Mandalong Southern Extension Project
Modification 5 - Extension of Longwall 24 and Addition of Longwall 24A
(SSD 5144 MOD 5)

Environmental Assessment Report
Section 96(2) of the *Environmental Planning and Assessment Act 1979*

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1. BACKGROUND

Centennial Mandalong Pty Limited (Centennial) owns and operates the Mandalong Coal Mine, located near Morisset, approximately 35 kilometres (km) southwest of Newcastle, in the Central Coast and Lake Macquarie local government areas (see **Figure 1**).

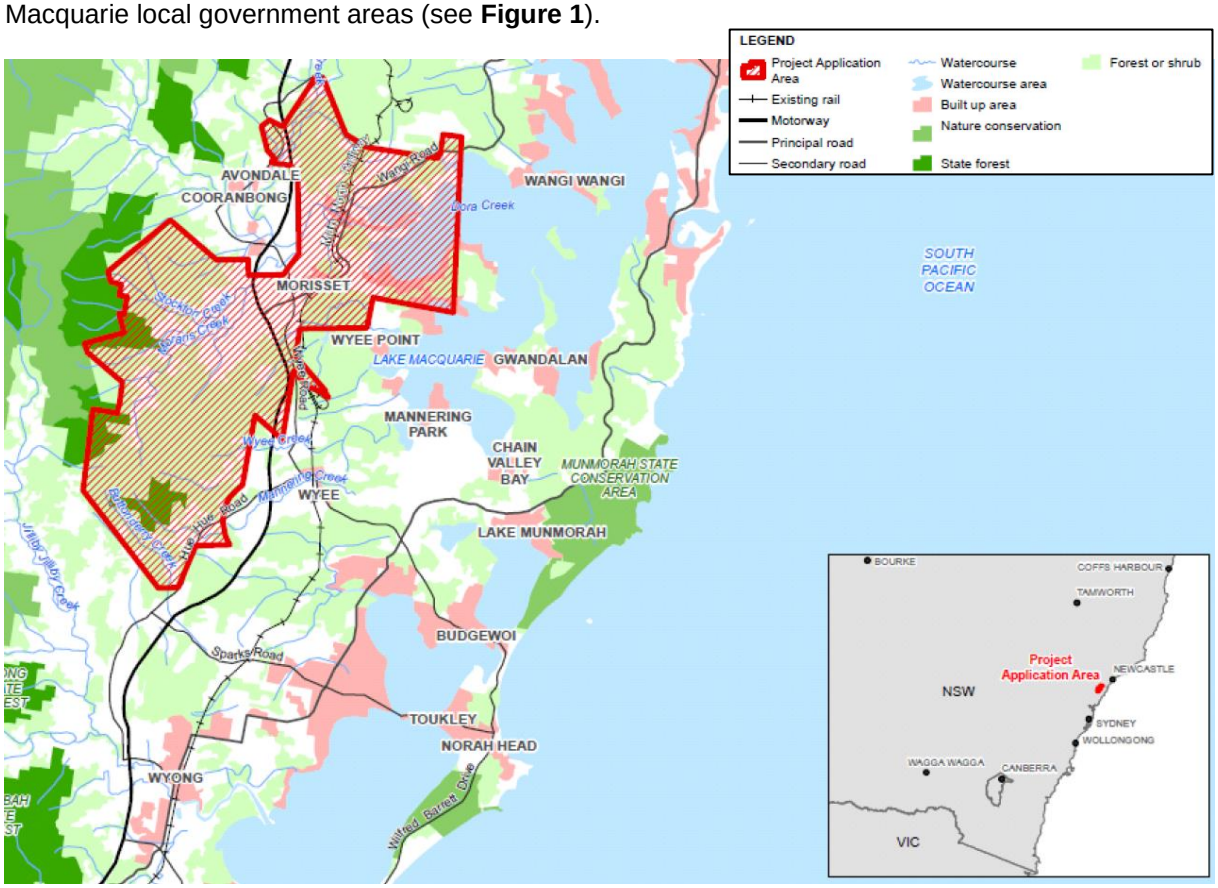

Figure 1: *Location of the Mandalong Coal Mine*

The Mandalong Coal Mine was originally approved in 1998 under development consent DA 97/800. In October 2015, consent was granted for the Mandalong Southern Extension Project (MSEP) under SSD 5144. The MSEP involves the continuation and extension of existing mining operations, as well as the development of an additional 40 longwall panels in the Southern Extension Area. SSD 5144 has been subsequently modified on four occasions to:

- relocate an existing transmission line;
- extend first workings associated with Longwalls 22 and 23 (LWs 22 and 23);
- increase the annual production limit from 6.0 to 6.5 million tonnes of run of mine (ROM) coal per annum; and
- extend secondary extraction associated with LWs 22 and 23.

Under SSD 5144, mining operations may be undertaken until 31 December 2040.

2. PROPOSED MODIFICATION

On 10 May 2017, Centennial lodged a modification application for the MSEP under section 96(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The modification seeks to:

- extend Longwall 24 (LW 24) by 931 metres (m);
- add an additional longwall panel (LW 24A); and
- extract approximately 3.71 million tonnes of ROM coal from the new/extended longwalls.

No changes are proposed with respect to the approved mine life, extraction rate, or site infrastructure. **Table 1** and **Figure 2** provide details of the geometry of the existing and proposed longwalls. A detailed description of the modification is provided in Centennial's Statement of Environmental Effects (SEE, see **Appendix A**).

Table 1: *Proposed longwall modifications*

Longwall No.	Existing Length (m)	Proposed Length (m)	Additional Yield (tonnes)
LW 24	1,631	2,570	1,030,813
LW 24A	N/A	2,470	2,679,560

When Centennial designed its current mine plan for the MSEP, Longwalls 22 to 24 were shortened due to historic uncertainties regarding the full extent of an igneous sill located to the west. However, subsequent geological investigations have confirmed that these longwalls may be lengthened, without interference from the sill. Centennial has previously obtained approval to extend LWs 22 and 23 (Modifications 2 and 4). Centennial is now seeking to extend LW 24 and add an additional panel to the southwest (LW 24A).

Centennial contends that the proposed modification would optimise resource recovery at the site, providing an additional 3,710,373 tonnes of saleable coal which would otherwise be sterilised.

3. STATUTORY CONTEXT

3.1 Section 96(2)

The modification application proposes to modify the consent granted under SSD 5144 in accordance with section 96(2) of the EP&A Act.

By operation of section 96(2)(a), a consent cannot be modified unless the consent authority is satisfied that the modified proposal is substantially the same development as the development for which consent was originally granted. The proposed modification involves a relatively minor expansion of underground mining operations which would be wholly contained within the existing project boundary. The Department is satisfied that the proposed modification is within the scope of section 96(2) and may be determined accordingly.

3.2 Approval Authority

The Minister for Planning is the approval authority for the application. However, the Director, Resource Assessments may determine the application under the Minister's delegation of 16 February 2015, as there were no public objections, Central Coast and Lake Macquarie City Councils did not object to the proposal, and no political donations have been reported by Centennial.

3.3 Landowner's Consent

The proposed/extended longwalls would be located underneath privately-owned land. However, as SSD 5144 was a 'public notification development' under clause 49(4) of the *Environmental Planning & Assessment Regulation 2000* (EP&A Regulation), landowner's consent was not required for the lodgement of the development application. By operation of clause 115(2) of the EP&A Regulation, the same principle applies to a modification application. As such, the written consent of the third-party property owners is not required for the lodgement of this application.

