

Attachment 11

Indicative Alternative
Underground Mining
Layout Review

Narrabri Underground Mine Stage 3 Extension Project

Environmental Impact Statement

2 October 2020

Mr David Ellwood
Director NCO Stage 3 Project
Whitehaven Coal Ltd
10 Kurrajong Creek Road
Baan Baa NSW 2390

Report No. NAR-005/3

Subject: Qualitative Subsidence Review for the Alternative Stage 3 Mine Plan at the Narrabri Mine

1.0 Introduction

1.1 Background

The Narrabri Mine 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 of New South Wales (NSW) (**Figure 1**). The Narrabri Mine is operated by Narrabri Coal Operations Pty Limited (NCOPL).

NCOPL is seeking a new Development Consent under the State Significant Development provisions of Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the Narrabri Underground Mine Stage 3 Extension Project (the Project).

The Project involves an extension of the approved underground mining area to the south to gain access to additional coal reserves within Mining Lease Applications (MLAs) 1 and 2, an extension of the mine life to 2044 and development of supporting surface infrastructure.

A detailed description of the Project is provided in **Section 2** in the Main Report of the Environmental Impact Statement (EIS).

1.2 Purpose of this Review Letter

The Project Subsidence Assessment (**Ditton Geotechnical Services [DGS], 2020**) forms part of the Project EIS. The Project Subsidence Assessment has been prepared based on the conceptual mine plan shown on Figure 2 that incorporates an extension of the approved Longwalls 203 to 209 into MLAs 1 and 2, and an additional longwall panel (Longwall 210) within MLA 1.

As described in **Section 2.6.2** in the Main Report of the EIS, the conceptual layout shown on **Figure 2** may be amended to include installation of additional main headings in Longwalls 203 to 209 as currently approved for the Narrabri Mine. The amendments to the underground mining area are herein referred to as the Alternative Project Underground Mine Plan and are shown on **Figure 3**.

The Alternative Project Underground Mine Plan may result in a minor reduction in coal extraction due to the additional workings (i.e. installation of additional main headings), as well as changes to the mining sequence and mining direction.

The final mining layout, mine sequence and mining direction for the Project would be subject to review and approval as a component of future Extraction Plans.

The Alternative Project Underground Mine Plan involves no change to the following key components of the Project as described in **Section 2** in the Main Report of the EIS:

- the overall underground mining area footprint;
- the maximum run-of-mine (ROM) coal production rate (i.e. 11 million tonnes per annum); and
- the surface infrastructure requirements.

The purpose of this review letter is to qualitatively consider the potential implications of adopting the Alternative Project Underground Mine Plan.

2.0 Maximum Subsidence Effect Predictions for the Alternative Project Underground Mine Plan

Based on a review of the EIS against the Alternative Project Underground Mine Plan in **Figures 4a** and **4b**, it is assessed that the maximum subsidence effects would remain unchanged compared to that assessed in the Project Subsidence Assessment.

The predicted subsidence contours would decrease where the mains are now proposed between the 200 and 300 series longwalls. This would result in higher tilts (20 to 30 mm/m) and strains (+/- 5 mm/m to 15 mm/m) occurring above and within 300 m distance of the northern and southern sides of the main headings.

It is assessed that the predicted subsidence effects for the Alternative Project Underground Mine Plan layout are likely to change for the following features due to their proximity to the main headings and the expected changes to the subsidence effect contours:

- Kurrajong Creek bed profile and gradients
- Farm Dams D40, D41 and D51

- Several unsealed access roads and fences

Given the nature of the impacts described in the Project Subsidence Assessment and the surface features, any changes in subsidence effects are unlikely to result in significant increases to predicted impacts at or along these features. The location and timing of the impacts is likely to change, however.

There are no changes to the predicted subsidence effects for the steep slopes, cliffs or archaeological sites previously assessed.

All other predicted impacts for the Alternative Project Underground Mine Plan are also assessed as likely to be consistent with the predicted impacts presented in the EIS for Stage 3 at the Narrabri Mine.

3.0 Conclusions and Recommendations

It is assessed that the Alternative Project Underground Mine Plan shown in **Figure 3** will not result in any significant changes to the predicted subsidence impacts relative to the mine plan as described in **DgS (2020)**.

The location and timing of surface effects and their impacts are expected to change for the Alternative Project Underground Mine Plan, however.

It is recommended that the subsidence effect contours for the Alternative Project Underground Mine Plan be prepared for the Extraction Plans. A review of proposed survey monitoring and impact management strategies should also be undertaken at this time.

For and on behalf of
Ditton Geotechnical Services Pty Ltd

A handwritten signature in black ink, appearing to read 'Steven Ditton', written in a cursive style.

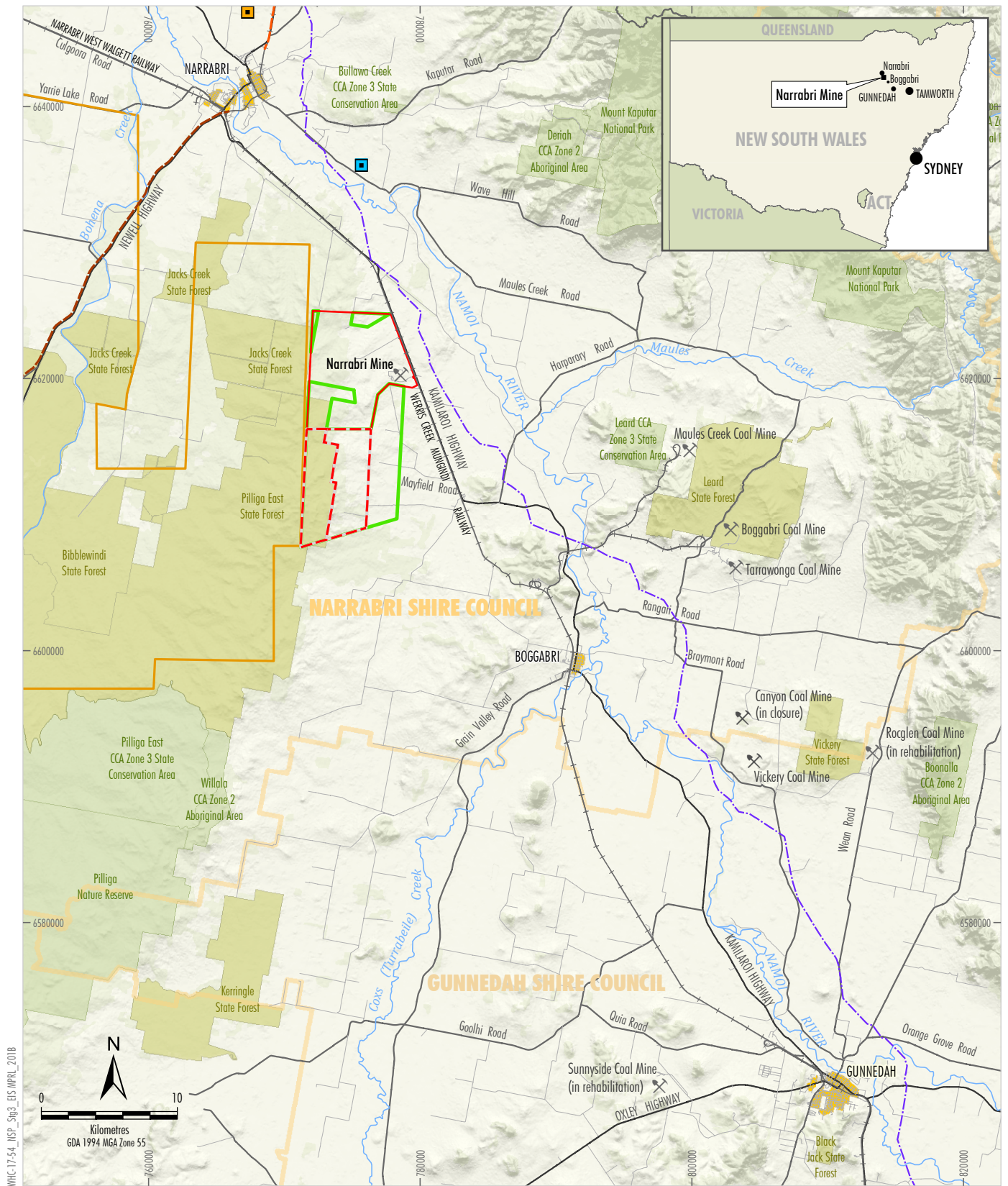
Steven Ditton
Principal Engineer

Attachments:

Figures 1 to 4b

References:

DgS, 2020. **Mine Subsidence Assessment for the Narrabri Underground Mine Stage 3 Extension Project** DGS Report No. NAR-005/2.



WMC-17-54_NSP_Sig3_EIS_MPRIL_2018

LEGEND

- Mine Site
- Exploration Licence (EL 6243)
- Mining Lease (ML 1609)
- Provisional Mining Lease Application Area
- Local Government Boundary
- State Forest
- State Conservation Area, Aboriginal Area

Other Major Projects

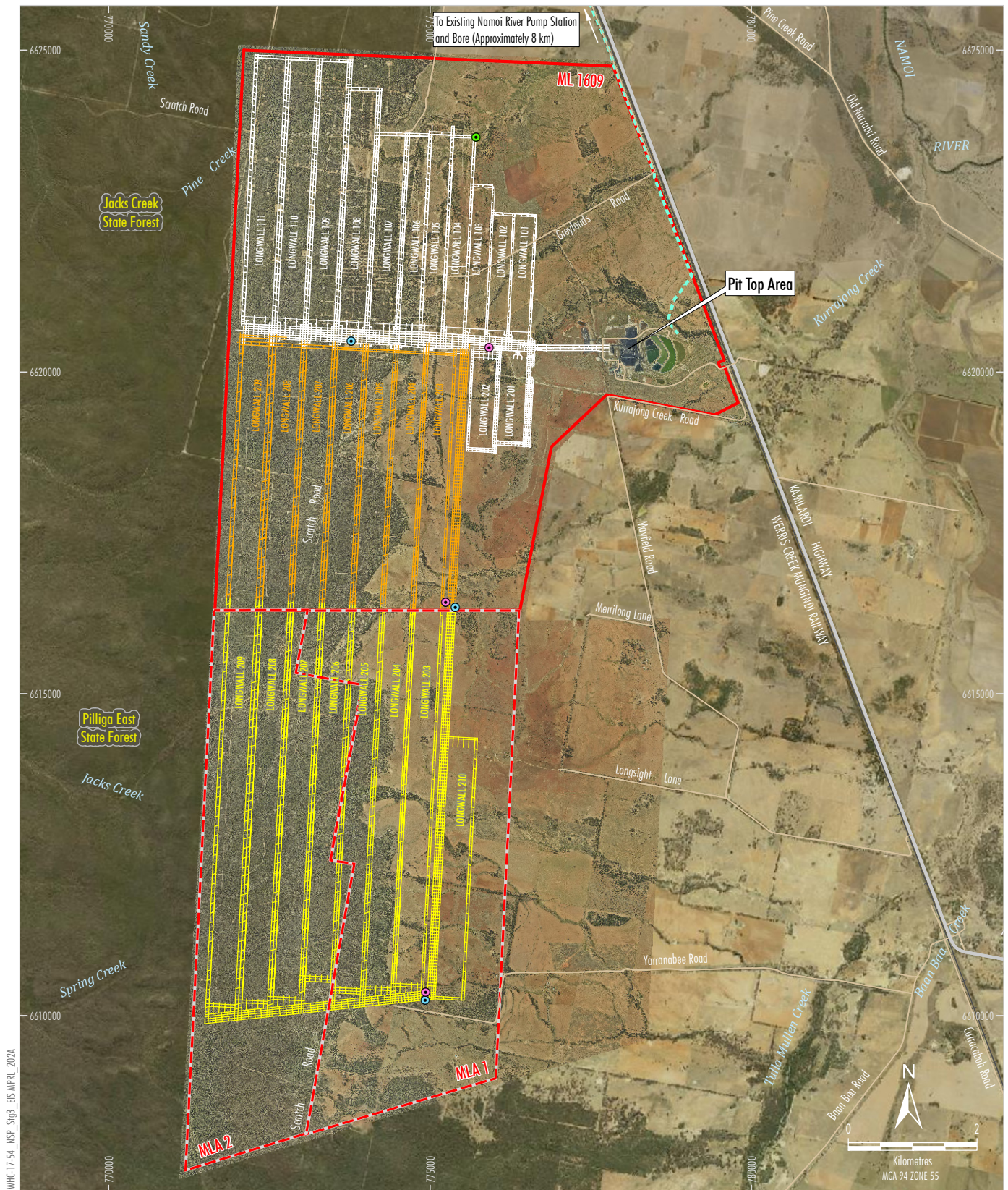
- Narrabri South Solar Farm
- Proposed Silverleaf Solar Farm
- Narrabri Gas Project (Santos NSW [Eastern] Pty Ltd)
- Inland Rail (Narrabri to North Star - Phase 1)
- Proposed Inland Rail (Narromine to Narrabri)
- Queensland Hunter Gas Pipeline

