EP-WMP with a revised Spring and GDE monitoring program supported by a TARP. Monitoring will focus on the Mayfield Spring (associated with the Purlawaugh Formation) and GDEs that fall inside the predicted impact zone (Figure A1-2 [in NCOPL response letter date 7 August 2023]). Performance measures for standpipe monitoring bores within 40 m of high priority GDEs are proposed to be adopted in accordance with the Aquifer Interference Policy (AIP). The groundwater level performance measure is ‘not more than 10% cumulative variation in water table 40 m from GDEs attributable to mining’. <u>GDEs</u> Since the majority of GDEs were not mapped at the time of the Stage 2 MOD 5 environmental assessment no assessment was made. Impacts at all of these GDEs were, however, assessed as part of the Narrabri Underground Mine Stage 3 Extension Project Groundwater Impact Assessment (AGE, 2020). Given that the Stage 3 mine plan represents a significant extension then this assessment would also apply to the smaller Stage 2 MOD 5 mine plan and the EP 203-206. Drawdown in excess of the relevant AIP thresholds is predicted at a number of potential terrestrial GDE areas. These areas are predominantly located within the Gunnedah Oxley Basin Murray Darling Basin Groundwater Source and include areas that are mapped as being dominated by Red Gum, River Red Gum, shallow freshwater wetland sedgeland with smaller areas of Ironbark and Box grassy woodland (Figure A1-2 [in NCOPL response letter date 7 August 2023]). However, the Narrabri Underground Mine Stage 3 Extension Project Biodiversity Development Assessment Report (BDAR) (Resource Strategies, 2020) concludes that the predicted water table drawdown is unlikely to affect the long-term viability of any facultative groundwater dependent vegetation mapped as high priority GDE in the Water Sharing Plans relevant to the Stage 3 Extension Project. The magnitude of the predicted drawdown at high priority GDEs will be significantly less than the estimated seasonal water table variation, and the drawdown will occur at a very slow rate. Minor changes to the groundwater regime may not have any adverse impacts on facultative GDEs that utilise groundwater as required (i.e. opportunistically); however, these ecosystems can dieback if reduced access to groundwater is prolonged, or if the change is too rapid that the trees are not able to adapt. The high priority GDEs that will be monitored are in areas close to the Namoi River to the northeast and close to Tulla Mullen Creek to the southeast. As shown on Figure A1-2 (in NCOPL response letter date 7 August 2023), two visual inspection sites will be monitored:	EP-WMP (Appendix A)

Agency feedback	NCOPL response	Document reference
	• Visual Inspection Site 1: GDEs northeast comprising shallow freshwater wetland sedgeland, River Red Gum and Box grassy woodland. • Visual Inspection Site 2: A small Red Gum location southeast of LW 203. Monitoring will be undertaken quarterly and include: • surface conditions (e.g. vegetation), with four photographs to be taken at each site comprising upstream, downstream, at the left bank and at the right bank; • flow rates; • water level; and/or • water quality (EC and pH). Bores monitoring the shallow strata (alluvium/regolith) along the three drainage lines between the underground workings and the GDEs will be used as early warning monitoring locations and monitored quarterly. These include the following bores as shown in Figure A1-3 (in NCOPL response letter date 7 August 2023): • proposed monitoring bores – P62, P68 and P74; and • existing monitoring bores – P4, P5 and P39B. Groundwater level monitoring and visual inspection data will be compared to determine if there are any correlations between any observed anomalies and results presented in the Annual Review. <u>Springs</u> Predicted drawdown impacts at potential aquatic and terrestrial GDE areas are summarised in Section 7.6.2 of the Narrabri Stage 3 Extension Project Groundwater Assessment (AGE, 2020). Maximum drawdowns of less than 5 centimetres are predicted at all three potential spring sites. As such, it is considered unlikely that discharge from these springs would be significantly affected. Given that the Stage 3 mine plan represents a significant extension then this assessment would also apply to the smaller Stage 2 MOD 5 mine plan and the EP 203-206. NCOPL propose to install two shallow standpipe bores, one upstream and one downstream of the Mayfield Spring. In addition, the overall Purlawaugh Formation monitoring bores will be used to detect regional observed drawdown versus predicted drawdown. The proposed monitoring bore P68 will monitor near-surface strata in the area to the northeast (Figure A1-3 [in NCOPL response letter date 7 August 2023]). Mayfield Spring will also be monitored at Visual Inspection Site 3 (Figure A1-2 [in NCOPL response letter date 7 August 2023]) quarterly and include: • surface conditions (e.g. vegetation), with four photographs to be taken at each site comprising upstream, downstream, at the left bank and at the right bank; • flow rates; • water level; and/or • water quality (EC and pH). As part of the Narrabri Mine groundwater monitoring program, monitoring is also proposed at a number of other GDE sites including Hardy's and Eather Springs and Blairmore Feature 1 and 2. Quaternary Alluvium monitoring bores P71, P72, P74 and P75 (Figure A1-2 [in NCOPL response letter date 7 August 2023]) are located within, or in close proximity to, the GDEs associated with Sandy Creek and its tributaries. These monitoring bores can provide additional data on ground water level and quality for assessment of potential impacts. <u>Trigger action response plan (TARP) for GDEs and springs</u>	

