



CHAIN VALLEY COLLIERY MINING EXTENSION 1 PROJECT

Volume

1

Environmental Impact Statement

Prepared for LakeCoal Pty Ltd
May 2013

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Chain Valley Colliery Mining Extension 1 Project

Environmental Impact Statement

Prepared for LakeCoal Pty Ltd | 28 May 2013

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Chain Valley Colliery Mining Extension 1 Project

Final

Report J12057RP1 | Prepared for LakeCoal Pty Ltd | 28 May 2013

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| Date | 28 May 2013 | 28 May 2013 | Date | 28 May 2013 |

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ENVIRONMENTAL IMPACT STATEMENT CERTIFICATION

For submission of an environmental impact statement (EIS) under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979*

EA prepared by

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Applicant

LakeCoal Pty Ltd
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Proposed development

Chain Valley Colliery Mining Extension 1 Project
Refer to Chapter 3 of the EIS for a detailed description of the proposed development

Land to be developed

Refer to Appendix B of EIS

Certification

We certify that we have prepared this EIS in accordance with the Director-General's environmental assessment requirements and to the best of our knowledge the information contained in this EIS is neither false or misleading



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Executive Summary

ES1 Introduction

ES1.1 Overview

The Chain Valley Colliery (the Colliery) is an underground coal mine located at the southern end of Lake Macquarie, managed and operated by LakeCoal Pty Ltd (LakeCoal) on behalf of the Wallarah Coal Joint Venture. Underground mining has occurred at the Colliery since 1962 extracting coal from three seams – the Wallarah, Great Northern and Fassifern Seams, with current mining activities limited to the Fassifern Seam. The Colliery currently operates under the major project approval MP10_0161 which was granted by the Minister for Planning and Infrastructure on 23 January 2012 and pertained to the continued mining within three areas referred to as Parcel A and Domains No. 1 and No. 2 (Figure E.1).

The Chain Valley Colliery Mining Extension 1 Project (the Proposal) will include:

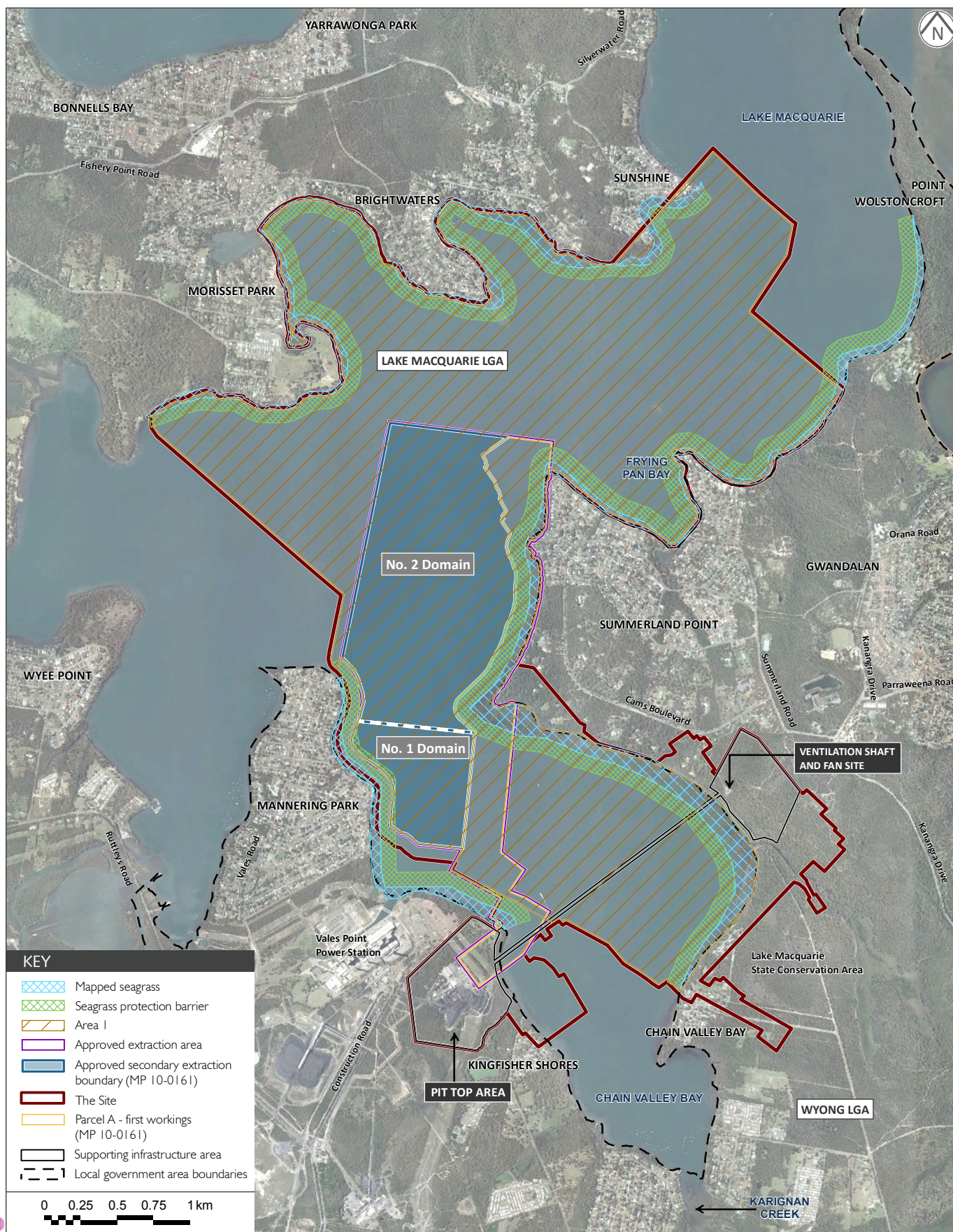
- an extension of the currently approved extraction area to allow underground mining to continue within the Fassifern Seam;
- the increase of the approved maximum rate of production from 1.2 million tonnes per annum (Mtpa) to 1.5 Mtpa of run-of-mine (ROM) coal;
- an increase in the approved hours for haulage of coal from the Colliery on private roads to Delta Electricity's Vales Point Power Station (VPPS), i.e., from 5.30 am to 5.30 pm, Monday to Friday (excluding public holidays) to 24 hours a day, seven days a week. No change to the approved hours of haulage on the public road network is sought;
- minor upgrades and modifications to existing approved infrastructure; and
- an extension of the approved mining by a period of approximately 14 years, i.e., to around 2027.

The Proposal includes the consolidation of the above with all the operations and environmental activities currently approved under MP10_0161, as modified, within a single development consent.

This Environmental Impact Statement (EIS) describes the Proposal, provides an assessment of its potential impacts and details measures that would be implemented to prevent, minimise and/or offset potential impacts.

ES1.2 Proposal need

Future global energy demand is predicted to involve an increase in coal consumption in the next decade or more, with predicted coal consumption in 2035 similar to total world coal demand in 2009 (IEA 2011). Mining of black coal is one of Australia's most important industries, creating significant employment and revenue in regional Australia. The black coal mining industry also plays a critical role in the supply of electricity to NSW customers, with nearly 90% of the State's electricity generated from coal. The Proposal will allow continued supply of these important reserves and continued contribution to export sales and associated earnings for Australia. Further, given its proximity to VPPS, the Colliery is well placed to provide a secure source of predictably priced thermal coal to help supply the State's electricity needs into the future.



The Site

Major project approval MP10_0161 provided a relatively short term approval life for the Colliery with expiry of the project approval on 31 December 2016. Geological features subsequently identified during mining of the approved secondary extraction area (Domains No. 1 and No. 2) will prevent LakeCoal from recovering all of the resource approved for mining under MP10_0161. It is now estimated that the reserves within the approved secondary extraction area will be exhausted by late 2013. If access to further coal reserves is not approved by this time the Colliery will be forced to shut down, affecting employment and the supply of coal to VPPS and other customers. Therefore, the Proposal is critical to the ongoing operation of the Colliery and for the continuation of its local, State and National benefits.

ES1.3 Proposal context

The land on which the Proposal would occur, if approved, is referred to throughout the EIS and supporting technical studies as the 'Site'. The Site is shown on Figure E.1 and comprises the supporting infrastructure area (pit top area and ventilation shaft and fan site), approved mining areas and proposed mining areas at the Colliery.

The Colliery's surface facilities are located at the pit top area at Mannering Park adjacent to VPPS and are accessed via Ruttleys Road and Construction Road (a private road which services the Colliery and VPPS). In addition, a ventilation shaft and fans are located at Summerland Point north-east of the pit top area on the northern shore of Chain Valley Bay.

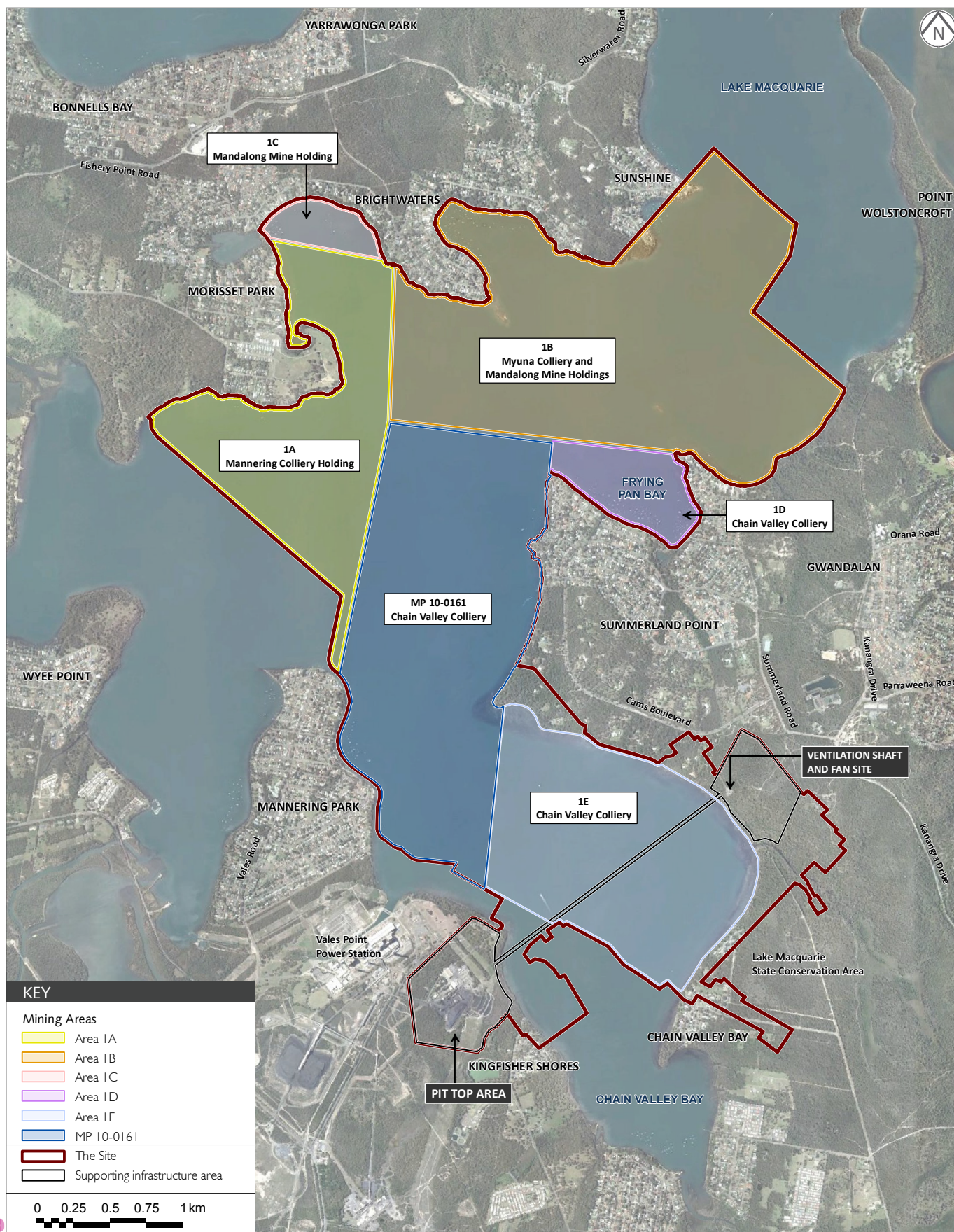
LakeCoal's mining tenements cover an area of approximately 2,100 hectares (ha) and straddle the boundary of Lake Macquarie and Wyong local government areas (LGAs). The Colliery's pit top area is located within the Wyong LGA in an existing industrial area at the southern extent of Lake Macquarie and west of Chain Valley Bay.

Nearby residential areas include Kingfisher Shores and Chain Valley Bay to the south-east, Mannering Park to the north-west and Summerland Point and Gwandalan to the north-east. The closest privately owned residences to the Colliery are located at Kingfisher Shores approximately 350 m south-east of the pit top surface infrastructure.

Three mining projects are currently operating in the area surrounding the Colliery, namely Mandalong Mine, Mannering Colliery and Myuna Colliery, each of which are owned and operated by subsidiaries of Centennial Coal Company Ltd (Centennial Coal).

ES1.4 Proposal description

The Proposal would involve the extension of underground mining within the Fassifern Seam in five areas identified as Areas 1A, 1B, 1C, 1D and 1E (collectively referred to as Area 1) as shown on Figure E.2. Areas 1A, 1B and 1C are within mining leases currently held by Centennial Coal for its Mannering Mine and Myuna and Mandalong Collieries and Areas 1D and 1E are located within existing LakeCoal holdings. No mining has been undertaken in the Great Northern and Wallarah Seams overlaying Area 1, except for parts of Area 1E which are located beneath the Colliery's historic workings. The proposed miniwall panels located within Area 1 would have a maximum face width of approximately 86.2 m and a maximum width of approximately 97 m with all secondary extraction confined to areas under the Lake Macquarie water body. Reserves within Area 1 have been estimated at 19.5 Mt of ROM coal.



Proposed mining areas 1A-1E

It is noted that the mine design was modified on several occasions as an outcome of environmental assessments to ensure adverse impacts are minimised. It is also noted that there is the potential for unknown geological structures or other environmental constraints to be discovered during the life of the mine. If this occurs the mine plan will need to be reassessed to determine more suitable panel layouts. Constraints generally limit the maximum planned extraction and, accordingly, lessen the potential for impacts such as subsidence. Significant changes to the mining layout may require LakeCoal to submit an application to modify the consent under the EP&A Act if they result in additional impacts beyond those assessed for the Proposal.

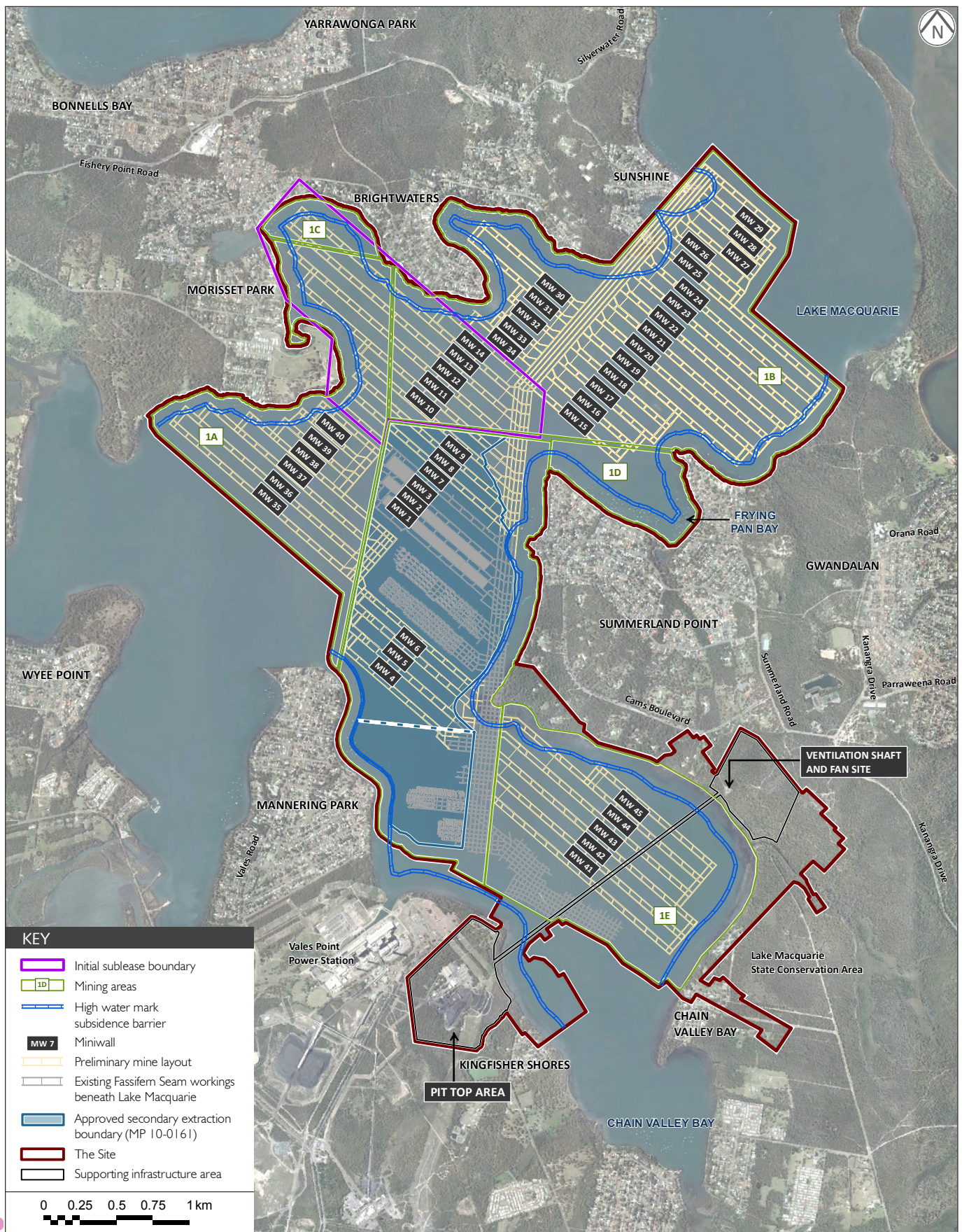
All mine plan refinements would be designed to ensure that:

- mining activities are contained within the Site;
- mining is in accordance with the High Water Mark Subsidence Barrier (HWMSB) shown on Figure E.3 and the Seagrass Protection Barrier (SPB) shown on Figure E.1;
- secondary extraction remains under Lake Macquarie;
- panels have a maximum miniwall width of 97 m; and
- subsidence is limited to a maximum of 620 mm where no overseam workings exist or 886 mm where historic overseam workings are present, in accordance with subsidence modelling undertaken for the Proposal.

To have the ability to mine within Area 1A, 1B and 1C LakeCoal will need to enter into an agreement with Centennial Coal, which holds the mining leases applicable to these areas. LakeCoal has currently entered into an agreement with Centennial Coal covering a portion of Areas 1A, 1B, and 1C for mining within the Fassifern Seam, subject to LakeCoal receiving the requisite approvals. The area subject to this agreement is identified as the initial sublease boundary on Figure E.3. The extraction of coal from the remainder of Areas 1A, 1B, and 1C would be regulated by a registered sublease between LakeCoal and Centennial Coal under the *Mining Act 1992*. Communication and cooperation between LakeCoal and Centennial Coal regarding mining within Areas 1A, 1B and 1C is ongoing.

No potential conflicts or ambiguities between the Proposal and Centennial Coal's approvals for the Mandalong Mine, Mannering and Myuna Colliery's are anticipated. It is noted that the Minister has the power to grant overlapping planning approvals.

Mining methods under the Proposal would be consistent with existing methods which involve underground mining of miniwall panels. Mining areas have been designed to minimise the impacts of subsidence to marine ecology, the shoreline and land infrastructure through ensuring secondary extraction occurs wholly under Lake Macquarie and outside of the HWMSB and the SPB. The HWMSB is designed to protect foreshore areas and the boundary of water bodies from mining induced subsidence and is determined by an angle of draw 35° lakewards from the line drawn vertically beneath the High Water Mark and from the point 2.44 m AHD above the High Water Mark landward to the depth of the workings. The SPB was adopted by LakeCoal to protect the seagrass beds of Lake Macquarie from mining induced subsidence and is determined by a 26.5° angle of draw from the surveyed boundary of seagrass beds to the depth of the workings.



Preliminary mine layout

Chain Valley Colliery Mining Extension | Project - Environmental Impact Statement

Figure E.3

It is proposed to increase the maximum rate of production at the Colliery from 1.2 Mtpa to 1.5 Mtpa of ROM coal. The additional 300,000 tonnes per annum would all be transported by private roads (i.e., the mine access road and Construction Road) to VPPS. The increase in production would result from efficiencies associated with generally longer panel lengths which result in less miniwall moves per year. The increase in production would be accommodated without increasing the capacity of existing infrastructure, staff numbers, or traffic movements on public roads.

The Proposal also includes the transport of product coal on private roads between the Colliery and VPPS 24 hours a day, seven days a week. As the Proposal will increase the Colliery's production rate, transport of product coal to the VPPS requires greater flexibility. Haulage of coal between the Colliery and VPPS is currently restricted to 5.30 am to 5.30 pm, Monday to Friday (excluding public holidays). Given that the Colliery operates 24 hours, 7 days a week, there is currently a need to stockpile coal extracted outside of the current approved haulage hours which necessitates double handling. This activity is not only inefficient but exacerbates potential environmental impacts in the form of air and noise emissions. An increase in the hours of haulage would enable higher volumes of product coal to be transported directly to the VPPS thereby increasing operational efficiencies and potentially reducing double handling of the product coal which will, in turn, help to reduce potential environmental impacts. Further, the number of trucks per day required to transport 1.5 Mtpa of ROM coal from the Colliery is not achievable under the current haulage restrictions and, therefore, additional haulage hours are required.

LakeCoal has also identified an opportunity to upgrade and modify pit top surface infrastructure, much of which has not been replaced since the commencement of operations at the Colliery in 1962, to enable improved operational efficiencies and manage potential environmental impacts from the Proposal.

ES1.5 Legislation and policy

The Proposal constitutes state significant development (SSD) under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as it is development for the purposes of coal mining as identified within Schedule 1 of the State Environmental Planning Policy (State and Regional Development) 2005. A development application (DA) for SSD must be accompanied by an EIS, prepared in accordance with the Environmental Planning and Assessment Regulation 2000. Before preparing an EIS, an applicant must request DGRs (the Director-General's requirements of the Department of Infrastructure and Planning) which are essentially terms of reference that specify what must be addressed in an EIS. The DGRs for the Proposal were issued on 14 August 2012.

For the Proposal to proceed, approval is required under the EP&A Act. This EIS has been prepared in accordance with the assessment requirements in the DGRs and accompanies a DA for SSD under Part 4, Division 4.1 of the EP&A Act.

ES2 Consultation

Consultation with relevant stakeholders was undertaken for the Proposal in accordance with the consultation requirements in the DGRs and LakeCoal's own stakeholder engagement initiatives. A stakeholder engagement strategy was prepared for the Proposal which identified the relevant stakeholders as Commonwealth, State and local government agencies, service providers, special interest groups, and local community members. Consultation with government agencies and service providers was undertaken through either face-to-face meetings, telephone interviews or distribution of briefing letters. Consultation with local community members was undertaken through the Colliery's website, information provided to the Colliery's Community Consultation Committee (CCC), a community information and feedback session and attendance at the Gwandalan/Summerland Point Precinct Committee meeting.

The matters raised during consultation were considered during the preparation of the EIS and development of assessment methods. Elements of the Proposal, such as no additional traffic generation on public roads and no secondary extraction under land, were committed to by LakeCoal in response to the outcomes of engagement with the community and government agencies.

ES3 Risk assessment

An environmental risk assessment was undertaken for the Proposal. With standard mitigation measures in place, the majority of environmental risks were assessed as low or medium with three high risk areas identified: loss of groundwater from aquifers; water quality impacts on terrestrial ecology; and direct and indirect employment impacts of closure. Technical assessments were undertaken for the moderate and high risk attributes which included recommendations for additional mitigation measures tailored to the likely impacts of the Proposal. This resulted in the lowering of the high risk areas to low risk, with the exception of the employment impacts should operations at the Colliery cease which remained high.

The results of the technical assessment reports prepared for the Proposal are summarised in the following section. Low risk attributes were also assessed and summarised below though technical reports were not considered warranted for these attributes.

ES4 Environmental assessment

ES4.1 Groundwater

Extensive past mining in the area surrounding the Colliery has resulted in localised depressurisation of the coal seams and interburden. The groundwater assessment predicted that further pressure losses resulting from the Proposal were unlikely to have significant additional impacts. This extent of drawdown would not impact any terrestrial alluvial systems or groundwater dependent ecosystems. Registered private bores within the drawdown extent are predicted to experience a maximum drawdown of less than 0.1 m in the alluvium and less than 1 m in deeper basement materials.

The total mean groundwater inflows to the underground workings in the Fassifern Seam are predicted to increase as a result of the increased production rate from 7.6 ML/day to approximately 10.5 ML/day. The groundwater quality within the Fassifern Seam is expected to be less saline than observed in decommissioned workings. However, the groundwater extracted would remain unsuitable for potable, livestock or irrigation use due to the continued dewatering of the Wallarah and Great Northern Seams.