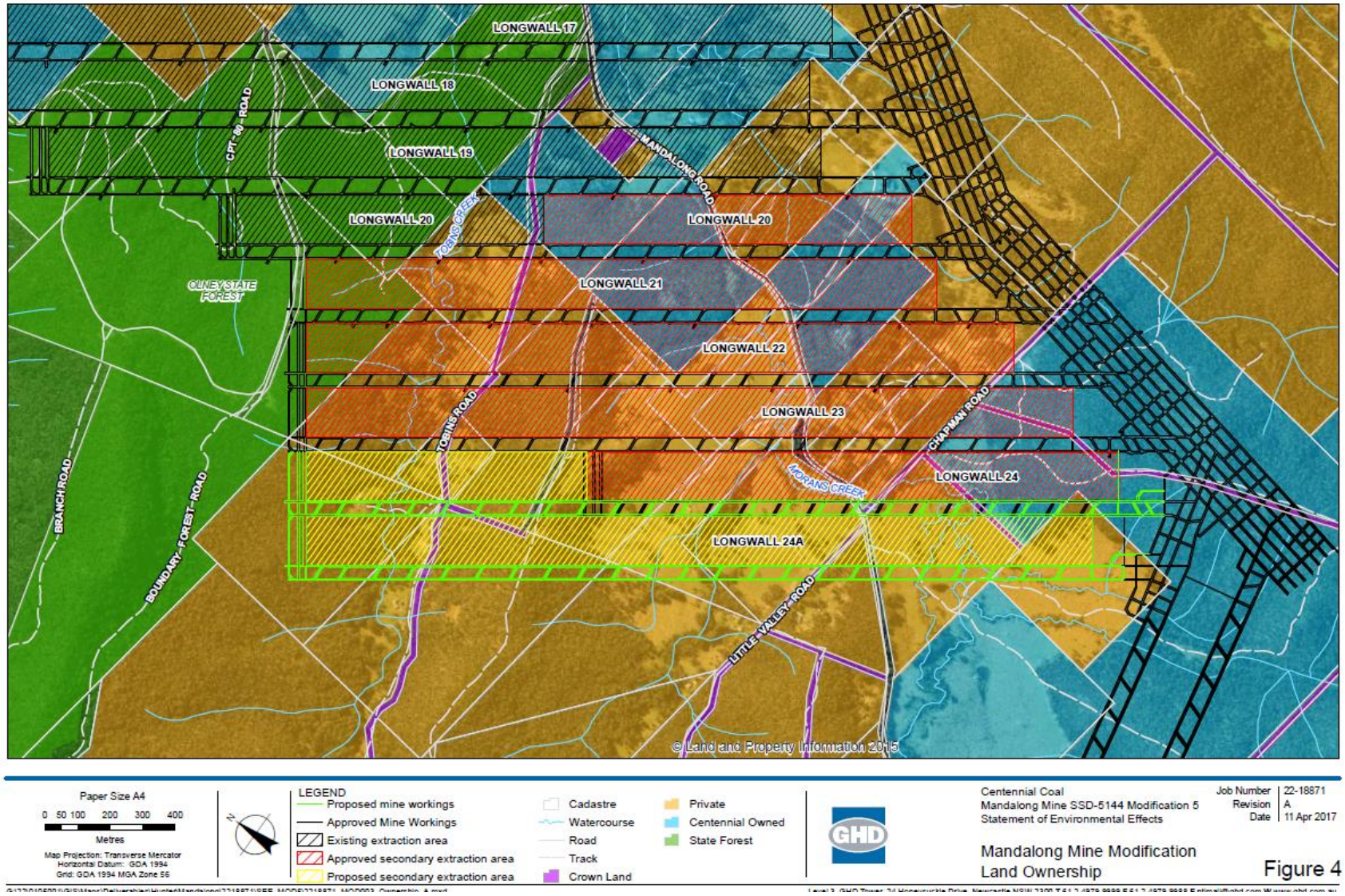

Figure 2: *Approved and proposed longwall layout*

3.4 Environmental Planning Instruments

A number of environmental planning instruments apply to the modification, including:

- *State Environmental Planning Policy (SEPP) (Mining, Petroleum and Extractive Industries) 2007*;
- *SEPP (Infrastructure) 2007*;
- *SEPP (State and Regional Development) 2011*;
- *SEPP No 33 – Hazardous and Offensive Development*;
- *Lake Macquarie Local Environmental Plan 2004*;
- *Lake Macquarie Local Environmental Plan 2014*; and
- *Wyong Local Environmental Plan 2013*.

4. CONSULTATION

After accepting the SEE (see **Appendix A**) for the proposed modification, the Department:

- publicly exhibited the SEE from 25 May to 8 June 2017 on the Department's website and at:
  - NSW Service Centres;
  - the offices of Central Coast and Lake Macquarie City Councils; and
  - the Nature Conservation Council's office;
- advertised the exhibition of the SEE in the *Central Coast Express Advocate* and the *Lakes Mail*;
- notified relevant State government agencies, utility providers, and both Councils;
- notified affected landowners; and
- notified each person that made a submission in relation to the original development application, or any of the previous four modification applications.

The Department is satisfied that the notification process met the requirements of the EP&A Act and the EP&A Regulation.

4.1 Agency Submissions

The Department received eight submissions from government agencies. No issues were raised by **Hunter New England Health**, **Roads and Maritime Services** or **Transgrid**.

Department of Primary Industries (DPI) did not object to the proposed modification and provided advice regarding recommended conditions. These matters are discussed in **Sections 5.2** and **5.4** below.

The **Division of Resources and Geoscience** (DRG) of the Department did not raise any objections regarding the proposed modification. DRG advised that sustainable rehabilitation outcomes can be achieved as part of the project and that any identified risks can be effectively regulated through the conditions of Centennial's mining leases. DRG requested that it review recommended conditions prior to determination.

The **Heritage Council of NSW** (Heritage Council) did not object to the proposed modification, and provided advice regarding recommended conditions. These recommendations are discussed in **Section 5.4** below.

The **Office of Environment and Heritage** (OEH) did not raise any objections regarding the proposed modification. However, OEH provided comments regarding potential flooding impacts. This issue is discussed in **Section 5.2** below. OEH also recommended additional conditions with respect to biodiversity and Aboriginal cultural heritage. These matters are discussed in **Sections 5.3** and **5.4** below, respectively.

Subsidence Advisory NSW (SANSW) did not raise any objections regarding the proposed modification. However, SANSW noted that the proposed modification would result in undermining of surface improvements including roads, residences and electricity infrastructure; and recommended that commercial agreements, including compensation arrangements, be established between the colliery and asset owners. SANSW also noted that changes to the *Mine Subsidence Compensation Act 1961* are expected to be implemented in 2018, and that impacts arising from Modification 5 may be managed under the new legislative framework. Subsidence impacts are discussed in **Section 5.1** below.

The Department did not receive submissions from the **Environment Protection Authority**, or from **Lake Macquarie** or **Central Coast Councils**.

4.2 Public Submissions

The Department received two public submissions. The first submission was provided by a Centennial employee, expressing support for the proposed modification. The second submission provided comments in relation to the proposal. Copies of both submissions are included in **Appendix B**.

The second submission was concerned primarily with subsidence-related impacts on land owned by the submitter. In particular, concerns were raised regarding the upgrading of electricity infrastructure in response to predicted subsidence impacts. The submission expressed concern regarding the inconvenience and visual impacts associated with these works, and questioned whether compensation would be provided by Centennial. Concerns were also raised regarding potential increased flooding impacts on agricultural productivity and future commercial enterprise in the locality. These issues are discussed in **Sections 5.1** and **5.2** below.

The submission also raised concerns regarding the adequacy of inspections previously undertaken as part of Centennial's Property Subsidence Management Plan (PSMP) process. The submission questioned why testing had not been undertaken to determine whether asbestos was present in an existing dwelling located over proposed LW 24A. This issue is discussed in **Section 5.1** below.

4.3 Response to Submissions

Centennial provided a Response to Submission (RTS) on 19 June 2017, addressing all submissions received during the exhibition period. The RTS was made publicly available on the Department's website. The RTS is included in **Appendix C**.

5. ASSESSMENT

The Department has assessed the merits of the proposed modification in accordance with the relevant objects and requirements of the EP&A Act. In its assessment, the Department has considered the:

- EIS for the original development application;
- conditions of consent for the development as originally approved and as since modified;
- the modification application, SEE, and RTS; and
- relevant environmental planning instruments, policies and guidelines.

The Department considers the key impacts of the modification relate to subsidence, water resources and biodiversity. Consideration of these impacts is provided below, with consideration of other impacts provided in **Table 5**.