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



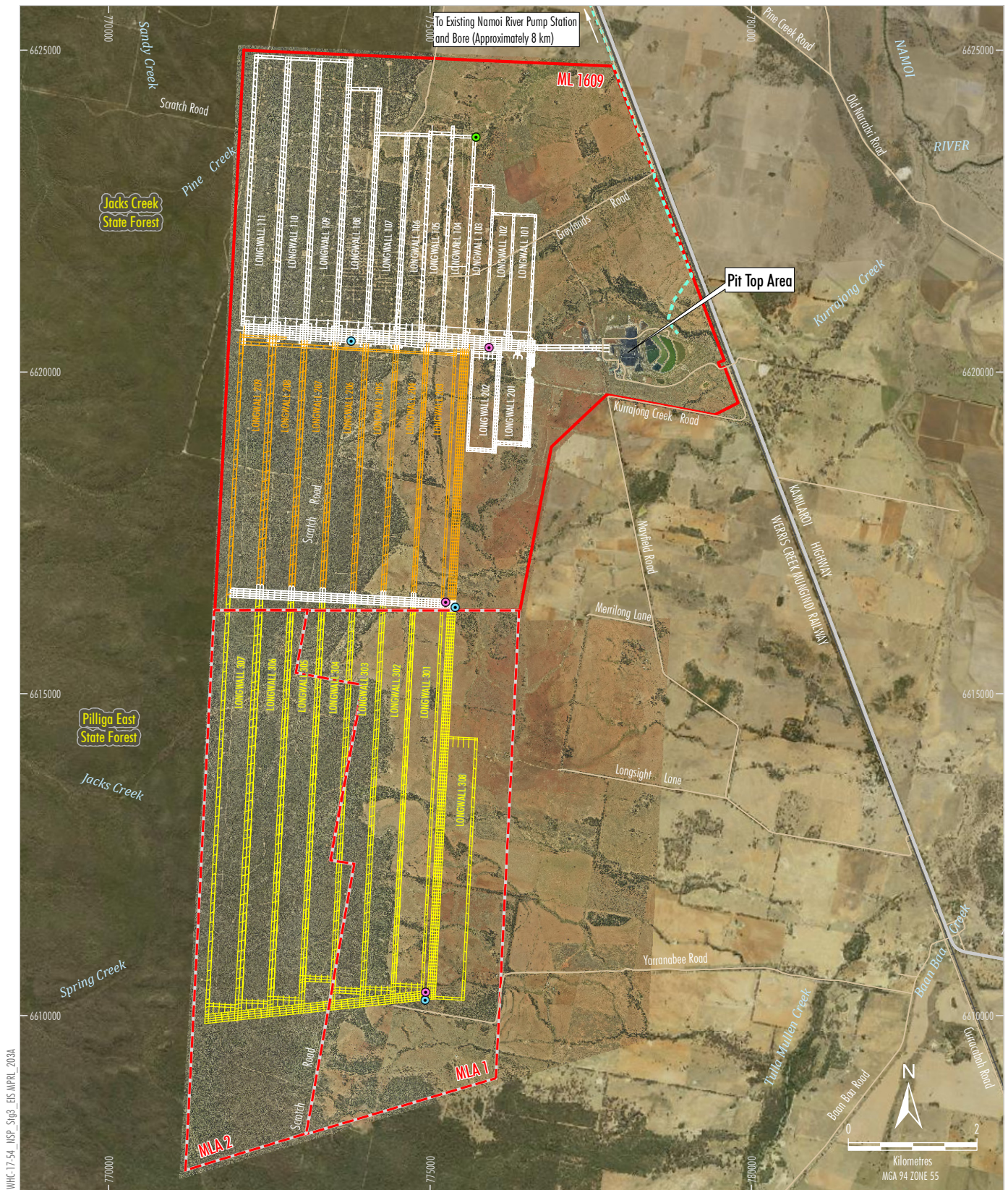
NARRABRI STAGE 3 PROJECT Regional Location

Figure 1



WHITEHAVEN COAL
NARRABRI STAGE 3 PROJECT
Project General Arrangement -
Indicative Underground Mining Layout

Figure 2

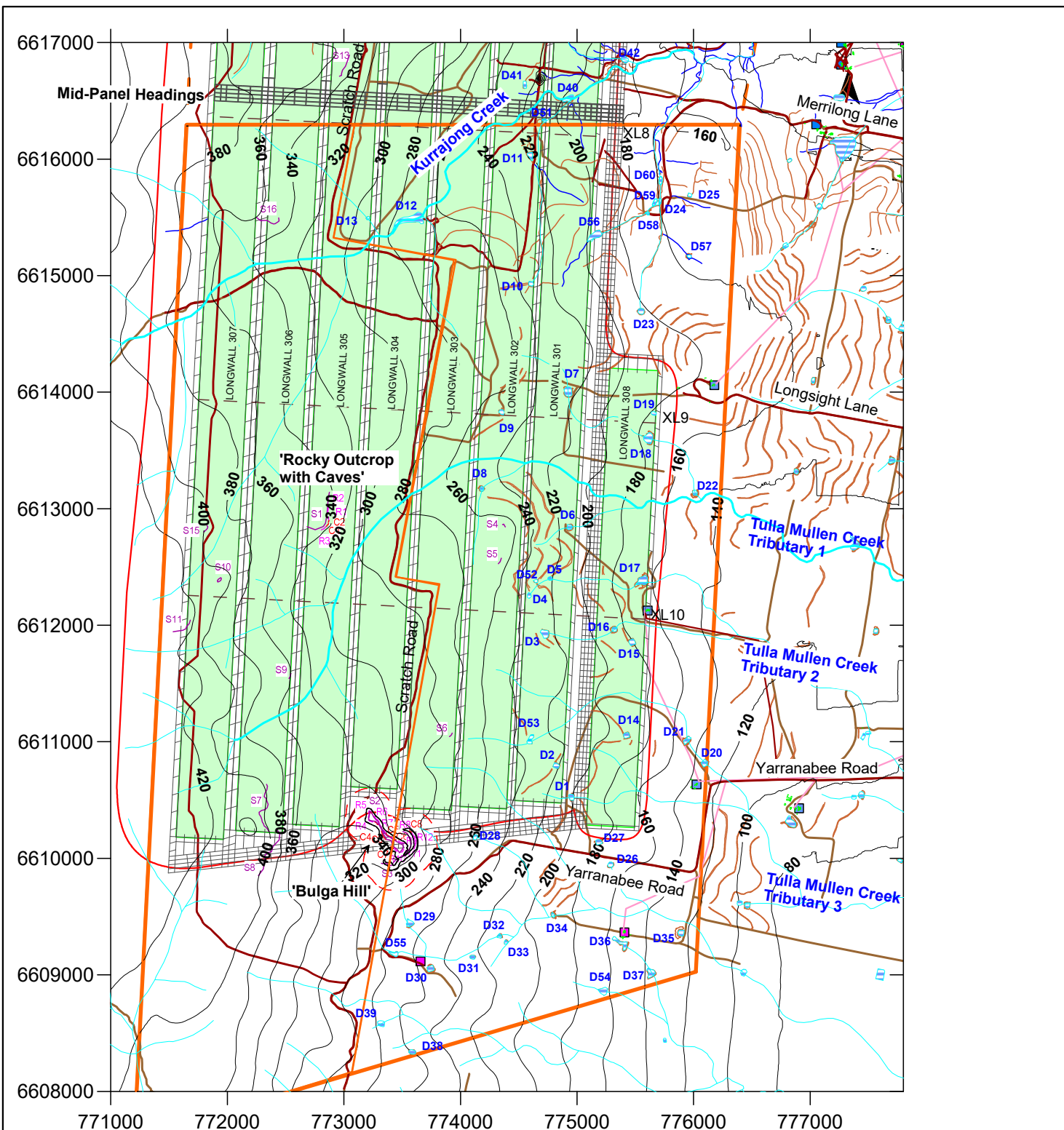


WHITEHAVEN COAL

NARRABRI STAGE 3 PROJECT

Project General Arrangement -
Indicative Alternative Underground
Mining Layout

Figure 3



Key:

- | | | |
|--|---|---|
| Cover Depth Contours (m) | Mining Lease 1609 Boundary | Ephemeral Creeks & Watercourses |
| Roads (unsealed) | Mining Lease Application Areas 1 & 2 Boundaries | Farm Dams (D40-D51, D61-D65) |
| Proposed Longwalls (LW203-210) | Prediction Cross Lines | Contour Banks |
| Approved Longwalls (LW108B-111, 201-202) | Angle of Draw to 20mm Subsidence | Powerlines (Domestic) |
| Extracted Longwalls (LW101-108A) | Dwellings & Sheds/Tanks/Orchards | Minor Cliffs, Rock Faces & Steep Rocky Slopes |
| Proposed Alternative Mine Plan | Private / NCO-Owned Buildings | |

DgS

Engineer: S.Ditton
 Drawn: S.Ditton
 Date: 15.10.19

Ditton Geotechnical
 Services Pty Ltd

Client: Narrabri Mine
 NAR-005/3

Title: Surface Features & Cover Depth Contours to the Mine Workings Roof with the Proposed Mid-Panel Main Headings & LW203 to 210 for the Stage 3 Project (see **Figure 4a** also)

Scale: 1:60,000

Figure No: 4b



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KP/JT:agb
G1972.Narrabri Stage 3 Extension Mine Plan Revision v03.01

12 October 2020

Attention: David Ellwood

Narrabri Coal Operations Pty Ltd
10 Kurrajong Creek Rd
Baan Baa NSW 2390
Australia

via email

Dear David,

RE: Narrabri Underground Mine Stage 3 Extension Project Revised Mine Plan – Groundwater Review

1 Introduction

1.1 Background

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The Project involves an extension of the approved underground mining area to the south to gain access to additional coal reserves within Mining Lease Applications (MLAs) 1 and 2, an extension of the mine life to 2044 and development of supporting surface infrastructure.

A detailed description of the Project is provided in Section 2 in the Main Report of the Environmental Impact Statement (EIS).

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1.2 Purpose of this review letter

The Project Groundwater Assessment (Australasian Groundwater and Environment Consultants [AGE], 2020¹) forms part of the Project EIS. The Project Groundwater Assessment has been prepared based on the conceptual mine plan shown on Figure 2 that incorporates an extension of the approved Longwalls 203 to 209 into MLAs 1 and 2, and an additional longwall panel (Longwall 210) within MLA 1.

As described in Section 2.6.2 in the Main Report of the EIS, the conceptual layout shown on Figure 2 may be amended to include installation of additional main headings in Longwalls 203 to 209 as currently approved for the Narrabri Mine. The amendments to the underground mining area are herein referred to as the Alternative Project Underground Mine Plan, and are shown on Figure 3².

The Alternative Project Underground Mine Plan may result in a minor reduction in coal extraction due to the additional workings (i.e. installation of additional main headings), as well as changes to the mining sequence and mining direction.

The final mining layout, mine sequence and mining direction for the Project would be subject to review and approval as a component of future Extraction Plans.

The Alternative Project Underground Mine Plan involves no change to the following key components of the Project as described in Section 2 in the Main Report of the EIS:

- the overall underground mining area footprint;
- the maximum run of mine (ROM) coal production rate (i.e. 11 million tonnes per annum); and
- the surface infrastructure requirements.

The purpose of this review letter is to qualitatively consider the potential implications of adopting the Alternative Project Underground Mine Plan on predicted groundwater impacts.

2 Objectives and scope of work

The primary objective of this groundwater review is to undertake a qualitative assessment of the potential additional groundwater impacts associated with the Alternative Project Underground Mine Plan shown in Figure 3.

In terms of predicted groundwater impacts, relative to groundwater impacts reported in AGE (2020) for the Narrabri Mine Stage 3 Extension Project (the Stage 3 Extension Groundwater Assessment), only the potential changes to the mining direction and sequencing (and hence inflows) described above in Section 1.2, have the potential to affect predicted groundwater impacts.

The work undertaken comprised review and analysis of:

- the Stage 3 Extension Groundwater Assessment (AGE, 2020); and
- estimated groundwater inflows to the existing mine workings (WRM, 2019)³.

Based on the above information, a qualitative review of potential changes in groundwater impacts likely to result from the Alternative Project Underground Mine Plan was developed, as described herein.

¹ Australasian Groundwater and Environmental Consultants Pty Ltd, Groundwater Assessment Narrabri Mine Stage 3 Extension Project, August 2020.

² Note that with the installation of additional main headings, the panels are proposed to be renumbered to include “300 series” panels.

³ WRM, 2019, Narrabri Coal Mine Water Balance Model Report, Report for Narrabri Coal Operations Pty Ltd.