The proposed workings have been designed to ensure that predicted subsidence levels are not likely to result in direct hydraulic connection with Lake Macquarie by limiting the height of connective fracturing in the overburden above the proposed workings. No direct hydraulic connection to Lake Macquarie has previously been observed in the Colliery's, or other mines', workings. Aquifer/aquitard interconnection, which can result from mining induced cracking and vertical subsidence of strata, is unlikely to occur based on subsidence predictions and as there are no recorded aquifers in this area.

LakeCoal will monitor potentially affected bores within the predicted drawdown extent to measure bore yields, saturated thickness and water quality, where access is permitted. The monitoring will enable detection of changes should they occur as a result of the Proposal. In the unlikely event that significant impacts occur as a result of subsidence from the Proposal, LakeCoal would enter into negotiations with the affected landowner(s) and the Mine Subsidence Board with the intent of formulating an agreement which provides compensatory measures. LakeCoal will also monitor and maintain records of actual pumping volumes of groundwater from the Colliery.

The Colliery undertakes groundwater monitoring in accordance with its groundwater monitoring program and Water Management Plan (WMP). Monitoring data is assessed against water quality criteria with response protocols and contingency measures triggered if a criterion was to be exceeded. The Colliery's groundwater monitoring program and WMP will be revised as a result of changes from the Proposal.

ES4.2 Surface water

As a result of the increase groundwater inflows described above, the Proposal would result in an increase in the daily water volumes pumped from the Fassifern Seam. In combination with surface runoff, water pumped from the underground workings is discharged from the sedimentation dams via the discharge point on Swindles Creek (LDP 1). LDP 1 is licensed under the Colliery's Environment Protection Licence (EPL 1770) which stipulates a maximum daily discharge limit of 12.161 ML. Discharge of water from the underground pumped to the surface under the Proposal would result in an exceedance of the EPL 1770 daily discharge limit during worst case rainfall predictions. To effectively manage water at the pit top area a combination of measures are proposed including utilisation of underground storage, an amendment to the daily discharge volume condition within EPL 1770 for consideration of rainfall events, and a commitment to limit the maximum daily pump rate from the underground workings to 10.5 ML/day.

Potable water sourced from Wyong Shire Council is currently used in the underground and pit top operations at the Colliery with the majority (85%) used in the underground operations. As previously noted, groundwater inflow to the underground workings has high salinity and is, therefore, not suitable for potable or operational purposes. LakeCoal is currently introducing measures to minimise potable water consumption and maximise recycled water use that are expected to result in a reduction in potable water use at the pit top area by 60% and at the Colliery overall by 9%.

The quality of water flowing into the underground workings under the Proposal is expected to be similar to, or less saline than, existing water quality. Therefore, no additional impacts to the surrounding environment are expected to occur under the Proposal from this water being discharged from the Site.

Water quality monitoring is undertaken by LakeCoal in accordance with the EPL requirements and its water quality monitoring program and this would continue under the Proposal. The Colliery's existing WMP will be updated in accordance with the findings of the Proposal's surface water assessment. LakeCoal would also investigate and, where practical, implement additional surface water management and monitoring measures, such as quantification of the Great Northern and Wallarah Seams' storage capacity, and daily measurements of discharge volumes.

ES4.3 Noise

Nearby residential locations, subject to noise criteria under MP10_0161, were identified as assessment locations for the Proposal. During worst case weather and operating conditions truck haulage of coal to VPPS would result in marginal increases of no more than 2 dB to existing night time noise levels at assessment locations in Mannering Park and Chain Valley Bay. This increase is not significant given that changes in noise levels of 2 dB or less are imperceptible to the human ear and are generally considered an acceptable noise level increase.

The main contributor to noise levels at the Colliery is the dozer which is conservatively assumed to be operating at 100% capacity in the modelling when historically it has operated for approximately 5% of operational hours. When the dozer is not operating, modelling predicts a 1 – 3 dB reduction in noise levels at the majority of assessment locations.

The assessment locations near the Summerland point ventilation shaft and fans are predominantly influenced by noise from the ventilation fans and will not experience an increase to existing night time noise levels from truck haulage of coal to VPPS.

When considering cumulative industrial noise, the noise levels under the Proposal would not change from existing cumulative operational levels and would remain below the relevant criteria.

Sleep disturbance noise levels are expected to remain below the relevant criteria, with the exception of one assessment location where a marginal exceedance (1 dB) of the criteria is predicted during worst case conditions (i.e., temperature inversions). This exceedance is likely to be imperceptible and, therefore, is not considered significant.

The Proposal would not increase traffic generation on public roads; however, the contribution of the existing Colliery related traffic was assessed. Existing traffic noise levels for Ruttleys Road, Pacific Highway and Doyalson Motorway Link Road were modelled to be above the day and night criteria for road traffic noise stipulated in the Road Noise Policy (DECCW 2011) when excluding Colliery related traffic. When Colliery related traffic is considered, road traffic noise emissions result in an imperceptible increase (less than 1 dB) to existing road noise emissions. This increase is within the Road Noise Policy's (DECCW 2011) allowable increase of 2 dB where existing road traffic noise criteria are already exceeded.

In summary, the Proposal would not result in significant noise impacts additional to those under existing conditions. LakeCoal has committed to managing and monitoring noise emissions from the Colliery as well as having long term goals to reduce noise emissions. The minor upgrades and modifications to surface infrastructure proposed under the Proposal are consistent with the objective of the Colliery's noise reduction program.

ES4.4 Air quality

Predicted particulate matter emissions associated with the Proposal are well below the impact assessment criteria set by the Environment Protection Authority and the National Environment Protection Council at all assessment locations. Additionally, particulate matter emissions associated with the Proposal in combination with emissions from neighbouring sources would not result in any exceedences of cumulative impact assessment criteria at the assessment locations.

Odour emissions associated with the Proposal would be below the threshold for odour detection at all assessment locations.

Average annual Scope 1 (direct) Greenhouse Gas (GHG) emissions under the Proposal were estimated to be 0.59 million tonnes of carbon dioxide equivalent which represents approximately 0.1% of Australia's commitment under the Kyoto Protocol (591.5 Mt CO₂-e) and a very small portion of global greenhouse emissions.

Particulate matter and GHG emissions would continue to be managed in accordance with the Colliery's Pollution Reduction Program and Air Quality and Greenhouse Gas Management Plan. GHG emissions from the Colliery would be reported in accordance with the *National Greenhouse and Energy Reporting Act 2007*.

ES4.5 Traffic

The number of movements of light and heavy vehicles on the public road network generated by the Colliery would not change under the Proposal. However, the extension of mining operations would result in continued traffic movements associated with the Colliery through to the year 2027.

Coal produced at the Colliery is sold to VPPS, other domestic customers, and exported to international customers via the Port Waratah Coal Services loader at Carrington East within the Port of Newcastle. Coal from the Colliery is transported by truck on public roads, except for sales to VPPS which are trucked entirely on private roads.

The assessment of the impact of continued haulage of coal on public roads assumed the current maximum limit of 270 truck loads per day is maintained. In recent years, however, the Colliery has typically operated well below the maximum daily truck load limit and, therefore, the results of the assessment are conservative. Coal transport to domestic customers (excluding sales to VPPS) would continue to generally occur on days when export coal transport is not occurring ensuring a maximum of 270 truckloads per day on public roads is maintained.

Over the life of the Proposal, background traffic levels on the public road network are projected to continue to occur at growth rates of between +2.3% to +3.0% based on the recorded traffic growth rates from daily traffic counts at the relevant locations on the major road network. Therefore, the Colliery's relative contribution to traffic levels would continue to decline until 2027 given that no increase to movements is proposed. The assessment confirmed that the road network generally has adequate capacity to accommodate Colliery related traffic movements in combination with background traffic growth. The exception is the F3 Freeway/Sparks Road Interchange intersection (east side) which is currently performing poorly, with significant traffic delays. Future upgrades to this intersection will likely be required, regardless of whether the Proposal is approved, to significantly improve the existing and future traffic situation for the benefit of general traffic on the road network. Capacity on some sections of the Colliery's export coal haulage route would also be substantially improved following the completion of the Hunter Expressway Project and other regional road improvements.

The Proposal has considered a number of alternative mechanisms for transportation of export coal including use of existing rail infrastructure. Potentially feasible options include the construction of a haul road, or part haul road part conveyor, to the Vales Point coal unloading facility. Economic assessments of the two options, including a benefit cost analysis and a net present value assessment, were undertaken for the Proposal. However, a preferred option has yet to be determined as further economic feasibility assessments and detailed environmental assessments are required and negotiations with landowners are ongoing. Therefore, an alternative mechanism for transportation of export coal does not form part of the Proposal. LakeCoal is committed to further investigating alternative mechanisms for transportation of export coal in an effort to reduce or eliminate coal haulage on public roads.

The Colliery currently implements a Road Transport Protocol, comprising a Traffic Management Plan and Code of Conduct for heavy vehicle truck drivers. Regular independent traffic audits of the coal haulage on public roads are undertaken by LakeCoal and would continue throughout the life of the Colliery. Due to the minor traffic impacts of the Proposal, no additional specific measures are required. However, the Colliery's Road Transport Protocol will be reviewed and updated as required to incorporate the Proposal.

ES4.6 Subsidence

Potential subsidence (the vertical downward movement of the land surface) resulting from the Proposal is restricted to the bed of Lake Macquarie by virtue of the mine plan design and the implementation of the HWMSB and SPB. Maximum cumulative vertical subsidence of 886 mm is predicted in parts of Area 1E where historic workings in the Great Northern and Wallarah Seams overlie proposed miniwall panels (i.e., MWs 41 to 45 shown on Figure E.3) and 620 mm in the remainder of Area 1 where no historic workings overlie the proposed panels (i.e., MWs 1 to 40 shown on Figure E.3). However, the incremental subsidence over the Site as a result of the Proposal generally averages 430 mm.

Although the level of subsidence is unlikely to have significant direct impact on the environment, possible flow-on or indirect effects related to seagrasses and benthic communities, groundwater and the wave climate have been investigated. The results of these investigations have been assessed in the respective technical reports as not significant.

Monitoring of subsidence will be undertaken annually using bathymetric surveys. In the unlikely event that significant exceedences occur above predicted subsidence effects, appropriate panel width or mining height reductions will be made to limit future impacts to acceptable levels. Separate monitoring and management arrangements for subsidence-related impacts to marine ecology and groundwater would be undertaken under the relevant management plans and associated monitoring programs.

ES4.7 Marine ecology

Benthic communities within the Site have previously been surveyed to determine the potential impacts of subsidence. These surveys have determined that abundance and community assemblage were not strongly linked to site type (including depth). Additionally, further analysis of the data identified that complex environmental variables including interactions between depth, dissolved oxygen levels, turbidity and sediment composition were influencing community assemblage. The predicted low levels of subsidence are, therefore, unlikely to impact benthic organisms.

Mapping of seagrass communities within the Site was undertaken to determine the SPB, with the mine plan subsequently amended to ensure no subsidence impacts on seagrass communities. Further, LakeCoal is in the process of revising the Seagrass Management Plan for the Colliery. This plan would include ongoing monitoring of seagrass communities within the Site and a program to provide further protection against adverse impacts seagrass beds.

There is moderate to high potential for three endangered marine species to occur within the Site including the Loggerhead and Green turtles and the seagrass *Posidonia australis*. These species are unlikely to be impacted by subsidence levels from the Proposal given the exclusion of secondary extraction within the SPB and the highly mobile nature of the turtle species which are unlikely to be impacted by the predicted changes in depth.

The Proposal is expected to result in an improvement in the quality of water discharged from the Colliery. Additionally, only minor changes to peak discharge rates are expected. Therefore, detrimental impacts to the surrounding marine environment are not anticipated to occur.

The Colliery's Benthic Communities Management Plan (BCMP) includes a robust monitoring program that will be updated to incorporate the Proposal. The BCMP provides a rigorous approach to determine potential subsidence impacts on benthic communities. Should monitoring determine any adverse impacts, the BCMP details potential mitigations measures that could be implemented to prevent further impacts such as modification of unmined panels.

ES4.8 Terrestrial ecology

The Proposal would result in minimal disturbance to terrestrial ecology as the majority of the works would occur underground. However, potential limited direct and indirect impacts to terrestrial biodiversity may result from aspects of the Proposal including: the sedimentation dam upgrade works, increased truck movements to VPPS, and ongoing operations.

No threatened flora or fauna species have been identified within or in proximity to any of the potential impact areas. It is considered unlikely that the sedimentation dam embankment area provides suitable habitat for any threatened flora species identified as occurring within the wider locality. Several threatened and migratory fauna species have been recorded within and surrounding the pit top area and the Summerland Point ventilation shaft and fans area. Assessments of significance determined that the Proposal is unlikely to result in significant impacts as the proposed work areas are not considered to represent important habitat for these species. Therefore, no significant impacts on threatened flora or fauna would occur as a result of the Proposal.

The proposed sedimentation dam upgrade works would be undertaken within an area containing vegetation that meets the description of the endangered ecological community (EEC) Swamp Oak Floodplain Forest, though it is in poor condition. Swamp Oak Floodplain Forest is common within the locality, and is part of a much larger remnant associated with Lake Macquarie and its foreshores with over 590 ha mapped within the wider Lower Hunter and Central Coast region (LHCCREMS 2003). This vegetation is unlikely to represent the original community in this location as it has been heavily influenced by the salinity of the mine water discharge from previous operations. Up to 0.37 ha of this community would be directly impacted as a result of the proposed works to upgrade the sedimentation dam wall and formalise a new spillway. Due to the poor condition of this community and the presence of larger remnants in the Lower Hunter and Central Coast region, the minor direct and indirect impacts as a result of the Proposal would not significantly impact on the local or regional distribution of the EEC.

It is possible that the area of Swamp Oak Floodplain Forest EEC, through which the mine water discharges, would be indirectly impacted as a result of the sedimentation dam upgrade works which will formalise the discharge point and prevent uncontrolled discharges to this area. This may result in changes to the composition and condition of this EEC; however, impacts may be positive as the current condition of vegetation is compromised by the persistent saline standing water in the area.

A Biodiversity Management Plan (BMP) is in place for the management of terrestrial ecology at the Colliery and will continue under the Proposal. Proposed weed management measures will ensure that weeds are managed during construction of the sedimentation dam upgrade works. This will ultimately improve the condition of the Swamp Oak Floodplain Forest EEC.

ES4.9 Heritage

A review of previous Aboriginal heritage assessments and reports relating the Wyong and Lake Macquarie LGAs indicated that artefacts have been found along the Lake Macquarie foreshore, rivers and creeks, or in mountainous areas. Aboriginal sites identified generally consist of midden sites, isolated finds, and scarred trees. Identified Aboriginal sites located near the Summerland Point ventilation shaft and fans are protected through the measures identified in the Colliery's Heritage Management Plan (HMP).

The record of land use in the Site and the extent of disturbance and modification to the landscape indicated that artefacts are unlikely to occur. The landforms in the Site are also considered to be areas where artefacts or subsurface deposits are unlikely. In areas where minor surface disturbance is proposed (e.g., sedimentation dam upgrade works) the landscape has been assessed as not likely to contain Aboriginal objects or sites due to the terrain and likely historical flooding. Due to the lack of sites identified and the high level of previous disturbance in proposed work areas, no survey or significance assessment was considered warranted.

The mine design eliminated the potential for impacts to Aboriginal heritage values from subsidence by application of the HWMSB which excludes registered Aboriginal heritage sites from impact areas of the Proposal. Further, no Aboriginal heritage sites were identified or predicted to occur in proposed work areas. Therefore, there are no predicted impacts to Aboriginal heritage from this Proposal.

In addition, identified Aboriginal sites near the Summerland Point ventilation shaft and fans would not be impacted by this Proposal as no impacts are proposed to occur in these areas and they will continue to be protected by the HMP.

No historic heritage items or areas of potential archaeological significance are located within the Site. No nearby historic heritage items would be impacted by the Proposal.

Management and monitoring of Aboriginal and historic heritage will continue to be undertaken in accordance with the Colliery's HMP which will be updated where required to accommodate the Proposal.

ES4.10 Wastes

Waste streams and volumes currently generated at the Colliery are expected to continue at comparative levels under the Proposal. Waste streams at the Colliery include solid, liquid and other minor wastes. These wastes are appropriately collected and stored for disposal, treatment, recycling or reuse. LakeCoal engages a number of licensed contractors for collection of wastes generated at the Colliery.

As there is no beneficiation of coal at the Colliery, there is no coal reject material which requires management or disposal. LakeCoal is committed to the principles of the *Waste Avoidance and Resource Recovery Act 2001* and provisions of the *Protection of the Environment Operations Act 1997* where priority is given to the prevention of waste generation. LakeCoal will implement a Waste Management Standard which will ensure waste production is minimised and appropriately managed.

ES4.11 Hazards

Potential existing hazards at the Colliery include bushfire, hazardous chemicals, risks to public safety, and spontaneous combustion. No additional potential hazards at the Colliery would result from the Proposal. LakeCoal currently implements various measures to manage these potential hazards which would continue under the Proposal.

ES4.12 Visual

Existing infrastructure and lighting at the Colliery have minor visual and lighting impacts on the surrounding visual landscape. These impacts are largely managed through maintenance of surrounding vegetation which screens the operations from sensitive viewpoints. The minor upgrades and modifications to infrastructure, additional truck movements, and additional surface lighting proposed under the Proposal would have minor to negligible visual impacts above those from the existing operations. Existing visual and lighting management measures would continue under the Proposal.

ES4.13 Soils

The Proposal is projected to have minimal consequences for soils as there is limited soil disturbance proposed. However, some proposed infrastructure upgrade and modification works could adversely impact soils, unless properly managed and monitored. Potential impacts include soil erosion and sediment loss, interaction with Acid Sulfate Soils and soil contamination. The implementation of specific plans to deal with these areas, namely Acid Sulfate Soils Management Plans, would ensure impacts are prevented or mitigated to acceptable levels. The Colliery's existing Water Management Plan would be updated to include any additional management measures required.

ES4.14 Rehabilitation

Rehabilitation objectives and methodology for the Colliery are set out in the current Mining Operations Plan (MOP) and incorporated into the Colliery's draft Rehabilitation Management Plan (RMP) which is currently with the Department of Resources and Energy for approval.

Whilst LakeCoal has committed to undertaking a progressive approach to rehabilitation of the mine, opportunities for progressive rehabilitation are limited as surface disturbance is largely restricted to areas of operational activities. Final rehabilitation of the Colliery would not occur until after the mine has closed, planned to be around 2027, subject to approval of the Proposal. Principles for the final rehabilitation have been established with the rehabilitated land intended to be compatible with surrounding vegetation communities.

Final land use would be determined in consultation with the land owner, Delta Electricity. Detailed rehabilitation proposals, including management and monitoring arrangements, would be provided in the MOP applying to the period incorporating mine closure and in the RMP, both of which would be subject to government approval.

ES4.15 Economic

A benefit-cost analysis of the Proposal was undertaken to determine whether it is acceptable from an economic efficiency perspective. The Proposal would result in an estimated net production benefit of \$218M, compared to estimated externality costs of \$1M. The net social benefits of the Proposal are estimated to be between \$217M and \$258M (when non-market value of employment is considered). Therefore, the Proposal is considered to be desirable and justifiable from an economic efficiency perspective.

Production benefits would be distributed amongst a range of stakeholders in Australia, including the local community, the NSW and Commonwealth governments, and LakeCoal. Externality costs may accrue to a number of stakeholders at the local, State, National and global level; however, it is anticipated that the costs would largely be insignificant due to the minor environmental impacts predicted.

The regional economic impact analysis estimated that the Proposal would result in a substantial additional contribution to the regional and NSW economies for the 14 year mine life period. If the Proposal does not proceed and the Colliery closes, a contraction in regional economic activity would occur. The significance of the impacts of closure would depend on the economic structure and trends in the regional economy at the time, whether other employment opportunities are available for displaced workers, and whether displaced workers and their families remain in the region.

The Proposal would provide substantial economic benefit to the NSW and regional economies. Accordingly, no mitigation measures are considered necessary.

ES4.16 Social

The Proposal does not propose to increase the Colliery's existing workforce. Therefore, there would be no increase in the region's population and, consequently, adverse social impacts on community infrastructure and services would be negligible. The Proposal would enable LakeCoal to continue to support the local community as a direct and indirect local employer, economic contributor and community partner.

The Colliery has a workforce of 160 workers and supports 418 and 635 families through direct and indirect employment, respectively. Approximately 90% of the Colliery's workforce resides within the Wyong and Lake Macquarie LGAs, with over half residing in the area for more than 15 years.

The Proposal would have no noticeable effects on the social amenity (in terms of noise, dust, odour, visual etc) of the surrounding areas. LakeCoal has implemented a range of measures to actively communicate and inform local stakeholders of its activities and to ensure it is able to identify opportunities to improve local amenity. LakeCoal would continue to address any Proposal-related concerns with local stakeholders during the EIS process and throughout the life of the mine.

The continued operations of the Colliery under the Proposal would provide sustained income, ongoing employment and positive flow-on effects. The presence of the workforce would also maintain positive impacts for the local economy due to demand for goods and services for other services and industries such as retail trade, hospitality, and construction. Conversely, the job losses that would result from the mine closure, should approval for the Proposal not be granted, would negatively affect the social wellbeing of the local area.

ES5 Conclusion

Previously unforeseen geological constraints will prevent LakeCoal from recovering the full resource approved under MP10_0161 and operations at the Colliery will cease in late 2013 unless access to additional reserves is approved before this time.

Developing the strategy for extension to mining provided the opportunity to review the Colliery's existing operations and identify initiatives that could enhance its value and improve efficiencies such as upgrades to infrastructure. These initiatives are reflected in the Proposal.

The Colliery is a long standing operation that has demonstrated its ability to efficiently extract a valuable natural mineral resource for the benefit of a range of stakeholders. The Proposal will enable the substantial regional and local economic and social benefits from the Colliery's operation to continue. It will also provide for the continued accrual of economic benefits to the local region from business expenditure, to the NSW Government in the form of royalties, and to the Commonwealth Government in the form of company and income taxes. The Colliery is also an important source of coal for VPPS and other customers.

The proposed mine design has been developed to find an appropriate balance between maximising resource extraction efficiency, minimising environmental impacts, and negating safety risks. This is demonstrated by secondary extraction areas occurring exclusively beneath Lake Macquarie and the application of the HWMSB, SPB and a layout to reduce the height of connective fracturing.

LakeCoal has committed to a range of management and monitoring measures that will be implemented throughout the life of the Proposal to prevent or minimise adverse impacts. Should the Proposal be approved it is assessed that it would be socially and economically desirable and its environmental impacts would be acceptable and meet all statutory requirements.

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1 Introduction

1.1 Background

The Chain Valley Colliery (the Colliery) is an underground coal mine located at the southern end of Lake Macquarie, approximately 60 km south of Newcastle (Figure 1.1). The Colliery is managed and operated by LakeCoal Pty Ltd (LakeCoal) on behalf of the Wallarah Coal Joint Venture. Underground mining has occurred at the Colliery since 1962 extracting coal from three seams – the Wallarah, Great Northern and Fassifern Seams, with current mining activities limited to the Fassifern Seam.

Pursuant to changes in the *Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Mining Act 1992* (Mining Act), which required mines that had commenced operations prior to the implementation of the EP&A Act to obtain an applicable approval under the EP&A Act by a specified date, LakeCoal sought approval for the continued operation of the Colliery with an application lodged in 2010. A Major Project Approval (MP10_0161) was granted by the Minister for Planning and Infrastructure on 23 January 2012 and pertained to the continued mining within three areas referred to as Parcel A and Domains No. 1 and No. 2 (Figure 1.2).

This Environmental Impact Statement (EIS) has been prepared to accompany a development application (DA) for state significant development (SSD) under Part 4, Division 4.1 of the EP&A Act for the Chain Valley Colliery Mining Extension 1 Project (the Proposal) as outlined in Section 1.2.

The EIS describes the Proposal, provides an assessment of its potential impacts and details measures that would be implemented to prevent, minimise and/or offset potential impacts. This information will be used by the Department of Planning and Infrastructure (DP&I), and relevant government agencies, to assess the Proposal's merits and make recommendations to the determining authority about whether or not to grant approval.

The land on which the Proposal would occur, if approved, is referred to throughout the EIS and supporting technical studies as the 'Site'. The Site is shown in Figure 1.2 and described in further detail in Section 1.4.

This EIS was prepared by EMGA Mitchell McLennan Pty Limited (EMM) on behalf of LakeCoal with input from a number of external specialists. The study team is presented in Appendix A.

1.2 Proposal overview

The Applicant is seeking development consent for:

- an extension of the currently approved extraction area to allow underground mining to continue within the Fassifern Seam;
- the increase of the approved maximum rate of production from 1.2 million tonnes per annum (Mtpa) to 1.5 Mtpa of run-of-mine (ROM) coal;
- an increase in the approved hours for haulage of coal from the Colliery on private roads to Delta Electricity's Vales Point Power Station (VPPS), i.e., from 5.30 am to 5.30 pm, Monday to Friday (excluding public holidays) to 24 hours a day, seven days a week. No change to the approved hours of haulage on the public road network is sought;
- minor upgrades and modifications to existing approved infrastructure; and

- an extension of the approved mining by a period of approximately 14 years, i.e., to around 2027.