5.1 Subsidence

5.1.1 Introduction

The SEE included a Subsidence Assessment (SA), which utilised the same methodology used in previous SAs for the MSEP, supplemented by observed subsidence impacts from the longwall panels which have been mined to date. A review of this observed data indicates that longwall mining operations at Mandalong have generally resulted in vertical subsidence of less than 1 m. The SA also indicates that measured tilts and strains have been consistent with previous predictions.

The approved mine plan incorporates narrower chain pillars for Longwalls 20 to 24 (37 m wide, compared with 46 m wide for previously mined longwalls). Observed subsidence impacts to date have been based on longwalls incorporating 46 m wide chain pillars, as to date, longwall extraction has not been undertaken on both sides of the 37 m chain pillars.

The proposed extension area has a maximum slope at the surface of between 18 and 27 degrees, and a depth of cover ranging from 250 to 330 m. The SA indicates that geotechnical conditions for the proposed extension area would be similar to those encountered during previous longwall extraction.

5.1.2 Subsidence Predictions

The modification would cause surface and sub-surface subsidence impacts, including cumulative subsidence impacts, which could affect a range of natural and built features. The predicted subsidence impacts associated with LWs 24 and 24A are illustrated in **Figure 3** below.

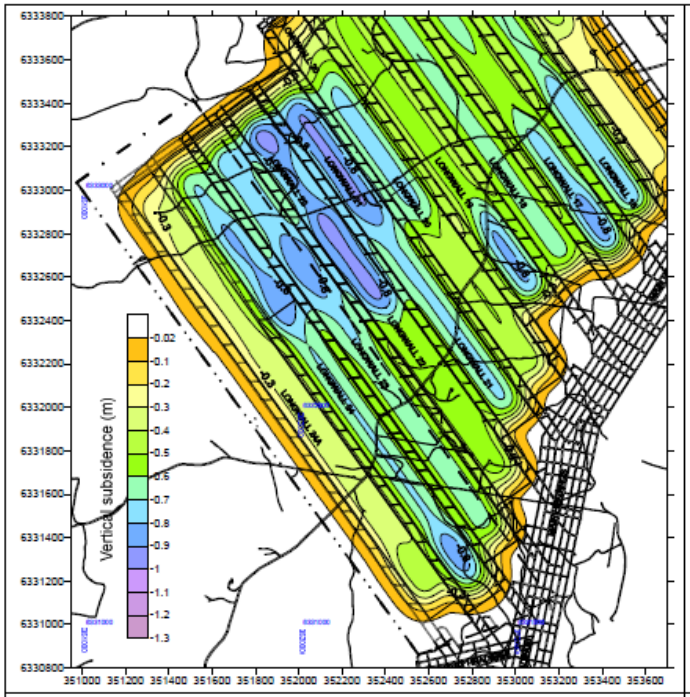

Figure 11 Vertical subsidence at end of LW24A

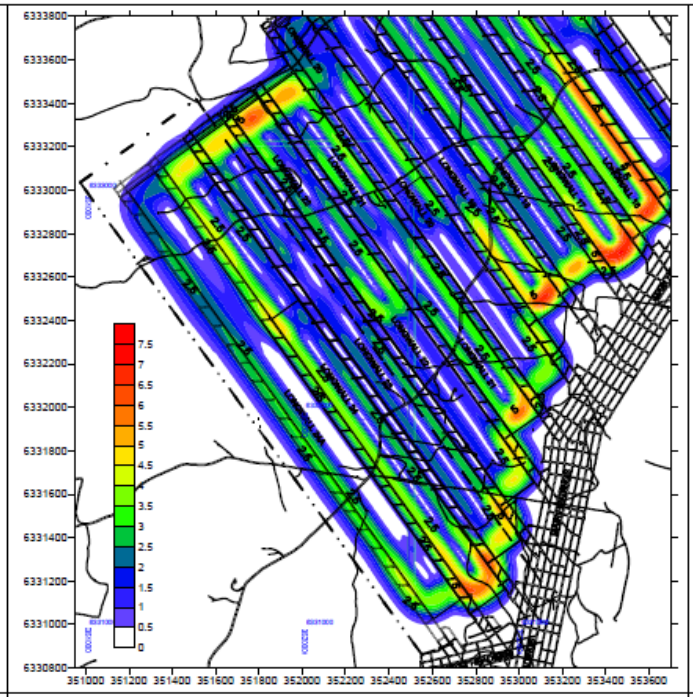

Figure 12 Tilt at end of LW24A

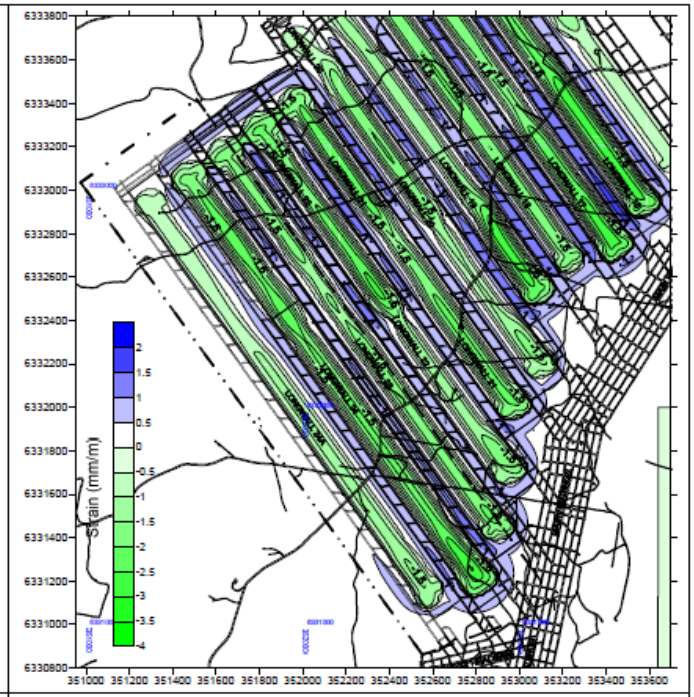

Figure 13 Strain at end of LW24A

Figure 3 *– Predicted vertical subsidence, tilt and strain at the end of Longwall 24A*
Note: Longwall 24A is the most westerly longwall in this figure.

Table 2 provides a comparison of subsidence predictions for the MSEP, as currently approved, and the predicted impacts associated with the proposed modification. These predictions fall within the range of previous subsidence predictions for Longwalls 1 to 24.

Table 2: *Predicted conventional subsidence effects – approved vs proposed*

Subsidence Parameter	Range of Subsidence Effect (Approved, all longwalls)	Maximum Predicted Subsidence Effect (LW 24 – 24A)
Maximum Vertical Subsidence (mm)	270-1340	884
Maximum Tilt (mm/m)	3-40	6.3
Maximum Tensile Strain (mm/m)	1-7	1.2
Maximum Compressive Strain (mm/m)	2-8	3

The SA indicated that it is unlikely that any tensile cracking or compressive buckling would develop in soil or rock as a result of the proposed modification. Given the low predicted values for tilt and strain, no significant far-field subsidence or 'upsidence' impacts were predicted. Discontinuous fracturing above the proposed longwalls is predicted to extend up to 100 m above the coal seam. However, given the depth of cover of 250 to 330 m above LWs 24 and 24A, the fracture zone would not be expected to reach the surface.

5.1.3 Surface Features and Potential Impacts

The SA included an assessment of potential subsidence impacts on existing surface improvements, including privately-owned dwellings, roads and telecommunications infrastructure. **Figure 4** indicates the location of built features in relation to LWs 24 and 24A.

Houses and Rural Structures

Eight dwellings are predicted to experience some degree of subsidence impacts as a result of the proposed modification. Only three of these are located directly above the proposed longwalls and a further four are located above existing approved longwalls. **Figure 5** shows the location of the affected dwellings. Predicted subsidence impacts on dwellings are summarised in **Table 3** below. The SA provides a more detailed assessment which includes other non-habitable structures such as sheds, carports and swimming pools (see **Appendix A**).