Agency feedback	NCOPL response	Document reference
	NCOPL will develop a TARP to guide implementation of appropriate response actions in the event of trigger levels being activated for GDEs and springs. Proposed triggers include: • routine monitoring indicates drawdown exceeds the trigger level over three consecutive monitoring events; • drawdown meets or exceeds the AIP performance criteria and drawdown criteria; and • deterioration is identified at Visual Inspection Sites and compared with nearby groundwater level trends. The actions and responses in the TARPs will initially involve investigations in consultation with suitably qualified experts to review historical data and trends, model predictions and assumptions, links to operations activities and external influence (e.g. climatic data) and an assessment of the potential risk of environmental harm. Note that proposed monitoring bores will not have trigger values until sufficient baseline data is available (6 to 24 months after establishment).	
Surface Water Recommendation (vi) Performance measures, performance indicators and TARPs should be consistent between all management plans under the EP.	NCOPL will review performance measures, performance indicators and TARPs to ensure consistency in the next revision of the EP-WMP for EP 203-206.	N/A
Surface Water Recommendation (vii) If operating under the Stage 3 Development Consent, the performance measure “Negligible environmental consequences beyond those predicted in the document/s listed in condition A2(c)” should be addressed by a suite of explicit performance indicators and corresponding TARPs in the EP WMP including for flow conditions, water quality, watercourse morphology, and aquatic and riparian ecology at selected sites.	NCOPL notes this recommendation as a relevant consideration for a future EP-WMP to be submitted under the Stage 3 Development Consent.	N/A
Surface Water Recommendation (ix) Greater effort is needed by the Proponent to achieve consistency and effective cross-referencing between the documents relevant to the EP WMP.	NCOPL will review the EP-WMP for consistency with relevant documents in the next revision of the EP-WMP for EP 203-206.	N/A
Groundwater Recommendation 4(i) and 4(ii) 4(i) While the evidence points to limited impacts to the Pilliga Aquifer, there is a need to increase the monitoring of the Sandstone to provide confidence in the groundwater modelling predictions. 4(ii) The planned additional monitoring should be implemented as soon as practicable and prior to completion of LW 203.	The Pilliga Sandstone thickness varies from zero at the mapped limit of the formation to approximately 50 m above longwall panels LW 204 to LW 206. NCOPL propose to increase the Pilliga Sandstone monitoring bore network to a total of 9 monitoring bores. As shown in Figure A1-2 (in NCOPL response letter date 7 August 2023), the following six standpipe sites are proposed to monitor the Pilliga Sandstone: • P60, west of LW111; • P66, southwest of LW 209; • P72, southwest of LW 209 next to Hardy’s Spring; • P82, west of LW 209; • P6B, a replacement bore next to the existing P6 monitoring bore, which is occasionally dry and has not been monitored since March 2012; and • P90, north of P8 above LW 208. The Santos Narrabri Gas Project uses seven monitoring bores to monitor the Pilliga Sandstone for groundwater levels. NCOPL will make use of the two most eastern locations to supplement the groundwater level data for the Pilliga Sandstone. The inclusion of three additional groundwater monitoring standpipes directly west and northwest of the NCOPL workings, together with the Santos monitoring will also ensure that an early warning system is in place and to also assess the potential origin of the observed aquifer interference.	**Response updated since Rev 0 (dated 10 February 2023) in relation to monitoring frequency of the Pilliga Sandstone bores – refer to NCOPLs response to DPE Water (OUT23/14639) recommendation 1.1 in Table A4-2.**

Agency feedback	NCOPL response	Document reference
	In accordance with Condition 4 of the progressive approval progressive approval of the Extraction Plan LW 203-206, the additional monitoring bores will be installed and commissioned within six months of the approval (by 7 November 2023).	
Groundwater Recommendation 4(iii) and 4(iv), and Surface Water Recommendation 3(ii) 3(ii) A detailed TARP for surface water diversions to the mine void should be included in the EP based on measured inflows to the void and their relation to rainfall events. 4(iii) Unexpectedly high inflows to the mine workings should be a trigger for a full reappraisal of the groundwater assessment and an update to the groundwater model. Care should be taken to maintain the monitoring network for mine inflows, including ensuring timely repairs to faulty equipment. 4(iv) Impacts to the Namoi aquifer are expected to be small and not discernible in the groundwater monitoring results for the aquifer. As with the Pilliga aquifer, if mine inflows significantly exceed the expected values then the likelihood of impacts to the aquifer should be reviewed.	The revised EP-WMP will include a TARP for mine inflow patterns (groundwater inflow TARP). TARP triggers will be based upon groundwater extracted from operations utilising measurements from flow meters. Mine water balance reviews utilising flow meter data will be undertaken quarterly. Proposed triggers include: • inflow rate 100% in excess of the predicted base case mean monthly equivalent inflow rate sustained for three consecutive weeks; and • inflow exceeds predicted groundwater make for two consecutive quarters. The actions and responses in the TARPs will initially involve investigations in consultation with suitably qualified experts to review historical data and trends, model predictions and assumptions, links to operational activities and external influence (e.g. climatic data) and an assessment of the potential risk of environmental harm. In the event of a significant increase in groundwater inflow to the underground workings, groundwater monitoring network data will be reviewed and groundwater level TARPs implemented if groundwater level triggers activated.	EP-WMP (Appendix A)