The Proposal includes the consolidation of the above with all the operations and environmental activities currently approved under MP10_0161, as modified, within a single development consent.

The proposed mining extension area is referred to as Area 1 (Figure 1.2). Area 1 is divided into five separate mining areas (1A to 1E) to reflect the differing mining tenement holders in each area (Figure 1.3). These areas are located to the west, north, north-west, north-east and south-east of the currently approved mining area, respectively. Area 1 has been designed to ensure secondary extraction is undertaken entirely beneath Lake Macquarie.

The Proposal will enable substantial regional and local economic and social benefits from the Colliery's operation to continue, such as direct employment at the Colliery and indirect employment through suppliers, contractors and some industries. The Proposal will also provide for the continued accrual of economic benefits to the local region from business expenditure and in the form of voluntary contributions to community infrastructure and services, to the NSW Government in the form of royalties, to the Commonwealth Government in the form of company and income taxes and to coal-fired power generators through the provision of lower cost coal. The latter should also benefit electricity consumers through the provision of lower cost electricity.

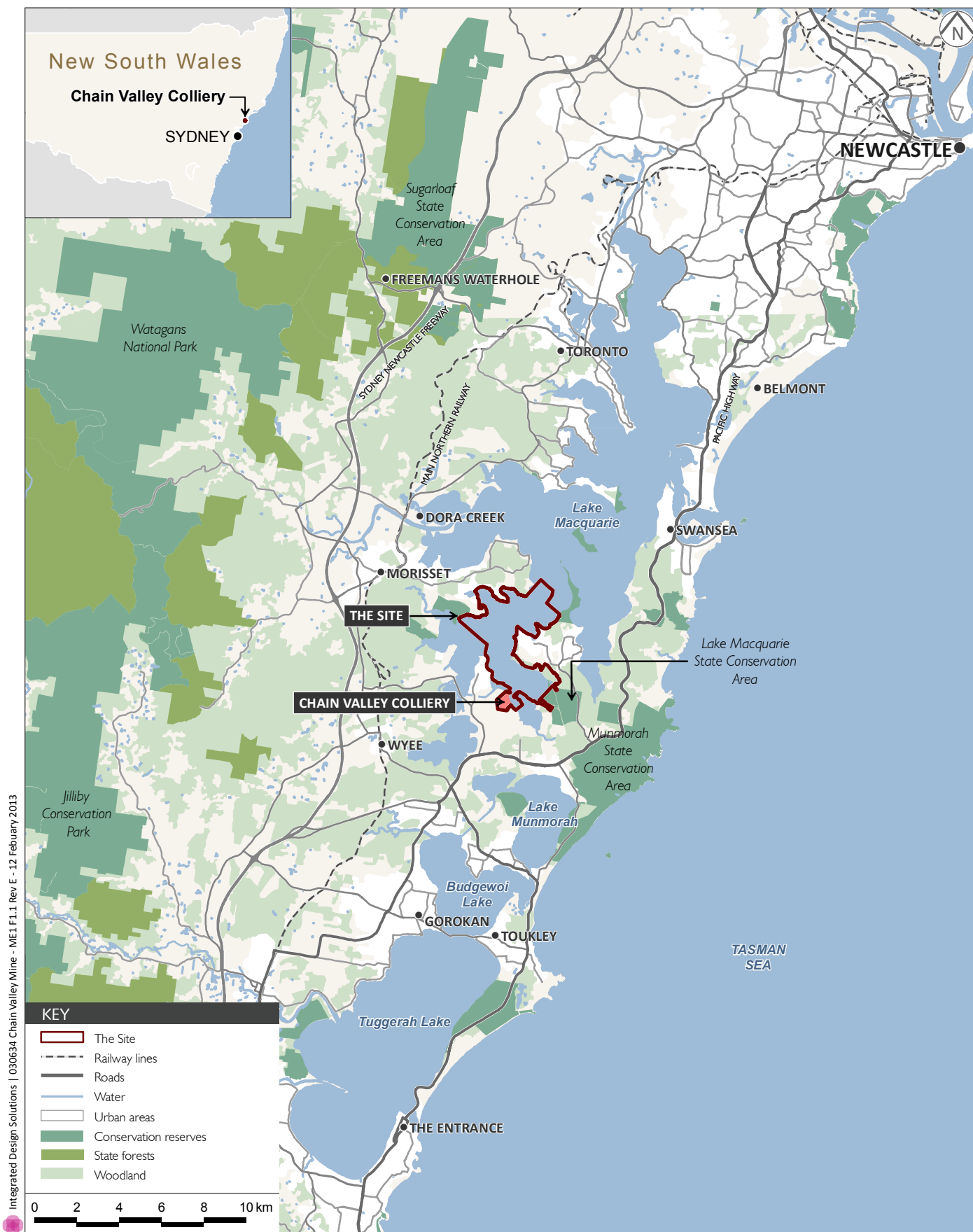
1.3 Applicant

The applicant is LakeCoal, the operator of the Colliery, which is wholly owned by LDO Coal Pty Ltd (LDO Coal). LakeCoal's contact details are as follows:

LakeCoal Pty Ltd
16 Spitfire Place, Rutherford
NSW 2320
Phone: (02) 4358 0800

Further information on the Colliery and its operations can be found at:

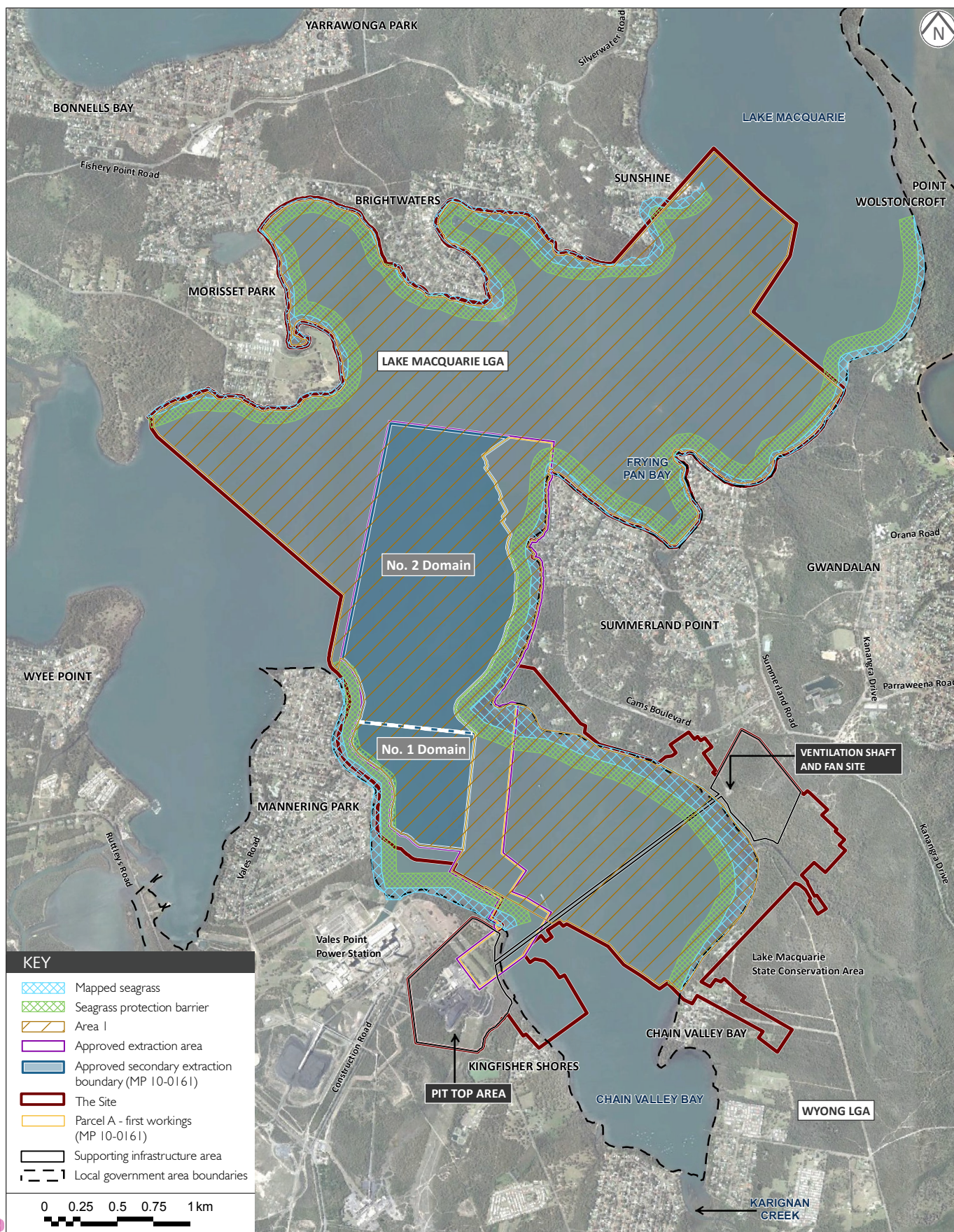
<http://www.chainvalleymine.com.au>



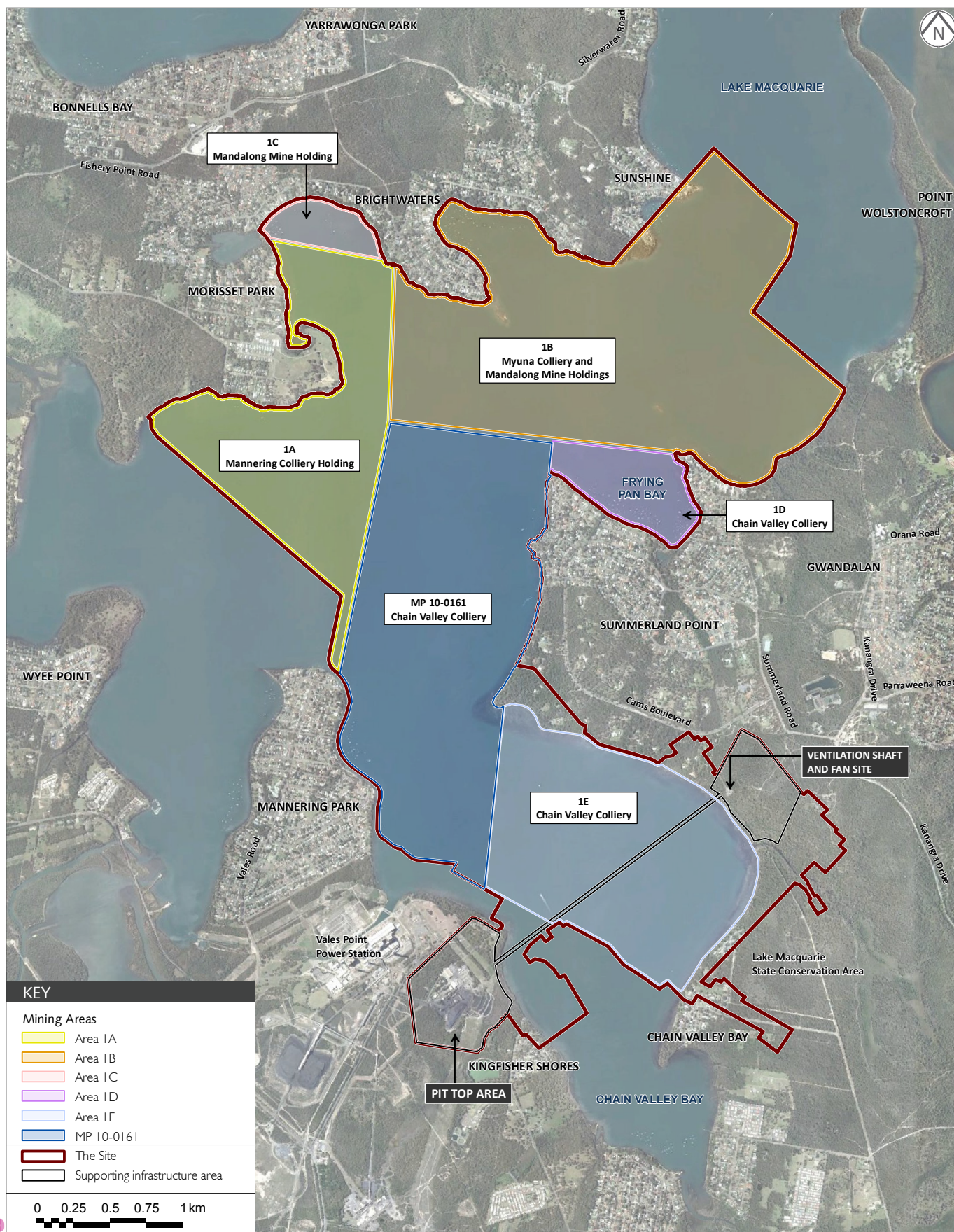
Regional context

Chain Valley Colliery Mining Extension | Project - Environmental Impact Statement

Figure I.1



The Site



Proposed mining areas 1A-1E

1.4 Site and surrounds

The Site is shown on Figure 1.2 and comprises the supporting infrastructure area (pit top area and ventilation shaft and fan site), approved mining areas and proposed mining areas at the Colliery. The Site, which is used to describe the area to which the Proposal applies, includes not only Area 1 but also the areas approved for mining under MP10_0161, with the intention that, should approval of the development application be granted, a single consent would apply to all mining operations at the Colliery. A schedule of lands for the Site is provided in Appendix B.

The Colliery's surface facilities are located at the pit top area at Mannering Park, adjacent to VPPS, and are accessed via Ruttleys Road and Construction Road (a private road which services the Colliery and VPPS). In addition, a ventilation shaft and fans are located at Summerland Point, north-east of the pit top area on the northern shore of Chain Valley Bay.

LakeCoal's mining tenements cover an area of approximately 2,100 hectares (ha) and straddle the boundary of Lake Macquarie and Wyong local government areas (LGAs). The Colliery's pit top area is located within the Wyong LGA, in an existing industrial area at the southern extent of Lake Macquarie and west of Chain Valley Bay.

The pit top area is approximately 1.1 km north of Mannering Colliery. Nearby residential areas include Kingfisher Shores and Chain Valley Bay to the south-east, Mannering Park to the north-west and Summerland Point and Gwandalan to the north-east. The closest privately owned residences to the Colliery are located at Kingfisher Shores, approximately 350 m south-east of the pit top surface infrastructure.

Areas of native vegetation occur adjacent to the pit top area, with the nearest protected area being Lake Macquarie State Conservation Area which lies adjacent to the eastern boundary of the Site, approximately 1.6 km east of the pit top area (see Figure 1.1).

1.5 Proposal need

1.5.1 Extension of mining area

The approval granted on 23 January 2012 for MP10_0161 provided a relatively short term approval life for the Colliery with expiry of the project approval on 31 December 2016. Geological features subsequently identified during mining of the approved secondary extraction area (Domains No. 1 and No. 2) will prevent LakeCoal from recovering all of the resource approved for mining under MP10_0161. It is now estimated that the reserves within the approved secondary extraction area will be exhausted by late 2013. If access to further coal reserves is not approved by this time, the Colliery will be forced to shut down, affecting employment and the supply of coal to VPPS and other customers. Therefore, the Proposal is critical to the ongoing operation of the Colliery and for the continuation of its local, State and National benefits.

Coal has met almost half of the increase in global energy demand over the last decade (International Energy Agency [IEA] 2011). In the World Energy Outlook 2011, IEA examined a number of future energy scenarios, including: maintaining current policies; implementing recent government policy commitments in a cautious manner; and the policies required to limit the long-term increase in the global mean temperature to 2°C above pre-industrial levels.

All of the energy scenarios involve an increase in coal consumption in the next decade (at least), with coal consumption in 2035 at least similar to total world coal demand in 2009 (IEA 2011). The Proposal will allow for the extraction of a State significant resources located within existing mining tenements using existing infrastructure.

Mining of black coal is one of Australia's most important industries, creating significant employment and revenue in regional Australia. Australia is the world's largest coal exporter and black coal is Australia's second highest export commodity (Australian Coal Association 2012). Approximately 147.3 million tonnes (Mt) of saleable black coal was produced in NSW in 2009/2010 or 40% of the total Australian production (Australian Bureau of Agricultural and Resource Economics and Sciences 2010). The Proposal will allow continued supply of these important resources and continued contribution to export sales and associated earnings for Australia.

The black coal mining industry also plays a critical role in the supply of electricity to NSW customers with nearly 90% of the State's electricity generated from coal. All of the generating corporations are investing in other forms of electricity production (gas and renewables) and these alternatives will help to meet growing demands. However, they will not generate enough electricity to replace that produced by coal-fired power stations on a continual basis, and it is probable that coal will continue to fuel a constant proportion of increasing electricity production.

Since 1996, when the National Electricity Market was introduced, about 15 – 20% of NSW's electricity needs have been supplied by other states, especially Victoria and Queensland, where the generators have their own sources of coal. This arrangement has substantial cost and environmental implications because there are considerable losses in transmitting electricity over the much greater distances from inter-state generating stations. Given its proximity to VPPS, the Colliery is well placed to provide a secure source of predictably priced thermal coal to help supply the State's needs into the future.

Affordable energy is a prerequisite for any developed economy. Substantial social costs would occur if NSW experiences disproportionate increases in electricity prices compared with other parts of Australia or its peer economies internationally.

1.5.2 Production rate

Developing the strategy for extension of mining operations also provided the opportunity to review the Colliery's existing operations and identify initiatives that could enhance its value and improve efficiencies. An increase to the approved maximum rate of production will involve the orderly use of established infrastructure, with no additional infrastructure required to accommodate the increased production rate other than minor upgrades and modifications to improve efficiencies or environmental outcomes. All of the additional 300,000 tonnes per annum (tpa) of coal extracted will be transported to the VPPS in response to demand for fuel to generate the region's electricity requirements.

1.5.3 Private road haulage hours

Mining at the Colliery operates 24 hours a day, 7 days a week under MP10_0161; however, haulage of coal between the Colliery and VPPS is restricted to 5.30 am to 5.30 pm, Monday to Friday (excluding public holidays). Consequently, there is a current need to stockpile coal extracted outside of the current approved haulage hours which necessitates double handling. This activity is not only inefficient but exacerbates potential environmental impacts in the form of air and noise emissions.

As the Proposal will increase the Colliery's production rate, transport of product coal to the VPPS requires greater flexibility. An increase in the hours of haulage would enable additional product coal to be transported directly to the VPPS, thereby increasing operational efficiencies and potentially reducing double handling of the product coal which will, in turn, help to reduce potential environmental impacts.

1.5.4 Surface infrastructure

LakeCoal has identified an opportunity to upgrade and modify pit top surface infrastructure, much of which has not been replaced since the commencement of operations at the Colliery in 1962, to enable improved operational efficiencies and manage potential environmental impacts from the Proposal.

The proposed changes to infrastructure are likely to support commitments made in several of LakeCoal's recently approved management plans. For example, the Colliery's Noise Management Plan (NMP) commits to the development of a noise reduction program which identifies the most effective and efficient means to reduce the noise emissions from the Colliery.

The proposed changes to infrastructure also accord with the Coal Mine Particulate Matter Control Best Practice Pollution Reduction Program (PAEHolmes 2012) which includes investigation of potential measures such as the use of a stacker to replace hauling between the current conveyor system and stockpile.

1.6 Director-General's Requirements

A request for Director-General's Requirements (DGRs) was submitted to the Director-General of the DP&I on 3 August 2012. The EMM document Request for Director-General's Requirements: Supporting Documentation (EMM 2011a), which was prepared and submitted with the request to assist the Director-General in preparing the DGRs for the Proposal, contained information relating to potential environmental impacts arising. The DGRs were issued on 14 August 2012 and are attached as Appendix C of this EIS.

As required under Section 78A of the EP&A Act, this EIS has been prepared in accordance with the DGRs. A list of each of the requirements and the relevant sections of the EIS that address the requirements are provided in Table 1.1. Each technical report also includes a list of DGRs and agency assessment requirements related to the particular environmental aspect and a reference where each of these has been addressed within the respective report.

Table 1.1 Summary of Director-General's Requirements

| Requirement | EIS reference |
|--|--|
| General Requirements | |
| The Environmental Impact Statement (EIS) for the development must meet the form and content requirements in Clauses 6 and 7 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000. | Volumes 1, 2, 3 and 4 |
| In addition, the EIS must include a: | |
| <ul style="list-style-type: none"> detailed description of the development, including: <ul style="list-style-type: none"> need for the proposed development; justification for the proposed mine plan, including efficiency of coal resource recovery, mine safety, and environmental protection; likely staging of the development - including construction, operational stage/s and rehabilitation; | <p>Section 1.5</p> <p>Section 3.1</p> <p>Sections 3.1 and 20.3</p> |

Table 1.1 Summary of Director-General's Requirements

| Requirement | EIS reference |
|---|---|
| <ul style="list-style-type: none"> - likely interactions between the development and existing, approved and proposed mining operations in the vicinity of the Site, particularly the approved Myuna Coal Project; - plans of any proposed building works; • consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments; • risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment; • detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment, which includes: <ul style="list-style-type: none"> - a description of the existing environment, using sufficient baseline data; - an assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and - a description of the measures that would be implemented to prevent, minimise and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage any significant risks to the environment; and • consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EIS. | <p>Sections 2.4 and 3.2</p> <p>Section 3.1.4</p> <p>Section 4.4</p> <p>Chapter 6</p> <p>Chapters 7 to 22</p> <p>Chapter 23</p> |
| Key Issues | |
| The EIS must address the following specific issues: | |
| Subsidence – including a detailed quantitative and qualitative assessment of the potential conventional and non-conventional subsidence impacts of the development that includes: | |
| <ul style="list-style-type: none"> • accurate predictions of the potential subsidence effects and impacts of the development, paying particular attention to the long-term stability of final pillars, including a robust sensitivity analysis of these predictions; • predictions of the potential cumulative subsidence effects and impacts from the development in conjunction with overlying and adjacent mining (whether historical, approved or proposed), including a robust sensitivity analysis of these predictions; • a detailed assessment of the potential environmental consequences of these effects and impacts on both the natural and built environment, paying particular attention to: <ul style="list-style-type: none"> - Lake Macquarie including its bed, seagrass beds and foreshores; and - other features considered to have significant economic, social, cultural or environmental values; and • a detailed description of the measures that would be implemented to prevent, minimise, remediate and/or offset subsidence impacts and environmental consequences (including adaptive management and proposed performance measures); | <p>Chapter 12 and Appendix I</p> <p>Appendix I</p> <p>Appendix I</p> <p>Sections 13.3.3 and 15.3</p> <p>Sections 12.4, 13.4 and 15.4 and Appendix I</p> |
| Traffic & Transport – including: | |
| <ul style="list-style-type: none"> • a detailed assessment of potential impacts of the development on the capacity, safety and efficiency of the local and regional road network, with particular regard to the condition of the existing road network; • a description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network in the surrounding area over the life of the development; and • an economic justification of transporting coal on public roads, including an assessment of alternative transport methods; | <p>Section 11.3 and Appendix H</p> <p>Section 11.4 and Appendix H</p> <p>Section 11.2.2 and Appendix H</p> |

Table 1.1 Summary of Director-General's Requirements

| Requirement | EIS reference |
|--|--|
| Water Resources – including: <ul style="list-style-type: none"> detailed assessment of potential impacts on the quality and quantity of existing surface and ground water resources, including detailed modelling of potential groundwater impacts; a detailed site water balance, including a description of site water demands, water disposal methods (inclusive of volume and frequency of any water discharges), water supply infrastructure and water storage structures; an assessment of proposed water discharge quantities quality/ies against receiving water quality and, if relevant, flow objectives; identification of any licensing requirements or other approvals under the Water Act 1912 and/or Water Management Act 2000; and a detailed description of the proposed water management system (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts; | <p>Section 7.3 and 8.3 and Appendices D and E</p> <p>Section 8.3.1 and Appendix E</p> <p>Section 8.3 and Appendix E</p> <p>Sections 4.5.7, 4.5.8 and 7.2.3</p> <p>Sections 7.4, 8.2 and 8.4 and Appendices D and E</p> |
| Biodiversity – including: <ul style="list-style-type: none"> a detailed assessment of potential impacts of the development on any terrestrial or aquatic threatened species or populations and their habitats, endangered ecological communities, groundwater dependent ecosystems and benthic communities in Lake Macquarie; and measures taken to prevent, reduce or mitigate impacts on biodiversity; | <p>Section 13.3 and 14.3 and Appendix J</p> <p>Sections 13.4 and 14.4</p> |
| Noise – including a quantitative assessment of potential: <ul style="list-style-type: none"> construction, operational and off-site transport noise impacts; reasonable and feasible mitigation measures, including evidence that there are no such measures available other than those proposed; and monitoring and management measures, in particular real-time and attended noise monitoring; | <p>Section 9.3 and Appendix F</p> <p>Section 9.4 and Appendix F</p> <p>Section 9.4</p> |
| Air Quality – including a quantitative assessment of potential: <ul style="list-style-type: none"> construction and operational impacts, with a particular focus on dust emissions including PM2.5 and PM10 emissions; reasonable and feasible mitigation measures to minimise dust emissions, including evidence that there are no such measures available other than those proposed; and monitoring and management measures; | <p>Section 10.3 and Appendix G</p> <p>Section 10.4 and Appendix G</p> <p>Section 10.4</p> |
| Greenhouse Gases – including: <ul style="list-style-type: none"> a quantitative assessment of potential Scope 1, 2 and 3 greenhouse gas emissions; a qualitative assessment of the potential impacts of these emissions on the environment; and an assessment of reasonable and feasible measures to minimise greenhouse gas emissions and ensure energy efficiency; | <p>Section 10.3.3 and Appendix G</p> <p>Section 10.3.3 and Appendix G</p> <p>Section 10.4.2</p> |
| Rehabilitation – including the proposed rehabilitation strategy for the Site, having regard to the key principles in the Strategic Framework for Mine Closure, including: <ul style="list-style-type: none"> rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria; nominated final land use, having regard to any relevant strategic land use planning or resource management plans or policies; and the potential for integrating this strategy with any other rehabilitation and/or offset strategies in the region. | <p>Chapter 20.2</p> <p>Chapter 20.2</p> <p>Section 20.2.5</p> |