3 Predicted groundwater impacts

The assessment of groundwater impacts summarised in the Stage 3 Extension Groundwater Assessment is primarily based on predictions from a numerical model of the groundwater system around the Narrabri Mine developed by AGE (AGE, 2020). The AGE report includes an assessment of potential impacts on:

- Groundwater levels during mine operation and post closure;
- Groundwater flow directions;
- Groundwater quality;
- Mine inflows;
- Groundwater licensing;
- Private water supply bores; and
- Potential Groundwater Dependent Ecosystems (GDEs).

AGE (2020) also assessed the predicted impacts of the Project against minimal impact considerations included in the NSW Aquifer Interference Policy (Department of Primary Industries [DPI]- Office of Water, 2012)⁴.

Sections 3.1 to 3.5 below provide a summary of groundwater impacts predicted in the Stage 3 Extension Groundwater Assessment (AGE, 2020) and an assessment of how these impacts are likely to change as a result of the Alternative Project Underground Mine Plan.

3.1 Mine inflows

3.1.1 Stage 3 Extension Groundwater Assessment

Predicted mine inflows as reported in the Stage 3 Extension Groundwater Assessment (AGE, 2020), based on the conceptual mine plan shown in Figure 2, are shown in Figure 4. Predictions indicate gradually increasing inflows as mining progresses downdip from longwall panel LW201 towards the deepest panel in the southern part of the mine, LW 209. Predicted inflows peak at 2,406 ML/year (equivalent to an extraction rate of 6.6 ML/d) in 2040 during mining of this panel before reducing slightly during the last three years of mining when two relatively shallow small panels (LW201 and LW202) at the easternmost limit of the mine (and the remaining portion of LW108 [LW108B]) would be mined.

⁴ Department of Primary Industries - Office of Water, 2012. NSW Aquifer Interference Policy, NSW Government policy for the licensing and assessment of aquifer interference activities.

3.1.2 Potential impacts of the Alternative Project Underground Mine Plan

As described in Section 1.2, in most respects Alternative Project Underground Mine Plan (Figure 3) is identical to that assessed in the Stage 3 Extension Groundwater Assessment. However, NCOPL seeks flexibility in regard to the mining direction and the mining sequence for the Alternative Project Underground Mine Plan. Accordingly, in order to identify the range of potential impacts, the alternative plan has been assessed through consideration of the following two scenarios:

- a predominantly east to west (down dip) mining direction as per the mine plan assessed in the Stage 3 Groundwater Assessment; and
- a predominantly west to east (up dip) mining direction (i.e. a reversal of the mining direction assessed in the Stage 3 Groundwater Assessment).

In the event that the Alternative Project Underground Mine Plan was also predominantly mined from east to west, as per the conceptual mine plan shown in Figure 2, then we would not anticipate any material change to the predicted mine inflows shown in Figure 4. NCOPL have advised that this is the most likely extraction scenario.

Conversely, if the mining direction was reversed from east to west under the current conceptual mine plan to west to east then the temporal pattern of mine inflows would likely also be reversed. Peak inflows would likely still occur during development of the deepest longwall panel (LW209) but would occur earlier in the mine life. Furthermore, peak inflows to panel LW209, if it was to be the first panel developed, may be marginally higher than currently predicted, since potentially significant quantities of groundwater inflow may occur from shallower panels to the east which will not have been previously dewatered and mined out. Mine inflows would then likely gradually reduce thereafter as mining operations progress from west to east into shallower panels which will have already been partially dewatered. However, since none of the other mining variables, in particular the depth and rate of mining and the mine footprint, are subject to change in the Alternative Project Underground Mine Plan, we do not anticipate any material change in the total (life of mine) volume of groundwater extracted in either of the two mining direction scenarios assessed.

3.2 Potential impacts on groundwater levels at sensitive receptors

3.2.1 Stage 3 Extension Groundwater Assessment

As shown in Table 1, AGE (2020) predicted potential groundwater level drawdown of in excess of 2 m at eight private water supply bores near the Narrabri Mine. Modelling indicates that three bores terminating in the Garrawilla Volcanics, three bores in the Napperby Formation and one bore each in the Purlawaugh and Arkarula formations could be impacted by more than the 2 m threshold as defined in the NSW Aquifer Interference Policy (DPI – Office of Water, 2012). As shown in Table 1, in almost all cases maximum drawdowns are predicted to occur sometime after mining ceases. No impacts of more than 2 m are predicted at any known existing private water supply bores in other strata in the vicinity of the Narrabri Mine.

Table 1 Private bores predicted to experience more than 2 m of drawdown from the Stage 3 Extension Groundwater Assessment (AGE, 2020)

Private bore ID	Groundwater Extraction Unit	Bore status	Bore Purpose	Project Drawdown		Cumulative Drawdown	
				Maximum predicted drawdown (m)	Year in which drawdown exceeds 2 m	Maximum predicted drawdown (m)	Year in which drawdown exceeds 2 m
House Bore	Garrawilla Volcanics	In use	S&D	2.34	2508	2.72	2360
257_Bore	Arkarula Formation	In use	S&D	12.59	2043	12.61	2043
GW008634	Napperby Formation ¹	Not in use	S&D	2.65	2191	3.35	2113
GW013851	Garrawilla Volcanics	In use	S&D	5.02	2260	5.70	2191
GW013858	Napperby Formation	In use	S&D	9.26	2067	10.93	2055
GW026121	Garrawilla Volcanics	In use	S&D	3.98	2260	4.57	2191
GW054227	Purlawaugh Formation	Not in use	S&D	3.79	2113	3.97	2113
Windmill Bore	Napperby Formation	In use	S&D	4.44	2050	4.61	2050

Note: ¹ Bore thought to be extracting from multiple “less productive” strata. Strata listed is the lowermost unit thought to be intersected in the bore.

As summarised in Table 2 impacts of in excess of the estimated NSW Aquifer Interference Policy (AIP, DPI -Office of Water, 2012) water table drawdown threshold are also predicted at a number of potential high priority groundwater dependent ecosystem (GDE) areas (AGE, 2020). Nevertheless predicted maximum drawdowns in these areas are substantially less than observed seasonal fluctuations in the Namoi Alluvium, which exceed 20 m in some places where natural climatic variations are amplified by seasonal irrigation extraction.

Table 2 Mapped high priority GDE areas where predicted water table drawdown exceed the estimated AIP threshold

Vegetation type	Total mapped area exceeding AIP threshold – Project only (hectares [ha])	Total mapped area exceeding AIP threshold – Project and Narrabri Gas Project (ha)
Namoi Valley Groundwater Source – Upper Zone 5 (estimated AIP threshold = 0.87 m)		
Box grassy woodland	0.5	0.5
River Red Gum	5.9	6.9
Gunnedah Oxley Basin Murray Darling Basin (MDB) Groundwater Source (estimated AIP threshold = 0.51 m)		
Narrow leaved Ironbark	16.1	16.1
Box grassy woodland	19.1	19.1
Red Gum	59.0	59.0
River Red Gum	27.7	28.3
Shallow freshwater wetland sedgeland	29.8	31.1
Total area	157.9	160.9

3.2.2 Incremental impacts of the Alternative Project Underground Mine Plan

As discussed in Section 2, in terms of predicted groundwater impacts, only the potential changes to the mining direction and sequencing (and hence inflows) have the potential to affect predicted groundwater impacts.

With regard to the potential impacts of any changes to the mining direction and/or sequencing, as discussed in Section 3.1, if the mining direction was reversed from predominantly east to west then predicted peak inflows may be marginally higher and occur earlier in the mine life than the predicted inflows shown in Figure 4, since mining of the deepest longwall panel (LW209) would occur earlier in the mine life. Conversely, the total volume of extraction (i.e. over the life of mine) is considered unlikely to change significantly even if the mining direction is reversed. Accordingly, whilst the timing of maximum predicted drawdown at sensitive receptors (bores and potential GDEs) could be brought forward, no material change to the predicted maximum drawdowns are anticipated. Impacts at two of the private bores listed in Table 1 (257_Bore and the Windmill Bore) could, therefore, occur prior to the completion of underground mining operations. Notwithstanding, no material changes to the magnitude of predicted drawdown at any of the bores listed are anticipated.

3.3 Groundwater flow and licensing impacts

3.3.1 Stage 3 Extension Groundwater Assessment

AGE (2020) also predicted minor impacts on:

- baseflow to the Namoi River;
- flow directions in and around the Narrabri Mine site; and
- groundwater resources in GAB aquifers (Southern Recharge Zone) and the Namoi Alluvium (Zone 5).

Predicted annual volumes requiring licences to account for these impacts are summarised in Table 3.

Table 3 Groundwater licensing summary – Stage 3 Extension Groundwater Assessment (AGE, 2020)

Water sharing plan	Water source/ management zone	Aquifers / River	Impacted resource	Peak volume requiring licensing during mining (ML/year)	Peak volume requiring licensing-post-mining (ML/year)	Existing licensed volume (Shares)
Upper and Lower Namoi Regulated River Water Sources	Upper and Lower Namoi	Namoi River (including tributary creeks)	Surface Water (indirect)	44 ^a	193	678
Namoi Alluvial Groundwater Sources	Upper Namoi Zone 5	Quaternary alluvium	Groundwater (indirect)	10	64	260
	Lower Namoi			0	1	Nil
NSW GAB Groundwater Sources	Southern Recharge Zone	Pilliga Sandstone, Purlawaugh Formation and outcropping Quaternary alluvium ^b	Groundwater (indirect)	42	88	248
NSW Murray Darling Basin Porous Rock Groundwater Sources	Gunnedah-Oxley Basin MDB	Porous strata between the base of the Purlawaugh Formation and top of the Boggabri Volcanics and outcropping Quaternary alluvium ^b	Groundwater (direct and indirect)	2,310	2,310	1,221

Notes: ^a modelling from WRM (2020) indicates that no extraction from the Namoi River (using the existing Namoi River pump) would be required for the Project.

^b as required under the relevant WSPs, includes predicted take from alluvial sediments which are mapped at outcrop within the boundary of the groundwater source shown on the plan map.

3.3.2 Incremental impacts of the Alternative Project Underground Mine Plan

As discussed in Section 3.1, if the mining direction was reversed from predominantly east to west, then predicted peak inflows may be marginally higher and occur earlier in the mine life than the predicted inflows shown in Figure 4. Accordingly, additional licences over and above the quantities summarised in Table 3 may be required under the WSP for the NSW Murray Darling Basin Porous Rock Groundwater Sources (i.e. for the Gunnedah-Oxley Basin MDB Groundwater Source). This groundwater source is currently significantly under-allocated and has had several controlled allocation periods of interest between 2017 and 2020. Most recently, the Controlled Allocation Order (Various Groundwater Sources) 2020 is offering 4,043 shares of the Gunnedah-Oxley Basin MDB Groundwater Source.

It should also be noted that previous predictions of inflow to the Narrabri Mine made by Hydrosimulations (2015⁵) and Aquaterra (2009⁶) have tended to over-predict actual inflows by up to a factor of two (refer to Section 5.6.2 of the Stage 3 Extension Groundwater Assessment for a discussion of this). The current Project numerical model also tends to conservatively slightly over-predict actual inflows by around 10% during the model calibration period (AGE, 2020). Where this pattern of over-prediction continues then the current licence, which allows extraction of 1,221 ML/yr, from the Gunnedah-Oxley Basin MDB Groundwater Source may be sufficient for some time given that average actual inflow to Narrabri Mine during 2018 (393 ML/yr) was only around 30% of the licensed quantity.

In accordance with the above discussion, NCOPL would continue to monitor mine inflows versus predictions and ensure that sufficient entitlements are held to account for groundwater inflow to the mining areas.

As discussed previously in Section 3.1.2 since the total volume of extraction is considered unlikely to change significantly even if the mining direction is reversed then no material change to the magnitude of predicted maximum impacts on water sources other than the Gunnedah-Oxley Basin MDB Groundwater Source are anticipated.

3.4 Brine disposal

Treatment of water using reverse osmosis (RO) at the Narrabri Mine leads to the generation of a brine waste stream. During operation this brine will be stored in a series of brine storage ponds. However, as described in the Stage 3 Extension Groundwater Assessment (AGE, 2020) brine stored in these ponds would be pumped back into the goaf areas and main headings at the completion of mining.

Implementation of the Alternative Project Underground Mine Plan would not prevent this brine disposal at the completion of the mining. In addition, since the total inflow volume is likely to remain materially unchanged, then the potential groundwater impacts associated with the brine disposal would not be significantly different if the Alternative Project Underground Mine Plan was implemented.

3.5 Assessment against Aquifer Interference Policy minimal impact considerations

The NSW Aquifer Interference Policy (DPI – Office of Water, 2012) establishes minimal impact considerations for highly productive and less productive groundwater sources. Reference to NSW Department of Planning, Environment and Industry – Water (DPIE – Water) mapping of highly productive groundwater in the vicinity of the Narrabri Mine confirms that the Namoi Alluvium and the Southern Recharge GAB Groundwater Source (predominantly the Pilliga Sandstone) are highly productive groundwater sources.