Table A4-2 DPE Water post submission recommendations

Agency recommendations	NCOPL response	Document reference
DPE Water (OUT23/3672) – 30 March 2023		
Recommendation 1.1 and 1.2 That the proponent provides a more detailed and appropriate methodology in the next revision of the plan to assess surface water take due to subsidence-related cracking. That the proponent ensures sufficient water entitlement is held in a water access licence to account for the maximum water take for each water source prior to take occurring.	The estimated maximum annual volume of surface water take due to subsidence related surface fracturing across the southern longwalls has been estimated to be (WRM, 2021) 3.5 ML for the first and second order watercourses and 0.7 ML for the third order watercourses. This methodology for predicting potential take from surface cracking has been reevaluated and remains unchanged from the previous assessment. NCOPL propose to rely on its harvestable right entitlement defined in the Water Management Act 2000 for the take of water from the first and second order watercourses. Given that the predicted annual volume of take from first and second order watercourses was calculated to be less than 1% of the entitlement and can be adequately accommodated within the available harvestable rights entitlement, monitoring of the potential surface take is not considered warranted. NCOPL will obtain a suitable licence issued under the *Water Sharing Plan for the Namoi and Peel Unregulated Rivers Water Sources 2012* for the expected take from third order watercourses. A monitoring method has been developed to estimate the actual annual take for the purpose of complying with water licensing requirements. The crack location, depth, width, and length will be monitored in accordance with the watercourse subsidence monitoring program outlined in Table 6-3 of the Extraction Plan - Water Management Plan (EP-WMP). If the cracks are repaired in accordance with the Extraction Plan - Land Management Plan (EP-LMP) before a runoff event occurs, then a crack volume calculation would not need to be made. If a runoff event occurs prior to the repair of the cracks, then measurements of each crack depth and crack width at the recently subsided waterway crossing are to be made and the potential capture volume for each crack is to be estimated and compared to the licensed volume obtained from the Water Sharing Plan for the Namoi and Peel Unregulated Rivers Water Sources 2012. This estimation process will be repeated if a second runoff event occurs prior to repair. An estimate of the actual annual take and reported in accordance with water licensing requirements. Further detail associated with this monitoring method will be outlined in the next revision of the EP-WMP for EP 203206.	**Response updated since Rev 0 (dated 10 February 2023) in relation to harvestable rights – refer to NCOPLs response to DPE Water (OUT23/14639) recommendation 1.1.**
Recommendation 2.1 That the proponent amends the WMP throughout to reflect, and be consistent with, the commitments made, and additional measures proposed to address DPE Water's previous recommendations (as itemised in Table A2-1, Attachment 2, pp77-84 of the WMP). **Attachment B Recommendation 2.1, Recommendation 2.2 and Recommendation 2.4** - Establish groundwater triggers for monitoring bores of the GAB, including the Pilliga Sandstone within the Southern Groundwater Recharge water source. - That the proponent improves and expands the groundwater monitoring network to detect changes between mining operations and sensitive receptors such as the Great Artesian Basin (GAB) recharge units and high priority groundwater dependent ecosystems. This is to include monitoring bores and the development of a Trigger Action Response Plan (TARP) for the GAB units. - That the proponent amends the monitoring and management program to detect changes early enough to allow the activation of mitigation to avoid adverse impacts.	**Responses to recommendations listed in Attachment B of OUT23/3672 are provided below (i.e. Attachment B Recommendation 2.1, Recommendation 2.2 and Recommendation 2)** The Pilliga Sandstone thickness varies from zero at the mapped limit of the formation to approximately 50 m above longwall panels LW204 to LW206. NCOPL propose to increase the Pilliga Sandstone monitoring bore network to a total of 9 monitoring bores. As shown in Figure B1-1 (in NCOPL response letter date 7 August 2023), the following six standpipe sites are proposed to monitor the Pilliga Sandstone: • P60, west of LW111; • P66, southwest of LW 209; • P72, southwest of LW 209 next to Hardy's Spring; • P82, west of LW 209; • P6B, a replacement bore next to the existing P6 monitoring bore, which is occasionally dry and has not been monitored since March 2012; and • P90, north of P8 above LW208.	**Response updated since Rev 0 (dated 10 February 2023) – refer to NCOPLs response to DPE Water (OUT23/14639) recommendation 2.1 and (OUT23/14639) recommendation 1.1 below.**

Agency recommendations	NCOPL response	Document reference
	The Santos Narrabri Gas Project currently uses seven monitoring bores to monitor the Pilliga Sandstone for groundwater levels, and monitoring data is publicly available. NCOPL will make use of the Santos Pilliga Sandstone bores DWH14PRLPS02, DWH14PRUPS01, DWH3PRLPS02 and DWH3PRUPS01 to supplement the groundwater level data for the Pilliga Sandstone (Figure B1-1 [in NCOPL response letter date 7 August 2023]). The inclusion of three additional groundwater monitoring standpipes directly west and northwest of the NCOPL workings, together with the Santos monitoring will also ensure that an early warning system is in place and to also assess the potential origin of the observed aquifer interference. The methodology for establishing groundwater level triggers has been revised and is presented in Table B1-1 (in NCOPL response letter date 7 August 2023). The revision of the groundwater level triggers involved the selection of an appropriate baseline groundwater level. A tiered approach has been established for the purpose of implementation of the groundwater level TARP. Additional tiered levels have been added for the Pilliga Sandstone bores. Note that proposed monitoring bores will not have trigger values until sufficient baseline data is available (6 to 24 months after establishment). The hydrograph for Pilliga Sandstone bore P7 showing the tiered trigger levels is shown in Figure B1-2 (in NCOPL response letter date 7 August 2023). Trigger levels for groundwater monitoring bores subject to triggers will be outlined in the next revision of the EP-WMP for EP 203206. Table B1-2 (in NCOPL response letter date 7 August 2023) provides a summary of the action/response approach to be taken when each tier of groundwater level triggers is reached.	
Recommendation 2.3 That the proponent ensures the TARP includes mitigation strategies for aquifer impacts that are consistent with those approved in existing development consents.	NCOPL will further develop the EP-WMP TARPs to guide implementation of appropriate response actions in the event of trigger levels being activated. Activation of trigger levels will initiate preliminary quality assurance and analysis of data, which will include checks for anomalous data and review of raw data. There are a number of relevant considerations that guide the implementation of response actions in the event of trigger levels being activated, including: • compliance with performance measures and environmental assessment predictions; • identification of changes in in observed/predicted groundwater inflow to underground workings considering natural variation; and • level of potential environmental risk to sensitive receptors. The actions and responses in the TARPs will initially involve investigations in consultation with suitably qualified experts to review historical data and trends, model predictions and assumptions, links to operational activities and external influence (e.g. climatic data) and an assessment of the potential risk of environmental harm. In relation to the groundwater TARP, where investigations identify that the risk of environmental harm is high, NCOPL would commence technical feasibility reviews into potential remedial measures in consultation with DPE, which may include but not be limited to: • re-pressurisation using water injection; and • reduction in cutting height to limit subsidence. On completion of technical feasibility reviews and where risk of environmental harm is high, NCOPL would then implement reasonable and feasible measures upon activation of the highest trigger levels in consultation with DPE.	EP-WMP (Appendix A)