Table 1.1 Summary of Director-General's Requirements

| Requirement | EIS reference |
|--|--|
| Heritage – both Aboriginal and non-Aboriginal; | Chapter 15 |
| Hazards – paying particular attention to public safety, including bushfires; | Chapter 17 |
| Waste – including: <ul style="list-style-type: none"> • accurate estimates of the quantity and nature of the potential waste streams of the development; and • a description of measures that would be implemented to minimise production of waste on site, and ensure that waste produced is appropriately managed; and | Section 16.2.5 Section 16.4 |
| Social & Economic – including an assessment of the: <ul style="list-style-type: none"> • potential direct and indirect economic benefits of the development for local and regional communities and the State; • potential impacts on local and regional communities, including: <ul style="list-style-type: none"> - increased demand for local and regional infrastructure and services (such as housing, childcare, health, education and emergency services); and - impacts on social amenity; • a detailed description of the measures that would be implemented to minimise the adverse social and economic impacts of the development, including any infrastructure improvements or contributions and/or voluntary planning agreement or similar mechanism; and • a detailed assessment of the costs and benefits of the development as a whole, and whether it would result in a net benefit for the NSW community. | Section 21.3.2 and Appendix M Section 22.3 and Appendix N Section 22.4 Section 21.2.3 |
| Plans and Documents The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule I of the Environmental Planning and Assessment Regulation 2000. These documents should be included as part of the EIS rather than as separate documents. | Figures 2.4 and 3.1 |
| Consultation During the preparation of the EIS, you must consult with relevant local, State and Commonwealth Government authorities, service providers, community groups and affected landowners. In particular you must consult with the: <ul style="list-style-type: none"> • Commonwealth Department of Sustainability, Environment, Water, Population and Communities; • Office of Environment and Heritage (including the Heritage Branch); • Environment Protection Authority; • Division of Resources and Energy within the Department of Trade and Investment, Regional Infrastructure and Services; • Department of Primary Industries (including the NSW Office of Water, NSW Forestry, Agriculture and Fisheries sections, Catchments and Lands (Crown Lands Division)); • Transport for NSW (including the Centre for Transport Planning, and Roads and Maritime Services); • Mine Subsidence Board; • NSW Health; • Hunter Central Rivers Catchment Management Authority; • Gosford - Wyong Councils Water Authority; • Wyong Shire Council; • Newcastle City Council; and • Lake Macquarie City Council. | Chapter 5 |

Table 1.1 Summary of Director-General's Requirements

| Requirement | EIS reference |
|---|-----------------------------|
| The EIS must: | |
| • describe the consultation process used and demonstrate that effective consultation has occurred; | Section 5.3 |
| • describe the issues raised by public authorities, service providers, community groups and landowners; | Section 5.4 |
| • identify where the design of the development has been amended in response to issues raised; and | Section 5.5 |
| • otherwise demonstrate that issues raised have been appropriately addressed in the assessment. | Section 5.5 |
| Further consultation after 2 years | |
| If you do not lodge a DA and an EIS for the development within 2 years of the issue date of these DGRs, you must consult further with the Director-General in relation to the requirements for lodgement. | N/A |
| References | |
| The assessment of the key issues listed above must take into account relevant guidelines, policies, and plans as identified. | Volumes 1, 2, 3 and 4 |
| Office of Environment and Heritage requirements | |
| The EIS must include an assessment of how the increase in water depth due to mine subsidence will affect the amount of light reaching the benthos and how this may affect plant productivity (i.e. benthic microalgae and seagrass as well as macroinvertebrate abundance and diversity). | Appendix J and Section 13.3 |
| The proposed development is considered unlikely to impact on threatened biodiversity covered by the <i>Threatened Species Conservation Act 1995</i> . However, the EIS should include a specific Statement of Commitments that in the event that subsidence of other impacts from the proposed development do adversely impact on threatened biodiversity, then those impacts will be offset in accordance with OEH policy, either OEH's 'Principals for the use of biodiversity offsets in NSW' (DECC 2011) or the 'NSW OEH Interim policy on assessing and offsetting biodiversity impacts of Part 3A, State significant development (SSD) and State significant infrastructure (SSI) projects' (OEH 2011). | Section 14.3.1 |
| The proponent must prepare a 'Heritage Management Plan' for the Project in consultation with the registered Aboriginal parties to detail management strategies for Aboriginal cultural heritage values associated with the broader project area. | Sections 2.3.3 and 15.4 |

1.7 EIS structure

This EIS has been prepared in accordance with the EP&A Act and Environmental Planning and Assessment Regulation 2000 (EP&A Regulation), and addresses the requirements of the relevant government agencies and matters raised during consultation with the community and special interest groups.

The EIS contains four volumes. Volume 1 contains the main report, the executive summary and Appendices A to C, which comprise:

- Appendix A – Study team
- Appendix B – Schedule of lands
- Appendix C – Director-General's Requirements

Volume 2 contains Appendices D to G, which comprise:

- Appendix D – Groundwater impact assessment
- Appendix E – Surface water impact assessment
- Appendix F – Noise impact assessment
- Appendix G – Air quality and greenhouse gas impact assessment

Volume 3 contains Appendices H to I, which comprise:

- Appendix H – Traffic impact assessment
- Appendix I – Subsidence impact assessment

Volume 4 contains Appendices J to N, which comprise:

- Appendix J – Marine ecology impact assessment
- Appendix K – Terrestrial flora and fauna appendices
- Appendix L – AHIMS search results
- Appendix M – Economic impact assessment
- Appendix N – Social impact assessment

2 Existing operations

2.1 History of Chain Valley Colliery

Underground mining has occurred at the Colliery since 1962 using a combination of bord and pillar and miniwall mining methods (refer to Section 2.2.2). Up until 2011 secondary extraction was undertaken using bord and pillar methods, whereas since 2011 secondary extraction at the Colliery has employed the miniwall mining method.

Historic workings are located under the southern extent of Lake Macquarie and areas of Summerland Point, Chain Valley Bay, Mannering Park and Kingfisher Shores. Areas of these historic workings within the Site are used for passive operational activities, such as: ventilation; water drainage; movement of personnel, materials and coal; conveyors; and services.

As discussed in Section 1.1, until January 2012 the Colliery continued to operate under Section 74 of the Mining Act which exempted mines operating in a mining lease prior to the implementation of the EP&A Act from the provisions of both environmental planning instruments (EPIs) and the EP&A Act. However, a repeal of Section 74 in December 2005 and an amendment of the EP&A Regulation meant that an approval under the EP&A Act was required for the Colliery's continued operation. MP10_0161 for the Domains 1 and 2 Continuation Project was granted by the Minister for Planning and Infrastructure on 23 January 2012.

An application to modify MP10_0161 under Section 75W of the EP&A Act was lodged with DP&I on 16 March 2012. The application sought approval for the revision of the miniwall panel layout and an increase in the maximum extraction width of particular miniwall panels. All other components of the Colliery as approved under MP10_0161 remained unchanged in the application.

An Environmental Assessment (EA) was prepared by EMM to support the MP10_0161_Mod 1 application (EMM 2012b). The EA was exhibited between 18 July and 2 August 2012 and a response to the six submissions received was submitted to the DP&I on 8 August 2012. The modification was approved by DP&I on 30 August 2012.

A summary of the current operations at the Colliery approved under MP10_0161, as modified, is provided in Table 2.1.

Table 2.1 Summary of approved operations at the Colliery

| Aspect | Summary |
|---------------------------------|--|
| Overview | <p>The Colliery's approved operations include:</p> <ul style="list-style-type: none"> • extraction of up to 1.2 Mtpa of ROM coal from the Fassifern Seam until 31 December 2016, from existing mining leases; • crushing coal at the Colliery's Coal Preparation Plant (CPP); • transporting coal by public roads to Port Waratah Coal Services (PWCS) for export; • transporting coal by private roads to VPPS and by public roads to Munmorah Power Station (MPS)¹ and other customers for domestic use; • installation and operation of upgraded ventilation shaft fans at Summerland Point; and • rehabilitation of pit top facilities, if the life of mine is not extended by a subsequent approval. |
| Mining and reserves | <p>Within Parcel A – continuation of first workings in the Fassifern Seam.</p> <p>Within Domains No. 1 and No. 2 – potential full extraction from the Fassifern Seam using a combination of full and partial bord and pillar extraction and miniwall mining.</p> |
| Mining methods | <p>Mining undertaken as bord and pillar (first workings) and subsequent full and partial pillar extraction (second workings) using continuous miners, as well as the recently-introduced use of miniwall mining methods (second workings) with extracted panel width up to 97 m.</p> <p>Extraction at a height up to 3.5 m, with roadways generally 3 m in height and extraction of approximately 4.4 Mt of ROM coal in total.</p> |
| Project life | Mining operations are approved until 31 December 2016. |
| Existing surface infrastructure | <p>Utilisation of existing surface infrastructure, including:</p> <ul style="list-style-type: none"> • personnel-and-material drifts, ROM coal conveyor drift; • upcast and downcast ventilation shaft and fans; • coal handling facilities for breaking, crushing, sizing and storing product coal; • administration and workshop facilities; and • water management infrastructure. |
| Coal processing | Screening and crushing of ROM coal at the Colliery. |
| Water demand and supply | 105 megalitres per annum in water use, drawn from Wyong Shire Council's (WSC) potable water supply mains. |
| Coal reject management | No coal rejects are generated. |
| Hours of operation | The mining operations are approved 24 hours a day, 7 days a week. Trucks delivering coal are only to be despatched between 5.30 am and 5.30 pm, Monday to Friday (excluding public holidays). |
| Product coal transport | <p>Road transportation via public roads to PWCS for export and to domestic industrial customers, including MPS and others. Approximately 55% of product is transported to the PWCS terminal and 45% to local customers.</p> <p>Road transportation via private roads to VPPS.</p> |
| Mine access | Existing road access from Construction Road, off Ruttleys Road. |
| Rehabilitation | Decommissioning of surface facilities and final rehabilitation following mine closure. |
| Employment | Employment of 120 full time personnel, as well as 40 full time equivalent contractors. |

Notes: 1. Approved but no currently undertaken. Additional work required prior to recommencing haulage to Munmorah Power Station.

The Colliery has been an important part of the local community for over 50 years, bringing with it significant economic and social benefits as identified in Chapters 21 and 22, respectively. Due to the long history of operations at the Colliery, there is also a good understanding of the social, physical and economic environments surrounding the Colliery. An overview of environmental management at the Colliery is provided in Section 2.3.

As described in Section 1.2, LakeCoal seeks to replace MP 10_1061 through the provision of a single consolidated development consent. Where appropriate, further detail on the existing operations and activities listed in Table 2.1 are provided in the following sections.

2.2 Mining

2.2.1 Coal reserves

The regional rock sequence in which the Colliery is situated transitions from coal bearing Permian strata to barren fluvial Triassic sediments. In particular, the strata include the Late Permian Moon Island Beach Subgroup of the Newcastle Coal Measures.

The Moon Island Beach Subgroup includes three major coal members – the Wallarah, Great Northern and Fassifern Seams. The Colliery was established to extract coal from these three seams. Typical stratigraphy within the Site is shown in Figure 2.1.

Within the Colliery's existing lease areas, extraction from within the Wallarah Seam is complete, and mining operations are currently being undertaken in the Fassifern Seam, the stratigraphically lower of the three seams. No mining in the Great Northern Seam is currently being undertaken; however, there are reserves remaining within the seam.

In the area of current mining, the Fassifern Seam lies 20 m to 60 m below the Great Northern Seam. It is approximately 4.5 m to 5.5 m thick with a working section of between 3 m to 3.5 m, leaving a coal roof and floor. The immediate non-coal roof and floor material is a tuffaceous claystone of varying hardness.

2.2.2 Mining methods

Operations at the Colliery consist of two phases: first workings where an initial cut of coal is extracted and negligible surface subsidence occurs; and secondary extraction where the majority of the coal reserves are extracted and, therefore, is the more productive phase of mining. Secondary extraction is generally necessary for the commercial viability of a mine, whereas first workings are necessary to establish roadways for access and ventilation.

The first workings necessary to support miniwall mining consist of the establishment of roadways, including main headings and gateroads. The roadways are constructed by mining the coal seam using a wide head continuous miner. The continuous miner has bolting rigs attached which allow installation of roof and rib support as the roadway development progresses. The coal produced is then transferred from the continuous miner to shuttle cars and then onto a conveyor which transports the coal to the surface facilities. Blocks of coal, or pillars, are left in the roadways to maintain the stability of the roof. Once developed, the main headings (or mains) connect the miniwall panels and provide access for equipment and personnel. The gateroads consist of two roads (maingate and tailgate) which extend from the mains and run parallel along the sides of the panel. The gateroads are connected at the end of the panel by an installation road which creates the face of the miniwall extraction block. The pillars of coal retained within the gateroads between two panels are referred to as chain pillars.

Secondary extraction by the miniwall method involves the use of shearing drums to cut back and forth across the face. The miniwall block is mined back towards the main headings. As the face is mined, the coal drops onto an armoured conveyor, is crushed and then loaded onto a conventional conveyor and transported up the maingate to the main headings and then to the surface facilities. Hydraulic roof supports known as chocks temporarily hold the roof up where coal has been extracted and provide protection for the operators. As mining progresses the roof then falls into the void (or goaf) created as the chocks advance, resulting in subsidence. Unless geological or safety considerations require otherwise, the miniwall block is fully extracted back to a solid block (barrier pillar) retained adjacent to the mains to provide stability in those headings. An illustration of the miniwall mining method is shown in Figure 2.2.

The miniwall mining method is considered the most appropriate method for the Colliery due to the geology in the Fassifern Seam and reduced levels of subsidence when compared to other underground mining methods such as longwall mining and, in some cases, bord and pillar mining. Miniwall mining also allows for increased recovery of reserves and safer mining conditions in comparison to bord and pillar mining.

The longwall method is similar to the miniwall method, where single slices of coal are progressively extracted, but involves extraction over a broader face width. For example, where a typical miniwall may result in the extraction of a block of coal of less than 100 m in width, a longwall would typically undertake extraction up to and over 300 m in width. Although longwall mining provides for greater recovery volumes of the reserves than miniwall mining, the miniwall method is preferred due to the geotechnical, safety and subsidence management considerations, primarily a consequence of the mining activities being undertaken below Lake Macquarie.

2.2.3 Mining parameters

The extent of secondary extraction activities in each miniwall panel (i.e., panel lengths) within the proposed mining areas have been specifically designed to ensure protection of:

- the Lake Macquarie foreshore – by the use of a high water mark subsidence barrier (HWMSB), consistent with the requirements of the relevant mining leases;
- seagrass communities – by the use of a seagrass protection barrier (SPB) consistent with Conditions 19 and 20 of the existing Subsidence Management Plan approval; and
- land based infrastructure – through the adoption of the HWSMB and confining extraction to areas underlying Lake Macquarie.

The application of the HWMSB is required as a condition of the relevant mining tenements and has been developed to protect foreshore areas and the boundary of water bodies from mining induced subsidence. The width of the HWMSB is determined by a 35° angle of draw lakewards from the High Water Mark and from the point 2.44 m AHD above the High Water Mark landward to the depth of the workings (see Figure 2.3). The Colliery's HWMSB is shown in Figure 3.1.

The SPB was adopted by LakeCoal to protect the seagrass beds of Lake Macquarie from any potential impacts from underground mining at the Colliery. The width of the SPB is determined by a 26.5° angle of draw from the surveyed boundary of the seagrass beds to the depth of the workings (see Figure 2.3). The SPB is shown in Figure 1.2.

The maximum vertical subsidence predicted for the Project approved under MP10_0161 (as modified) is 418 mm. To-date the Colliery has completed mining of Miniwalls (MWs) 1 and 2 and partially extracted MW 3, with a detailed bathymetric survey undertaken in March 2012 to measure lake depths accurately and calculate subsidence based on a comparison with a 2010 bathymetric survey completed by the Office of Environment and Heritage (OEH). At that time, the results showed approximately 100 mm of subsidence in the areas of completed miniwall mining. Predicted subsidence associated with the Proposal is detailed in Chapter 12.

2.2.4 Extraction rate

Extraction rates in the years prior to the introduction of the miniwall method in 2011 approximated 750,000 tpa of ROM coal, with a historical maximum of 1.1 Mtpa ROM coal. The Colliery has produced approximately 940,000 tonnes (t) in the 12 months to November 2012 utilising miniwall mining methods. While production was expected to reach close to the maximum of 1.2 Mt of ROM coal, as approved under MP10_0161, productivity was affected by mechanical issues and development float during 2012.

2.2.5 Coal processing

The Colliery produces a raw crushed thermal coal with relatively low sulphur which is suitable for both export and domestic markets. Raw coal is crushed underground following extraction from the seam and then transported to the surface on conveyor via a 500 t interseam bin. Once on the surface, it undergoes a screening and secondary sizing process according to the specific market demands of the customer. The extracted coal does not require washing or additional treatment. As a result, ROM coal production equates to product coal production from the Colliery.

Product coal is conveyed to one of two on-site product bins prior to being loaded into trucks for delivery either off site or to the product stockpile. Production volumes, customer demand, shipping schedules and current limitations on product coal transport necessitate the need for product coal stockpiling.

Generally, the product stockpile is in the order of 40,000 t, but can be up to 150,000 t depending on the above factors.

As there is no beneficiation of coal product at the Colliery, there is no coal reject material which requires management or disposal.

2.2.6 Product coal transport

Product coal from the Colliery is hauled by truck, either to domestic customers or to the PWCS loader at Carrington East where it is loaded onto ships destined for international customers. Truck loading currently occurs between the hours of 5.30 am and 5.30 pm, Monday to Friday (excluding public holidays).

Haulage to PWCS involves transport via a number of public roads as described in Chapter 11.

Approximately 30% of product coal is currently sold to the adjacent VPPS. Haulage of product coal to VPPS does not necessitate trucks travelling on any public roads, with all transport occurring via the Colliery's access road and Construction Road, both of which are private sealed roads.

In addition to the coal supply to VPPS and the export coal supply via PWCS at Carrington, approximately 180,000 tpa of coal is currently supplied to other domestic customers. Domestic coal transport generally occurs on days when the transportation of export coal is not occurring to minimise truck movements on public roads.

LakeCoal recognises that transport of coal to PWCS via public roads is a concern to the community and government and is currently investigating options for the use of rail to enable export coal to reach the port of Newcastle. In this regard, a significant amount of work has been undertaken on analysis of environmental constraints and engineering feasibility relating to installation of the infrastructure necessary to enable rail haulage. Additional details on these investigations and their outcomes are provided in Section 3.3.5.

In accordance with MP10_0161, a coal transport options report was submitted to the Director-General of Planning and Infrastructure for approval on 28 December 2012. This report, which will be reviewed and revised every two years, focuses on options to reduce or eliminate the use of the public roads for the transport of coal.

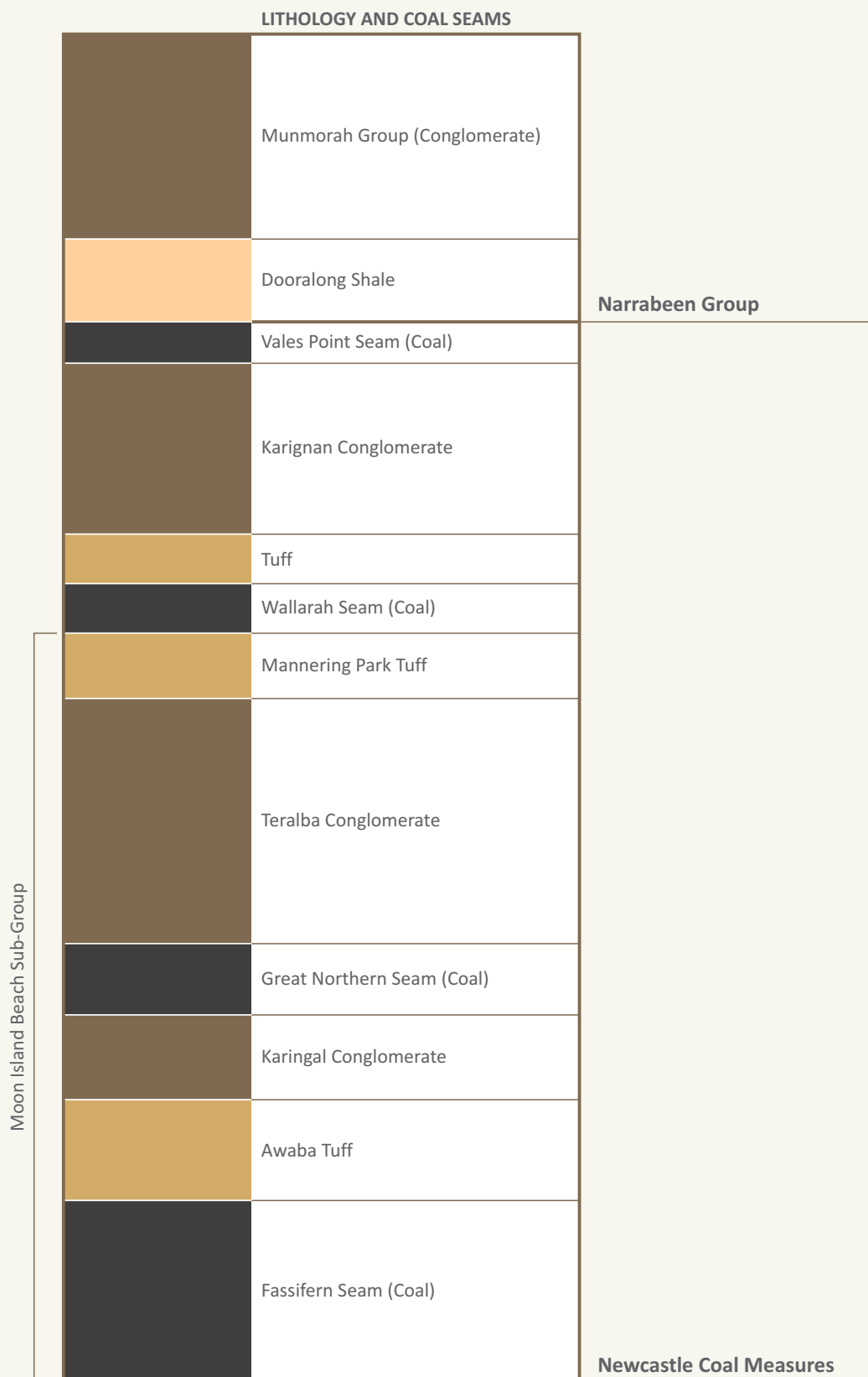
LakeCoal has recently updated the Road Transport Protocol (RTP) for the Colliery which describes the designated haulage routes, truck movements and haulage hours and includes a Traffic Management Plan (TMP) and Code of Conduct for truck drivers, and is in the process of establishing an agreement with WSC for the contribution of funds for the maintenance of local roads in accordance with Schedule 3, Condition 24 of MP10_0161.

2.2.7 Site infrastructure

The surface infrastructure supporting the Colliery is located at the pit top area and Summerland Point. The infrastructure at the pit top is shown on Figure 2.4 and includes:

- main administration offices;
- a surface electrical sub-station, cable belt switch room and electrical haulage rooms;
- ROM and final product bins;
- a bath house;
- a workshop;
- storage sheds;
- 80,000 and 132,000 litre water tanks;
- settling and diffusing ponds;
- a ROM coal bin;
- a coal stockpile area;
- a downcast ventilation shaft; and
- various other items such as compressors, a weighbridge, water storage and a diesel storage tank.

At Summerland Point, site infrastructure comprises an upcast ventilation shaft and fans within a fenced compound, an overhead and underground power supply, and an unsealed access road.