A detailed description of the predicted groundwater impacts of the conceptual mine plan shown in Figure 2 is provided in Section 7.11 of the Stage 3 Extension Groundwater Assessment (AGE, 2020). As described in the preceding sections in this report, other than a possible increase in peak inflows to the mine should the Alternative Project Underground Mine Plan include a reversal of mining direction, no material changes to the predicted impacts of the Project are anticipated. Accordingly, the minimal impact considerations findings summarised in Section 7.11 of the Stage 3 Extension Groundwater Assessment (AGE, 2020) would still apply in the event that the Alternative Project Underground Mine Plan is implemented.

⁵ HydroSimulations, 2015. Narrabri Mine Modification, Groundwater Assessment.

⁶ Aquaterra, 2009. Narrabri Coal Mine Stage 2 Longwall Project, Hydrogeological Assessment.

As summarised in Section 7.11 of the Stage 3 Extension Groundwater Assessment (AGE, 2020), for the most part the Project has been assessed as meeting minimal impact classifications except for predicted water table drawdown at high priority GDE sites covering 7.4 within the Namoi Alluvium and a further 153.6 ha within the Gunnedah Oxley Basin MDB Groundwater Source area. Potential impacts on these GDEs are considered in Appendix D of the EIS.

4 Conclusions

In summary, we do not anticipate any material changes to predicted groundwater impacts due to the Alternative Project Underground Mine Plan. NCOPL is seeking to retain flexibility in regard to the mining direction and mining sequence for the Alternative Project Underground Mine Plan. In the event that the alternative plan was predominantly mined from east to west (the most likely scenario) then we would not expect any material changes to either the timing or magnitude of predicted mine inflows or other predicted impacts.

In order to identify the range of potential impacts this review has also considered the scenario where the mining direction is reversed and development of the deepest (westernmost) longwall panel (LW209) occurs earlier in the mine life. In the unlikely event that the plan is implemented in this way then predicted impacts at eight private bores and at a number of potential GDE areas close to the Narrabri Mine may occur earlier than currently predicted. However, no material changes to the magnitude of predicted drawdown are anticipated, since the overall footprint of underground mining operations and other mining variables are unchanged.

Similarly, in the event that the mining direction is reversed during implementation of the plan then peak groundwater inflows to the modified Narrabri Mine could be marginally higher and occur earlier during the mine life than currently predicted. However, no material change to the total volume of groundwater extracted over the life time of the Narrabri Mine is anticipated. Nevertheless, NCOPL will continue to monitor mine inflows versus predictions and ensure that licensed volumes are adjusted as required.

If you have any queries about this review, please do not hesitate to contact me.

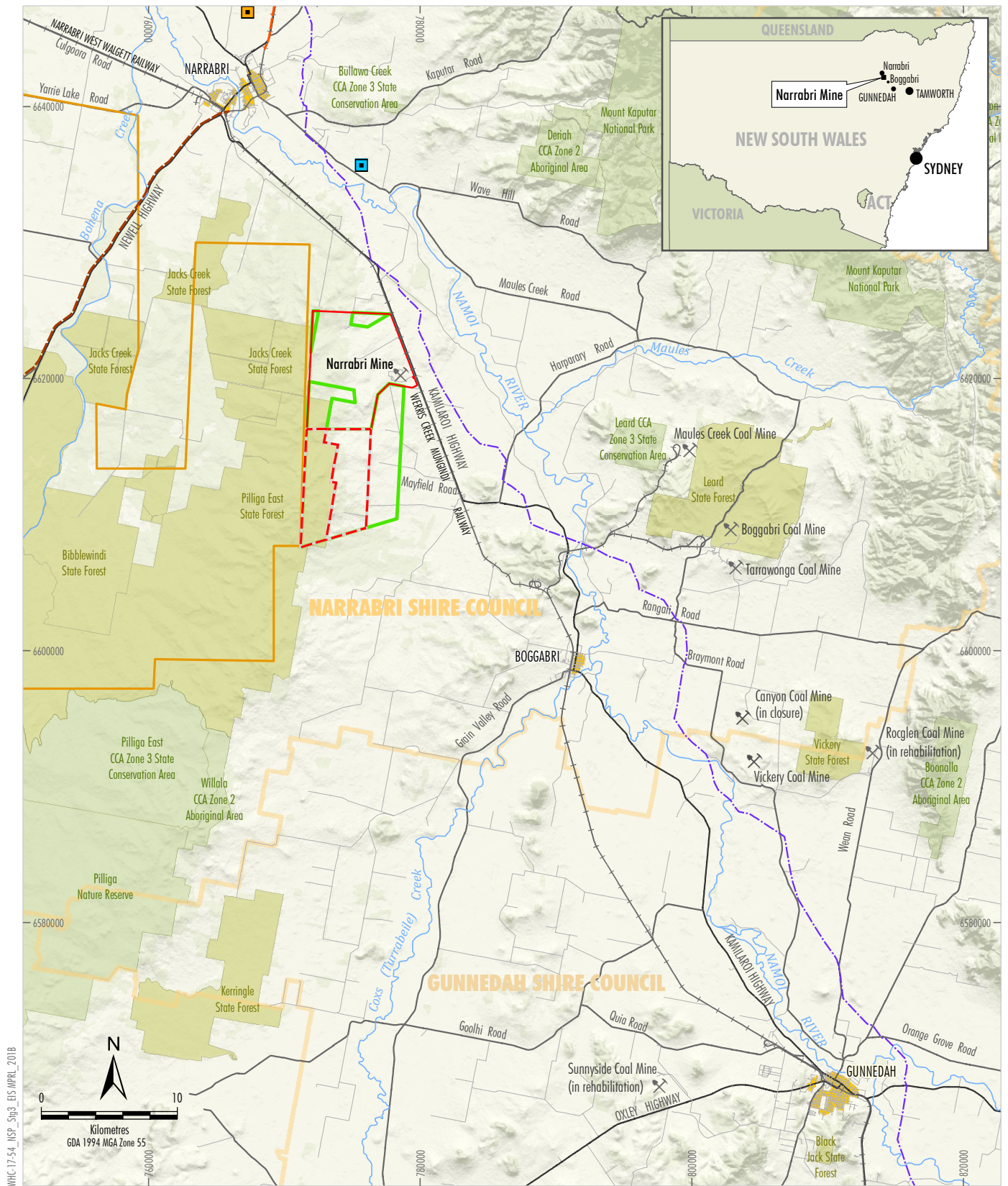
Yours faithfully,



Keith Phillipson

Principal Hydrogeologist

Australasian Groundwater and Environmental Consultants Pty Ltd



WMC-17-54_NSP_Sig3_EIS_MPRIL_2018

LEGEND

- Mine Site
- Exploration Licence (EL 6243)
- Mining Lease (ML 1609)
- Provisional Mining Lease Application Area
- Local Government Boundary
- State Forest
- State Conservation Area, Aboriginal Area

Other Major Projects

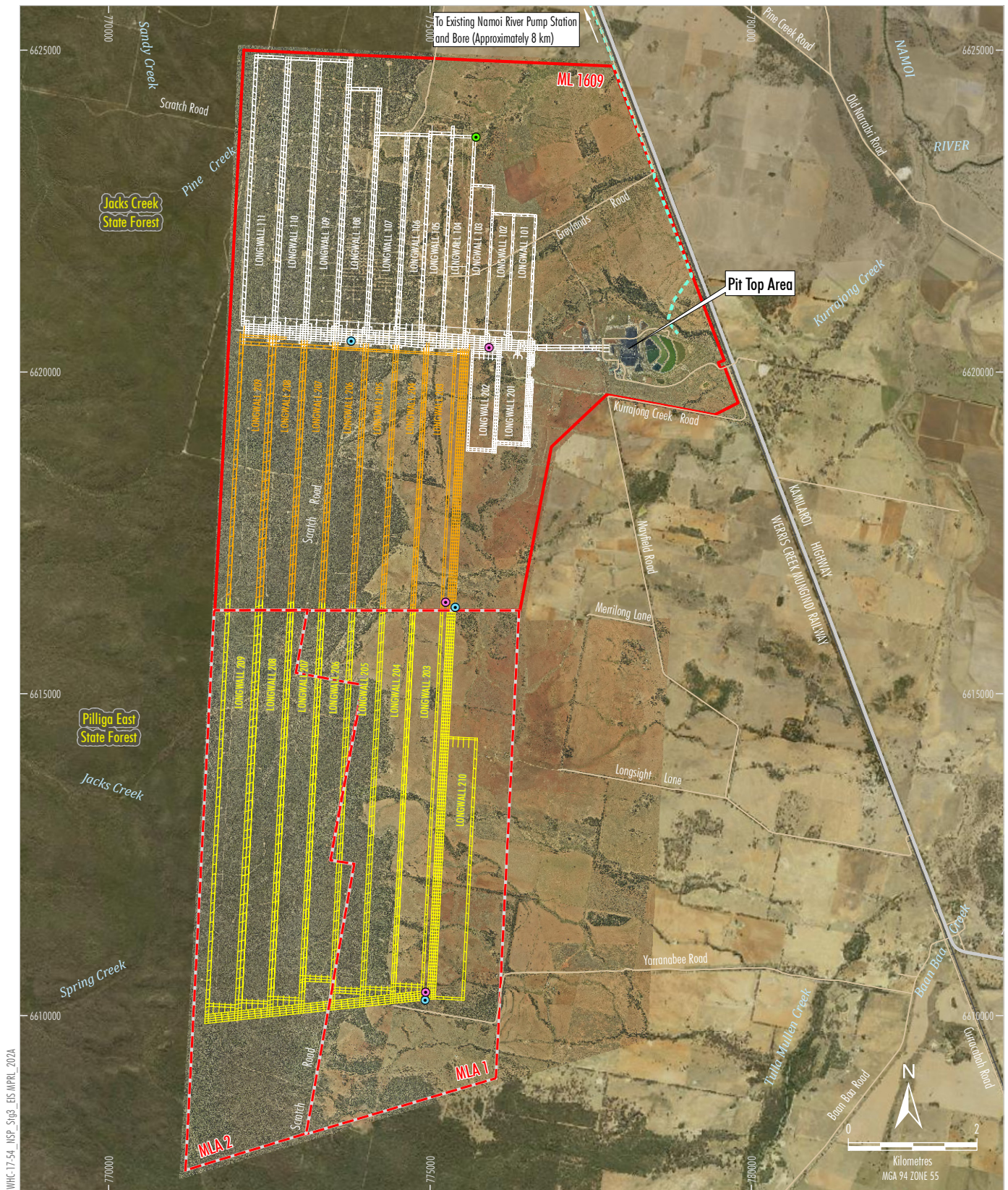
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- Inland Rail (Narrabri to North Star - Phase 1)
- Proposed Inland Rail (Narromine to Narrabri)
- Queensland Hunter Gas Pipeline