Agency recommendations	NCOPL response	Document reference
	NCOPL will revise the EP-WMP TARPs to include implementation of reasonable and feasible measures upon activation of the highest trigger levels to ensuring performance measures are achieved. The Pilliga Sandstone TARP is discussed further in response to Attachment B Recommendation 2.1, and the GDEs and springs TARP discussed further in response to Recommendation 2.6. **Response updated since Rev 0 dated 10 February 2023 – refer to NCOPLs response to DPE Water (OUT23/14639) recommendation 2.1 and (OUT23/14639) recommendation 1.1 below.**	
Recommendation 2.5 and Attachment B (OUT23/3672) Recommendation 2.7 That the proponent review and redevise the TARP to be compliant with the conditions of approval, considering identified exceedances and the unsuitability of existing trigger thresholds. That the proponent ensures Trigger Action Response Plans are adhered to for groundwater drawdown limits (2.7 of OUT23/150).	NCOPL engaged AGE to undertake a review of groundwater level trigger levels, which involved the selection of an appropriate baseline groundwater level, typically established based on the pre-mining period of 2008 to 2011. Additional trigger locations are proposed, and the trigger methodology has been adjusted as detailed in Attachment B Recommendation 2.1. Revised trigger levels and the implementation of TARPs for groundwater monitoring bores with triggers will be outlined in the next revision of the EP-WMP for EP 203-206. **Response updated since Rev 0 dated 10 February 2023 – refer to NCOPLs response to DPE Water (OUT23/14639) recommendation 2.1 and (OUT23/14639) recommendation 1.1 below.**	EP-WMP (Appendix A)
Recommendation 2.6 and Attachment B (OUT23/3672) Recommendation 2.1 That the proponent establish specific monitoring, evaluation and reporting targets for groundwater dependent ecosystems in the current WMP (i.e. do not defer to Stage 2). Establish performance targets to monitor, evaluate and report on high priority GDEs.	NCOPL propose to update the EP-WMP with a revised GDE and spring monitoring program supported by a TARP. Monitoring will focus on the Mayfield Spring (associated with the Purlawaugh Formation) and GDEs that fall inside the predicted impact zone (Figure B1-3 [in NCOPL response letter date 7 August 2023]). Performance measures for standpipe monitoring bores within 40 m of high priority GDEs are proposed to be adopted in accordance with the Aquifer Interference Policy (AIP). The groundwater level performance measure is ‘not more than 10% cumulative variation in water table 40 m from GDEs attributable to mining’. <u>GDEs</u> Since the majority of GDEs were not mapped at the time of the Stage 2 MOD 5 environmental assessment no assessment was made. Impacts at all of these GDEs were, however, assessed as part of the Narrabri Underground Mine Stage 3 Extension Project Groundwater Impact Assessment (AGE, 2020). Given that the Stage 3 mine plan represents a significant extension then this assessment would also apply to the smaller Stage 2 MOD 5 mine plan and the EP 203-206. Drawdown in excess of the relevant AIP thresholds is predicted at a number of potential terrestrial GDE areas. These areas are predominantly located within the Gunnedah Oxley Basin Murray Darling Basin Groundwater Source and include areas that are mapped as being dominated by Red Gum, River Red Gum, shallow freshwater wetland sedgeland with smaller areas of Ironbark and Box grassy woodland (Figure B1-3 [in NCOPL response letter date 7 August 2023]). However, the Narrabri Underground Mine Stage 3 Extension Project Biodiversity Development Assessment Report (BDAR) (Resource Strategies, 2020) concludes that the predicted water table drawdown is unlikely to affect the long-term viability of any facultative groundwater dependent vegetation mapped as high priority GDE in the Water Sharing Plans relevant to the Stage 3 Extension Project. The magnitude of the predicted drawdown at high priority GDEs will be significantly less than the estimated seasonal water table variation, and the drawdown will occur at a very slow rate. Minor changes to the groundwater regime may not have any adverse impacts on facultative GDEs that utilise groundwater as required (i.e. opportunistically); however, these ecosystems can dieback if reduced access to groundwater is prolonged, or if the change is too rapid that the trees are not able to adapt. The high priority GDEs that will be monitored are in areas close to the Namoi River to the northeast and close to Tulla Mullen Creek to the southeast. As shown on Figure B1-3 (in NCOPL response letter date 7 August 20230, two visual inspection sites will be monitored:	EP-WMP (Appendix A)