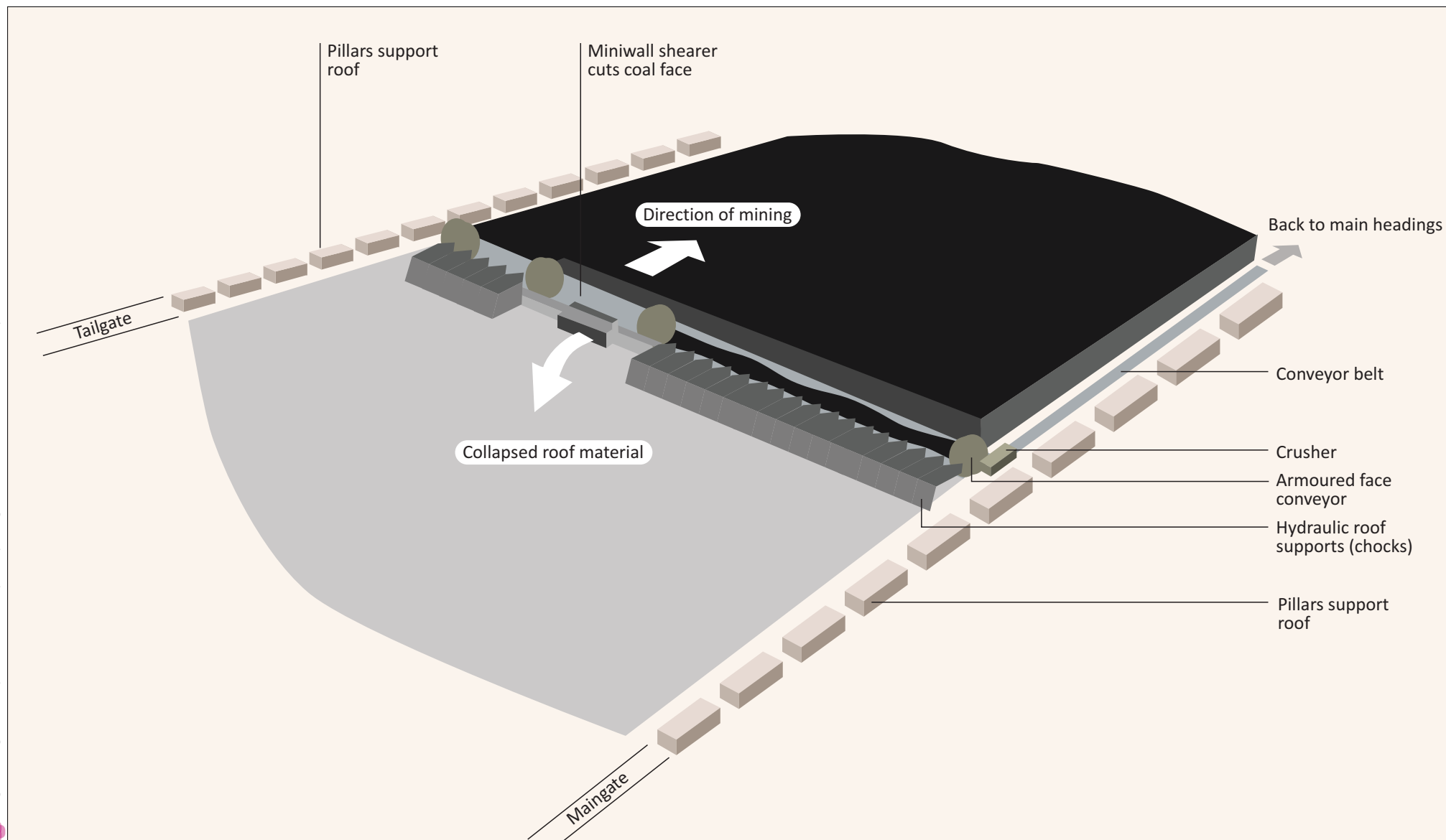


Source: Modified by AECOM (2011) from Seedsman Geotechnics Pty Ltd (2010).

Typical stratigraphy at the Site

Chain Valley Colliery Mining Extension 1 Project - Environmental Impact Statement

Figure 2.1

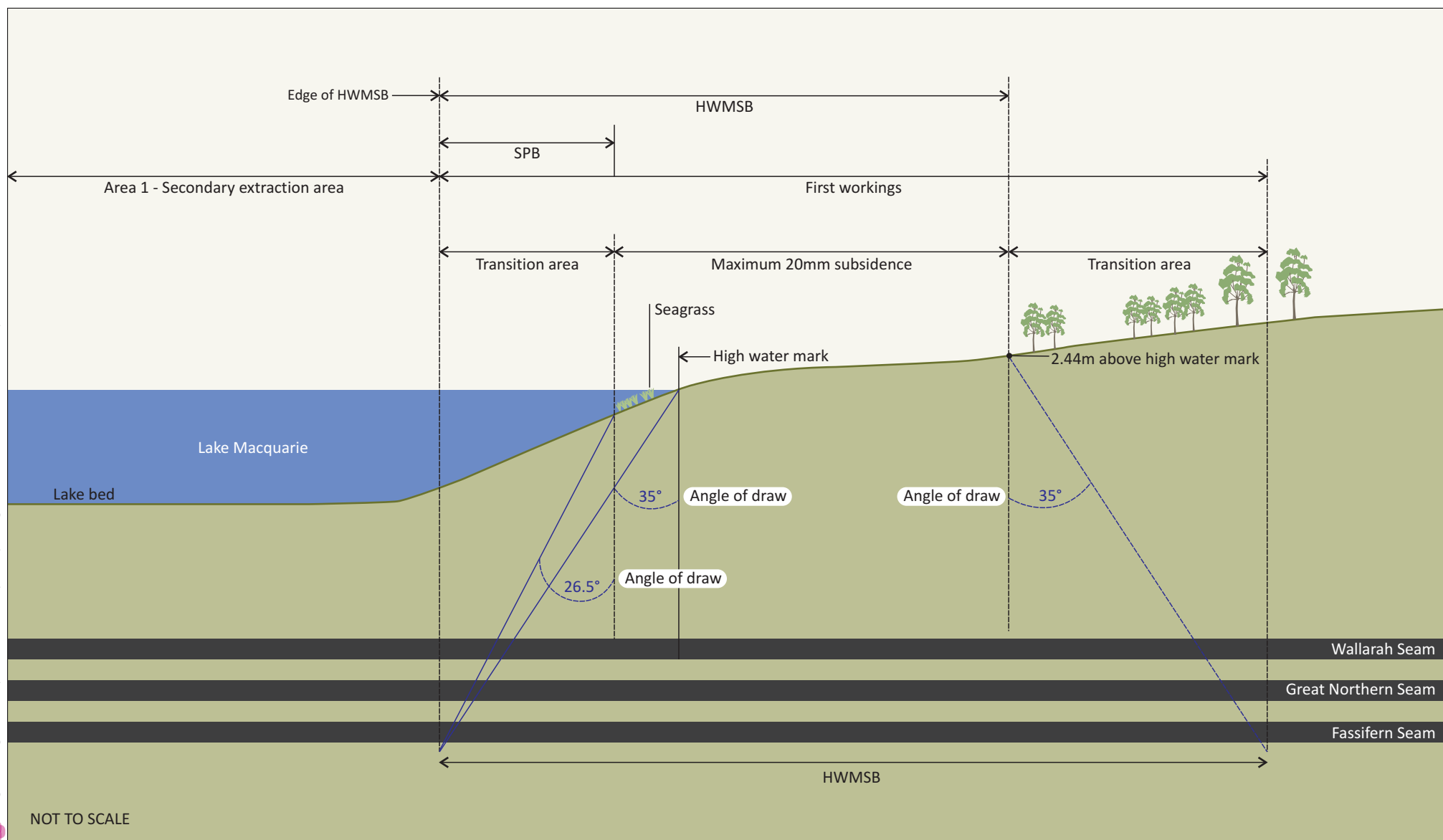


Source: Modified from yahoo.brand.edgar-online.com

Miniwall mining method schematic

Chain Valley Colliery Mining Extension I Project - Environmental Impact Statement

Figure 2.2



Source: Modified from AECOM 2011 Environmental Assessment - Chain Valley Colliery Domains 1 and 2 Continuation Project

Protection barrier schematic

Chain Valley Colliery Mining Extension 1 Project - Environmental Impact Statement

Figure 2.3



Source: Modified from image provided by LakeCoal

Main pit top infrastructure elements

Chain Valley Colliery Mining Extension I Project - Environmental Impact Statement

Figure 2.4

2.2.8 Water management

Water management at the Colliery is segregated into clean and mine water systems and controlled through the use of specific controls which are set out within the Colliery's Water Management Plan (WMP).

Existing water management measures include:

- the implementation of a range of sediment and erosion control measures at the pit top for all construction, operational and maintenance activities to mitigate potential impacts on watercourses and the surrounding environment;
- the use of dirty and clean water catchment separation with diversion of collected clean water away from disturbed areas through a series of banks and channels; and
- the use of a series of 13 interconnected sediment ponds to treat all of the Colliery's wastewater (excluding carpark stormwater runoff), allowing the settlement of fines and suspended solids prior to discharge in accordance with Environment Protection Licence (EPL) 1770.

Further details on the Colliery's water management systems are provided in Chapters 7 and 8.

2.3 Environmental management

2.3.1 Overview

Environmental management at the Colliery is undertaken in accordance with:

- the Colliery's Environmental Management Strategy (EMS);
- commitments made in EAs prepared for the Colliery;
- various environmental management plans, including the Colliery's Subsidence Management Plan;
- the Colliery's EPL; and
- the Colliery's Mining Operations Plan (MOP).

The existing environmental management processes and procedures are referred to where relevant in the EIS technical assessments and an overview is given below.

2.3.2 Environmental Management Strategy

Under Condition 1, Schedule 5 of MP10_0161, LakeCoal was required to prepare and implement an EMS for the Colliery. The EMS is an overarching document which identifies the relevant environmental management procedures which are included in the Colliery's various plans, strategies and programs. The EMS identifies the personnel who are accountable for implementing management procedures and describes their roles and responsibilities. The Colliery's EMS was approved by DP&I on 6 November 2012.

2.3.3 Management plans

In accordance with the approval requirements of MP10_0161, the Colliery has developed a range of management plans and implemented a regime for environmental management and reporting. The following management plans have been approved:

- NMP;
- Air Quality and Greenhouse Gas Management Plan (AQGHGMP);
- RTP;
- WMP; and
- Biodiversity Management Plan (BMP).

The Colliery's Heritage Management Plan (HMP) is currently with DP&I for assessment. A Rehabilitation Management Plan (RMP) has been prepared and is currently with the Department of Resources and Energy (DRE) for approval.

Schedule 3, Condition 6 of MP10_0161 requires LakeCoal to prepare an extraction plan for all second workings within the Site. However, a Subsidence Management Plan (SMP) that was approved by the DRE prior to 31 December 2011 is taken to meet the requirements of the condition. The Colliery has a SMP, approved prior to 31 December 2011, in place for its current operations.

The SMP considers, amongst other matters: recovery of reserves; mining safely beneath the waters of Lake Macquarie; predictions of subsidence effects and impacts and likely environmental consequences. The approved SMP requires annual reporting and implementation of appropriate management measures with respect to subsidence and seagrass protection. The SMP includes a Seagrass Management Plan (SGMP) and Benthic Communities Management Plan (BCMP).

2.3.4 Environmental Protection Licence

The Colliery has an existing EPL 1770, which was initially issued under the *Protection of the Environment Operations 1997* (PoEO Act) on 10 November 2000 and transferred to LakeCoal in April 2002. The licence has been varied several times with the most recent variation issued on 21 December 2011. A further variation to EPL 1770 to reflect Project Approval MP10_0161 is currently being processed. In accordance with the requirements of EPL 1770, LakeCoal undertakes monthly monitoring of water quality prior to its release into Lake Macquarie. EPL 1770 also stipulates requirements for maintenance of monitoring records, recording of complaints, and requirements for annual reporting.

2.3.5 Mine closure and rehabilitation

Under MP10_0161 mining operations at the Colliery are approved until 31 December 2016. Should the Proposal not be approved, the Colliery would be required to cease mining operations by that date and undertake rehabilitation of the Colliery.

Mining operations in NSW are required, as a condition of an authorisation issued under the Mining Act, to conduct mining operations in accordance with a MOP. A MOP sets out in detail how a mine would be rehabilitated over the course of the mining project. In the case of underground mines such as the Colliery, little if any rehabilitation is normally required before the mine is closed due to the continuing need for the surface infrastructure for operational purposes.

The approved Colliery's MOP applies until 2015 and covers:

- objectives of closure rehabilitation planning criteria;
- rehabilitation of disturbed land;
- proposed rehabilitation at the end of the MOP period; and
- rehabilitation trial and research.

The Colliery's current MOP will expire in 2015 prior to the MP10_0161 expiry date. Updated MOPs will be prepared to cover the period beyond 2015, subject to approval of the Proposal, with the content and format of the documents to be consistent with the relevant guidelines. Should the current application not receive approval, a mine closure plan would be prepared for approval by relevant authorities. The mine closure plan would be consistent with the MOP.

In accordance with Schedule 3, Condition 41 of MP10_0161, a RMP has been drafted and distributed to relevant stakeholders for comment, the comments have been incorporated and the plan has been submitted to DRE for approval. This plan covers:

- rehabilitation objectives;
- rehabilitation methodology;
- monitoring programs;
- performance standards and proposed completion criteria; and
- the nominated final land use, having regard to any relevant strategic land use planning or resource management plans or policies in place at the time and the potential for integrating the proposed rehabilitation with any other rehabilitation and/or offset strategies in the region.

Government policy currently mandates that MOPs are the primary instruments for ensuring mine rehabilitation is carried out in a well-planned and environmentally responsible manner. However, the roles of MOPs and RMPs are under regulatory review. The RMP has been prepared to reinforce and complement the Colliery's MOP. The RMP is not overly prescriptive, as the passage of time will undoubtedly encompass changes to land use policies and planning that will need to be taken into account in the final RMP and improve its efficacy.

Mine closure and rehabilitation is discussed further in Chapter 20.

2.3.6 Annual reviews and independent audits

Under the provisions of Schedule 5, Condition 4 of MP10_0161, LakeCoal is required to annually review the environmental performance of the Project to the satisfaction of the Director-General. This review must:

- describe development carried out in the previous calendar year and that proposed for the next 12 months;
- provide a review of monitoring results over the previous year and a comparison against relevant statutory requirements;

- identify any non-compliance over the past year and describe actions to ensure compliance;
- identify trends in monitoring data;
- identify discrepancies between predicted and actual impacts, and analyse the potential cause; and
- describe what measures will be implemented over the coming year to improve environmental performance of the Project.

LakeCoal is required to commission an Independent Environmental Audit of the Project under the provisions of Schedule 5, Condition 9 of MP10_0161 within 12 months of the approval of MP10_0161 and every three years thereafter, unless the Director-General directs otherwise. In accordance with Schedule 5, Condition 10 of MP10_016, within six weeks of the completion of this audit, or as otherwise agreed by the Director-General, LakeCoal must submit a copy of the audit report to the Director-General, together with its response to any recommendations contained in the audit report. This audit has been completed and is available for viewing on the LakeCoal website.

2.4 Existing interactions with surrounding Colliery operations

Three mining projects are currently operating in the area surrounding the Colliery, namely Mandalong Mine, Mannering Colliery and Myuna Colliery, each of which are owned and operated by subsidiaries of Centennial Coal Company Ltd. Each of the mines currently have varying approvals to extract the coal resource from defined areas in single or multi seam operations, with varying approved extraction rates and mining methods. Operations between the Colliery and the surrounding Centennial Coal operations occur independently of each other, although some informal arrangements with regard to data sharing exist. These surrounding operations, together with their existing interactions with the Colliery and the Proposal, are described below.

LakeCoal has entered into an agreement with Centennial Coal covering a portion of Areas 1A, 1B, and 1C for mining within the Fassifern Seam, subject to LakeCoal receiving the requisite approvals. The area subject to this agreement is identified as the initial sublease boundary on Figure 3.1. Further information on agreements between LakeCoal and Centennial Coal is provided in Section 3.2.1.

2.4.1 Mandalong Mine

Mandalong Mine is an underground mine located west of Morisset in the Lake Macquarie LGA. The mine was approved on 14 October 1998 under Part 4 of the EP&A Act (DA No. 97/800). The mine is owned and operated by Centennial Mandalong Pty Ltd. The original consent has been modified eight times with the most recent modification approved 23 August 2012.

The mine is currently approved to produce 6 Mtpa of ROM coal through longwall and bord and pillar mining within the West Wallarah and Great Northern Coal Seams. Mandalong Mine has historically had its subsidence regulated and monitored via approval of SMPs for its operations. Maximum vertical subsidence of 1.5 m (125 m panel) and 2.91 m (250 m panel) is approved under DA No. 97/800. In February 2012 Centennial Coal lodged an application at Mandalong Mine known as the Southern Extension Project. The application (SSD 5154) pertains to mining within the Wallarah and Great Northern Seams at the same rate of production for a further 21 years.

Mandalong Mine's current approved development consent boundary incorporates the proposed mining extension Area 1C. However, this area is not approved for mining. Through consultation with Centennial Coal, it is understood that there are no current or foreseeable plans to extract coal from this area.

2.4.2 Mannering Colliery

Mannering Colliery is an underground mine located 3 km south of Mannering Park near VPPS. The mine is owned and operated by Centennial Mannering Pty Ltd. Continuation of mining was approved on 12 March 2008 under Part 3A of the EP&A Act (MP06_0311).

Mannering Colliery is currently approved to produce up to 1.1 Mtpa of ROM coal (until 31 March 2018) through bord and pillar mining (first workings only) within the Fassifern Seam and consequently, maximum vertical subsidence of 20 mm is predicted. A modification application to the project approval was approved in October 2012 (MP06_0311 Mod 1) which provides for an increase in the approved mining area by approximately 22% and continued mining within the Fassifern and Great Northern Seams.

Mannering Colliery's current approved mine plan incorporates proposed mining extension Area 1A. However, MP06_0311 Mod 1 does not encroach into the Colliery's proposed mine plan.

2.4.3 Myuna Colliery

Myuna Colliery is an underground mine located on the western side of Lake Macquarie between Arcadia Vale, Wangi Wangi, the Morisset Peninsula and Point Wolstoncroft. The mine is owned and operated by Centennial Myuna Pty Ltd, a subsidiary of Centennial Coal. Continuation of mining at Myuna Colliery was approved on 18 January 2012 under Part 3A of the EP&A Act (MP10_0080).

Current approved operations include bord and pillar mining within the Wallarah, Great Northern and Fassifern Seams at a maximum production rate of 2 Mtpa. Under the conditions of MP10_0080, approval of vertical subsidence is restricted to a maximum of 650 mm for all mining under Lake Macquarie.

Myuna Colliery's current approved mine plan incorporates the proposed mining extension Area 1B; however, no detailed mine layout has been presented for proposed mining operations in this area. Myuna Colliery has approval to mine within the Fassifern Seam until 31 December 2032.

2.5 Tenements applicable to the Site

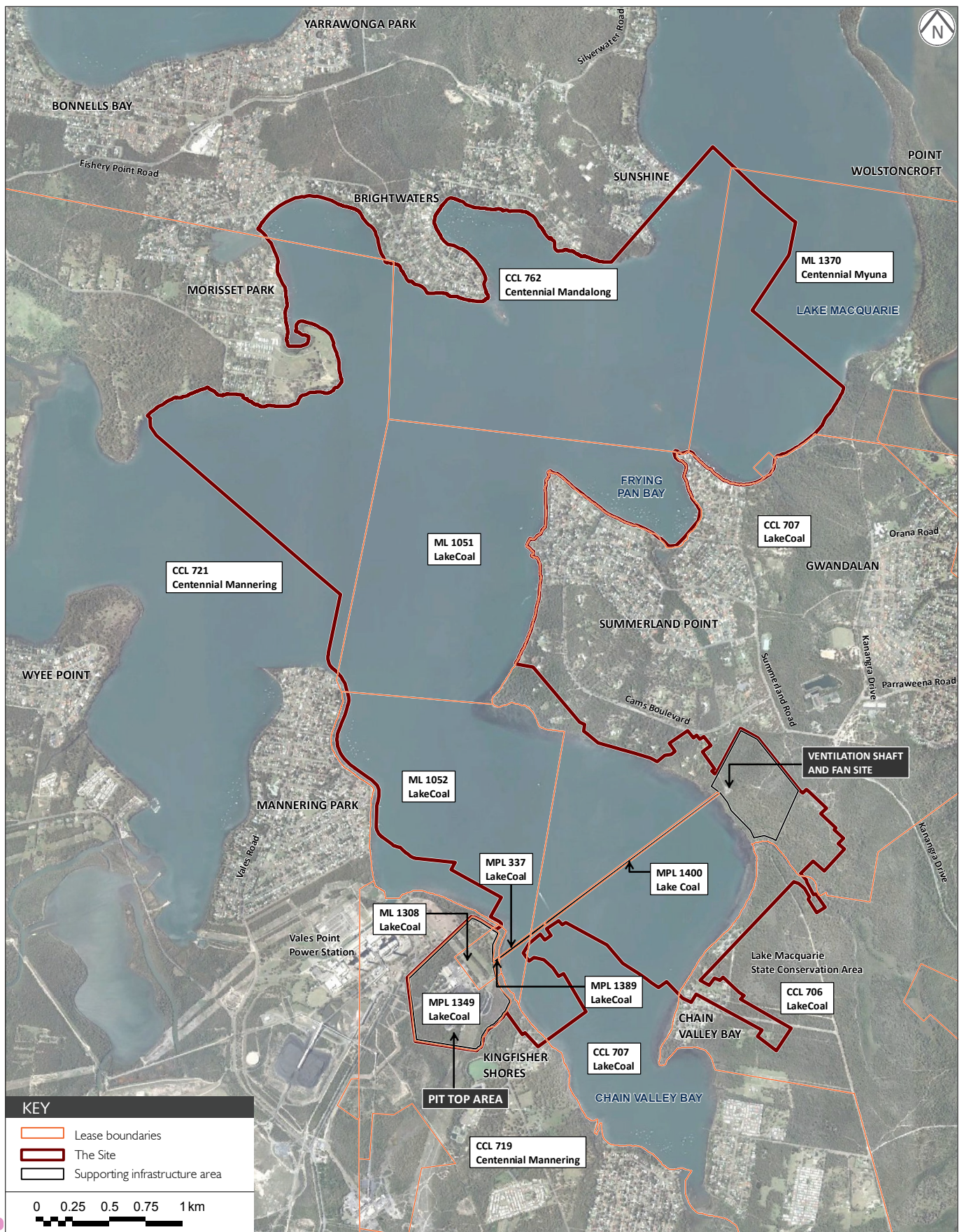
The Site includes all or parts of the tenements listed in Table 2.2, including several tenements held by Centennial Coal for its Mandalong Mine, Mannering and Myuna Collieries. The tenements and areas referred to in Table 2.2 as they relate to the Site are presented in Figure 2.5.