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



NARRABRI STAGE 3 PROJECT Regional Location

Figure 1



WHC-17-54_MSP_Sig3_EIS_MPR_2024

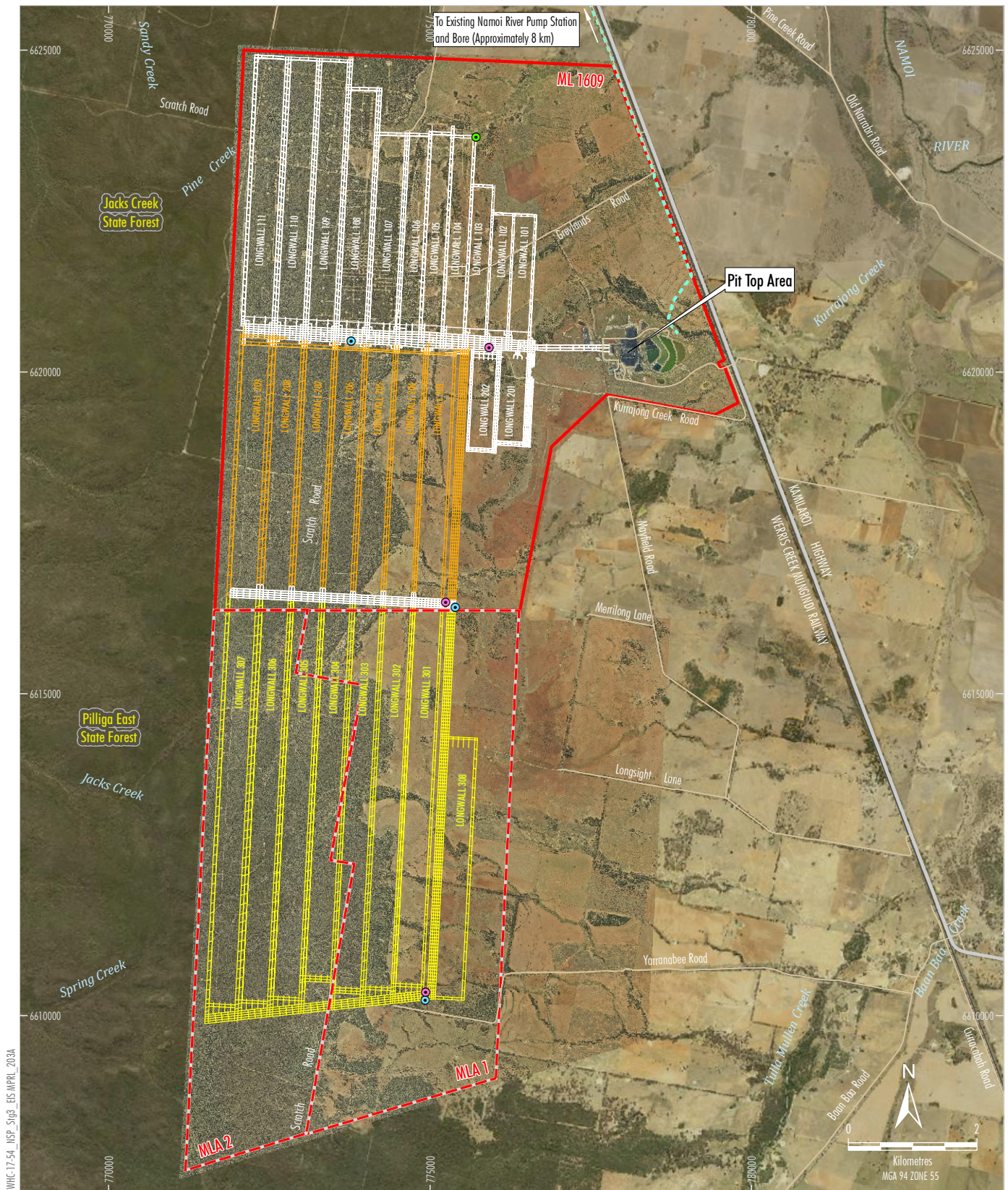
LEGEND

- Mining Lease (ML 1609)
- Provisional Mining Lease Application Area
- Existing Namoi River Pipeline (Buried)
- Approved Underground Mining Layout
- Indicative Underground Mining Layout to be Extended for Project
- Indicative Underground Project Mining Layout
- Indicative Ventilation Complex (Downcast)
- Indicative Ventilation Complex (Upcast)
- Indicative Ventilation Complex (Upcast - Decommissioned)

Source: NCOPL (2019); NSW Spatial Services (2019)


NARRABRI STAGE 3 PROJECT
Project General Arrangement -
Indicative Underground Mining Layout

Figure 2



WHITEHAVEN COAL

NARRABRI STAGE 3 PROJECT

Project General Arrangement -
Indicative Alternative Underground
Mining Layout

Figure 3

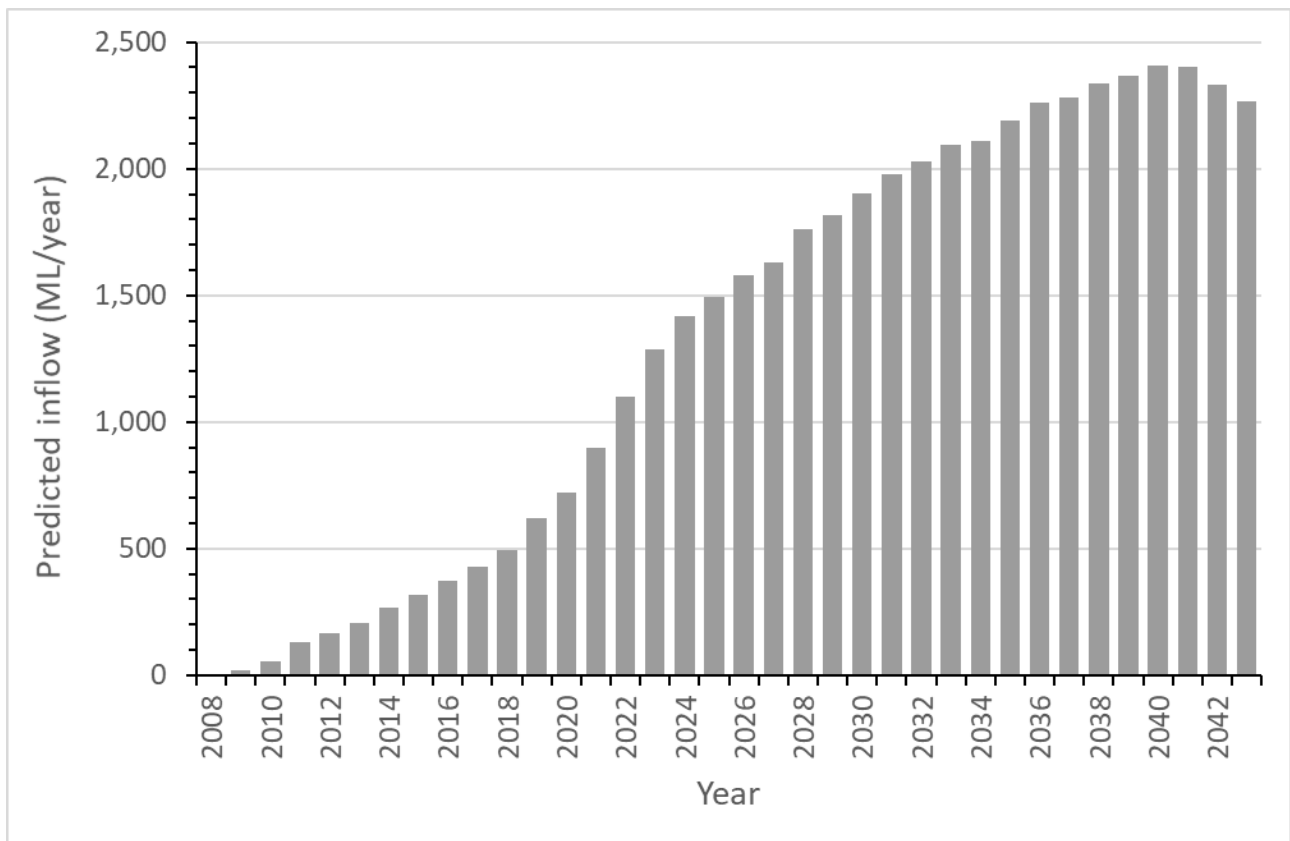


Figure 4 Predicted mine inflow, Stage 3 Extension Groundwater Assessment (AGE, 2020)

Alternative Project Underground Mine Plan - Surface Water Review Narrabri Mine

Narrabri Coal Operations Pty Ltd
0189-17-H2, 12 October 2020

For and on behalf of WRM Water & Environment Pty Ltd
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Senior Principal Engineer

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1 Introduction

1.1 BACKGROUND

The Narrabri Mine 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 of New South Wales (NSW) (Figure 1.1). The Narrabri Mine is operated by Narrabri Coal Operations Pty Limited (NCOPL).

NCOPL is seeking a new Development Consent under the State Significant Development provisions of Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the Narrabri Underground Mine Stage 3 Extension Project (the Project).

The Project involves a southern extension of the approved underground mining area to gain access to additional coal reserves within Mining Lease Applications (MLAs) 1 and 2, an extension of the mine life to 2044 and development of supporting surface infrastructure.

A detailed description of the Project is provided in Section 2 in the Main Report of the EIS.

1.2 PURPOSE OF THIS REVIEW

The Project Surface Water Assessment (WRM Water & Environment [WRM], 2020) forms part of the Project Environmental Impact Statement (EIS). The Surface Water Assessment has been prepared based on the conceptual mine plan shown in Figure 1.2 that incorporates an extension of the approved Longwalls 203 to 209 into MLAs 1 and 2, and an additional longwall panel (Longwall 210) within MLA 1.

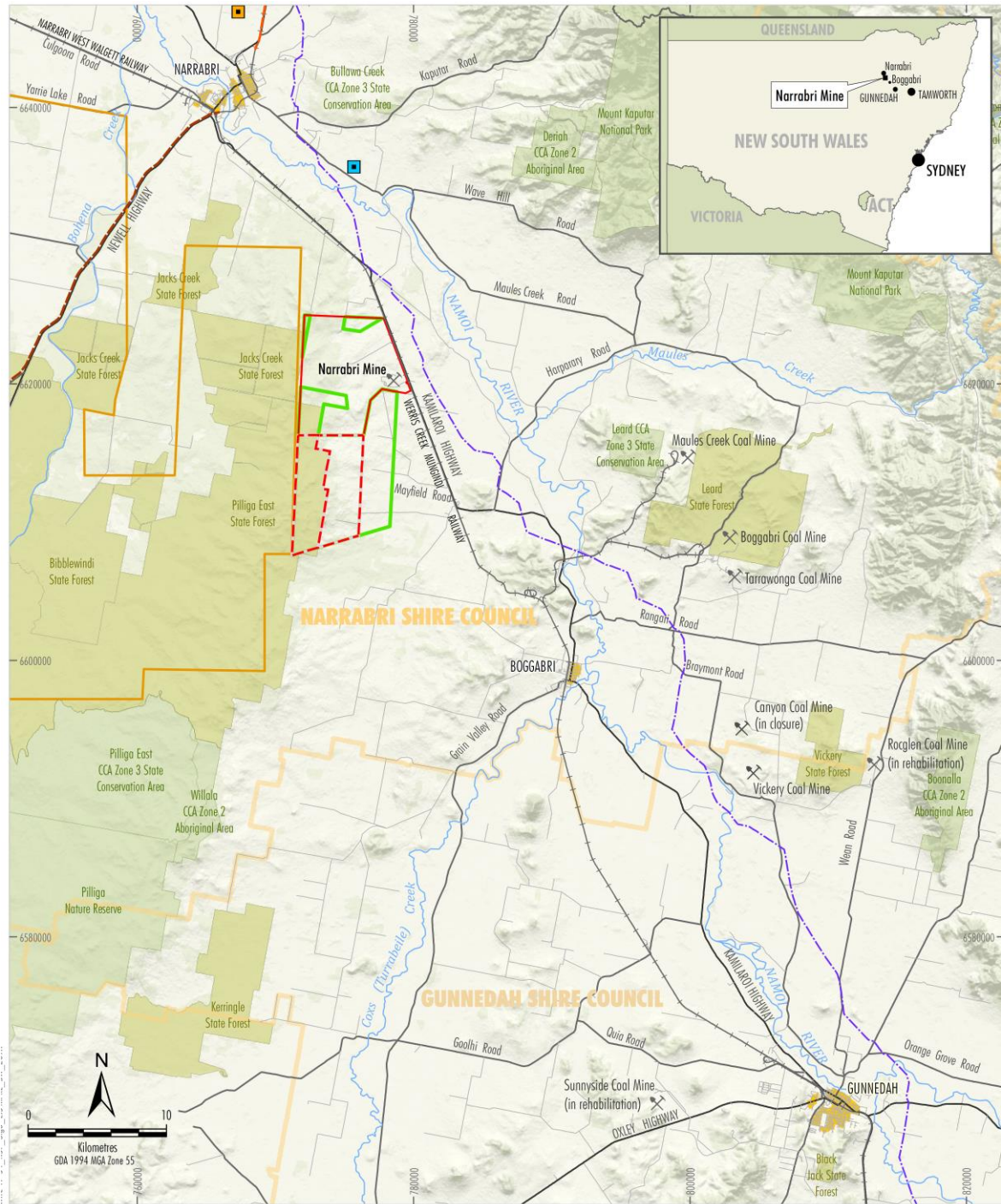
As described in Section 2.6.2 of the Main Report of the EIS, the conceptual layout shown on Figure 1.2 may be amended to include installation of additional main headings in Longwalls 203 to 209 as currently approved. The amendments to the underground mining area are herein referred to as the Alternative Project Underground Mine Plan, and are shown on Figure 1.3.

The Alternative Project Underground Mine Plan may result in a minor reduction in coal extraction due to the additional workings, as well as changes to the mining sequence and mining direction. The final mining layout, mine sequence and mining direction for the Project would be subject to review and approval as a component of future Extraction Plans.

The Alternative Project Underground Mine Plan involves no change to the following key components of the Project as described in Section 2 in the Main Report of the EIS:

- the overall underground mining area footprint;
- the maximum run of mine (ROM) coal production rate (i.e. 11 million tonnes per annum); and
- the surface infrastructure requirements.

The purpose of this review letter is to qualitatively consider the potential implications of adopting the Alternative Project Underground Mine Plan.