Agency recommendations	NCOPL response	Document reference
	• Visual Inspection Site 1: GDEs northeast comprising shallow freshwater wetland sedgeland, River Red Gum and Box grassy woodland. • Visual Inspection Site 2: A small Red Gum location southeast of LW 203. Monitoring will be undertaken quarterly and include: • surface conditions (e.g. vegetation), with four photographs to be taken at each site comprising upstream, downstream, at the left bank and at the right bank; • flow rates; • water level; and/or • water quality (EC and pH). Bores monitoring the shallow strata (alluvium/regolith) along the three drainage lines between the underground workings and the GDEs will be used as early warning monitoring locations and monitored quarterly. These include the following bores as shown in Figure B1-1 (in NCOPL response letter date 7 August 2023): • proposed monitoring bores – P62, P68 and P74; and • existing monitoring bores – P4, P5 and P39B. Groundwater level monitoring and visual inspection data will be compared to determine if there are any correlations between any observed anomalies and results presented in the Annual Review. <u>Springs</u> Predicted drawdown impacts at potential aquatic and terrestrial GDE areas are summarised in Section 7.6.2 of the Narrabri Stage 3 Extension Project Groundwater Assessment (AGE, 2020). Maximum drawdowns of less than 5 centimetres are predicted at all three potential spring sites. As such, it is considered unlikely that discharge from these springs would be significantly affected. Given that the Stage 3 mine plan represents a significant extension then this assessment would also apply to the smaller Stage 2 MOD 5 mine plan and the EP 203-206. NCOPL propose to install two shallow standpipe bores, one upstream and one downstream of the Mayfield Spring. In addition, the overall Purlawaugh Formation monitoring bores will be used to detect regional observed drawdown versus predicted drawdown. The proposed monitoring bore P68 will monitor near-surface strata in the area to the northeast of the spring (Figure B1-1 [in NCOPL response letter date 7 August 2023]). Mayfield Spring will also be monitored at Visual Inspection Site 3 (Figure B1-3 [in NCOPL response letter date 7 August 2023]) quarterly and include: • surface conditions (e.g. vegetation), with four photographs to be taken at each site comprising upstream, downstream, at the left bank and at the right bank; • flow rates; • water level; and/or • water quality (EC and pH). As part of the Narrabri Mine groundwater monitoring program, monitoring is also proposed at a number of other GDE sites including Hardy's and Eather Springs and Blairmore Feature 1 and 2. Quaternary Alluvium monitoring bores P71, P72, P74 and P75 (Figure B1-3 [in NCOPL response letter date 7 August 2023]) are located within, or in close proximity to, the GDEs associated with Sandy Creek and its tributaries. These monitoring bores can provide additional data on ground water level and quality for assessment of potential impacts. <u>Trigger action response plan (TARP) for GDEs and springs</u>	

Agency recommendations	NCOPL response	Document reference
	NCOPL will develop a TARP to guide implementation of appropriate response actions in the event of trigger levels being activated for GDEs and springs. Proposed triggers include: • routine monitoring indicates drawdown exceeds the trigger level over three consecutive monitoring events; • drawdown meets or exceeds the AIP performance criteria and drawdown criteria; and • deterioration is identified at Visual Inspection Sites and compared with nearby groundwater level trends. The actions and responses in the TARPs will initially involve investigations in consultation with suitably qualified experts to review historical data and trends, model predictions and assumptions, links to operational activities and external influence (e.g. climatic data) and an assessment of the potential risk of environmental harm. Note that proposed monitoring bores will not have trigger values until sufficient baseline data is available (6 to 24 months after establishment).	
Recommendation 2.7 and Attachment B (OUT23/3672) Recommendation 2.3 That the proponent describes the implementation of the interpretation of groundwater monitoring in comparison with remotely sensed (InSAR) subsidence reporting. That the Water Management Plan of the Extraction Plan be amended to include the requirements for regular InSAR subsidence reports and to interpret those in association with groundwater level monitoring.	NCOPL investigations into InSAR technology and its application to interpretation of groundwater monitoring indicate that it is unlikely to be an appropriate tool for the Narrabri Mine and surrounds. InSAR maps millimetre-scale displacements of the earth's surface using two or more images collected by specific satellites. In order to achieve acceptable accuracy, solid reference points such as infrastructure or hard surfaces are required. The application of InSAR technology is limited in areas with: • significant, rapid displacement such as longwall mining subsidence; and/or • naturally high variability in displacements caused by dense vegetation or crop harvesting. Dense vegetation in the western half of the mining lease and extending into Jacks Creek and Pilliga East State Forests, and areas of cropping along the Namoi River are expected to prevent any valid comparative analysis between groundwater monitoring and InSAR data for these areas. Additionally, industry-wide adoption and application of InSAR to support groundwater monitoring is not yet apparent. Its use in the Australian context is shown by recent works of the Office for Groundwater Impact Assessment (Queensland Government, 2021) and Geoscience Australia (Geoscience Australia, 2022) where InSAR was applied broadly over entire basins in support of modelling. Both reports note that further work is needed to reduce uncertainty and that the methodologies of InSAR interpretation are evolving. As detailed in responses above, NCOPL are proposing to increasing monitoring of the Pilliga Sandstone and GDEs with additional bores, quarterly sampling events, and visual inspection sites to be supported by a TARP. NCOPL do not propose to undertake InSAR monitoring given the limitations of the technology and lack of established standards and methods for its use in groundwater monitoring for underground coal mines.	N/A
DPE Water (OUT23/14639) – 7 September 2023		
Recommendation 1.1 That the proponent ensures sufficient water entitlement is held in a water access licence to account for the maximum water take for each water source prior to take occurring.	DPE Water have acknowledged that NCOPL had proposed to use harvestable right to account for surface water take due to subsidence related surface fracturing for the first and second order watercourses. DPE Water have advised that the use of a harvestable right must be associated with the capture of water in a harvestable rights dam. Accordingly, NCOPL will obtain a suitable licence issued under the Water Sharing Plan for the Namoi and Peel Unregulated Rivers Water Sources 2012 for the expected take from first, second, and third order watercourses.	EP-WMP (Appendix A)