Table 2.2 Mining tenements applicable to the Site and lease expiry dates

| Mining tenement | Holder | Lease expiry date | Applicability to the Site |
|-----------------|----------|-------------------|---|
| ML 1051 | LakeCoal | 7 July 2022 | Incorporates part of the proposed mining area referred to as Area 1D (refer Figure 1.3) and part of the area approved under MP10_0161. |
| ML 1052 | LakeCoal | 7 July 2022 | Incorporates part of the proposed mining area referred to as Area 1E (refer Figure 1.3) and part of the area approved under MP10_0161. |
| MPL 1349 | LakeCoal | 5 October 2028 | Mining purposes lease for the pit top area. |
| CCL 706 | LakeCoal | 29 April 2022 | Incorporates historical workings within the Fassifern, Wallarah and Great Northern Seams which are, and would continue to be utilised for passive operational activities. |

Table 2.2 Mining tenements applicable to the Site and lease expiry dates

| Mining tenement | Holder | Lease expiry date | Applicability to the Site |
|------------------------|--|--------------------------|--|
| CCL 707 | LakeCoal | 30 December 2023 | Incorporates part of the proposed mining area referred to as Area 1E and historical workings within the Fassifern, Wallarah and Great Northern Seams which are, and would continue to be, utilised for passive operational activities and the Summerland Point ventilation shaft and fans. |
| ML 1308 | LakeCoal | 4 May 2022 | Mining lease for the mine drift entries. |
| MPL 337 | LakeCoal | 30 January 2016 | Mining purposes lease for a portion of the electricity cable on the bed of Chain Valley Bay connecting the pit top switchyard to the ventilation shaft fan at Summerland Point. |
| MPL 1389 | LakeCoal | 14 May 2031 | Mining purposes lease for a portion of the electricity cable on the bed of Chain Valley Bay connecting the pit top switchyard to the ventilation shaft fan at Summerland Point. |
| MPL 1400 | LakeCoal | 6 November 2031 | Mining purposes lease for a portion of the electricity cable on the bed of Chain Valley Bay connecting the pit top switchyard to the ventilation shaft fan at Summerland Point. |
| CCL 719 | Centennial Mannering with part subleased to LakeCoal | Renewal being sought | Incorporates historic workings within the Wallarah and Great Northern Seams which are utilised by the Colliery for passive operational activities. |
| CCL 721 | Centennial Mannering | 29 July 2026 | Incorporates part of the area approved under MP06_0311 and the proposed mining area referred to as Area 1A (refer to Figure 1.3). |
| CCL 762 | Centennial Mandalong | 13 October 2022 | Incorporates part of the area approved under DA97/800 and part of the proposed mining areas referred to as Areas 1B and 1C (refer to Figure 1.3). |
| ML 1370 | Centennial Myuna | 2 December 2016 | Incorporates part of the proposed mining area referred to as Area 1B (refer to Figure 1.3). |



Mining tenements and tenement holder applicable to the Site

Chain Valley Colliery Mining Extension | Project - Environmental Impact Statement

Figure 2.5

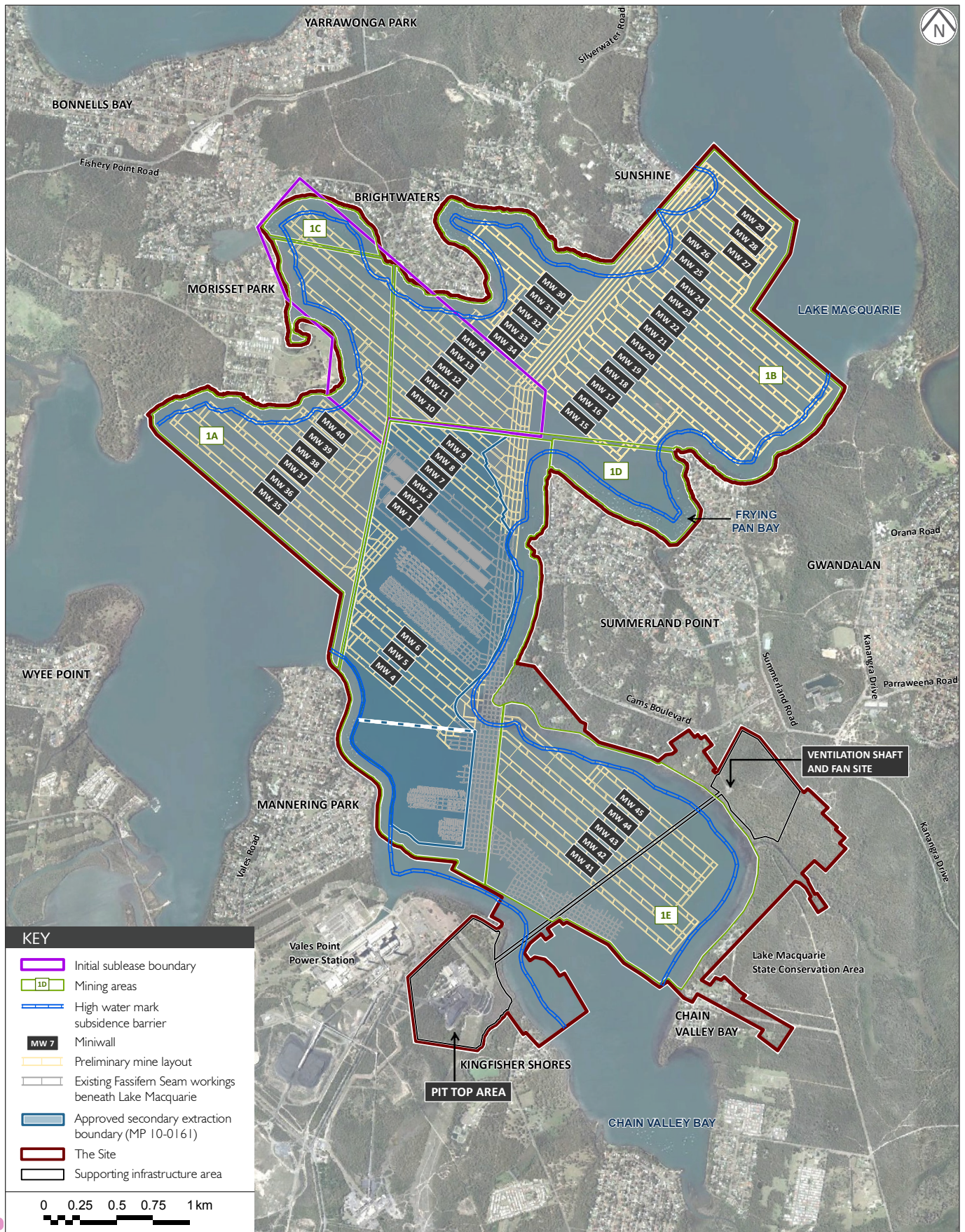
3 The Proposal

3.1 Proposal description

A description of the Proposal elements is provided in the following sub-sections. In order to provide context for the development application and assist readers to understand the nature and magnitude of the differences between what is currently approved and what is proposed, a summary of changes to the operations as approved under MP10_0161 is provided in Table 3.1. Aspects considered are consistent with those presented in Table 2.1. The preliminary miniwall layout is shown in Figure 3.1.

Table 3.1 Key changes to approved operations under MP10_0161

| Aspect | Summary of changes |
|----------------------------------|--|
| Overview | <p>Proposed elements comprise:</p> <ul style="list-style-type: none">• an extension of the currently approved extraction area to allow underground mining to continue within the Fassifern Seam;• the increase of the approved maximum rate of production from 1.2 Mtpa to 1.5 Mtpa of ROM coal;• an increase in the approved hours for haulage of coal from the Colliery to Delta Electricity's VPPS on private haul roads, i.e., from 5.30 am to 5.30 pm, Monday to Friday (excluding public holidays) to 24 hours a day, seven days a week;• minor upgrades and modifications to infrastructure; and• an extension of the approved mining period by a further 14 years, i.e., to around 2027. |
| Mining and reserves | Underground mining of the Fassifern Seam within Area 1. Estimated additional reserves of 19.5 Mt of ROM coal. |
| Project life | A 14 year extension to the life of the project, i.e., from approval until around 2027. |
| Proposed surface infrastructure | Minor upgrade and/or replacement of surface infrastructure as identified in Section 3.1.4. |
| Coal processing | No change. |
| Water demand and supply | Increase in potable water use, drawn primarily from WSC's potable water supply mains, to 120 ML per annum. |
| Hours of operation and transport | <p>Truck haulage of product coal to be undertaken 24 hours a day, seven days a week on private haul roads.</p> <p>No change for haulage on public roads.</p> <p>No change to approved operating hours.</p> |
| Product coal transport | <p>No change to road transport routes.</p> <p>Additional coal produced to be transported to VPPS. As a result, approximately 44% of product will be transported to PWCS terminal and 56% to local customers.</p> |



Preliminary mine layout

3.1.1 Extension of mining area

i Coal reserves

The preliminary miniwall layout in Figure 3.1 would allow for the extraction of an estimated 19.5 Mt of ROM coal from the Fassifern Seam. However, minor changes to the mine design may be made as mining progresses in response to geological features identified or changes to the mapped occurrences of seagrass communities over time (see section below) which would likely impact the estimated reserves available for extraction.

ii Mining area

In addition to the mine area already approved under MP10_0161, the Proposal would involve mining within the Fassifern Seam in five areas identified as Areas 1A, 1B, 1C, 1D and 1E on Figure 3.1. Areas 1A, 1B and 1C are within mining leases currently held by Centennial Coal for its Mannering, Myuna and Mandalong Collieries. Areas 1D and 1E are located within the existing Colliery holdings. With the exception of parts of Area 1E, which are located beneath historic workings, no mining has been undertaken in the Great Northern and Wallarah Seams overlaying Area 1. A total of 45 miniwall panels would be mined which would have a maximum face width of approximately 86.2 m and a maximum width of approximately 97 m.

It should be noted that, while the impacts of mining panels MW1 to MW3 have been considered in this EIS, the mining of these panels was approved under MP10_0161 with MWs 1 and 2 completed and MW3 partially extracted. Extraction within panels MW4 to MW9 was also approved under MP10_0161; however, the design of these panels has generally been modified for the Proposal.

The mine plan has been designed to enable connection between proposed and historic mining areas, thereby providing efficient access for personnel, plant and machinery and to existing infrastructure. Further, the mine plan was designed to minimise subsidence impacts to seagrass communities, the shoreline and land based infrastructure through ensuring secondary extraction occurs wholly under Lake Macquarie and outside of the HWMSB and SPB.

Refinements to the panel layout or orientation may occur as a result of geotechnical constraints encountered during mining. However, importantly, any changes would be within the approved extraction area boundary and be designed to ensure subsidence impacts are equal to or less than those identified and assessed within this document. Furthermore, any change in the design of a particular panel would:

- be contained within the Site;
- be designed in accordance with the HWMSB and the SPB;
- ensure secondary extraction remains under Lake Macquarie;
- have a maximum miniwall width of 97 m; and
- limit subsidence to a maximum of 620 mm where no overseam workings exist or 886 mm where historic overseam workings are present, in accordance with subsidence modelling undertaken for the Proposal.

3.1.3 Private road haulage hours

It is proposed to transport product coal on private roads between the Colliery and VPPS 24 hours a day, seven days a week. As discussed in Section 1.5.3, the increase in hours is required to facilitate efficiencies in the transportation of coal to VPPS and reduce the need for coal stockpiling and double handling at the pit top. Currently, any coal extracted outside approved haulage hours that is destined for VPPS must be stockpiled and rehandled at the Colliery's pit top area, with associated noise and dust impacts. By loading coal for VPPS directly into trucks for immediate haulage, double handling is minimised and potential environmental impacts reduced. The Proposal would have an environmental benefit in this regard.

The transport hours of product coal on public roads would continue to be undertaken between 5.30 am and 5.30 pm, Monday to Friday (excluding public holidays).

3.1.4 Surface infrastructure

Minor upgrades and modifications to existing surface infrastructure at the Colliery's pit top area would provide improved operational efficiencies and environmental outcomes at the Colliery. Changes to several infrastructure items are also required as an outcome of the impact assessments presented herein to manage potential impacts associated with the Proposal.

The majority of surface infrastructure at the pit top area has not been replaced since the mine commenced operations over 50 years ago. Through the mine design and assessment process, LakeCoal has identified minor infrastructure upgrades and modifications that would occur over the life of the mine, should the Proposal be approved. It should be noted that the majority of the upgrades and modifications identified in Table 3.2 constitute normal operational activities and, in themselves, may not necessarily require development consent. Some of the upgrades and modifications were identified in existing management plans for the Colliery as proposed mitigation measures.

All proposed surface infrastructure upgrades and modification would be contained within existing disturbed areas of the pit top facility of the Colliery. Replacement of infrastructure would occur within the general footprint of the equipment being replaced, and would be undertaken on a "like for like" basis. Upgrade of ageing infrastructure would provide a beneficial environmental outcome via the delivery of newer, more efficient equipment.

Table 3.2 Proposed minor upgrades and modifications to pit top infrastructure

| Element | Proposal |
|-------------------------------------|--|
| Replacement of crushers and screens | <p>The Colliery's crushers and screens are used to size coal to customer specifications and are considered to be adequate for current operations. LakeCoal consider that ageing of this infrastructure would necessitate replacement during the extended approval period being sought under this Proposal.</p> <p>Replacement of this infrastructure may provide an improved environmental outcome through reduction of noise and air emissions via enclosed and attenuated crushers and screens which are not present in the existing infrastructure.</p> |
| Surface conveyors | <p>Surface conveyors would be replaced during the approval period as required. Noise emissions from proposed conveyors would be considered prior to replacement to ensure noise emissions are the same of lower than current levels. A stacker conveyor is also proposed from the final product bin to the stockpile which will reduce truck stockpiling activities.</p> |
| Drift conveyor | <p>The current drift conveyor utilises a cable belt design. Due to the age of the system, recent mechanical issues and general lack of local support for these conveyor systems, substantial operational delays have been incurred. Accordingly, during the period of the Proposal it is expected that the conveyor system, including the drive head design and associated infrastructure will be replaced.</p> |

Table 3.2 Proposed minor upgrades and modifications to pit top infrastructure

| Element | Proposal |
|---|---|
| Surface lighting | <p>LakeCoal proposes to install additional lighting structures at the pit top area to improve safety and visibility during night time operations. These lighting structures would be situated in the vicinity of the product stockpile, buildings and roads.</p> <p>All proposed lighting structures would be designed to ensure compliance with AS4282-1997 Control of the obtrusive effects of outdoor lighting, including:</p> <ul style="list-style-type: none"> switching lights off when not required for safety, security, or enhancement of night-time amenity; directing lights downward, not upward, to illuminate the target area only; and the use of high pressure sodium lamp fittings where practical to help minimise light spill and sky glow effects of additional lighting at the Colliery. |
| Water storage capacity and water pressure | <p>The Colliery currently has two 132,000 L and one 80,000 L water tanks located toward the western boundary of the pit top area. It is proposed that these water tanks be replaced, or storage supplemented with additional tanks, and a pump installed in the vicinity of the tanks to ensure required water pressure is maintained around the pit top and underground. Any replacement or new tanks would be within the existing disturbance footprint.</p> |
| Air compressors | <p>The majority of the current air compressors are aged and will be due for replacement within the period of the Proposal. Replacement compressors would likely be of increased capacity (around 900 cfm) to support the continued development of the mine, which is required as the distance of reticulation increases. All compressors would continue to be housed within the existing compressor shed.</p> |
| Upgrade of sedimentation dams | <p>The existing final sedimentation dam (D10 shown on Figure 8.1) for the Colliery experiences seepage through the embankment and, as a result, not all water is directed through the existing discharge point which flows into Swindles Creek (shown on Figure 2.4) and then into Lake Macquarie. The Proposal includes works to upgrade the sedimentation dam wall, to prevent future leakage, upgrade the discharge location (spillway), and incorporate a new discharge monitoring point.</p> |
| Sealing of car park | <p>The Colliery's on-site car parking area is distributed around the north and western sides of the main Colliery administration building, approximately 150 m inside the main entrance. During the time of the peak daytime parking demand on a typical weekday, approximately 110 cars are parked in these car parking areas. This parking area is predominantly unsealed. LakeCoal proposes to seal this parking area to provide an all weather car park for employees, contractors and visitors to the Colliery.</p> |
| Secondary coal screening | <p>During the period of Proposal it is expected that a mobile screening plant would be used on an ad hoc basis for screening coal to a specific size for smaller domestic customers. The use of the screen would not be expected to exceed three days per month.</p> |
| Secondary electric haulage | <p>A secondary electric haulage system runs adjacent to the drift belt and is used primarily for movement of personnel when the main haulage system is in use or out of service for maintenance. Unlike the main electric haulage system which was replaced in the 1980s, the secondary electric haulage system has not been upgraded and, consequently, would likely be replaced during the period of the Proposal. The upgrade would involve replacing the existing electrical winder system and building that houses this system, along with associated infrastructure. The replacement infrastructure would likely segregate the electric drive system from the electrical controls (based on current design standards) which would result in an additional small building being required. All construction would be within the existing disturbance footprint.</p> |
| Bath house facilities | <p>The current bath house is significantly smaller than the original bath house built for the site (now the operations building). While no additional employees will be required as a result of the Proposal, it is expected that during the period of the Proposal an upgrade to the existing bath house will occur, or an additional bath house, will be installed to reduce congestion in the current bath house. As with the other proposed infrastructure changes, all construction would be within the existing disturbance footprint.</p> |

The need for changes to panel layout as a result of geological structures would be determined during establishment of development headings. These headings which are formed around all sides of the panel prior to extraction would reveal presently unknown, and better define known, geological structures. Minor changes are common and are unlikely to have additional environmental impacts to those assessed under the Proposal. Constraints generally limit the maximum planned extraction and, accordingly, lessen the potential for impacts such as subsidence. For example, MW 4 is shorter than planned due to a major fault identified which was larger than originally mapped and this constraint, whilst it adversely impacts the recovery of coal, would result in less subsidence and less coal transport and emissions.

Resulting changes which are minor in nature would be carried out in accordance with the parameters set out in the Extraction Plan. Any minor changes to panel layouts would be notified to DP&I via the submission of Extraction Plans for miniwall panels as required under MP10_0161. LakeCoal will implement an adaptive management approach which will involve the monitoring, remediation and periodic evaluation of the consequences of mining, with possible adjustment of the mining layout and/or methods to achieve the required measures of performance.

The EIS has assessed the Proposal based on the proposed mine plan layout which has been developed based on known geological structures and other environmental constraints. If presently unknown constraints are discovered during the life of the mine, they will require the need to reassess the suitability of the panel layouts dependant on the nature of geological structures found. It is acknowledged that changes to the mining layout of a more significant nature, which may result in additional impacts beyond those contemplated in the EIS, would require LakeCoal to submit an application to modify the consent under the EP&A Act.

iii Mining method

Mining methods within Area 1 would be consistent with the current methods as described in Section 2.2.2 and approved under MP10_0161.

The direct transition from the approved to the proposed mining areas and the ability of the Colliery's existing surface infrastructure to accommodate the increase in the maximum production rate means that there is no defined construction phase for the Proposal.

iv Mine sequence

The sequencing of mining under the Proposal is currently scheduled to occur sequentially in order of panel numbers. Mining would first occur to the north, then to the north-east and west of the approved secondary extraction area. The final area to be mined would be to the south-east of the approved secondary extraction area and beneath historic workings in the Great Northern and Wallarah Seams. Modifications to the mining sequence are, however, subject to changes in scheduling which may arise during the period of the Proposal.

3.1.2 Production rate

It is proposed to increase the maximum rate of production from 1.2 Mtpa to 1.5 Mtpa of ROM coal. The additional 300,000 tpa would all be transported by private roads (the mine access road and Construction Road) to VPPS.

The increase in production would result from efficiencies associated with longer miniwall lengths, seen in most proposed miniwall panels, which result in less miniwall moves per year. The increase in production would be accommodated without increasing the capacity of existing infrastructure, staff numbers or traffic movements on public roads.

3.1.5 Consolidation of existing approvals

It is intended that the development consent for the Proposal, if granted, would consolidate the existing approval MP10_0161. The mining and support activities currently approved under MP10_0161 would continue to be undertaken during the proposed mine life. As discussed in Section 1.4, the Site, to which the Proposal applies, includes the area to which MP10_0161 applies as well as the proposed mining areas illustrated in Figure 3.1.

A consolidated approval would:

- provide for greater management and compliance monitoring efficiencies;
- reduce administration time for both LakeCoal and regulators; and
- promote transparency for the community and other stakeholders.

It is intended that the new approval would integrate the relevant conditions of MP10_0161 and that, following approval, MP10_0161 would be surrendered by LakeCoal in accordance with Clause 8P of the EP&A Regulation.

3.2 Proposed interactions with surrounding mining operations

3.2.1 Interactions between planning approvals

As discussed in Section 2.4, existing planning approvals apply to parts of Area 1, namely:

- Project Approval 10_0080 – Myuna Colliery;
- Project Approval 06_0311 – Mannering Colliery; and
- Development Consent DA No.97/800 – Mandalong Mine.

These approvals are referred to collectively in this document as the Centennial Coal planning approvals.

It is not proposed as part of this Proposal that any of the Centennial Coal planning approvals will be surrendered or consolidated. Therefore, if development consent for this Proposal is granted, it would overlap in part with the Centennial Coal planning approvals.

LakeCoal has, and will continue to, negotiate with Centennial Coal about the carrying out of mining in areas that are subject to Centennial Coal's mining authorities. Importantly, it is noted that, in proposed mining areas that lie within tenements held by Centennial Coal, LakeCoal's sole right to extract the coal reserves would be regulated by a registered sublease between LakeCoal and Centennial Coal under the Mining Act, irrespective of the type or nature of agreements between Centennial Coal and LakeCoal.

In addition to the above, Centennial Coal has supported LakeCoal's application for mining within the entirety of the Site (as defined by Figure 3.1) in a letter dated 1 August 2012, which was subsequently provided to both the DRE and DP&I. At this stage, however, further agreements enabling LakeCoal to operate in the remaining areas held by Centennial Coal are still to be developed.

The proposed sublease arrangement, and any other subleases, would require LakeCoal to comply with the provisions of the Mining Act when carrying out mining in the extension area in tenements currently held by Centennial Coal.

3.2.2 Granting of overlapping approvals

LakeCoal has received legal advice that the Minister has the legal power to grant overlapping planning approvals but that, as a matter of policy, the grant of overlapping planning approvals should be limited to circumstances where it does not cause ambiguities about the application of the relevant planning approvals. That is, that any government department and any other person is readily able to ascertain what planning approval is being relied upon to permit the development. This also allows for the department or person to readily ascertain what the environmental conditions are which apply to the development.

LakeCoal considers that the risk of ambiguities arising from having overlapping planning approvals is low in the current circumstances, as:

- LakeCoal will commit to only carrying out mining operations in the extension areas consistent with the development consent granted pursuant to this Proposal. That is, LakeCoal would not carry out mining operations pursuant to, or seek to rely upon, any of the Centennial Coal's planning approvals;
- the Centennial Coal planning approvals and this Proposal relate to different types of mining operations (i.e., bord and pillar and miniwall) and, therefore, it will only be practically possible to implement one approved development in a mining area;
- LakeCoal's sole right to extract the coal reserves from any areas of overlap would be regulated by a registered sublease between LakeCoal and Centennial Coal under the Mining Act;
- the Minister for Resources and Energy is required to approve the sublease;
- the sublease would be registered on the title of the mining lease and public searches would show whether or not LakeCoal held a sublease and, therefore, it could be ascertained under which development consent mining activities were being undertaken;
- the provisions of the Mining Act and the requirement to lodge a MOP will regulate in further detail how the proposed mining operations will be carried out. This plan will set out the proposed mine operator and the planning approvals which are relied upon; and
- the requirement for the subleased area to be registered as a colliery holding under Section 163 of the Mining Act, together with the requirement to appoint either LakeCoal or Centennial Coal as the coal operator of the subleased area under the *Coal Mine Health and Safety Act 2002*, means that it will be readily ascertainable which party is undertaking the mining operations. It should be noted that there can only be one coal operator for any mining area.

Given the close proximity of a number of adjacent operations it is difficult to predict with certainty which of the mine operators may ultimately carry out mining in the various component areas within Area 1. Therefore, given the uncertainties of how the individual projects may proceed in the future, LakeCoal submits that it is in accordance with the principles of ecologically sustainable development (ESD) to allow for the Centennial Coal planning approvals to continue to exist and for any development consent granted for this Proposal to overlap with those approvals. Centennial Coal supports this approach.

3.2.3 Potential areas of conflict

i Mandalong Mine

Mandalong Mine has approval under DA No. 97/800 to mine within the West Wallarah and Great Northern Seams using longwall and bord and pillar mining methods. The project boundary approved under DA No. 97/800 includes mining tenement CCL 762 held by Centennial Mandalong which includes Area 1C and parts of Area 1B. However, mining is not approved within CCL 762. Therefore, no potential conflicts or ambiguities between DA No. 97/800 and the Proposal are anticipated.

DGRs have recently been issued for Mandalong Mine's Southern Extension Project (SSD 5514). As with DA 97/800, the application area boundary for the Southern Extension Project includes CCL 762. However, mining is only proposed within EL6317, targeting the Wallarah and Great Northern Seams with no mining proposed east of the F3 Freeway or within the Fassifern Seam. Should approval be granted for the Southern Extension Project, mining within EL6317 would allow for a further 21 years of mining at Mandalong Mine. Given that the Proposal would be completed prior to this time, there is anticipated to be no overlap between the mining of Area 1C and potential mining by Mandalong Mine within CCL 762. Therefore, no potential conflicts or ambiguities between SSD 5514, or future applications at Mandalong Mine, and the Proposal are anticipated.

ii Mannering Colliery

Mannering Colliery has approval under PA 06_0311 to mine within the Fassifern Seam using bord and pillar mining methods within CCL 721. Area 1A is located within CCL 721 and partially overlaps with Mannering Colliery's approved mining area. The agreement with Centennial Coal for LakeCoal to mine within part of CCL 721, as described in Section 2.4, applies to part of Area 1A; however, an agreement will need to be reached with Centennial Coal to mine the remainder of this area. Such an agreement would address potential conflicts between mining operations and how these will be managed. Further, the mining lease for the area will detail which proponent has the right to mine. Details of the agreement would be provided to DP&I and DRE prior to the commencement of mining in this area.

It should also be noted that Mannering Colliery is currently under care and maintenance and, therefore, potential concurrent mining activities may not occur.

No other conflicts or ambiguities between PA06_0311 and the Proposal are anticipated.

iii Myuna Colliery

Myuna Colliery has approval under MP10_0080 to mine within the Wallarah, Great Northern and Fassifern Seams using bord and pillar methods. The project application area is within CCL 762 and ML 1370 and partially overlaps with Area 1B. An agreement, similar to that in place and proposed for Area 1A, will need to be established between LakeCoal and Centennial Coal to mine the areas of Area 1B within Myuna Colliery's project application area. Such an agreement would address potential conflicts between mining operations and how these will be managed. Further, the mining lease for the area will detail which proponent has the right to mine. Details of the agreement would be provided to DP&I and DPI prior to the commencement of mining in this area.

No other conflicts or ambiguities between MP10_0080 and the Proposal are anticipated.

3.3 Alternatives considered

A number of alternatives were considered for each of the Proposal elements as described in the following sub-sections.