Table 3*: Predicted subsidence impacts at affected dwellings*

Property Reference	Approved Project			Proposed Modification		
	Vertical Subsidence (mm)	Tilt (mm/m)	Strain (mm/m)	Vertical Subsidence (mm)	Tilt (mm/m)	Strain (mm/m)
73*	-390	1.7	0.8	-670	1.6	0.6
88*	-490	0.9	0.9	-500	0.9	0.9
212*	-550	3.5	-0.8	-600	2.1	0.0
219*	-330	0.4	0.5	-610	2.6	0.2
206+	0	0	0	-470	3.7	0.2
207+	-20	0.8	0.3	-790	2.1	-1.2
218+	0	0	0	-320	2.2	-1.1
205	0	0	0	-20	0.6	0.3

*Notes: * Located above existing approved longwalls*
+ Located above proposed longwalls

The SA did not originally identify any subsidence impacts on existing structures within Property 205. This assessment was subsequently revised and the predicted impacts on the existing dwelling are shown in **Table 3** above. The Department notes that 20 mm is commonly accepted as the minimum detectable threshold for mining-induced movement. The predicted subsidence impacts at this location are considered to be negligible.

Previous longwall mining indicates that tilt of less than 7 mm/m generally does not result in significant impacts to houses. Affected dwellings may experience some minor and repairable impacts such as cracking of internal plasterboard or cornices.

The SA concludes that all predicted strains and tilts associated with the proposed modification are considered safe, serviceable and repairable for residential dwellings, in accordance in accordance with SA NSW criteria.

Existing conditions require Centennial to ensure that privately-owned residences remain safe, serviceable and repairable throughout the life of the development, and require Centennial to fully repair or compensate for any subsidence impacts. Existing conditions also require Centennial to develop Property Subsidence Management Plans (PSMPs) in consultation with each landowner. Each PSMP must include a detailed structural inspection of each property and provide clear commitments to mitigate, repair or otherwise compensate for any damage. Centennial would be required to prepare PSMPs for all affected properties as part of an updated Extraction Plan, prior to commencing secondary extraction of LWs 24 and 24A. Centennial has committed to include Property 205 in this process.

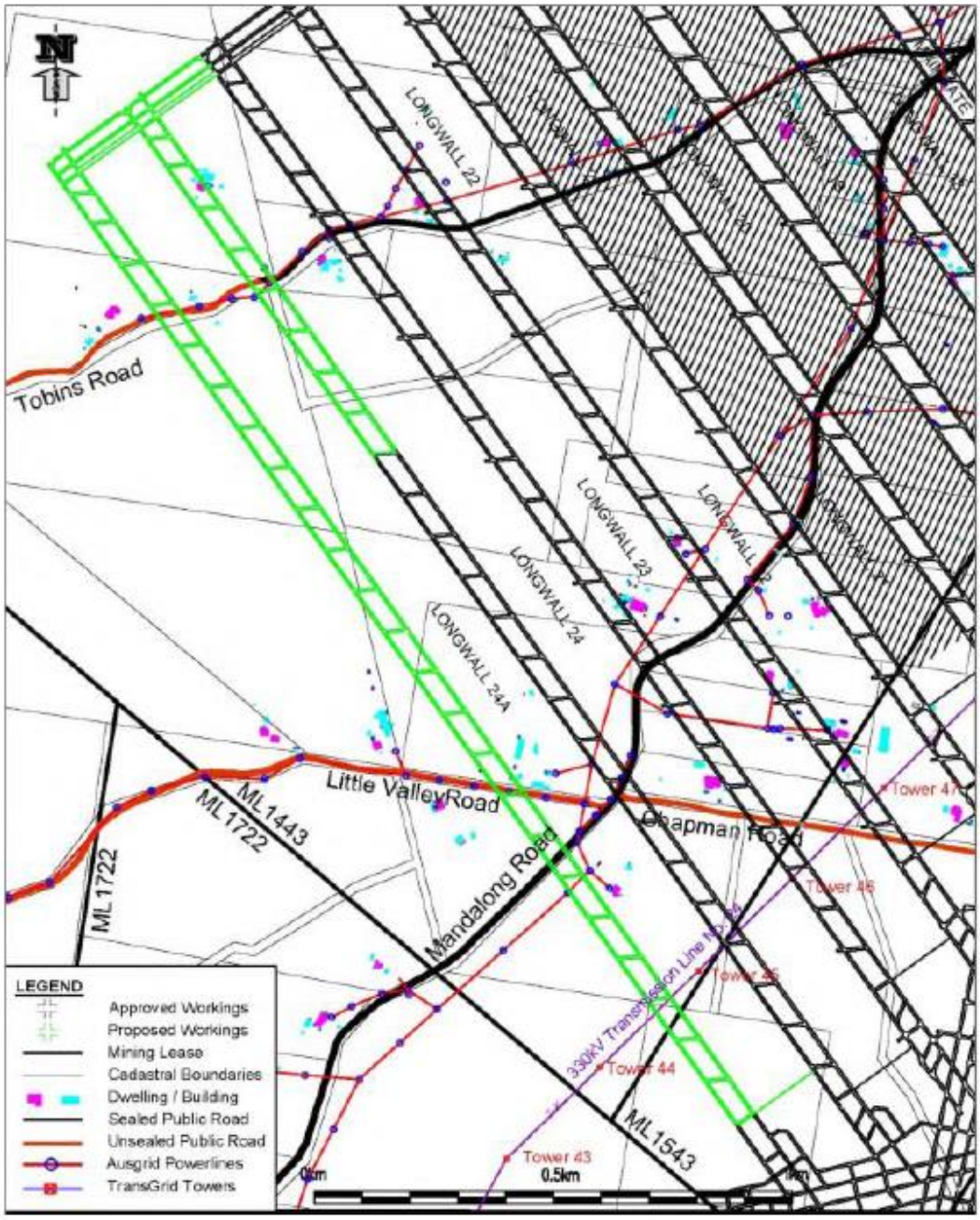

Figure 4 *– Location of built features*

Structural inspections have already been undertaken at some of the affected residences as part of the PSMP process. One submission raised concerns that this inspection did not involve testing of wall lining boards to determine whether the residence contained asbestos. In response, Centennial advised that a visual inspection of the dwelling was undertaken by a structural/civil engineer in June 2016. Based on this inspection, and the age of the building, it was determined that the cladding was not asbestos-based. The submitter subsequently arranged for independent testing of the cladding, which indicates that the material is asbestos-based. The Department notes that Centennial has committed to further consultation with the landowner during development of PMSPs for LWs 24 and 24A. If specific mitigation measures are required for the management of asbestos, these may be established as part of the PSMP process.

Overall, the Department is satisfied that privately-owned structures are not likely to be significantly impacted by the proposed modification and that any minor impacts would be readily identified and repaired under existing conditions.

Electrical and Telecommunications Infrastructure

The SA identifies three TransGrid towers (T45 – T47) which may be impacted by the proposed modification. Centennial previously entered into a commercial agreement with TransGrid to install concrete cruciform footings for each of the three affected towers. The installation of these footings commenced in March 2017, and work is expected to be completed by August 2017. TransGrid has reviewed the proposed modification and raised no concerns.

Existing conditions also require Centennial to prepare a Built Features Management Plan (BFMP) for all key public infrastructure, in consultation with the relevant service providers. This requires Centennial to identify all items of key infrastructure (including transmission lines and towers) and provide specific commitments to mitigate, repair and/or compensate any damage in a timely manner. The Department is therefore satisfied that potential impacts on electricity and telecommunications infrastructure would continue to be satisfactorily managed under existing conditions and Centennial's existing commercial agreements.

One submission raised concerns regarding the visual, amenity and safety impacts associated with installation of the cruciform footings. The submission questioned the legal basis for entry on to private property, and whether compensation would be provided to landowners. In response, Centennial advised that the subsidence mitigation work is currently being undertaken by Transgrid, as authorised under the *Electricity Supply Act 1995*. These works are contained within an easement, and entry onto the subject property is authorised under the Act, without any obligation to pay compensation. It is understood that Centennial offered to enter into a compensation agreement with affected landowners as a goodwill gesture. However, Centennial advised that the terms of the agreement were not accepted by all landowners, and no further offers will be made.

The Department recognises that these mitigation works will cause some disruption for the affected landowners. However, these works do not form part of the proposed modification, and are not subject to assessment under Part 4 of the EP&A Act. The Department also notes that efforts have been made to consult with, and provide some compensation to landowners. Consequently, there is limited scope or reason to impose any further obligations on Centennial in this regard.