Agency recommendations	NCOPL response	Document reference
	As outlined in the response to DPE Water and Panel recommendations submitted by NCOPL on 7 August 2023, this water take is estimated to be 3.5 ML for the first and second order watercourses and 0.7 ML for the third order watercourses.	
Recommendation 2.1 That the proponent updates the water management plan to include outcome-based groundwater impact performance targets. These targets should have progressively tiered mitigation and management controls that constrain impacts to within approved limits.	In the response to DPE Water and Panel recommendations submitted by NCOPL on 7 August 2023, the following measures were identified as tiered mitigation controls for the Pilliga Sandstone groundwater monitoring locations: • re-pressurisation using water injection; and • reduction in cutting height to limit subsidence. NCOPL acknowledge DPE Water's concerns that re-pressurisation using water injection would mask the extent of the impact of connectivity, including long-term cross-aquifer contamination. Accordingly, DPE Water have advised that it does not support masking the impact of connectivity. DPE Water have recommended several mitigation options be included as part of the progressively tiered mitigation and management controls to be established for the Pilliga Sandstone groundwater monitoring locations, with reference made to the recommended options being presented as part of the impact assessment to obtain development consent. *It is noted that the DPE Water recommendation 'ceasing mining of panels west of the existing panel being mined' was not presented as a management option as part of the Narrabri Mine Modification 5 Environmental Assessment*.. NCOPL propose to include the following tiered mitigation controls for the Pilliga Sandstone groundwater monitoring bore locations, consistent with the measures proposed as part of the *Narrabri Mine Modification 5 Environmental Assessment – Appendix A Subsidence Assessment* (DGS, 2015): • reduction in cutting height to limit subsidence; • narrowing panel widths; and • limiting mining to first workings. *It is noted that 'decrease panel width' was presented as a management option as part of the Narrabri Mine Modification 5 Environmental Assessment, however narrowing the panel widths 'to pre-modification 5 approval' was not specified as part of this management measure*. The Tier 2 level trigger risk assessment would trigger an investigation phase, which would involve completing investigation and technical feasibility reviews into these remedial options (including establishment of provisional performance measures) in consultation with DPE. The Tier 3 level risk assessment would trigger an implementation phase, which would involve implementation of reasonable and feasible measures to ensure performance measures are achieved in consultation with DPE. As noted by DPE Water, sufficient time is required to demonstrate that the implemented management controls are effectively constraining the impact from reaching the next threshold. In the event of a continuation of an adverse drawdown trend (beyond the time required to demonstrate effectiveness of implemented controls), additional management responses would be implemented as required. The tiered management approach, including specific response actions, is proposed to be set out in the groundwater level drawdown TARP within the Extraction Plan – Water Management Plan. This will be consistent with the approach described in the response to DPE Water and Panel recommendations submitted by NCOPL on 7 August 202specifically the response to item '*Attachment B Recommendation 2.1, Recommendation 2.2 and Recommendatio2.4*.'	EP-WMP (Appendix A) **Response updated in relation to monitoring frequency of the Pilliga Sandstone bores (i.e. since Rev 0 dated 10 February 2023) – refer to NCOPLs response to DPE Water (OUT23/18914) recommendation 1.1 below.**
DPE Water (OUT23/18914) – 17 November 2023		
Recommendation 1.1 The proponent should provide further commitment to implement impact mitigation and management controls on the Great Artesian Basin groundwater sources.	To further increase the management controls on the Great Artesian Basin groundwater sources (Pilliga Sandstone), NCOPL propose to increase the frequency of groundwater level monitoring of Pilliga Sandstone bores from quarterly to monthly. The monitoring program is provided in Table A1 (in NCOPL response letter dated 6 December 2023) and an overview of the bore locations is provided in Figure A1 (in NCOPL response letter dated 6 December 2023).	EP-WMP (Appendix A)

Agency recommendations	NCOPL response	Document reference
	The increase in frequency of groundwater level monitoring to monthly monitoring will expedite the activation of the trigger action response plan (TARP) for the Pilliga Sandstone bores (outlined in Table A1 [in NCOPL response letter dated 6 December 2023]) where trigger criteria are reached over two consecutive exceedances for bores. In effect, this means that TARP actions for the Pilliga Sandstone bores would be commenced in a period of only two months, rather than six months as previously proposed. The summary of the Pilliga Sandstone TARP approach is presented in Table A2 (in NCOPL response letter dated 6 December 2023).	