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

- | | |
|---|---|
| Mine Site | Other Major Projects |
| Exploration Licence (EL 6243) | Narrabri South Solar Farm |
| Mining Lease (ML 1609) | Proposed Silverleaf Solar Farm |
| Provisional Mining Lease Application Area | Narrabri Gas Project (Santos NSW [Eastern] Pty Ltd) |
| Local Government Boundary | Inland Rail (Narrabri to North Star - Phase 1) |
| State Forest | Proposed Inland Rail (Narramine to Narrabri) |
| State Conservation Area, Aboriginal Area | Queensland Hunter Gas Pipeline |

WHITEHAVEN COAL
NARRABRI STAGE 3 PROJECT
Regional Location

Figure 1.1 - Narrabri Mine regional location (Source: Resource Strategies)



WMC1754_NSP_Sp3_15.MPL_2024

Source: NCOPL (2019); NSW Spatial Services (2019)

- LEGEND**
- Mining Lease (ML 1609)
 - Provisional Mining Lease Application Area
 - Existing Namoi River Pipeline (Buried)
 - Approved Underground Mining Layout
 - Indicative Underground Mining Layout to be Extended for Project
 - Indicative Underground Project Mining Layout
 - Indicative Ventilation Complex (Downcast)
 - Indicative Ventilation Complex (Upcast)
 - Indicative Ventilation Complex (Upcast - Decommissioned)


NARRABRI STAGE 3 PROJECT
Project General Arrangement -
Indicative Underground Mining Layout

Figure 1.2 - Project general arrangement indicative underground mining layout
(Source: Resource Strategies)



2 Assessment of impacts

2.1 SUBSIDENCE IMPACTS ON WATERWAYS

2.1.1 Overview

MLAs 1 and 2 are located within the Kurrajong Creek and Tulla Mullen Creek tributary catchments (see Figure 2.1). Both of these tributaries drain to Tulla Mullen Creek to the east of the Project, which then drains to the Namoi River. These creeks are all ephemeral with minimal to no baseflow. Several farm dams are located across the drainage lines.

The Alternative Project Underground Mine Plan includes additional main headings across Longwalls 203 to 209 along the southern margin of Mining Lease 1609. These main headings underly Kurrajong Creek. No changes are proposed under the Tulla Mullen Creek tributary catchments between the Project and the Alternative Project Underground Mine Plan and as such the impacts described in the Project Surface Water Assessment for the Tulla Mullen Creek tributary do not change.

An assessment of the potential changes to the Kurrajong Creek due to the Alternative Project Underground Mine Plan are given below.

2.1.2 Project impacts

The impacts on Kurrajong Creek in the Project Surface Water Assessment were based on subsidence predictions made by Ditton Geotechnical Services (DGS, 2020). DGS predicted that the ground would subside by up to 2.75 m in the centre of the longwall panels and up to 0.5 m across the chain pillars (the unmined sections between the longwall panels). Longitudinal profiles along the Kurrajong Creek centre line for existing and post mining subsidence conditions are shown in Figure 2.2.

A summary of the predicted impacts on Kurrajong Creek given in the Project Surface Water Assessment is given below:

- Major changes in channel geomorphology due to changes in channel location (avulsions) are unlikely as the pre- and post-subsidence channels are located within well-confined valleys.
- Some of the minor (1st order) channels may drain into the creek at alternate locations and cause localised bank scour, particularly above Longwalls 207 and 209.
- Minor increases in channel erosion would be expected on the downstream side of each chain pillar due to the increased channel slope.
- Additional in-channel ponding is expected to occur above all longwall panels upstream of each chain pillar. The ponded areas are expected to accumulate sediment over time.
- Existing farm dams on Kurrajong Creek that may be impacted by the Project will be decommissioned.
- Numerous contour banks above Longwalls 203 and 204 would be impacted by subsidence. Some contour banks would ultimately drain in two directions, causing contour banks to silt up and overtop, potentially resulting in minor downstream erosion by the concentration of flow.
- The existing headcut within Kurrajong Creek (see Figure 2.2), located downstream of the mining area is expected to be unchanged by the Project.

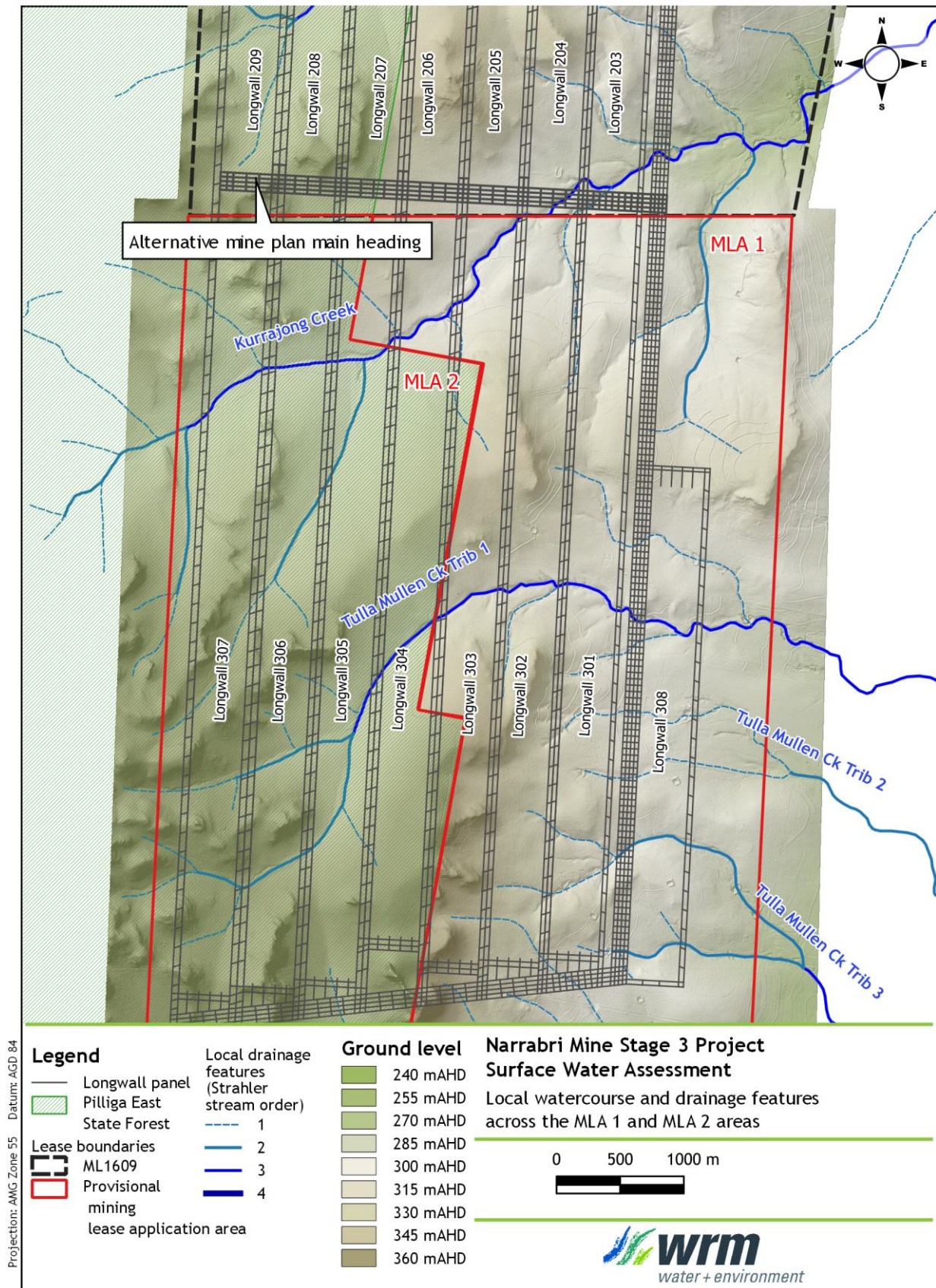


Figure 2.1 - Local watercourse and drainage features across the MLA 1 & MLA 2 areas

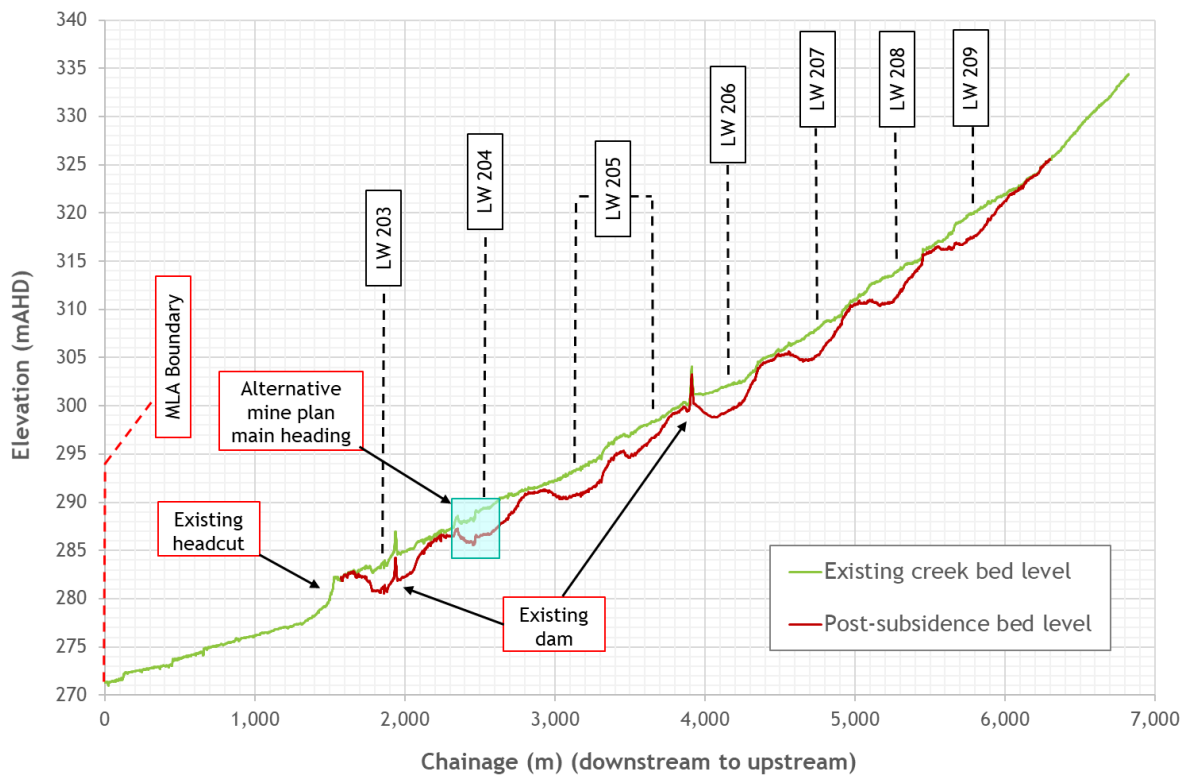


Figure 2.2 - Longitudinal profile of Kurrajong Creek channel bed

2.1.3 Alternative Project underground mine plan impacts

Figure 2.1 shows the location of the (approved) main heading in the Alternative Project Underground Mine Plan. Figure 2.2 shows the location of the main heading along the longitudinal profile of Kurrajong Creek. The main heading would cross Kurrajong Creek over longwall 204 and a minor first order gully over longwall 203. A photograph of Kurrajong Creek at the location of the additional main headings is shown in Figure 2.3. The Kurrajong Creek channel at this location consists of a broad flow path with a minor low flow channel. It has a bed slope of approximately 0.8% with the left and right bank floodplains rising at a consistent 10% gradient. The bed material consists of a sandy loam with some grass indicating it may retain water following rainfall.

DGS (2020a) has advised that the maximum subsidence effects would remain unchanged for the Alternative Project Underground Mine Plan compared to that assessed in the Project Subsidence Assessment Main Report. The predicted subsidence effect contours (subsidence, tilt and horizontal strain) would vary where the main headings are proposed between the 200 and 300¹ series longwalls. There are no changes to the predicted subsidence effects for the steep slopes, cliffs or archaeological sites previously assessed.

On the basis of the DGS (2020) advice, there would be minimal change to the subsidence related impacts on Kurrajong Creek or the adjoining overbank areas from that described in the Surface Water Assessment (WRM, 2020) (Section 2.1.2). The subsidence of Kurrajong Creek over the main heading would reduce, which would reduce the extent of additional ponding over Longwall 204. The impact of this change on the geomorphological behaviour of Kurrajong Creek would be negligible. The potential change in the direction of mining for the Alternative Project Underground Mine Plan would have no material impact on the final landform.

¹ Note that with the installation of additional main headings, the panels south of the main headings are proposed to be renumbered to include "300 series" panels (Figure 2.1).



Figure 2.3 - Photograph of Kurrajong Creek at the location of the additional main heading

2.2 IMPACT ON LOCAL CATCHMENT FLOWS

2.2.1 Project impacts

The Surface Water Assessment showed that the Project would have limited impacts on local catchment flows. Any impacts associated with the construction of the ventilation shaft and service borehole pad sediment dams would be minor and temporary as this infrastructure is progressively constructed and rehabilitated after its use is completed.

The impact of mine subsidence on surface flow volumes and low and medium flows was also predicted to be minor. The volume of additional instream storage is negligible when compared to the mean annual flow in the local waterways. The impact on the low and medium flows or flow regime of the watercourses is also negligible given that the instream depressions are widely distributed and that the watercourse vegetation are already adapted to the highly ephemeral nature of the existing flow regime that have no baseflow.

2.2.2 Alternative Project underground mine plan impacts

The Alternative Project Underground Mine Plan would result in no change to the surface infrastructure requirements. Further, the addition of the approved main heading would moderately reduce in-stream ponding. On this basis, there would be no measurable change on the impact of catchment flows due to the Alternative Project Underground Mine Plan.