Local Roads

The predicted compressive strains associated with LWs 24 and 24A may cause some minor compression bumps to form within the bitumen seal on Tobins Road and Mandalong Road. However, the SA notes that these impacts are likely to be consistent with previous predictions. The Department considers these impacts are likely to be of a relatively minor nature, and would be suitably managed under the site's BFMP.

5.1.4 Conclusion

The Department is satisfied that Centennial's SA has used an appropriate subsidence prediction model which has been calibrated using local geological information and monitoring results from completed longwalls at the mine.

Existing consent conditions require Centennial to ensure compliance with subsidence performance measures for the natural and built environments. This includes providing compensatory and offset measures in the event of any exceedance. Centennial is required to monitor subsidence levels as part of the Extraction Plan required for all second workings on site.

In its submission, SANSW recommended that commercial agreements be established with all affected asset owners which detail compensation arrangements in the event of subsidence impacts. In its RTS, Centennial noted that existing conditions regarding PSMPs and the BFMP effectively serve this purpose. The Department agrees with Centennial's position, and considers that no changes to existing conditions are required in this regard.

Overall, the Department is satisfied that subsidence impacts associated with LWs 24 and 24A would be similar to recorded impacts from the 21 longwalls which have been mined to date. The Department considers that these impacts would be suitably managed under existing conditions of consent and an updated Extraction Plan.

5.2 Water Resources

The SEE included a Water Resources Impact Assessment (WRIA) which applied the hydrogeological model developed for the MSEP, and then recalibrated as part of Modification 3 to more accurately reflect observed groundwater inflows at the mine since 2013.

Currently, water from the underground workings at Mandalong Mine is pumped to an underground storage facility at the Cooranbong Entry Site (CES) and discharged via an existing Licensed Discharge Point (LDP001). No changes to existing water management infrastructure are proposed. The WRIA also indicates that the proposed modification would not require any changes to Centennial's existing water licences.

5.2.1 Groundwater Resources

There are two key hydrogeological units within the proposed extension area: a shallow alluvial aquifer, and a non-alluvial aquifer system comprising fractured and porous rock, located within the coal seams and overburden. Groundwater sources in the vicinity of the mine are typically low-yielding, with a beneficial use category of 'primary industry' (suitable only for stock watering).

The WRIA assessed the likely groundwater impacts of the modified development for the years 2018, when mining of LWs 24 and 24A is expected to conclude, and 2036, when maximum groundwater inflows are predicted to occur.

Mine Inflows

Modelling indicates that the proposed modification would increase groundwater inflows by approximately 0.15 megalitres (ML) per day during 2018. Following extraction of LWs 24 and 24A, it is predicted that there would be no observable increase in groundwater flows into the mine workings associated with the proposed modification.

Groundwater inflows into the underground workings are predicted to increase over the life of the mine, eventually peaking at approximately 2.1 ML per day in 2036. This is consistent with previous predictions for LWs 22 and 23 considered during assessment of Modification 4.

Groundwater Levels / Pressure

The WRIA indicated that alluvial groundwater levels would not be reduced by more than 0.1 m throughout the period of mining. Given that alluvial groundwater levels typically vary by approximately 1 m due to climatic variations, the impacts of the proposed modification are expected to be negligible. In addition, any fluctuations in alluvial groundwater levels are expected to be temporary and localised, as a result of shallow tensile and compressive cracking. It is expected that such cracks would fill over time, and the hydraulic conductivity and porosity of the alluvial aquifers would eventually revert to pre-mining values.

The WRIA also indicated that any increase in vertical migration of alluvial groundwater to the underlying, non-alluvial aquifer system is unlikely. Historically, such increases have generally occurred in areas where the depth of cover is less than 170 m. The depth of cover above LWs 24 and 24A is in excess of 250m.

The WRIA calculated drawdown within non-alluvial groundwater sources as a groundwater pressure differential between pre-mining and post-mining conditions. The modelling indicated that depressurisation greater than 2 m may occur in fractured and porous rock water sources up to 230 m above LWs 24 and 24A. These predictions are consistent with existing levels of depressurisation at the mine. The greatest depressurisation is likely to occur up to 120 m above the longwalls. Depressurisation within this zone may occur as a result of continuous fracturing, however, the WRIA indicates that groundwater pressures may begin to stabilise or gradually recover approximately three to five years after undermining.

There is one active private bore located within a 1 km radius of the proposed extension area (GW078043). This bore is 33 m deep, and is installed in the fractured and porous rock groundwater source. It is understood that the bore is used for stock watering and domestic purposes. The maximum predicted drawdown at this location following the completion of mining of Longwall 24A is 0.7 m.

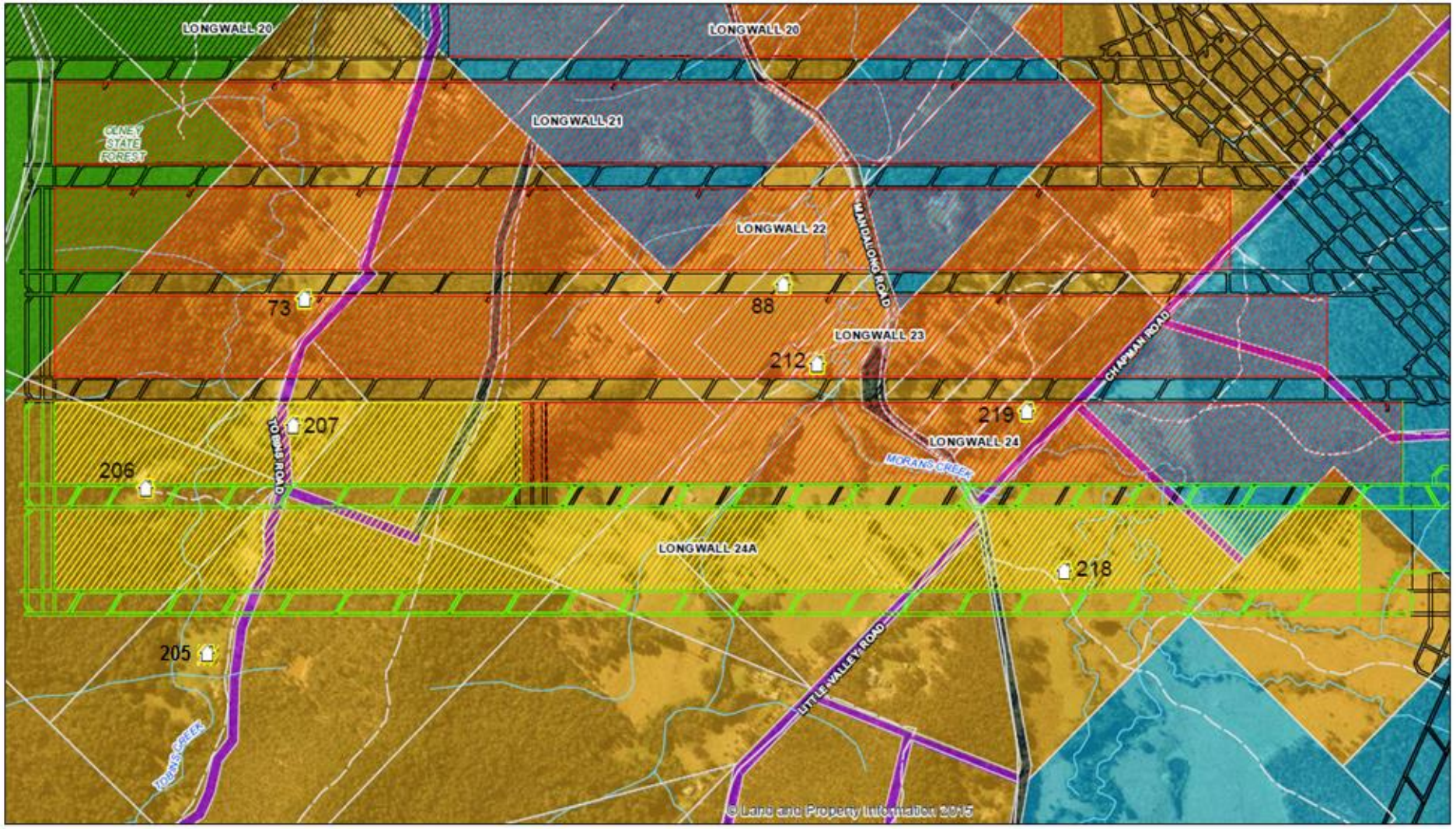

Figure 5 *– Location of privately owned residences*

Consequently, the Department considers that the proposed impacts fall within the Level 1 minimal impact considerations under the *NSW Aquifer Interference Policy* and are therefore acceptable.