Table A4-3 DCCEEW Water post submission recommendations

Agency recommendations	NCOPL response	Document reference
DCCEEW Water (OUT24/17840) – 15 November 2024		
The proponent should update the water management plan (WMP) to include a specific timeframe for when performance targets will be set for the newer bores installed to represent the shallower aquifers. This update should include a description of how the already altered influences to baseline conditions are to be accounted for in setting trigger thresholds.	The new Pilliga Sandstone bores, completed in 2023, are listed in Table 1 and presented in Figure 6-1 of the EP-WMP. These locations will be assessed for inclusion in the trigger table (Table 6-5, EP-WMP) once sufficient data is available. A suitably qualified hydrogeologist will review data for each monitoring point on a quarterly basis as part of the routine quarterly data reviews already in place. The review will determine whether enough data has been gathered to define trigger levels. Once sufficient data is available, appropriate trigger thresholds will be identified following the methodology outlined in Section 6.2.6 of the EP-WMP. Trigger levels for all the bores listed in Table 1 will be developed as soon as possible. However, it is not possible to predict in advance how much monitoring data will be required. This is because initial readings at monitoring points can be influenced by drilling operations, and it may take time for groundwater levels to stabilize and accurately reflect actual conditions. As an example, this is evident at monitoring bore P90. This is the closest monitoring location to the panels subject of the Extraction Plan (located west of LW206). Water level data for P90 indicated a level of 261.5 mAHD in Q4, 2023. Levels increased relatively rapidly to around 285 mAHD in August 2024 representing a 23.5 m difference relative to the initial readings. The last two sampling events indicated a potential stabilised groundwater level. Ongoing monitoring is required to confirm a stable level and will also provide information on the significance of any seasonal fluctuations on level. Ideally, at least 12 monthly readings following stabilisation would be available for each monitoring point to allow appropriate trigger levels to be set. In the case of P90, this would mean that sufficient data is likely to be available at the end of Q1 2025 assuming that data indicates stable levels at around 285 mAHD. Once additional triggers have been determined then a revised EP-WMP including any additional trigger bores would be submitted to the Secretary within three months of receipt of the hydrogeologist's trigger setting report. In determining trigger levels, the 'baseline' period will be adjusted based on climate and mining operational considerations and the expert opinion of the hydrogeologist. Monitoring bore P42_90, that was drilled post-mining in 2018, is an example of an existing trigger bore that does not have pre-mining baseline data. The trigger level is based on the 5th percentile of the available data. **Table 1 New Pilliga Sandstone monitoring bores** Type | Monitoring bore | Date drilling completed | Ground level (mAHD) | Total depth (mBGL) | Screen interval (mBGL) Standpipe | P6B | 3 November 2023 | 326.252 | 108 | 93 to 102	EP-WMP, Section 6.2.1

<table>
<tr><th>Agency recommendations</th><th>NCOPL response</th><th>Document reference</th></tr>
<tr><td></td><td>
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<tr><td></td><td>P60</td><td>22 September 2023</td><td>299.513</td><td>37.2</td><td>29 to 35</td></tr>
<tr><td></td><td>P66</td><td>25 October 2023</td><td>377.223</td><td>63</td><td>57 to 63</td></tr>
<tr><td></td><td>P82</td><td>4 October 2023</td><td>367.788</td><td>110</td><td>104 to 110</td></tr>
<tr><td></td><td>P90</td><td>28 September 2023</td><td>315.030</td><td>80</td><td>70 to 76</td></tr>
<tr><td>VWP</td><td>P77-1</td><td>12 October 2023</td><td>302.536</td><td>40</td><td>-</td></tr>
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<tr><td>The proponent should update the Water Management Plan (WMP) to include:
• Age dating isotopes and methane in the groundwater quality sampling suite for a selection of bore monitoring sites and passive mine inflow to evaluate cross-connectivity and changes over time.
• Water quality mitigating strategies/responses that maintain the highest beneficial use of the Pilliga Sandstone aquifer and are aligned with those developed to manage groundwater level impacts.</td><td>Monitoring bore P42 is a monitoring location with available data for both the Gunnedah Oxley Basin (GOB) units and the Pilliga Sandstone. Groundwater levels at P42, as well as data from Santos' nearby Narrabri Gas Project bores, do indicate an upward gradient from the deeper GOB to the overlying Pilliga Sandstone. This is likely because the shallower units, including the Pilliga Sandstone, occur at outcrop in the area (i.e. in the central parts of the basin) and heads are therefore controlled by ground level. The deeper units do not outcrop locally and significant artesian pressures are observed in places. Whilst this points to the potential for some discharge from the GOB to the Pilliga, head differences are significant in places, which tends to confirm low connectivity and hence discharge.

Work recently undertaken by CSIRO (Raiber et al, 2022) focusses on the adjacent Narrabri Gas Project lease area. Based on analysis of electrical conductivity, methane and radiocarbon data, CSIRO conclude that there is "no or only very limited hydrogeological connectivity between the Pilliga Sandstone and underlying Gunnedah Basin formations" in the southern and eastern part of the Narrabri Gas Project area (i.e. adjacent to the Narrabri Coal Mine lease area; Raiber et al, 2022). This conclusion is based on the finding that the GOB strata contains significantly more saline groundwater with higher methane concentrations and lower radiocarbon such that even a small volume of inflow into the overlying Pilliga Sandstone would be "readily noticeable within the Pilliga Sandstone" (Raiber et al, 2022). NCOPL propose to undertake a sampling program for methane and radiocarbon dating (14C and 36CL) to further support the conclusions made by CSIRO; a hydrogeologist will be engaged in 2025 to undertake this work. This research sampling program has been included in Section 9 of the WMP and commits to reporting outcomes in the hydrogeological Annual Reviews.

Regarding mitigation strategies for water quality impacts on the Pilliga as a result of upward flow from the GOB, operation of the mine would reduce heads in the GOB and therefore mitigate the impact mechanism.