3.3.1 Extension of mining area

The Colliery's historic workings in the Great Northern and Wallarah Seams exist under land areas including Summerland Point, Chain Valley Bay, Mannering Park and Kingfisher Shores. Significant extractable reserves remain beneath these land areas which fall within mining leases held by LakeCoal. Therefore, given that the reserves within the approved secondary extraction area will be exhausted by late 2013, it was both incumbent on LakeCoal by virtue of the requirement under its tenements to maximise recovery of reserves and prudent to investigate extension of mining beyond areas beneath Lake Macquarie to ensure effective development of the State's coal reserves and the continued viability of the Colliery.

LakeCoal, however, chose not to pursue mining under areas of land as part of this application, as it is considered that the potential impacts of subsidence on land based infrastructure resulting from underground mining could not be properly assessed and mitigated within the limited timeframe required for approval of additional mining areas. Further, mining under land is considered to have the potential for greater levels of impact and is a less desirable alternative than mining under Lake Macquarie at the present time. Therefore, the mine plan was designed so that secondary extraction areas occur exclusively under Lake Macquarie.

A range of miniwall panel layouts were considered during the mine design and environmental assessment process. The panel layout was modified a number of times in consideration of geological features, recovery of reserves, geotechnical and subsidence predictions and to reflect the outcomes of the comprehensive seagrass survey effort undertaken for the Proposal.

Section 3.1.1.ii describes additional parameters that governed the form of the extension area and mine design.

The preferred mine design is justified as it finds the appropriate balance between maximising recovery of reserves and minimising the potential for adverse safety and environmental impacts.

3.3.2 Production rate

As stated in Section 3.1.2, the increase in production results from mining efficiencies realised through a mine design which incorporates generally longer miniwall panels (though the maximum width would not change) than previously possible within the existing secondary extraction boundary. The efficiencies achieved through the mining of mostly longer panels and the resulting reduction in down time which occurs when the miniwall is relocated, would enable the Colliery to extract an additional 300,000 t of coal over a 12 month period. This additional production would be used to help satisfy demand for coal at VPPS. If the production rate is not increased, or reduced from that proposed, the Colliery would not be able to help meet this demand and the required coal would have to be sourced from an alternative source. Given its proximity, it is considered that the Colliery is ideally placed to provide coal to VPPS as it minimises the distance the coal is transported from the source and the potential for environmental impacts, such as air and noise emissions. It is also worth noting that Mannering Colliery, which has historically provided coal to VPPS, has been placed under care and maintenance.

3.3.3 Private road haulage hours

The alternative to increasing the approved hours for haulage of coal to VPPS is to maintain the approved hours of 5.30 am to 5.30 pm, Monday to Friday (excluding public holidays). Haulage during these restricted hours is considered incompatible with the 24 hour, 7 days a week operation of the Colliery, leading to the need to stockpile coal out of approved haulage hours. As stated in Section 1.5.3, the need to stockpile coal leads to double handling of the product and creates the potential for increased environmental impacts in the form of greater air and noise emissions. Potential environmental impacts from the change to the hours of coal haulage on road, as assessed under the Proposal, are considered negligible.

Another alternative to the increase to the approved hours for haulage is increased haulage within the approved hours. An assessment of the increase in haulage within approved hours was undertaken compared to current levels; however, it was determined this would be insufficient to transport the total 1.5 Mtpa, as detailed below.

With the current haulage restrictions (i.e., 5:30 am to 5:30 pm, Monday to Friday and not at all on public holidays) there are a maximum of 252 days available to transport coal from the Colliery on public roads. To transport the 660,000 tpa to PWCS it is determined by using an average rate of 150 loads per day (4,500 tonnes per day) that 147 days are required to achieve the annual transport volume. As a result, this leaves 105 days (252 days minus 147) to transport the remaining 840,000 tpa (660,000 tpa to VPPS and 180,000 to other domestic customers). To achieve the volume in under 105 days, in the order of 267 loads per day are required. Conversely, if the 840,000 tpa (660,000 tpa to VPPS and 180,000 to other domestic customers) was transported at the average rate of 150 loads per days then 187 days would be required to achieve the annual transport volumes. This leaves 65 days (252 days minus 187) to transport the remaining 660,000 tpa to PWCS. To achieve the volume in under 65 days, in the order of 339 loads per day are required.

The above calculations show that, when retaining the existing limitations on haulage hours and days, average truck loads per day would need to be in the order of 267 to 339 to accommodate the additional volume of coal transported to the VPPS. This is not considered achievable or desirable from the perspective of potential impacts to amenity and, therefore, additional haulage hours are required. With 7 days per week haulage an average of between 125 and 129 truck loads per day are required which is considered a feasible operational scenario.

The internal haulage to VPPS can be undertaken more efficiently using a smaller number of trucks over a longer period of each day. This would be achieved by trucks loading from the product bin and transporting coal directly to VPPS without stockpiling. Conversely, less time spent hauling directly leads to additional volumes required to be stockpiled and rehandled at the site.

The acceptability of 24 hour, 7 days a week haulage on private roads was confirmed by specific detailed assessments prescribed in this EIS, which concluded that the adverse environmental impacts from the change in hours is negligible. Assessments demonstrate that 24 hour, 7 days a week haulage provides operational flexibility, reduces rehandling and is able to provide a reduction of environmental impacts through increased efficiencies. It is likely that hours would generally be restricted to 5:30 am to 10 pm, 7 days per week. However, given the acceptable level of impacts predicted and to maximise the aforementioned benefits, the Proposal seeks approval for the 24 hours, 7 days per week haulage to VPPS.

No change to the restrictions in relation to haulage on public roads is being sought.

3.3.4 Surface infrastructure

i General

The alternative to the minor upgrade and modifications to pit top infrastructure is to maintain the infrastructure in its current form. This option was dismissed, however, as the benefits outlined in Section 3.1.4 would not be realised. It should be noted that the majority of the upgrades and modifications identified in Table 3.2 constitute normal operational activities and, in themselves, may not necessarily require development consent. Further, some of the upgrades and modifications were identified in existing management plans for the Colliery as proposed mitigation measures.

ii Sedimentation dam upgrade

The proposed sedimentation dam wall and discharge location (spillway) upgrades have been designed to avoid impacts on identified threatened ecological communities where possible. This preferred discharge option follows an existing formed access track and will have no direct impact on the adjacent Swamp Sclerophyll Forest endangered ecological community (EEC). It will, however, have a small direct impact on 0.12 ha of Swamp Oak Floodplain Forest EEC which is in poor condition adjacent to the dam wall. Alternatives to the preferred option would require considerable direct impacts on both EECs.

Several options were investigated for these works to prevent further leakage of the dam wall into an area containing the Swamp Oak Floodplain Forest EEC. The preferred option for the embankment upgrade will require the removal of a small area 0.25 ha (in addition to the 0.12 ha affected by the spillway upgrade) of Swamp Oak Floodplain Forest EEC, but potentially provide beneficial results to the entire patch (3 ha) of this EEC, by reducing the area of the community permanently inundated by saline water and, therefore, soil salinity. All identified alternatives would require comparable or greater impacts on this EEC and a greater cost and were, therefore, dismissed.

3.3.5 Alternative options to haulage on public roads

LakeCoal is committed to investigating alternative mechanisms for transportation of export coal to the PWCS in an effort to reduce or eliminate truck haulage on public roads. As a result of this commitment, and consistent with the conditions of the approval under MP10_0161, preliminary investigations have been carried out to determine the feasibility of a range of options. As required by the DGRs these investigations are detailed in the Traffic Impact Assessment (TIA) for the Proposal (Appendix H), and include:

- investigation of rail transport via use/ upgrade of the Vales Point rail loop and coal handling facilities;
- consideration of use of the Eraring coal loader;
- consideration of use of the Newstan coal loader;
- consideration of use of the Teralba coal loader; and
- consideration of use of the proposed Wallarah rail loop.

Investigations determined that a number of proposed alternatives were not feasible for either economic, logistic, or practicality reasons. Of the options investigated, the preferred option involves the construction of a haul road to the Vales Point coal unloading facility, including infrastructure construction to enable coal to be loaded onto trains for transport to the PWCS.

Detailed economic assessments including a benefit cost analysis (BCA) and a net present value (NPV) assessment have been undertaken for this proposed alternative transport option compared to the ongoing use of public roads, with a description of these assessments and their findings provided within the TIA (Appendix H) and Section 11.2.2. Two options were considered: Option 1 – a private haul road between the Colliery and Vales Point rail loop; and Option 2 – a part haul road, part conveyor to the Vales Point rail loop. The BCA determined that Option 1 has positive net benefits when no discounting is applied and under a -20% costs sensitivity analysis while Option 2 has positive net benefits only under a -20% costs sensitivity analysis at a 4% discount rate. Both options only had a positive NPV using the -20% costs sensitivity assessment with a positive value for Option 1 at all discount rates and a positive value for Option 2 at only a 4% discount rate.

The economic feasibility of the identified options will need to be analysed at greater certainty levels to confirm the economic viability of pursuing alternate export coal haulage options from the current practice of using trucks on public roads to transport coal to PWCS. Further economic assessments of the options will be undertaken within a year of approval for the Proposal. Environmental assessments, such as terrestrial ecology and Aboriginal heritage, will also need to be undertaken for the predicted land disturbance associated with construction of either option. The most critical component for further detailed economic studies will be the future potential for LakeCoal to access additional resources outside of the approved mining area, so as to give certainty to future life of mine and hence transport requirements. Agreements between LakeCoal and the relevant landowners whose properties must be accessed to enable construction of either option are also yet to be reached, though they are the subject of ongoing negotiations. The preferred alternative would also require LakeCoal to commit to substantial capital expenditure. Given these factors, and in consideration of the Proposal's critical timeframe with the approved secondary extraction area being exhausted by late 2013, the preferred rail loading option does not form part of the current Proposal.

LakeCoal is committed to continuing to pursue the proposed alternative transport option. Should the necessary agreements and certainty around the life of the mine be realised, LakeCoal would submit an application to have this transport option approved as a modification to the consolidated consent described in Section 3.1.5.

3.3.6 Do nothing option

The alternative to seeking an extension to the approved areas of mining would be to limit mining to the area currently approved and, on completion, close the Colliery which is currently predicted to occur in late 2013.

Closure of the Colliery would result in:

- the direct loss of 120 full time employees and 40 full time equivalent contractors;
- the loss of benefits to surrounding communities and regional economy arising from the Colliery's operations;
- potential sterilisation of coal reserves that can be mined with minimal environmental impact. It is unlikely that extraction of the coal within the nominated areas could be undertaken economically from operations other than the Colliery;
- a failure of the Applicant to realise the benefits from its investment; and
- a lost opportunity for VPPS to source a reasonably priced, long term supply of coal for its energy generation requirements.

The environmental, social and economic benefits and disbenefits of the Proposal and from closure of the Colliery should approval not be granted, are provided in Chapters 7 to 22.

4 Legislative considerations

4.1 Introduction

This chapter describes the relevant Commonwealth and NSW State legislation and regulatory framework under which the Proposal has been assessed and would be determined.

4.2 Approvals history

As detailed in Section 2.1, the Colliery commenced operations in 1962, prior to the introduction of the EP&A Act in 1979 and, until January 2012, continued to operate under Section 74 of the Mining Act which exempted mines operating in a mining lease from the provisions of environmental planning instruments (EPIs) and the EP&A Act. However, a repeal of Section 74 in December 2005 and an amendment of the EP&A Regulation meant that an approval under the EP&A Act was required for the Colliery's continued operation.

The mining area proposed under the current Proposal encompasses areas for which Centennial Coal planning approvals MP06_0311 (Mannering Mine), MP10_0080 (Myuna Colliery), and DA97/800 (Mandalong Colliery) apply. These areas, referred to as Areas 1A, 1B and 1C, are shown in Figure 3.1 and discussed further in Section 3.1.1. The planning approvals and any associated applications relevant to the Site are summarised in Table 4.1.

Table 4.1 Planning approvals and applications relevant to the Site

| Application/ Approval No. | Status | Proponent | Description |
|------------------------------|--------------------------|----------------------|---|
| MP10_0161 | Approved 23 January 2012 | LakeCoal | <ul style="list-style-type: none">Continuation of mining at the Colliery within the Fassifern Seam in three areas referred to as Parcel A and Domains No. 1 and No. 2 for a five year period using a combination of bord and pillar and miniwall methods.A maximum production rate of 1.2 Mtpa of ROM coal. |
| MP10_0161_Mod 1 | Approved 30 August 2012 | LakeCoal | <ul style="list-style-type: none">Modification to the approved miniwall panel layout within Domains No. 1 and No. 2 and an increase in the maximum extraction width for all miniwalls beyond MW2. |
| DA97/800 | Approved 14 October 1998 | Centennial Mandalong | <ul style="list-style-type: none">Underground mining at the Mandalong Mine within the West Wallarah and Great Northern Seams at a maximum rate of 6 Mtpa of ROM coal using longwall and bord and pillar mining methods.The DA97/800 application area boundary includes part of the proposed mining areas referred to as Areas 1B and 1C. |
| MP06_0311 | Approved 12 March 2008 | Centennial Mannering | <ul style="list-style-type: none">Underground mining at the Mannering Colliery using bord and pillar mining methods within the Fassifern Seam at a maximum rate of 1.1 Mtpa of ROM coal until 31 March 2018.The approved mining area includes part of the proposed mining area referred to as Area 1A. |
| MP06_0311_Mod 1 | Lodged 8 August 2011 | Centennial Mannering | <ul style="list-style-type: none">Extension of mining at Mannering Colliery within the Fassifern and Great Northern Seams, to recover an additional 1.4 Mt of ROM coal.Increase in the number of full time employees to 170. |

Table 4.1 Planning approvals and applications relevant to the Site

| Application/ Approval No. | Status | Proponent | Description |
|------------------------------|-----------------------------|---------------------|--|
| MP10_0080 | Approved 18 January 2012 | Centennial Myuna | <ul style="list-style-type: none">Underground mining at the Myuna Colliery using bord and pillar mining methods within the Wallarah, Great Northern and Fassifern Seams at a maximum rate of 2 Mtpa of ROM coal until 31 December 2032.The approved extraction area includes part of the proposed mining area referred to as Area 1B. |

4.3 Environmental Planning and Assessment Act 1979

The EP&A Act and the EP&A Regulation provide the framework for environmental planning and assessment in NSW. Part 4 of the EP&A Act relates to development assessment, including Division 4.1 which specifically relates to the assessment of development deemed to be significant to the State (or SSD).

Section 89C(2) of the EP&A Act states that a:

“...State environmental planning policy may declare any development, or any class or description of development, to be State significant development.”

Schedule 1 of State Environmental Planning Policy (State and Regional Development) 2011 (the SRD SEPP) identifies what constitutes SSD, with one form being development for the purpose of coal mining. As the Proposal is of a kind described within Schedule 1 of the SRD SEPP, it meets the requirements for SSD (see Section 4.4.2 below for further information).

Under Section 89D of the EP&A Act, the Minister for Planning and Infrastructure is the consent authority for SSD. However, it should be noted that pursuant to Section 23 of the Act, the Minister may delegate the consent authority function to the Planning Assessment Commission, the Director-General or to any other public authority.

A DA for SSD must be accompanied by an EIS, prepared in accordance with the EP&A Regulation. Before preparing an EIS, an applicant must request DGRs which are essentially terms of reference which specify what must be addressed in an EIS. The DGRs for the Proposal were issued on 14 August 2012 and are included with this EIS in Appendix C. The sections of the EIS where the DGRs have been addressed are identified in Table 1.1.

When assessing a DA for SSD, the consent authority is required to take into consideration the matters outlined in Section 79C of the EP&A Act. This states:

“(1) Matters for consideration – general

In determining a development application, a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the development application:

- (a) the provisions of:
 - (i) any environmental planning instrument, and

- (ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Director-General has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and
 - (iii) any development control plan, and
 - (iiia) any planning agreement that has been entered into under section 93F, or any draft planning agreement that a developer has offered to enter into under section 93F, and
 - (iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), and
 - (v) any coastal zone management plan (within the meaning of the *Coastal Protection Act 1979*),
- that apply to the land to which the development application relates,
- (b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,
 - (c) the suitability of the site for the development,
 - (d) any submissions made in accordance with this Act or the regulations,
 - (e) the public interest.”

The EPIs relevant to the Proposal are discussed below. Despite the above, Clause 11 of the SRD SEPP states that development control plans do not apply to SSD.

4.4 Environmental planning instruments

The following EPIs are relevant to the Proposal and are discussed in the following sections:

- State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (the Mining SEPP);
- the SRD SEPP;
- State Environmental Planning Policy 71 – Coastal Protection (SEPP 71);
- Lake Macquarie Local Environmental Plan 2004 (LMLEP 2004); and
- Wyong Local Environmental Plan 1991 (Wyong LEP 1991).

4.4.1 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The Mining SEPP provides for the proper management and development of mineral, petroleum and extractive material resources for the social and economic welfare of NSW. The Mining SEPP establishes appropriate planning controls to encourage ecologically sustainable development.

Clause 7 of the Mining SEPP states that:

‘7. Development permissible with consent:

(1) Mining

“Development for any of the following purposes may be carried out only with development consent:

(a) underground mining carried out on any land,...

Accordingly, under the Mining SEPP the Proposal is permissible with development consent.

4.4.2 State Environmental Planning Policy (State and Regional Development) 2011

The SRD SEPP, amongst other matters, defines certain development that is SSD. Clause 8 of the SEPP states:

“(1) Development is declared to be State significant development for the purposes of the Act if:

(a) the development on the land concerned is, by the operation of an environmental planning instrument, not permissible without development consent under Part 4 of the Act, and

(b) the development is specified in Schedule 1 or 2.”

Schedule 1 of the SRD SEPP defines a range of general SSDs, including mining. Clause 5 of Schedule 1 states:

“(1) Development for the purpose of mining that:

(a) is coal or mineral sands mining, or

(b) is in an environmentally sensitive area of State significance, or

(c) has a capital investment value of more than \$30 million.”

The Proposal meets both the requirements of Clause 8 of the SRD SEPP as it is not permissible without development consent under the Mining SEPP and is development specified in Schedule 1. Therefore, the Proposal is declared SSD for the purposes of the EP&A Act.

4.4.3 State Environmental Planning Policy No.71 – Coastal Protection

SEPP 71 aims to protect and manage the natural, cultural, recreational and economic attributes of the coastal zone of NSW. The land on which the pit top area and the Summerland Point ventilation shaft and fans are located is within the coastal zone and, therefore, SEPP 71 applies to the Proposal. Clause 8 of SEPP 71 sets out matters of consideration that a consent authority must take into account when determining an application for development within the coastal zone. Consideration of the matters in Clause 8 relevant to the Proposal is provided in Table 4.2.

Table 4.2 **Consideration of SEPP 71, Clause 8 matters**

| Matter | Comment |
|--|--|
| <p>(a) the aims of this Policy set out in clause 2,</p> <ul style="list-style-type: none"> • to protect and manage the natural, cultural, recreational and economic attributes of the New South Wales coast, and • to protect and improve existing public access to and along coastal foreshores to the extent that this is compatible with the natural attributes of the coastal foreshore, and • to ensure that new opportunities for public access to and along coastal foreshores are identified and realised to the extent that this is compatible with the natural attributes of the coastal foreshore, and • to protect and preserve Aboriginal cultural heritage, and Aboriginal places, values, customs, beliefs and traditional knowledge, and • to ensure that the visual amenity of the coast is protected, and • to protect and preserve beach environments and beach amenity, and • to protect and preserve native coastal vegetation, and • to protect and preserve the marine environment of New South Wales, and • to protect and preserve rock platforms, and • to manage the coastal zone in accordance with the principles of ecologically sustainable development (within the meaning of section 6 (2) of the Protection of the Environment Administration Act 1991), and • to ensure that the type, bulk, scale and size of development is appropriate for the location and protects and improves the natural scenic quality of the surrounding area, and • to encourage a strategic approach to coastal management. | <p>The Proposal is consistent with the aims of the Policy.</p> |
| <p>(b) existing public access to and along the coastal foreshore for pedestrians or persons with a disability should be retained and, where possible, public access to and along the coastal foreshore for pedestrians or persons with a disability should be improved,</p> | <p>The Proposal does not impact existing public access to and along the coastal foreshore.</p> |
| <p>(c) opportunities to provide new public access to and along the coastal foreshore for pedestrians or persons with a disability,</p> | <p>The Proposal would not impact any areas of coastal foreshore where new public access could be provided.</p> |
| <p>(d) the suitability of development given its type, location and design and its relationship with the surrounding area,</p> | <p>The Proposal is suitable given that it involves an existing underground mine.</p> |
| <p>(e) any detrimental impact that development may have on the amenity of the coastal foreshore, including any significant overshadowing of the coastal foreshore and any significant loss of views from a public place to the coastal foreshore,</p> | <p>Proposed mining is limited to areas under Lake Macquarie, with areas of mining restricted by the HWMSB so as not to impact on the foreshore.</p> |
| <p>(f) the scenic qualities of the New South Wales coast, and means to protect and improve these qualities,</p> | <p>The Proposal would not impact the scenic qualities of the NSW coast.</p> |
| <p>(g) measures to conserve animals (within the meaning of the Threatened Species Conservation Act 1995) and plants (within the meaning of that Act), and their habitats,</p> | <p>The Proposal would not significantly impact on the conservation of threatened animal or plant species or their habitats (see Section 14.3).</p> |
| <p>(h) measures to conserve fish (within the meaning of Part 7A of the Fisheries Management Act 1994) and marine vegetation (within the meaning of that Part), and their habitats</p> | <p>The Proposal would not significantly impact on the conservation of threatened fish species or marine vegetation or their habitats (see Section 13.3).</p> |

Table 4.2 **Consideration of SEPP 71, Clause 8 matters**

| Matter | Comment |
|---|--|
| (i) existing wildlife corridors and the impact of development on these corridors, | There are no existing wildlife corridors within the Site and, therefore, the Proposal would not impact on these. |
| (j) the likely impact of coastal processes and coastal hazards on development and any likely impacts of development on coastal processes and coastal hazards, | The Proposal would not impact on coastal processes or hazards (see Appendix I). Sea level rise attributed to climate change would not impact on surface infrastructure (see Section 17.2.5). |
| (k) measures to reduce the potential for conflict between land-based and water-based coastal activities, | The Proposal does not conflict between land-based and water-based coastal activities. |
| (l) measures to protect the cultural places, values, customs, beliefs and traditional knowledge of Aboriginals, | The Proposal would not significantly impact on Aboriginal heritage (see Section 15.3). |
| (m) likely impacts of development on the water quality of coastal waterbodies, | The Proposal would not result in a significant impact on water quality of Lake Macquarie (see Section 8.3.3). |
| (n) the conservation and preservation of items of heritage, archaeological or historic significance, | The Proposal would not significantly impact on Aboriginal or historic heritage (see Section 15.3). |
| (p) only in cases in which a development application in relation to proposed development is determined: | The Proposal would not have significant cumulative impacts on the environment (see environmental assessments in Chapters 7 to 22). |
| (i) the cumulative impacts of the proposed development on the environment, and | Measures to ensure the efficient use of water and energy at the Colliery are discussed in Sections 8.4 and 10.4, respectively. |
| (ii) measures to ensure that water and energy usage by the proposed development is efficient. | |

4.4.4 Lake Macquarie Local Environmental Plan 2004

The waters of Lake Macquarie are located within Lake Macquarie LGA to which the LMLEP 2004 applies. Area 1 is within Zone 11 – Lakes and Waterways Zone. Under LMLEP 2004, mining within Zone 11 is permissible with consent. Therefore, the Proposal is permissible with development consent under LMLEP 2004, and is considered to be compatible with the objectives of Zone 11.

Lake Macquarie City Council (LMCC) has prepared the Draft Lake Macquarie Local Environmental Plan 2012 (Draft LMLEP) which conforms with the Standard Instrument and will replace the LMLEP 2004. Public submissions on the Draft LMLEP closed in December 2012 and the document is expected to be adopted in 2013. Under the Draft LMLEP, Area 1 will be zoned W1 Natural Waterways. This zone prohibits any use that is not identified as being permissible with or without consent in the land use table. Mining is not listed, and therefore the Proposal would be prohibited under the draft instrument. As mentioned in Section 4.4.1, the Proposal is permissible under the Mining SEPP. In the event of an inconsistency, Section 36 of the EP&A Act stipulates that there is a general presumption that a State environmental planning policy prevails over a local environmental plan. Therefore, the prohibition under the Draft LMLEP does not affect the Proposal's permissibility.

4.4.5 Wyong Local Environmental Plan 1991

The suburbs of Mannering Park and Summerland Point which include the Colliery's pit top and the Summerland Point ventilation shaft and fans lie within Wyong LGA to which the Wyong LEP 1991 applies. The Colliery's pit top area and Summerland Point ventilation shaft and fans are zoned No. 5(a) (Special Uses – Power Station) and the area to the east of the sedimentation dams at the pit top area, through which the mine water discharge water flows, is zoned No. 7(g) (Wetlands Management Zone). Development for the purposes of mining is permissible with consent in Zone No. 5(a). Drainage is permissible with consent in Zone No. 7(g). The Proposal is considered to be compatible with the objectives of both Zone 5(a) and Zone No. 7(g).