Groundwater Quality
Since the commencement of longwall mining in 2005, there have been no observed changes to groundwater pH or EC which have resulted in a lowering of the current beneficial use category. It is not expected that the proposed modification would reduce the beneficial use category for either alluvial or fractured and porous rock groundwater sources, including GW078043.

Groundwater Dependent Ecosystems (GDEs)
GDEs within the proposed modification area include *Coastal Wet Gully*, *Alluvial Tall Moist Forest* and *Freshwater Wetland Complex*. These GDEs are located along ephemeral drainage lines and utilise the shallow aquifer system. However, they are each considered to be facultative ecosystems, which are not entirely reliant on groundwater. Furthermore, given the depth of depth of cover above the proposed longwalls, impacts on the shallow aquifer system are predicted to be negligible. The Department is therefore satisfied that the proposed modification would not have a significant impact on GDEs.

Management and Mitigation
Existing conditions require Centennial to prepare a Water Management Plan (WMP) as a component of the necessary Extraction Plan, prior to commencing secondary extraction of LWs 24 and 24A. This would include a detailed Groundwater Monitoring Program to monitor and report on groundwater inflows, changes to groundwater yields or quality, and potential impacts on bore users and GDEs. Centennial is also required to regularly validate its groundwater model, by comparing monitoring results against modelled predictions.

DPI recommended the inclusion of an additional condition requiring Centennial to obtain an independent peer review of its groundwater model, prior to the commencement of activities associated with Modification 5. The Department is satisfied that this requirement can be addressed as part of the updated Extraction Plan for LWs 24 and 24A, and recommends that existing conditions be modified accordingly.

5.2.2 Surface Water Resources
The proposed extension area is located within the Morans Creek and Tobins Creek catchments. Both creeks are ephemeral, typically flowing for brief periods following significant rainfall events. The extension area also forms part of the wider catchment for Dora Creek.

Channel Instability
Both Morans Creek and Tobins Creek are generally well vegetated, with relatively cohesive bank sediments and low rates of bank erosion. Consequently, the WRIA concluded that both creeks show high resilience in response to subsidence. The WRIA identified one potential area of risk within the Tobins Creek channel, where a 0.2 m headcut is located above Longwall 23, downstream of Longwall 24. However, it is unlikely that the proposed modification would worsen existing erosion within the creek channel, and Centennial has previously committed to monitor flow paths in this location.

Baseline surface water quality monitoring in Morans Creek indicates that water upstream of the proposed extension area is slightly acidic, with elevated concentrations of dissolved aluminium, cobalt and iron. Underground mining may lead to localised changes to water quality, including an increase in total suspended solids and turbidity. However, the WRIA concludes that any such impacts on water quality would be negligible and of a temporary nature.

The proposed modification is not expected to have any significant impacts on channel stability, beyond those which have been previously assessed. Within the Morans Creek channel, the maximum subsidence is predicted to increase by 131 mm where the channel crosses above Longwall 19. The average predicted grade change would also increase from 0.02% under approved conditions to 0.05%. However, the maximum predicted grade change as a result of the proposed modification would be 2.06%, compared with the 2.11% predicted under approved conditions. No significant changes are predicted within the Tobins Creek channel. The proposed modification is not expected to significantly alter the flow capacity of either creek.

Water Licensing, Discharge and Salts

The WRIA predicted an increase in groundwater inflows that would need to be transferred to the Borehole Dam at the CES and discharged through the site's Licensed Discharge Point (LDP001). However, this increase not attributable to the proposed modification alone, but rather the life of mine workings for the project as a whole. Under approved conditions, annual discharges to LDP001 would peak at 1,264 ML in 2036. Under proposed conditions, this would increase to 1,275 ML in 2036. The maximum groundwater extraction volume under the site's existing water licence is 1,825 ML per year.

An increase in groundwater inflows would also result in additional salt transfers and discharges. The proposed modification would result in a maximum salt discharge at LDP001 of 3,063 tonnes in 2036 with an average salinity in water discharged of 3,590 µS/cm. This represents a slight increase from the most recent predictions in the Modification 4 SEE (3,009 tonnes in 2036 with an average salinity of 3,550 µS/cm). However, peak discharges would remain significantly lower than the original predictions in the MSEP EIS. These small changes can be attributed to the recalibration of the hydrogeological model at the time of Modification 3.

Management and Mitigation

Existing conditions specify performance measures for water management at the site. These measures include maintenance or improvement of baseline channel stability, and the development of site-specific performance criteria for in-stream water quality and aquatic ecology.

Existing conditions also require Centennial to develop a detailed Surface Water Management Plan (SMWP) as a component of the site's overall WMP. The SWMP must include a program to monitor and report on downstream channel stability, water quality, and the health of streams and riparian vegetation. The SWMP must also provide mechanisms to evaluate the effectiveness of Centennial's water management systems, and to respond to any exceedances of the performance measures.

5.2.3 Flooding

The SEE included a Flood Assessment Report (FAR), which analysed the cumulative impacts of underground mining for Longwalls 1 to 24A. The FAR applied observed subsidence monitoring data from Longwalls 1 to 17, along with subsidence predictions for Longwalls 18 to 24A. The FAR assessed the likely impacts of the modified development during the 1 year and 1 in 100-year Annual Recurrence Interval (ARI) flood events. Three separate scenarios were modelled for each flood event. The first was based on actual subsidence predictions for the proposed modification. The second and third scenarios were prepared as part of a sensitivity analysis, which considered flooding impacts in the event that subsidence impacts were significantly greater than predicted (1.5 times greater and 2 times greater, respectively).

Predicted Flood Impacts

Seven dwellings are predicted to experience a reduction in flood freeboard during a 1 in 100-year flood event as a result of the proposed modification. Four of these dwellings (73, 74, 207 and 213) would maintain at least 0.5 m freeboard during the 1 in 100-year event. Two dwellings (212A and 219) already have a predicted freeboard of less than 0.5 m during the 1 in 100-year event, under the approved mining scenario. In these locations, freeboard would be marginally reduced from 0.29 m to 0.24 m (212A) and from 0.49 m to 0.42 m (219). Freeboard at dwelling 70A would be reduced to below 0.5 as a result of the modification. However, this property is mine-owned.

In its submission, OEH noted these predicted freeboard decreases at selected dwellings, compared to pre-mining conditions. OEH also noted that the predicted decreases were even more significant under the second and third modelled scenarios. Overall, however, OEH observed that the predicted impacts on habitable dwellings would generally be small and result in no observable increase in flood risk. The Department also notes that modelled scenarios 2 and 3 are based on subsidence impacts significantly greater than those predicted in the SA (1.5 and 2 times greater). Given that subsidence impacts at the mine have generally remained well within previous predictions, these scenarios are considered unlikely.

The proposed modification would result in some minor changes to flood hazard categories for some privately-owned properties, as defined by the NSW Government's *Floodplain Development Manual.* No changes to hazard categories were predicted for existing structures during the 1 in 100-year ARI event. However, the access route for one dwelling (43A) is predicted to increase from category L2 (in which vehicles are considered unstable) to L3 (in which wading is unsafe).

Some changes to peak flood depths and peak flow velocities are also expected in areas of predicted subsidence. However, the FAR concludes that predicted subsidence associated with LWs 24 and 24A would not significantly alter the flow conveyance capacity of the existing channels, including Morans Creek and Tobins Creek. The FAR indicates that subsidence impacts may create new areas of in-channel ponding within the watercourses on site. Centennial has also proposed to monitor the affected channels to determine whether any drainage works would be required.