Therefore, given the recent studies that suggest no or low potential for vertical connectivity between the Pilliga Sandstone and deeper formations, NCO do not consider there is sufficient monitoring evidence to immediately warrant strengthening mitigating strategies/responses. It is noted that the WMP includes performance measures for groundwater quality and that an exceedance of these performance measures would be assessed by a suitably qualified hydrogeologist, with reasonable and feasible remediation measures to be implemented in consultation with DPHI.</td><td>Response superseded – see DCCEEW Water OUT25/945 response below.</td></tr>
<tr><td>The proponent should update the groundwater dependent ecosystem (GDE) monitoring at the visual inspection (VI) sites (VI1-VI8) to include monitoring the underlying aquifer at a minimum of three of these sites.</td><td>Visual inspection (VI) sites VI1 and VI2 are at high priority GDE sites which have a predicted drawdown in excess of the relevant NSW Aquifer Interference Policy (AIP) performance measures:

Not more than 10% cumulative variation in water table 40m from GDEs attributable to mining.

These areas are predominantly located within the Gunnedah Oxley Basin MDB Groundwater Source and include areas which are mapped as being dominated by Red Gum, River Red Gum, shallow freshwater wetland sedgeland with smaller areas of Ironbark and Box grassy woodland (BoM, 2018).

No dedicated groundwater monitoring bores are proposed in proximity to these areas (VI1 and VI2). Shallow strata (alluvium/regolith) monitoring bores P4, P5, P39B, P62, P63, P68, P69, P74 and P75 are located between the underground workings and the GDEs. They will provide 'early warning' monitoring results that when compared with VI data, will determine if there are any correlations between any observed anomalies. The comparison will occur twice per year and be recorded in the annual review. Additionally, a suitably qualified hydrogeologist is engaged to undertake quarterly groundwater data reviews.</td><td>EP-WMP, Section 6.2.2</td></tr>
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Agency recommendations	NCOPL response	Document reference
	Mayfield Spring is associated with the Purlawaugh Formation and is situated some distance from the Pilliga Sandstone (AGE, 2020). VI3 is located at Mayfield Spring and is supported by alluvial groundwater monitoring bores P91 and P92. In addition, the overall Purlawaugh Formation monitoring bores will be used to detect drawdown. Alluvial monitoring bore P68, located north-east of Mayfield Spring, will also provide early warning monitoring. The TARP will be implemented for any significant drawdown (exceeding predicted drawdowns) observed at the early monitoring bores and/or observed deterioration at the visual inspection sites. Alluvial monitoring bore P71 is in close proximity to VI4. Deeper monitoring bores P72 (Purlawaugh) and VWP P73 are in the same location. GDEs associated with sites VI5 to VI8 are further south of VI4 and further from the Stage 3 mining area. Maximum drawdowns associated with the Stage 3 extension project of less than five centimetres are predicted at the three potential spring sites (Hardys, Eather, and Blairmore). As such, it is considered unlikely that discharge from these springs would be significantly affected (AGE, 2020). The proposed monitoring of the GDEs at VI sites and at the monitoring bores identified above (as per the EP-WMP) is considered sufficient.	
The proponent should update the water management plan (WMP) to improve the TARP relating to passive inflow water take. This should include measurements that can identify any exceedance, and provides a clear link between the performance measure and the trigger.	The revised EP-WMP now includes Table 2 to provide a clear link between the performance objective for mine inflows and the TARP. **Table 2 Predicted groundwater take TARP triggers (AGE, 2024)** Water year / Total (ML/year) / TARP Trigger 1 [a] / TARP Trigger 2 [b] 2024 / 558 / 139.5 / 21.5 2025 / 625 / 156.3 / 24.0 2026 / 763 / 190.8 / 29.3 2027 / 934 / 233.5 / 35.9 2028 / 1,058 / 264.5 / 40.7 2029 / 1,166 / 291.5 / 44.8 2030 / 1,252 / 313.0 / 48.2 2031 / 1,238 / 309.5 / 47.6 Notes: a = total predicted volume (ML/year) divided by 4 to present average quarterly threshold. b = total predicted volume (ML/year) divided by 52 to present average weekly threshold and multiplied by 2 to represent 100 % of predicted weekly average	EP-WMP, Table 7-1
DCCEEW Water (OUT25/945) – 28 January 2025		
The proponent should update the Water Management Plan (WMP) to include age dating isotopes and methane in the groundwater quality sampling suite for a selection of bore monitoring sites and passive mine inflow to evaluate cross-connectivity and changes over time.	NCOPL has incorporated additional detail of the sampling program into the EP-WMP. NCOPL proposes to undertake a sampling program for methane (CH4) and radiocarbon dating (14C and 36CL) to further support the conclusions made by CSIRO. The proposed scope of work includes consultation with CSIRO to confirm that similar sampling and other methodologies are applied to ensure that the findings are robust and comparable to the existing work. The sampling program will include sixteen (16) groundwater monitoring points, the majority of which are located towards the west of the mining lease in areas where both the Gunnedah Basin strata and Pilliga Sandstone are present.	EP-WMP Section 9.7.1 and Table 6-6
The EP/WMP should include the following performance measure to protect the water quality (beneficial use) and groundwater levels (pressure) of the Pilliga Sandstone aquifer of the GAB: “Subsidence impact or environmental consequences is not to exceed that predicted in the EIS”.	NCOPL has incorporated this performance measure into the EP-WMP.	EP-WMP Table 4-2

Table A4-4 IEAPM post submission queries

Agency recommendations	NCOPL response	Document reference
IEAPM advice – 4 March 2025		
To be determined		

Appendix A Water Management Plan

Appendix B Land Management Plan

Appendix C Biodiversity Management Plan

Appendix D Heritage Management Plan

Appendix E Built Features Management Plan

Appendix F Public Safety Management Plan

Appendix G Coal Resource Recovery Plan

Appendix H Plans 1 to 7

Appendix I Subsidence Risk Assessment

Appendix J Mine subsidence assessment report for LW 203-206

Appendix K Subsidence Monitoring Program