2.3 IMPACT ON NAMOI RIVER FLOWS

2.3.1 Project impacts

AGE (2020) determined that the potential impact of the Project on baseflow in the Namoi River and its tributaries during the Project life would be negligible. Baseflow impacts to the Namoi River and its tributaries of up to approximately 200 ML/yr were predicted to be lost post-mining. The Surface Water Assessment demonstrated that this loss of baseflow

would not be measurable given that flows in the Namoi River are regulated by releases from the upstream dams with flows maintained at approximately 1,900 megalitres per day (WRM, 2020).

The Namoi River would not be subject to direct subsidence effects (DGS, 2020).

2.3.2 Alternative Project underground mine plan impacts

AGE (2020a) do not anticipate any material changes to the predicted groundwater impacts due to the Alternative Project Underground Mine Plan. On this basis, there would be no material change to the Namoi River flows from that given in the Surface Water Assessment.

2.4 IMPACT ON SURFACE WATER QUALITY

2.4.1 Project impacts

The Project would involve the use of the existing/approved water management infrastructure with minor augmentations and extensions, including the progressive developments of pumps, pipelines, water storage and other water management infrastructure. The Surface Water Assessment determined that the Project water management system is unlikely to result in adverse impacts to downstream surface water quality. In particular:

- the likelihood of an uncontrolled release of mine/Pit Top Area runoff water, which may contain elevated levels of salts or other pollutants is very low (less than 1%);
- no brine (concentrate produced by the reverse osmosis (RO) process) would be released as the approved brine storage ponds will be constructed as and when required to store the excess brine;
- the sediment dams would continue to be dewatered following runoff events, and would only overflow within the EPL 12789 limits for wet weather discharges;
- the filtered water that is proposed to be released to the Namoi River would be treated by RO, and would comply with the release criteria outlined in EPL 12789;
- the controlled release of treated water would not adversely impact on water quality in the Namoi River; and
- surface cracking associated with mine subsidence is expected to only cause a temporary increase in turbidity and will revert back to background conditions as the cracks fill in and repair.

2.4.2 Alternative Project underground mine plan impacts

Given the very minor changes proposed as part of the Alternative Project Underground Mine Plan, no changes to the existing/proposed water management strategy and infrastructure would be required. AGE (2020a) has advised that peak groundwater inflows to the Narrabri Mine could be marginally higher and occur earlier during the mine life than currently predicted. However, no material change to the total volume of groundwater extracted over the life time of the Project is anticipated.

The water balance modelling undertaken for the Surface Water Assessment showed that the site water inventory generally tracked the predicted groundwater inflows. On the basis of the AGE (2020) advice, the overall site water inventory and therefore the required water management infrastructure and predicted downstream water quality impacts, would not change from that described in the Surface Water Assessment. However, the construction timing of the approved additional brine storage ponds may change if the mining direction is reversed.

The site water balance would be revisited on an annual basis to compare the actual behaviour of the Narrabri Mine site water management system to the predicted outcomes of the Surface Water Assessment (WRM, 2020).

2.5 IMPACT ON EXTERNAL WATER REQUIREMENTS

2.5.1 Project external water requirements

NCOPL currently owns sufficient water access licences (WALs) to supply the existing and the predicted Project extension external water demands. The Project is predicted to be a net producer of water through much of the Project life.

2.5.2 Alternative Project underground mine plan impacts

Based on the advice from AGE (2020a) that there would be no material change to the total volume of groundwater extracted over the life time of the Narrabri Mine due to the Alternative Project Underground Mine Plan, no additional WALs from a surface water source would be required for the Alternative Project Underground Mine Plan.

2.6 IMPACT ON FLOODING

2.6.1 Project impacts

The Project Pit Top Area is located at least 20 m in elevation above the Namoi River floodplain and, as such, the Namoi River would not inundate the Project Pit Top Area under any circumstance. Given the above, the Project is not expected to have any impact on Namoi River flooding.

The Project would not include changes to the Pit Top Area and no significant infrastructure is proposed as part of the Project that would significantly impact on the flow of water in any of the local tributaries.

The local waterways subject to mine subsidence are well confined. As a result, there would be no significant changes to the flooding behaviour along any of the local waterways.

2.6.2 Alternative Project underground mine plan impacts

The proposed Alternative Project Underground Mine Plan would involve no change to the surface infrastructure requirements of the Project and therefore, the flood impacts would not change from that presented in the Surface Water Assessment. That is, there would be no significant changes to the flooding behaviour along any of the local waterways or the Namoi River.

2.7 CUMULATIVE IMPACTS

2.7.1 Project impacts

There are currently numerous mines operating in the Namoi River catchment. The nearest mine to the Project is the Maules Creek Coal Mine which is located approximately 25 km to the east. With respect to cumulative impacts on water supply, any take of water from the Namoi River, whether it be for industrial or agricultural use, is managed through the *Water Sharing Plan for the Upper Namoi and Lower Namoi Regulated River Water Sources 2016*. The plan has considered the cumulative impacts of all water users in the catchment to ensure the environmental needs of the catchment are satisfied. The Project would comply with the provisions of this plan and the available WALs, if required, to minimise the cumulative impacts.

The Narrabri Gas Project EIS (Santos NSW (Eastern) Pty Ltd, 2017) (which is located directly west of the Project) concluded that the Narrabri Gas Project would have low risk of surface water impacts with the implementation of the proposed management measures.

Given the above, the Project is unlikely to result in any cumulative impacts to surface water resources (WRM, 2020).

2.7.2 Alternative Project underground mine plan impacts

The Alternative Project Underground Mine Plan would result in:

- no significant changes to the surface water quality impacts from that described in the Surface Water Assessment;
- no measurable changes in Namoi River or local catchment flows from that described in the Surface Water Assessment; and
- no significant changes to the flooding behaviour along any of the local waterways or the Namoi River from that described in the Surface Water Assessment.

Therefore, there would be no significant changes to cumulative impacts from that described in the Surface Water Assessment.

2.8 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

2.8.1 Project impacts

Based on the detailed assessment presented in the Surface Water Assessment, and in consideration of the Significant Impact Guidelines (Commonwealth of Australia, 2013), the Project would not result in significant changes to the quantity or quality of water available to third party uses or the environment.

Accordingly, the Project would not have a significant impact on surface water resources on a local, regional, state or national scale.

2.8.2 Alternative Project underground mine plan impacts

The Alternative Project Underground Mine Plan would not have a significant change in impact on surface water resources on a local, regional, state or national scale, based on the information presented above.

3 Management, monitoring and licensing

The Surface Water Assessment determined that the Narrabri Mine site water management system is robust and adequate to protect the environmental values of the receiving waters. Given the minimal changes proposed as part of the Alternative Project Underground Mine Plan, no changes to the Narrabri Mine site water management system would be required to the proposed management and monitoring measures identified in the Surface Water Assessment.

In addition, no additional WALs from a surface water source would be required because there would be no material change to the total volume of groundwater extracted over the life time of the Project due to the Alternative Project Underground Mine Plan (Section 2.5.2).

4 Conclusion

A summary of the proposed Alternative Project Underground Mine Plan surface water impact in comparison to those given in the Surface Water Assessment are as follows:

- There would be minimal change to the subsidence related impacts on Kurrajong Creek or the adjoining overbank areas from that described in the Surface Water Assessment. The subsidence of Kurrajong Creek over the main heading would reduce, which would reduce the extent of additional ponding over Longwall 204. The impact of this change on the geomorphological behaviour of Kurrajong Creek would be negligible. The potential change in the direction of mining for the Alternative Project Underground Mine Plan would have no material impact on the final landform.
- There would be no measurable change on the impact of local catchment flows due to the Alternative Project Underground Mine Plan. No additional surface infrastructure would be required that would reduce catchment area and the addition of the approved main heading would moderately reduce instream ponding.
- There would be no material change to the Namoi River flows from that described in the Surface Water Assessment given that AGE (2020a) has advised that they do not anticipate any material changes to predicted groundwater impacts due to the Alternative Project Underground Mine Plan.
- The Alternative Project Underground Mine Plan is unlikely to result in adverse impacts to downstream surface water quality. The overall site water inventory in the water management system would not change and therefore the required water management infrastructure and predicted downstream impacts would not change. However, the construction timing of the approved additional brine storage ponds may change if the mining direction is reversed.
- No additional WALs from a surface water source would be required because there would be no material change to the total volume of groundwater extracted over the life time of the Project due to the Alternative Project Underground Mine Plan.
- There would be no material changes to the flooding behaviour along any of the local waterways or the Namoi River because the proposed Alternative Project Underground Mine Plan would utilise the same surface infrastructure assessed in the Surface Water Assessment.

Overall, there would be no additional impacts to surface water due to the Alternative Project Underground Mine Plan than those described in the Surface Water Assessment for the Project.

5 References

- | | |
|------------|--|
| AGE, 2020 | <i>Narrabri Underground Mine Stage 3 Extension Project Groundwater Assessment</i> . Report prepared for Narrabri Coal Operations Pty Ltd by Australian Groundwater and Environmental Consultants, 2020. |
| AGE, 2020a | <i>Narrabri Coal Mine Stage 3 Extension Project Revised Mine Plan - Groundwater Review</i> . Letter prepared for Narrabri Coal Operations Pty Ltd by Australasian Groundwater and Environmental Consultants, 2020. |

Commonwealth of Australia, 2013	<i>Significant impact guidelines 1.3: Coal seam gas and large coal mining developments—impacts on water resources.</i>
DGS, 2020	<i>Mine Subsidence Assessment for the Narrabri Underground Mine Stage 3 Extension Project.</i> Report prepared for Narrabri Coal Operations Pty Ltd by Ditton Geotechnical Services, 2020.
DGS, 2020a	<i>Mine Subsidence Assessment for the Narrabri Underground Mine Stage 3 Extension Project.</i> Report prepared by Ditton Geotechnical Services on behalf of Narrabri Coal Operations Pty Ltd, 2020.
WRM, 2020	<i>Narrabri Underground Mine Stage 3 Extension Project Surface Water Assessment.</i> Report prepared for Narrabri Coal Operations Pty Ltd by WRM Water & Environment Pty Ltd, August 2020.

Narrabri Underground Mine Stage 3 Extension Project

Economic Review of the Alternative Project Underground Mine Plan

1. BACKGROUND

The Narrabri Mine 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 of New South Wales (NSW). The Narrabri Mine is operated by Narrabri Coal Operations Pty Limited (NCOPL).

NCOPL is seeking a new Development Consent under the State Significant Development provisions of Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for the Narrabri Underground Mine Stage 3 Extension Project (the Project).

The Project involves a southern extension of the approved underground mining area to gain access to additional coal reserves within Mining Lease Applications (MLAs) 1 and 2, an extension of the mine life to 2044 and development of supporting surface infrastructure. A detailed description of the Project is provided in Section 2 in the Main Report of the EIS.

2. PURPOSE OF THIS REVIEW LETTER

The Project Economic Assessment (AnalytEcon, 2020) forms part of the Project Environmental Impact Statement (EIS). The Project Economic Assessment has been prepared based on the conceptual mine plan shown in Figure 2-1 that incorporates an extension of the approved Longwalls 203 to 209 into MLAs 1 and 2, and an additional longwall panel (Longwall 210) within MLA 1.

As described in Section 2.6.2 in the Main Report of the EIS, the conceptual layout shown in Figure 2-1 may be amended to include the installation of additional main headings in Longwalls 203 to 209 as currently approved, and/or installation of additional main headings. The amendments to the underground mining area are herein referred to as the Alternative Project Underground Mine Plan (the Alternative Mine Plan), and are shown in Figure 2-2.

Figure 2-1. Project general arrangement – indicative underground mining layout



Source: Resource Strategies.

Figure 2-2. Project General Arrangement – Indicative Alternative Project Underground Mining Layout



Source: Resource Strategies.

The purpose of this review letter is to consider the potential implications of adopting the Alternative Mine Plan on the key outcomes of the Project Economic Assessment.

As with the Project Economic Assessment, this review letter has been prepared generally in accordance with the 'Guidelines For The Economic Assessment Of Mining And Coal Seam Gas Proposals' (NSW Government 2015, the EA Guidelines) and the 'Technical Notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals' (NSW Government 2018, the EA Technical Notes).

3. ALTERNATIVE PROJECT UNDERGROUND MINE PLAN CONTEXT

3.1. OVERVIEW

The Alternative Mine Plan would include the installation of additional main headings in Longwalls 203 to 209 as currently approved, and/or the installation of additional main headings relative to the conceptual layout shown in Figure 2-1.

The Alternative Mine Plan may result in a minor reduction in coal extraction due to the additional workings, as well as changes to the mining sequence and mining direction.

The final mining layout, mine sequence and mining direction for the Project would be subject to review and approval as a component of future extraction plans.

The Alternative Mine Plan involves no change to the following key components of the Project as described in Section 2 in the Main Report of the EIS:

- the overall underground mining area footprint;
- the maximum run-of-mine coal production rate (i.e. 11 million tonnes per annum); and
- the surface infrastructure requirements.