The FAR also indicates that there may be a small increase in potential remnant ponding as a result of the proposed modification (see **Figure 6**). These impacts would be limited to areas of predicted subsidence. These impacts would be most pronounced above Longwalls 19 and 24. Centennial has proposed to undertake monitoring at eight additional locations during and after longwall mining, and if required, to carry out remedial drainage works (see **Figure 6**). The FAR also notes that completed drainage works near Deaves and Mandalong Roads may assist in draining areas prone to ponding.

The proposed modification is expected to have a minimal impact on existing public roads, beyond those impacts which have previously been assessed. The FAR identifies one additional section of Mandalong Road which is expected to require mitigation and/or remediation work as a result of the modification. The Department is satisfied that such works could be incorporated in an updated BFMP.

Management and Mitigation

Existing conditions of consent provide a robust framework for the management of flooding impacts associated with the MSEP. These conditions require Centennial to undertake a flood impact assessment as part of the PSMP for each subsidence affected property. In the event that any residence has a minimum freeboard of less than 0.5 m during a 1 in 100-year flood event, Centennial must provide recommendations to mitigate flood risks, for example, by raising or relocating the residence. Centennial must then implement the recommendations of the assessment within an agreed timeframe. Where mitigation works cannot be undertaken, the landowner is afforded acquisition rights under the consent.

Centennial has also committed to prepare, as part of its WMP, a flood monitoring program, including updated flood modelling and recommendations to minimise and mitigate flood impacts on the eight affected residences, private properties and public infrastructure.

Overall, the Department considers that the predicted flooding impacts associated with the proposed modification would be similar to previously observed flooding impacts at the mine. The Department is satisfied that the existing conditions would continue to provide an effective framework for the management and mitigation of these impacts, and that no changes to these conditions are required.

5.2.4 Conclusion

The Department is satisfied that the proposed modification would not significantly increase the impacts of the approved development on water resources. Subject to the implementation of suitable mitigation and management measures, the Department is satisfied that the proposed modification would not:

- have a significant impact on groundwater levels, quality or the health of GDEs;
- have a significant impact on surface water flows or quality; or
- significantly alter existing flood regimes, or compromise existing dwellings and infrastructure.

The Department considers that any incremental impacts associated with the proposed modification can be suitably managed and mitigated through modified conditions of consent, an updated site WMP and an updated WMP component to Extraction Plans.

5.3 Biodiversity

The SEE included a Biodiversity Assessment Report (BAR), prepared in accordance with the *Framework for Biodiversity Assessment* (FBA). As no vegetation clearing is required for the proposed modification, the BAR assessed potential biodiversity impacts within the subsidence impact zone for LWs 24 and 24A, based on a 26.5 degree angle of draw.

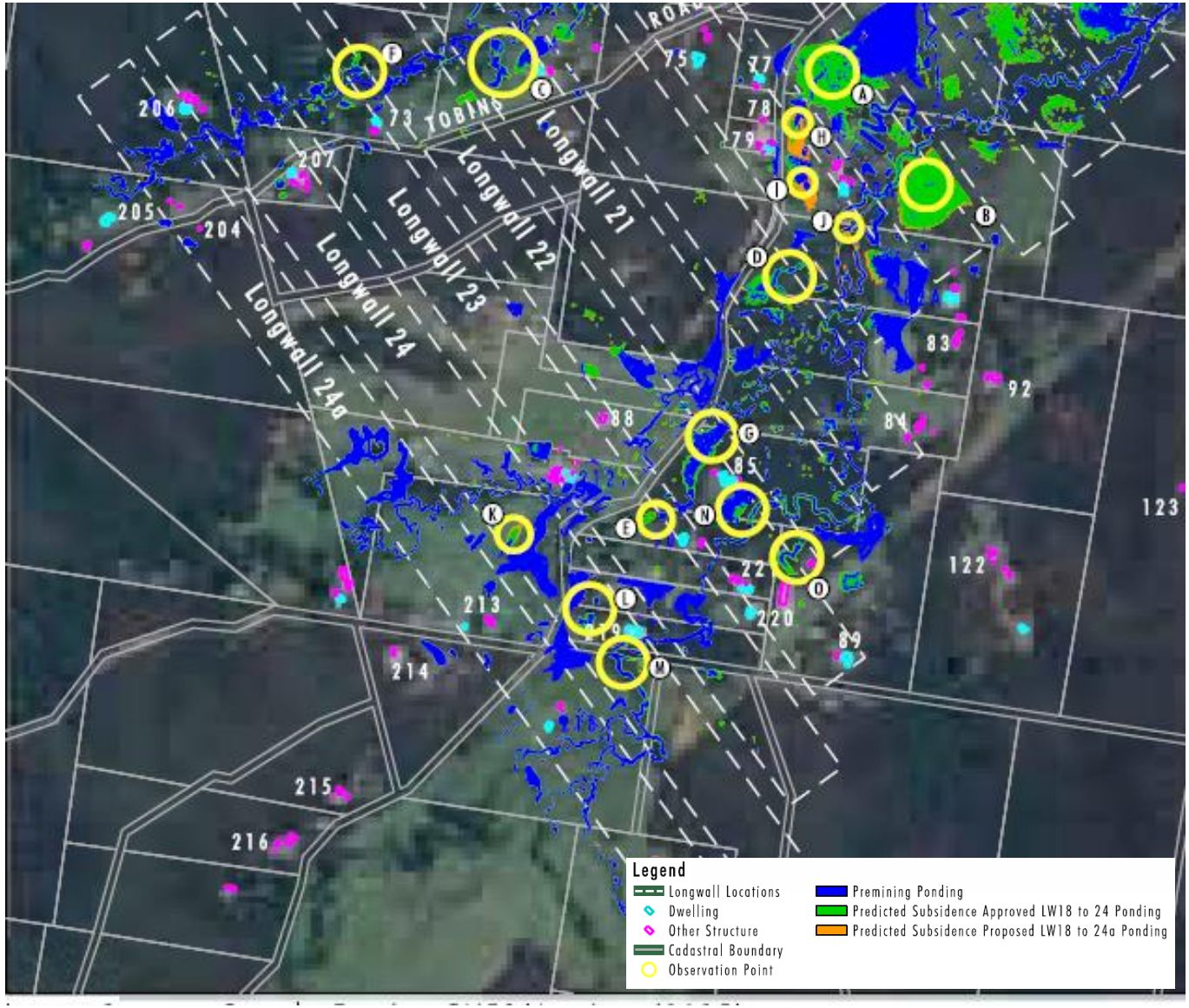

Figure 6: *Potential Remnant Ponding and Monitoring Locations*
Note: Proposed monitoring locations are numbered "H" to "O".

The BAR predicted subsidence-induced ponding would affect 0.38 hectares (ha) of native vegetation, comprising four Plant Community Types (PCTs). These PCTs also correspond with three Endangered Ecological Communities (EECs) listed under the *Threatened Species Conservation Act 1995* (TSC Act). These impacts are summarised in **Table 4** below.

Table 4: *Predicted Impacts on EECs*

PCT Code	Endangered Ecological Community	Area of Subsidence Induced Ponding (ha)
HU507	River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	0.03
HU533	Freshwater Wetlands on Coastal Floodplains	0.16
HU937	Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregion	0.06
HU937d		0.13
	Total	**0.38**

The existing approved development is predicted to result in 4.49 ha of native vegetation disturbance due to remnant ponding. As such, the proposed modification represents an eight percent increase in predicted disturbance. To further monitor and mitigate any potential impacts, Centennial has also proposed to monitor potential ponding locations, and if necessary, undertake drainage works.

As the proposed modification does not involve the clearing of vegetation, and all potential impacts are subsidence-related, no specific offset strategy has been proposed. OEH raised no issue with this approach, as neither the FBA nor the *NSW Biodiversity Offsets Policy for Major Projects* (Offsets Policy) specifically deals with impacts from mine subsidence, particularly where there is no direct clearing. However, OEH recommended the inclusion of an additional condition specifying that, in the event that mine subsidence causes any unexpected impacts on threatened biodiversity, these impacts must be offset in accordance with the Offsets Policy.