3.2. KEY ECONOMIC PARAMETERS

3.2.1. Product coal production profile

NCOPL has indicated that the Alternative Mine Plan would result in a minor reduction in the total product coal production over the life of Project (less than a 5 per cent reduction). The product coal production profile would be generally consistent with the Project.

The thermal and PCI product coal split for the Alternative Mine Plan would remain similar to the Project.

3.2.2. Coal Prices

The coal prices adopted for the Project (Section 2.4.2 of Project Economic Assessment) would also be applied to the Alternative Mine Plan.

3.2.3. Capital and operating expenditures

NCOPL has indicated that the development of the additional main headings required for the Alternative Mine Plan would result in an increase in capital costs in the order of 10 per cent on a net present value (NPV) basis over the Project life.

The residual value of land and capital would be unchanged for the Alternative Mine Plan relative to the Project.

The additional main headings required for the Alternative Mine Plan would also require additional longwall machine changeouts that would result in increased operating costs. These increased operating costs would, however, be minor over the life of the Project (around 1 per cent on an NPV basis).

Decommissioning costs would be unchanged for the Alternative Mine Plan relative to the Project.

3.2.4. Workforce assumptions

There would be no change to the construction workforce in the Alternative Mine Plan.

There would, however, be an increase in the operational workforce associated with additional development and longwall changeouts required from 2025 onwards (except for the rehabilitation and closure phase). The average operational workforce (full time equivalents) would increase by approximately 5 per cent.

The average wage and salary payments assumptions would remain unchanged for the Alternative Mine Plan relative to the Project.

4. COST-BENEFIT ANALYSIS – NSW COMMUNITY

The EA Guidelines require a cost-benefit analysis (CBA) to be prepared to evaluate the economic impacts of a coal mining proposal on the NSW community. This section compares the central results of the CBA for the Alternative Mine Plan to those for the Project.

4.1. METHODOLOGY AND ASSUMPTIONS

In all cases, the relevant counterfactual are the economic outcomes for the Narrabri Mine (the Reference Case). Consistent with the Project Economic Assessment, we assumed that although operations at the Narrabri Mine are currently approved through to July 2031, mining would continue through to 2034 to allow for all of the approved Narrabri Mine layout to be mined. This assumption is conservative since it implies that additional NSW benefits are attributed to the Reference Case from 2032 to 2034.

All assumptions underpinning the analysis in this letter review are the same as those documented in the Project Economic Assessment. This includes the assumptions made in respect of future coal prices and exchange rates, as well as assumptions about average wage and salary payments to the workforce, and all NSW and regional economic parameters.

4.2. NSW ROYALTIES

The Project would generate NSW royalty payments of \$668 million in NPV terms, \$259 million more than in the Reference Case. The incremental royalty payments were derived by multiplying product coal production schedules with projected (quality-adjusted) coal prices, subtracting allowable deductions, and multiplying by the relevant royalty rate.

As the Alternative Mine Plan would result in a minor reduction in the total product coal production over the life of Project (less than a 5 per cent reduction) and the product coal production profile and product coal split would be generally consistent with the Project (Section 3.2.1), a minor reduction (in the order of 5 per cent) in royalty payments relative to the Project would be expected.

4.3. COMPANY INCOME AND OTHER TAX PAYMENTS

4.3.1. Company income taxes

The NSW share of company income taxes attributable to the Project is estimated at \$316 million, or \$177 million in NPV terms more than in the Reference Case. Aggregate company income tax payments were derived by deducting operating costs, including the costs of mitigating externalities, wages & salaries, royalty and tax payments, and depreciation of capital assets from gross revenues to derive taxable income.

The Alternative Mine Plan is expected to result in minor reduction in NSW's share of company income taxes taking into account the following:

- reduced gross revenue – the minor reduction in the total product coal production over the life of Project (less than 5 % reduction) (Section 3.2.1) would reduce gross revenues and profits and therefore reduce company income tax payments;

- increased capital costs – the approximate 10 per cent increase in capital costs over the Project life (on an NPV basis) (Section 3.2.3) would reduce profits and therefore reduce company income tax payments;
- increased operating costs – the 1 per cent increase in operating costs over the Project life (on an NPV basis) (Section 3.2.3) would also reduce profits and therefore reduce company income tax payments;
- increased wage costs – the approximate 5 per cent increase in aggregate wage costs over the Project life (Section 3.2.4) would reduce profits and therefore reduce company income tax payments; while
- reduced royalty payments – the minor reduction in royalty payments (expected to be in the order of 5 per cent) would tend to increase profits and therefore increase company income tax payments.

On balance, it is expected that NSW's share of company income taxes for the Alternative Mine Plan would be similar to the Project but would be slightly lower.

4.3.2. Other Tax Payments

The Alternative Mine Plan would result in an increase in the share of personal income tax payments accruing to NSW due to the increase in the operational workforce (Section 3.2.4).

However, the EA Guidelines generally do not permit the higher than average salaries that are generally paid in the mining sector to be recognised as a benefit for NSW workers. Given that this is the case, consistent with the Project Economic Assessment, we have conservatively not estimated the additional personal income taxes (a share of which can be attributed to NSW) and payroll taxes (which accrue to NSW in full) that would be generated by the Project.

The Alternative Mine Plan would not change other tax payments relative to the Project (i.e. land tax, local government rates).

4.4. THE NSW SHARE OF THE NET PRODUCER SURPLUS

The Project is estimated to generate a producer surplus of \$2,013 million in NPV terms, or \$1,150 million more than in the Reference Case. The NSW share of the net producer surplus is estimated at \$163 million in NPV terms.

The Alternative Mine Plan would be expected to result in a minor reduction in producer surplus for the reasons set out in Section 4.3.1.

4.5. OTHER ASPECTS

The Alternative Mine Plan would not change the following aspects relative to the Project:

- economic benefits to workers;
- economic benefits to landholders;
- economic benefits to suppliers;
- net public infrastructure costs; and
- any loss of surplus to other industries.

4.6. NET ENVIRONMENTAL, SOCIAL AND TRANSPORT-RELATED COSTS

The Project would potentially give rise to external effects that would impact third parties. However, with the exception of greenhouse gas (GHG) emissions, NCOPL would mitigate these external effects, including by implementing various management and compensation measures, by purchasing the requisite water licenses, and by implementing a biodiversity offset strategy. The costs of these external effects would therefore be internalised by NCOPL, so that no net cost is attributable to the NSW community.

The NSW share of the incremental GHG emissions attributable to the Project is estimated at around \$860,000 in NPV terms and constitutes a cost to the NSW community. Given the small (less than 5 per cent) reduction in coal output, no material change in GHG emissions would be expected.

The Alternative Mine Plan is not expected to result in significant change to the net environmental, social and transport-related costs relative to the Project.

4.7. INCREMENTAL NET BENEFITS OF THE ALTERNATIVE PROJECT FOR THE NSW COMMUNITY

The net benefits of the Project for NSW are estimated at \$599 million in NPV terms, consisting of:

- royalties of \$259 million in NPV terms;
- the NSW share of company income tax of \$177 million in NPV terms; and
- the NSW share of the net producer surplus of \$163 million in NPV terms.

As described in in Sections 4.2 to 4.4, the Alternative Mine Plan is expected to result in a minor reduction to royalty payments, NSW share of company income tax and NSW share of the net producer surplus.

Given the above, it is expected that the net benefits of the Project for NSW would be similar to the Project but would be slightly lower.

5. FLOW-ON EFFECTS OF THE ALTERNATIVE PROJECT FOR THE NSW COMMUNITY

This section describes the incremental ‘second-round’ or ‘flow-on’ effects that the Alternative Project would generate for the NSW community and the local region.

5.1. INCREMENTAL FLOW-ON BENEFITS FOR NSW

The Project is estimated to have the following flow-on effects for NSW:

- additional annual average employment flow-on benefits of 162 FTE jobs in the Project Scenario; and
- additional gross value added of \$192 million in NPV terms, or \$15 million per annum.

Given the larger operational workforce for the Alternative Mine Plan (in the order of 5 per cent, Section 3.2.4), employment flow-on benefits would be expected to increase. The anticipated minor reduction in the producer surplus would be expected to also reduce gross value added by a small amount.

5.2. INCREMENTAL FLOW-ON BENEFITS FOR THE LOCAL REGION

The flow-on effects of the Project for the local region consist of the positive incremental flow-on effects generated by the Project, but also a small offsetting impact arising from a reduction in agricultural activities.

As noted in the Project Economic Assessment, two definitions for the local region have been adopted in order to better capture the local economic impacts of the Project (the Alternative Project):

- the ‘SA3 Region’, consistent with the EA Guidelines, which captures the places of residence of around 30 per cent of the operational workforce; and
- the ‘Project Region’, consisting of the Narrabri and Gunnedah local government areas (LGAs), which captures the places of residence of almost 60 per cent of the operational workforce.

The flow-on effects for the local region consist of the additional local employment and disposable income generated by the Project.

Taking into account a small reduction in flow-on impacts attributable to the displacement of agriculture in the local region, the Project is predicted to generate the following flow-on effects:

- incremental aggregate disposable income flow-on effects of \$62 million in NPV terms (\$24 million in NPV terms) for the Project Region (the SA3 Region), or \$5 million annually (\$2 million annually) for the Project Region (the SA3 Region); and
- incremental employment flow-on effects of 68 FTE jobs (32 FTE jobs) for the Project Region (the SA3 Region).

The Alternative Mine Plan would, on average, employ a larger operational workforce relative to the Project (Section 3.2.4), and would therefore increase local employment by around 5 per cent. As a result, the incremental flow-on effects for the Alternative Mine Plan would also be expected to increase relative to the Project, both in terms of employment and disposable income flow-on effects.

6. LOCAL EFFECTS ANALYSIS

This section describes the local effects analysis (LEA). The LEA is intended to complement the CBA by translating the effects estimated at the state level into local impacts. In order to fully capture the local economic effects (Section 0), consistent with the Project Economic Assessment, the LEA has been prepared for two regional definitions:

- the SA3 Region, consistent with the requirements in the EA Guidelines; and
- the Project Region, encompassing Narrabri and Gunnedah LGAs, where a large share of the operational workforce resides.

6.1. INCREMENTAL DISPOSABLE INCOME

The incremental disposable income accruing to the local workforce is a key focus of the LEA. The incremental disposable income benefit accruing to the Project workforce is calculated by comparing, for the Project and the Narrabri Mine, the additional disposable income that the respective workforce would earn relative to the average regional wage, and then taking the difference.

The Project Economic Assessment concluded that the local operational workforce would benefit from:

- an increase in disposable income of \$55 million in NPV terms in the Project Region; and
- an increase in disposable income of \$30 million in NPV terms in the SA3 Region.

The operational workforce for the Alternative Mine Plan would, on average, be about 5 per cent larger than for the Project (Section 3.2.4). For either definition of the local region, the increase in disposable income would therefore be larger than for the Project.

6.2. NET BENEFITS OF THE ALTERNATIVE MINE PLAN FOR THE LOCAL REGION

The Project Economic Assessment identified a range of incremental economic benefits from the Project that would flow to the local region, consisting of employment and disposable income effects, as well as relevant expenditures:

- If broader employment flow-on effects are taken into account (and accounting for a small reduction in agricultural employment), the total incremental employment effects are estimated at an annual average of 168 FTE operational jobs for the Project Region, or 82 FTE operational jobs for the SA3 Region.
- If broader disposable income flow-on effects are taken into account (also accounting for a small reduction in agricultural income), the total local disposable income effects are estimated at \$117 million in NPV terms for the Project Region and \$54 million in NPV terms for the SA3 Region.
- Net additional purchases from local suppliers are estimated at \$65 million in NPV terms for the Project Region or \$43 million in NPV terms for the SA3 Region.
- The local region would benefit from an additional \$1.8 million in NPV terms in rate payments to Narrabri Shire Council.

Where externalities or impacts on third parties at the local level are expected to occur, NCOPL would mitigate these. No net cost should therefore be attributed to the local region. For all practical purposes, the societal costs of any GHG emissions that might be attributed to the local region are zero.

The aggregate net benefits of the Alternative Mine plan for the local region can be expected to be greater than for the Project:

- The Alternative Mine Plan would, on average, employ a larger operational workforce on the same terms and conditions as the Project (Section 3.2.4). Aggregate (direct and flow-on) employment and disposable income benefits for the local region are therefore also expected to be larger.
- The Alternative Mine Plan is expected to increase operating expenditures (Section 3.2.3). The share of these expenditures directed to businesses in the local region is therefore also expected to increase.
- The additional rate payments accruing to Narrabri Shire Council are expected to remain unchanged for the Alternative Mine Plan.

No change in externalities or impacts on third parties are expected to occur as a result of the Alternative Mine Plan.

7. REFERENCES

AnalytEcon, 2020. Narrabri Underground Mine Stage 3 Extension Project Economic Assessment prepared for Narrabri Coal Operations Pty Ltd, August.

NSW Government, 2018. Technical Notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals, April.

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