Existing conditions establish performance measures for subsidence impacts, including subsidence related impacts on biodiversity. These conditions require Centennial to ensure that any environmental consequences for threatened species, populations or communities associated with its underground workings remain 'negligible'. In the event that these performance measures are exceeded, Centennial must remediate the impact, or provide a suitable offset. The Department is therefore satisfied that the concerns raised by OEH are suitably addressed by existing conditions, and no further changes are necessary.

Overall, the Department considers that biodiversity impacts associated with the proposed modification would be minimal, and would be suitably managed under existing conditions.

5.4 Other Impacts

The Department is satisfied that the other impacts of the proposed modification are likely to be minor or negligible. The assessment of other impacts is summarised in **Table 5** below.

Table 5*: Other impacts*

Issue	Impact and Consideration	Recommendation
Aboriginal Cultural Heritage	• The SEE included a Heritage Impact Assessment (HIA). The study area for the HIA was based upon the 26.5 degree angle of draw around LWs 24 and 24A. • The HIA identified one Aboriginal site within the study area (AHIMS #45-3-3678). This is a scarred tree, located above the approved footprint of LW 24. • The proposed modification is predicted to cause up to 700 mm of vertical subsidence in the vicinity of #45-3-3678. The scarred tree is a living tree, with a well-established root system. Consequently, the proposed modification is not expected to have a significant impact on the site. • However, Centennial has proposed to monitor the site, in accordance with its Northern Region Aboriginal Cultural Heritage Management Plan (ACHMP). In the event that significant tilting is observed, Centennial has	No additional conditions necessary.

Issue	Impact and Consideration	Recommendation
	committed to implement corrective measures in consultation with OEH. • OEH advised that it has no concerns with respect to Aboriginal cultural heritage. However, OEH recommended an additional condition of consent, specifying that Aboriginal heritage management for the proposed modification area must be undertaken in accordance with the recommendations in Centennial's Northern Region ACHMP. • Existing conditions require Centennial to update its Management Plans within three months of any modification. The Department is satisfied that this will fulfil OEH's requirements.	
European Heritage	• There are no listed heritage items in the vicinity of the proposed extension area. However, there is potential for heritage material to be discovered on site, including relics associated with historic forestry activities. • The HIA identified land within the study area which may have been used as a cemetery. However, there is no record of human burials at the site, and the proposed modification is not expected to have any adverse impact on this land. • The Heritage Council advised that the proposed modification is unlikely to have any additional impacts beyond those previously assessed. However, the Council recommended the inclusion of a precautionary condition, requiring Centennial to cease work in the event that significant European Cultural Heritage material is discovered. • The Department supports the inclusion of a precautionary condition regarding unexpected finds. However, the Department is mindful that not all finds would be considered 'significant' heritage material, and require the immediate cessation of work. • Therefore, the Department's preferred approach would be for Centennial to develop a detailed protocol as part of the site's Heritage Management Plan (HMP). This protocol would outline procedures to protect and evaluate any potential heritage items. Should the item be considered significant, the protocol would then outline procedures to cease work and notify OEH.	The Department considers that the existing Heritage Management Plan (HMP) condition should be amended to include a protocol in the event that potential European heritage material is discovered.
Agricultural Impacts	• The SEE included an Agricultural Impact Statement (AIS). The study area for the AIS was defined by the 26.5 degree angle of draw for LWs 24 and 24A. The study area consists of approximately 180 ha of native vegetation and cleared grassland. • The three dominant Land and Soil Capability Classes within the study area are Class 5, 6 and 7. The agricultural capability of the land ranges from moderately low to very low. • There is no identified Biophysical Strategic Agricultural Land (BSAL) within the study area. • There is approximately 69 ha of potential grazing land within the proposed extension area. The AIS concluded that properties in the area are of a relatively small size, and are unlikely to produce significant income from grazing activities. • One submission raised concerns regarding the potential impacts on agricultural productivity as a result of increased flooding. • Flooding impacts are discussed in **Section 5.2.3** above. The AIS indicates that remnant ponding would temporarily remove approximately 0.25 ha from potential cattle grazing. This equates to approximately 0.001% of the study area. • No soil stripping activities are proposed. Centennial has proposed to remediate soils that are subject to	No additional conditions necessary.

Issue	Impact and Consideration	Recommendation
	ponding by developing engineered drainage channels and applying gypsum to minimise erosion. • In its submission, DPI suggested an additional condition requiring Centennial to implement the AIS's recommendations. These recommendations include the drainage and soil improvement measures discussed above, as well as the repair of dams and farm fencing in the event of damage. However, the Department is satisfied that these matters would be suitably addressed by existing PSMP and Extraction Plan requirements under the consent, and that no further changes are required in this regard. • The proposed modification is not expected to have a significant detrimental impact on agricultural production in the locality. The Department is satisfied that any impacts would be of a minor, temporary nature, and would be managed under existing conditions and an updated Extraction Plan.	
Air Quality and Noise	• The modification is not expected to materially change the mine's approved air quality and noise impacts. • The proposed modification would yield an additional 3.71 million tonnes of ROM coal. The SEE included a Greenhouse Gas Assessment (GGA) which estimated the resulting increase in greenhouse gas emissions. • The proposed modification is expected to contribute an additional 0.13% to the total life-of-mine emissions. • The Department is satisfied that the proposed modification represents a negligible increase to the project's overall emissions.	No additional conditions necessary.
Socio-economic	• The SEE included an Economic Assessment (EA). • The proposed modification would have a total economic benefit of approximately $27.6 million (present value). This includes an additional $8.6 million to the local/regional economies and an additional $19 million in NSW Government royalties. • The risks of the proposed modification (including potential environmental and social impacts) were estimated conservatively at $3.5 million (present value). • The Local Effects Analysis (LEA) indicates that socio-economic impacts are likely to be of short duration. • Overall, the proposed modification is expected to have a net benefit of $24.1 million (net present value). • The Department is satisfied that the proposed modification would maximize the economic benefits of the MSEP, without significantly increasing its social impacts.	No additional conditions necessary.

6. RECOMMENDED CONDITIONS

The Department has drafted a recommended Notice of Modification (see **Appendix D**) and a consolidated version of the consent as it is proposed to be modified (see **Appendix E**). The Department considers that the environmental impacts of the project can be appropriately managed through the proposed amended conditions of consent.

Centennial has reviewed and accepted the recommended conditions.

7. CONCLUSION

The Department has assessed the modification application, SEE and RTS in accordance with the relevant requirements of the EP&A Act. The Department has carefully considered the proposal's potential impacts on the natural and cultural environment and on nearby residents.

The Department has concluded that, subject to implementation of contemporary Extraction Plans, other management plans and the proposed mitigation measures, the modification can be carried out with

minimal environmental impacts. Under existing conditions, all management plans, strategies and programs must be reviewed, and if necessary, updated within 3 months of the approval of any modification.

The Department considers that the project would optimise the recovery of coal resources within the existing approved consent area, using existing infrastructure and equipment. The Department has carefully considered potential mine subsidence, water resources impacts and biodiversity impacts of the proposal. The Department is satisfied that all potential impacts can be appropriately managed under existing and/or updated conditions of consent. The Department is therefore satisfied that the proposed modification is in the public interest and should be approved, subject to conditions.

8. RECOMMENDATION

It is RECOMMENDED that the Director, Resource Assessments, as delegate of the Minister for Planning:

- **considers** the findings and recommendations of this report;
- **determines** that the modification request falls within the scope of section 96(2) of the EP&A Act;
- **approves** the modification application SSD 5144 MOD 4, subject to conditions; and
- **signs** the attached notice of modification (**Appendix D**).

Colin Phillips 24/07/17

Colin Phillips
Team Leader
Resource Assessments

Howard Reed 1.8.17

Howard Reed
Director
Resource Assessments

APPENDIX A: STATEMENT OF ENVIRONMENTAL EFFECTS

See: http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8447

APPENDIX B: SUBMISSIONS

See: http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8447

APPENDIX C: RESPONSE TO SUBMISSIONS

See: http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=8447

APPENDIX D: NOTICE OF MODIFICATION

APPENDIX E: CONSOLIDATED CONSENT