Clause 19 of the Wyong LEP 1991 "Development near lakes, rivers and creeks" applies to the carrying out of development on land adjoining Lake Macquarie and, therefore, applies to the Proposal. Clause 19 requires consideration of the impacts of development on water quality, quantity and supply, whether watercourses or water bodies would be detrimentally impacted, and whether the development incorporates best practice water sensitive urban design techniques. Considerations of these are provided in Chapter 8 and Appendix E.

Clause 41A of the Wyong LEP 1991 applies to development of land within Zone No. 7(g) and provides that Council must not consent to any development on such land without consideration of a wetland effects statement. The Proposal does not require consent from Council; however, the impacts of the Proposal on the land zone No. 7(g) are considered in Section 14.3.2.

WSC has prepared the Draft Wyong Shire Council LEP (Draft Wyong LEP) which conforms with the Standard Instrument and will replace the Wyong LEP 1991. Public submissions on the Draft Wyong LEP closed in February 2013 and the document is expected to be adopted mid-2013. Under the Draft Wyong LEP, the pit top area is zoned SP1 Special Activities, the Summerland Point ventilation shaft and fans are zoned E1 National Parks and Nature Reserves, and the area east of the pit top sedimentation dams, through which the mine water discharge water flows, is zoned E2 Environmental Conservation. Development for the purposes of underground mining is prohibited within zones SP1, E1 and E2. However, as discussed previously, the Mining SEPP prevails over the Draft Wyong LEP and the prohibition does not affect the Proposal's permissibility.

4.5 Other State legislation

The following Acts are relevant to the Proposal.

4.5.1 Coastal Protection Act 1979

The *Coastal Protection Act 1979* (Coastal Protection Act) provides for the protection of NSW's coastal environment. The Coastal Protection Act defines the coastal zone of NSW within which the Colliery's pit top area and Summerland Point ventilation shaft and fans are located. Under Part 3 of the Coastal Protection Act, concurrence from the Minister for the Environment is required for certain development. Concurrence from the Minister is not required for the Proposal as it is SSD (see Section 4.5.9).

4.5.2 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (FM Act) declares and lists threatened species of fish and marine vegetation and endangered populations and ecological communities. It contains measures to conserve those identified species, populations and communities and to promote ESD. Permits under Sections 201, 205 and 219 of the FM Act are not required for SSD (see Section 4.5.9).

4.5.3 Mining Act 1992

The Mining Act makes provision for granting mining authorities, leases and licences for the exploration and mining of minerals and coal. The Mining Act places controls on methods of exploration and mining, the disposal of mining waste, land rehabilitation, and environmental management activities.

A number of mining leases and consolidated coal leases issued under the Mining Act are applicable to the Proposal (see Figure 2.5). A written and registered sublease between LakeCoal and Centennial Coal under the Mining Act would enable LakeCoal to undertake mining within the leases held by Centennial Coal. The MOPs or RMPs applicable to the various leases would be amended, as required, in accordance with the Proposal.

4.5.4 Mine Subsidence Compensation Act 1961

The *Mine Subsidence Compensation Act 1961* (MSC Act) establishes a mechanism for the payment of compensation for damage by subsidence resulting from the mining of coal or shale. Mine Subsidence Districts can be established by the Mine Subsidence Board under Section 15 of the MSC Act, within which approval for alteration or erection of improvements and subdivision is required from the Board. Terrestrial areas of the Site, including the pit top area and the Summerland Point ventilation shaft and fans areas, together with historical workings within the Great Northern and Wallarah Seams, are located within the Swansea North Entrance Mine Subsidence District.

Consultation with the Mine Subsidence Board was undertaken for the Proposal (see Section 5.3).

4.5.5 Protection of the Environment Operations Act 1997

The PoEO Act is the principal NSW environmental protection legislation and is administered by the Environmental Protection Authority (EPA). Schedule 1 of the PoEO Act lists the 'scheduled activities' which are to be regulated by an EPL which includes criteria and monitoring requirements for licensed activities. A coal mine that has a capacity to produce more than 500 t of coal per day or has disturbed a total surface area of more than 4 ha is a scheduled activity. The Colliery has an existing EPL (EPL 1770) which was initially issued 10 November 2000 and transferred to LakeCoal in April 2002. The licence has been varied several times with the most recent variation issued 21 December 2011. A further variation to EPL 1770 to reflect Project Approval MP10_0161 is currently being processed. Groundwater and surface water assessments undertaken for the Proposal have determined that the EPL would need to be varied as a result of the Proposal, as discussed in Section 8.3.4.

4.5.6 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) aims to conserve biological diversity in NSW through the protection of threatened and endangered flora and fauna species and ecological communities (EECs). The potential impacts of the Proposal on threatened species and EECs listed under the TSC Act are discussed in Section 14.3.1 and 14.3.2 of this document.

4.5.7 Water Act 1912

The Water Act regulates the issue and trade of water licences in NSW water sources where water sharing plans have not yet commenced. This includes a water licence or authority to extract groundwater under Part 5 of the Water Act. LakeCoal currently holds bore licence 20BL173107, issued under the Water Act, for the purposes of mine dewatering up to a maximum rate of 4,443 ML per annum (refer also to Section 7.2.3).

4.5.8 Water Management Act 2000

The *Water Management Act 2000* (WM Act) regulates the use and interference with surface and groundwater in NSW and applies to those water sources which are managed by an operational water sharing plan. The Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009, commenced on 1 August 2009 and applies to the South Lake Macquarie water source. Water use and water management work approvals under Sections 89 and 90, respectively, of the WM Act apply to the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009; however, these approvals are not required for SSD (see Section 4.5.9). Activity approvals, including aquifer interference approvals, under Section 91 of the WM Act do not currently apply to the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009.

An assessment of aquifer impacts resulting from the Proposal is provided in Section 7.3. The Proposal would not result in any water take from sources regulated by the WM Act.

The NSW government recently implemented an Aquifer Interference Policy. This policy establishes requirements for licensing and approvals for aquifer interference activities under the Water Act, WM Act and other relevant legislation. Further consideration of the Aquifer Interference Policy is provided in Appendix D.

4.5.9 Approvals not required or which cannot be refused

Under Section 89J of the EP&A Act the following authorisations are not required for SSD:

- “(a) the concurrence under Part 3 of the *Coastal Protection Act 1979* of the Minister administering that Part of that Act;
- (b) a permit under Section 201, 205 or 219 of the *Fisheries Management Act 1994*;
- (c) an approval under Part 4, or an excavation permit under Section 139, of the *Heritage Act 1977*;
- (d) an Aboriginal heritage impact permit under Section 90 of the *National Parks and Wildlife Act 1974*;
- (e) an authorisation referred to in Section 12 of the *Native Vegetation Act 2003* (or under any Act repealed by that Act) to clear native vegetation or State protected land;
- (f) a bush fire safety authority under Section 100B of the *Rural Fires Act 1997*; and
- (g) a water use approval under Section 89, a water management work approval under Section 90 or an activity approval (other than an aquifer interference approval) under Section 91 of the *Water Management Act 2000*.”

Further, under Section 89K of the EP&A Act, the following authorisations cannot be refused and are to be substantially consistent with a development consent for SSD:

- “(a) an aquaculture permit under Section 144 of the *Fisheries Management Act 1994*,
- (b) an approval under Section 15 of the *Mine Subsidence Compensation Act 1961*,
- (c) a mining lease under the *Mining Act 1992*,
- (d) a production lease under the *Petroleum (Onshore) Act 1991*,
- (e) an environment protection licence under Chapter 3 of the *Protection of the Environment Operations Act 1997* (for any of the purposes referred to in Section 43 of that Act),

- (f) a consent under Section 138 of the *Roads Act 1993*,
- (g) a licence under the *Pipelines Act 1967*.”

4.6 Commonwealth legislation

4.6.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) aims to protect matters deemed to be of national environmental significance (NES) including:

- world heritage properties;
- places listed on the National Heritage Register;
- Ramsar wetlands of international significance;
- threatened flora and fauna species and ecological communities;
- migratory species;
- Commonwealth marine areas; and
- nuclear actions (including uranium mining).

If an action (or proposal) would, or is likely to, have a significant impact on any matters of NES, it is deemed to be a Controlled Action and requires approval from the Commonwealth Environment Minister or the Minister’s delegate. To determine whether a proposed action would or is likely to be a Controlled Action, an action may be referred to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC).

The matters of NES that have the potential to be impacted by the Proposal include threatened flora and fauna species and ecological communities. The Proposal is unlikely to significantly impact on these matters of NES, as discussed in Section 14.3.2, and a referral to DSEWPaC is not required. A copy of the Terrestrial ecology assessment (Chapter 14) was sent to DSEWPaC on 4 December 2012 to brief them on the Proposal and potential impacts to threatened flora and fauna species and ecological communities following a request received on 20 November 2012. To date no additional comment has been received.

4.6.2 Native Title Act 1993

The *Native Title Act 1993* establishes that some Aboriginal and Torres Strait Islander people have rights and interests to their land that comes from their traditional laws and customs. The National Native Title Tribunal is responsible for maintaining a register of native title claimants and bodies to whom native title rights have been granted. When affected by a proposed development, these native title holders or claimants must be consulted prior to the granting of a mining lease over land to which the native title claim or right applies.

There are currently no native title claims, unregistered claimant applications or indigenous land use agreements relating to the Site.

5 Stakeholder engagement

5.1 Introduction

This chapter describes the process for, and outcomes from, stakeholder engagement undertaken for this EIS. Specifically, it describes the:

- stakeholder engagement objectives and identification;
- stakeholder engagement activities;
- stakeholder engagement results; and
- matters raised during engagement and their consideration.

5.2 Stakeholder engagement objectives and identification

The objectives of stakeholder engagement were to:

- provide accurate and relevant information about the Proposal to stakeholders to create, maintain or increase awareness of the Proposal;
- enable stakeholders to comment on the Proposal and EIS so that it can be amended if needed to reflect stakeholder values and expectations; and
- satisfy the stakeholder engagement requirements established by the DGRs.

Stakeholders identified for direct engagement were divided into two groups, namely:

- government and service providers; and
- community and special interest groups.

Table 5.1 lists the government stakeholders nominated by the DGRs to be engaged.

Table 5.1 Identified stakeholders

| | |
|--|--|
| Government and service provider | |
| Commonwealth government agencies | DSEWPaC |
| State government agencies | OEH (including heritage branch) EPA DTIRIS Department of Primary Industries (including NOW), NSW Forestry, Agriculture and Fisheries sections, Catchments and Lands (Crown Lands Division)) Transport for NSW (including the Centre for Transport Planning and Roads and Maritime Services (RMS)) Mine Subsidence Board NSW Health Hunter-Central Rivers Catchment Management Authority |
| Local government authorities | Gosford-Wyong Councils Water Authority WSC Newcastle City Council (NCC) LMCC |
| Community and special interest groups | Chain Valley Colliery Community Consultative Committee (CCC) Local residents Manning Park, Gwandalan and Summerland Point Community Precinct Committees |
| Service Providers | Central Coast Local Health District Central Coast Medicare Local Hunter Medicare Local |

5.3 Stakeholder engagement activities

5.3.1 Government and service providers

On 15 May 2012, LakeCoal provided correspondence to DP&I which highlighted constraints within MP10_0161 that had the potential to threaten the viability of the Colliery. The correspondence documented a range of changes to both mining operations within approved mining areas, as well as additional mining areas for which LakeCoal was considering future extraction of reserves. Area 1, which is the subject of the current Proposal, was initially identified as an area in which LakeCoal was seeking to undertake mining operations. LakeCoal representatives met with DP&I on 16 May 2012 to discuss these issues in greater detail. Matters raised by DP&I in the meeting have subsequently been included in the DGRs issued for the Proposal.

Prior to lodgement of the *Request for Director-General's Requirements: Supporting Documentation* (EMM 2012a), LakeCoal representatives met with DRE on 2 August 2012 to present a Conceptual Project Development Plan to DRE technical officers. At this meeting, DRE verbally accepted progression of the Proposal to the planning assessment and approval process and later confirmed its support in its letter to DP&I dated 9 August 2012.

In accordance with the requirements of the DGRs the Commonwealth, State and local government authorities identified in Section 5.2 were sent letters providing the details of the Proposal as well as an offer of further information or, should it be preferred, a face to face briefing.

Each authority had no further requirements with respect to information on the Proposal at that stage, with the exception of DSEWPaC which requested a copy of the Proposal's terrestrial ecology assessment. This was provided on 4 December 2012.

Representatives of LakeCoal and EMM met with officers representing LMCC on 7 August 2012, and WSC on 13 August 2012. The purpose of the meetings was to provide Council officers with a briefing of the Proposal and to seek information/ feedback as to the particular issues relating to each LGA. A summary of the matters raised at those meetings with respect to the Proposal is provided in Table 5.2.

Telephone interviews were also held with social planners from WSC and LMCC, as well as representatives from the Central Coast Local Health District, Hunter-New England Local Health District, Central Coast Medicare Local and Hunter Medicare Local to inform the social impact assessment (SIA) (Appendix N). A summary of the matters raised in these interviews is provided in Table 5.2.

5.3.2 Community and special interest groups

As stated in the Colliery's environment and community policy, LakeCoal is committed to communicating and engaging with the community and other stakeholders in respect to ongoing operations at the Colliery. Consistent with this commitment, community consultation for the Colliery is ongoing and comprises:

- a community hotline number (1800 687 557) providing the community with the opportunity to provide feedback, including matters of concern and complaints, relating to operations at the Colliery;
- the Colliery website (chainvalleymine.com.au) which contains information on mine operations and management, project applications, community engagement and contact details. The Proposal has a dedicated page on the website, which contains the *Request for Director-General Requirements: Supporting Documentation* (EMM 2012a), e-newsletter, and community hotline number;
- the publication of environmental monitoring results associated with the Colliery's operation on the website; and
- through the Colliery's CCC.

As a means of specifically targeting community feedback on the Proposal, a community information and feedback session was held for the Proposal and a LakeCoal representative attended the Gwandalan/Summerland Point Precinct Committee meeting. An overview of these stakeholder engagement activities, together with additional information on the CCC, is provided in the following subsections.

i Community information and feedback session

In accordance with LakeCoal's commitment to engage with and inform the local community as to operations at the Colliery, a community information session was held following submission of the *Request for Director-General's Requirements: Supporting Documentation* (EMM 2012a), to promote awareness and provide information on the Proposal and a forum for feedback on any issues/ concerns which would require consideration as part of the environmental assessment process.

The session was held on 30 August 2012 at Chain Valley Bay Community Hall and was led by representatives of LakeCoal and EMM.

Flyers notifying the time, date and location of the session, and providing EMM's contact details were dropped into letter boxes in the communities adjacent to the Proposal between 19 and 24 August 2012. A newspaper advertisement notifying the time, date and location of the session was published on 22 August 2012 in the Lakes Mail, Newcastle Herald, Central Coast Express Advocate and Newcastle Post. Letters were also sent to the State and Federal members, and representatives of WSC and LMCC were invited to the session via telephone and written invitation.

Details of the Proposal were displayed during the session via a series of 'story boards' and a video presentation showing the miniwall mining technique.

The session was attended by 22 people, comprising a mix of local residents and representatives of the Chain Valley Bay Progress Association, Lake Munmorah and Chain Valley Bay Precinct committees, Chain Valley Bay Hall Committee, and the Colliery's CCC.

Feedback received during the session was generally positive. Matters raised and where these have been addressed in this EIS, are provided in Table 5.2.

ii Committee attendance

A LakeCoal representative attended a Gwandalan/ Summerland Point Precinct Committee meeting to present a briefing on the Proposal and answer questions. Feedback received at this meeting was generally positive towards the Proposal.

iii Community consultative committee

The CCC was preceded by a stakeholder reference group, which was established in 2009 during preparation of the application to continue operation of the Colliery. The stakeholder reference group continued to meet under a CCC after the Continuation Project (MP 10_0161) was approved, established in accordance with Schedule 5, Condition 6 of MP10_0161, with the first meeting on 15 May 2012.

The Proposal was discussed at the four CCC meetings held to date: 15 May 2012; 7 August 2012; 13 November 2012; and 19 February 2013. LakeCoal representatives described the proposed mining areas, mine design considerations and Proposal timeline. As well as raising matters at the CCC meetings, CCC members were invited to independently contact EMM to provide feedback for consideration in the EIS. To date, no direct contact has been made.

5.4 Stakeholder engagement results

5.4.1 Government and service providers

Matters raised from those government agencies and service providers that provided feedback during consultation are listed in Table 5.2, together with a reference identifying where each matter is addressed in the EIS.

Table 5.2 **Government and service providers**

| Stakeholder | Theme | Matters raised | Date | Type | Outcome | EIS reference |
|-------------|-------------------------------------|--|----------------|---|---|--------------------------------|
| Government | | | | | | |
| WSC | Community services and demographics | <ul style="list-style-type: none"> Recommended the use of council's social planning district as part of community profile for Northern Wyong localities | 16 August 2012 | Telephone interview with Social Planner | Carried out in Social Impact Assessment | Chapter 22 |
| | | <ul style="list-style-type: none"> Recommended the use of crime data as part of community profile | | | As above | Appendix N |
| | | <ul style="list-style-type: none"> Advised that localities around Chain Valley Bay are closely connected | | | Noted and considered in the Social Impact Assessment | Appendix N |
| | | <ul style="list-style-type: none"> Advised that limited access to facilities and services may be an issue | | | As above | Section 22.3.3 |
| | Community consultation | <ul style="list-style-type: none"> Recommended that a community information session be held prior to lodgement of the EIS for public exhibition. It was also recommended that contact be made with relevant precinct groups to advise of the Proposal | As above | Telephone interview with Social Planner | Community Information Session held on 30 August 2012. Precinct groups invited | Section 5.3.2 |
| | | <ul style="list-style-type: none"> Noted that a stakeholder engagement plan should be prepared for the Proposal | | | Noted and prepared for EIS | Chapter 5 |
| | Traffic and transport | <ul style="list-style-type: none"> Highlighted community concern over truck haulage on public roads and safety issues associated with the Construction Road intersection | 13 August 2012 | Meeting with Council officers | Noted and considered in the Traffic Impact Assessment | Sections 3.3.5 and 11.3.4 |
| | Aquatic ecology | <ul style="list-style-type: none"> Raised the potential for impacts to seagrasses as a matter requiring consideration. Requested mapping and consideration of rehabilitation and mitigation measures | As above | As above | Noted and considered as part of the Marine Ecology Impact Assessment | Sections 13.2.4, 13.3 and 13.4 |

Table 5.2 **Government and service providers**

| Stakeholder | Theme | Matters raised | Date | Type | Outcome | EIS reference |
|-------------|-------------------------------------|--|----------------|---|--|-------------------------------|
| LMCC | Water recycling | <ul style="list-style-type: none"> Requested that water reuse initiatives and measures, including consideration of sourcing water from the VPPS were addressed in the EIS | As above | As above | Noted and considered in Surface water Impact Assessment | Section 8.4.2 and Appendix E |
| | Noise management | <ul style="list-style-type: none"> Noted that the EIS must address potential noise impacts and their management | As above | As above | Noted and considered in Noise Impact Assessment | Section 9.3 and 9.4 |
| | Community services and demographics | <ul style="list-style-type: none"> Recommended that the EIS/ SIA reference council social planning policies and strategies | 13 August 2012 | Telephone interview with Social Planner | Carried out in Social Impact Assessment | Section 22.3.8 |
| | | <ul style="list-style-type: none"> Advised the recent Australian Bureau of Statistics (ABS) census data should be used in the EIS/SIA | | | As above | Section 22.2 and Appendix N |
| | | <ul style="list-style-type: none"> Recommended that consideration be provided to the community profile across the whole LGA | | | As above | Chapter 22 and Appendix N |
| | | <ul style="list-style-type: none"> Noted the diverse nature of the community in southern LGA (including high number of holiday homes) | | | As above | Section 22.2.3 |
| | | <ul style="list-style-type: none"> Noted that some communities are isolated with little or no public transport | | | As above | Section 11.3.7 |
| | | <ul style="list-style-type: none"> Noted that there is limited youth infrastructure | | | As above | Section 22.3.3 and Appendix N |
| | | <ul style="list-style-type: none"> Noted that there is poor access to health services | | | As above | Section 22.3.3 and Appendix N |
| | Aboriginal heritage | <ul style="list-style-type: none"> Potential impacts on Aboriginal heritage sites along the lake foreshore was raised | 7 August 2012 | Meeting with Council officers | Noted and considered in the assessment of heritage impacts | Section 15.3.1 |
| | Benthic communities | <ul style="list-style-type: none"> Potential impacts to benthic communities resulting from changes to the level of lake floor was raised | As above | As above | | Section 13.3.3 |

Table 5.2 Government and service providers

| Stakeholder | Theme | Matters raised | Date | Type | Outcome | EIS reference |
|---|---|--|---------------------------------------|----------------------------|------------------|---------------|
| DP&I | The Proposal and its need | <ul style="list-style-type: none"> As per DGRs | 16 May 2012 | Meeting with DP&I officers | Addressed in EIS | Table 1.1 |
| DSEWPaC | Ecological matters | <ul style="list-style-type: none"> DSEWPaC requested a copy of justification as to why a EPBC referral was not considered necessary. Draft terrestrial ecology and aquatic ecology chapters of EIS provided to DSEWPaC. | 21 September 2012 and 4 December 2012 | Letter correspondence | N/A | N/A |
| OEH (including the Heritage Branch) | Background to, and description of, the Proposal | <ul style="list-style-type: none"> No response received | 21 September 2013 | Letter correspondence | N/A | N/A |
| EPA | As above | <ul style="list-style-type: none"> No response received | 21 September 2012 | Letter correspondence | N/A | N/A |
| DTIRIS | As above | <ul style="list-style-type: none"> No response received | 21 September 2012 | Letter correspondence | N/A | N/A |
| Department of Primary Industries (including the NSW Office of Water, NSW Forestry, Agriculture and Fisheries sections, Catchments and Lands (Crown Lands Division)) | As above | <ul style="list-style-type: none"> No response received | 21 September 2012 | Letter correspondence | N/A | N/A |
| Transport for NSW (Including the Centre for Transport Planning, and Roads and Maritime Services) | As above | <ul style="list-style-type: none"> No response received | 21 September 2012 | Letter correspondence | N/A | N/A |
| Mine Subsidence Board | As above | <ul style="list-style-type: none"> No response received | 21 September 2012 | Letter correspondence | N/A | N/A |
| NSW Health | As above | <ul style="list-style-type: none"> No response received | 21 September 2012 | Letter correspondence | N/A | N/A |
| Hunter Central Rivers Catchment Management Authority | As above | <ul style="list-style-type: none"> No response received | 21 September 2012 | Letter correspondence | N/A | N/A |

Table 5.2 Government and service providers

| Stakeholder | Theme | Matters raised | Date | Type | Outcome | EIS reference |
|--|-----------|--|-------------------|---|--|-------------------------------|
| Gosford – Wyong Councils Water Authority | As above | <ul style="list-style-type: none"> No response received | 21 September 2012 | Letter correspondence | Response received from | N/A |
| Service providers | | | | | | |
| Department of Education and Communities | Education | <ul style="list-style-type: none"> Issues associated with limited educational services were noted | 22 October 2012 | Telephone interview with Senior Regional Assets Planner and Regional Assets Manager | Noted and considered in Social Impact Assessment | Section 22.3.3 and Appendix N |
| | | <ul style="list-style-type: none"> Existing capacity within primary and secondary schools was noted | 22 October 2012 | As above | As above | Section 22.3.3 and Appendix N |
| Central Coast Local Health District | Health | <ul style="list-style-type: none"> Limited health service issues with no increase in workforce population from the Proposal was noted | 22 October 2012 | Telephone interview with Manager Capital Works and Asset Management | Noted and considered in Social Impact Assessment | Section 22.3.3 and Appendix N |
| Central Coast Medicare Local | | <ul style="list-style-type: none"> Issue with general practitioners closing ‘books’ to new patients was noted | 22 October 2012 | Telephone interview with Practice Support Officer | Noted and considered in Social Impact Assessment | Section 22.3.3 and Appendix N |
| | | <ul style="list-style-type: none"> Limited access to mental health related services in northern part of Wyong LGA was raised | 22 October 2012 | As above | As above | Section 22.3.3 and Appendix N |
| Hunter Medicare Local | | <ul style="list-style-type: none"> Shortfall of General Practitioners towards southern end of Lake Macquarie was noted | 22 October 2012 | Telephone interview with Communications Officer | Noted and considered in Social Impact Assessment | Section 22.3.3 and Appendix N |

5.4.2 Community and special interest groups

Matters raised during community and special interest group engagement activities presented in the preceding sections are listed in Table 5.3 together with a reference identifying where each matter is addressed in the EIS.

Table 5.3 Community and special interest groups

| Stakeholder | Theme | Matters Raised | EIS reference |
|-------------------------------|-----------------------------------|---|------------------------------|
| CCC | Proposal | • Mine design associated with miniwall operations | Section 3.1.1 and Figure 3.1 |
| | | • Proposal timeframe | Table 3.1 |
| | | • Timely access to Proposal information | Section 5.3.2 |
| | | • Extent of mine extension under Lake Macquarie | Section 3.1.1 |
| | | • Extension of mining under existing residential areas | Section 3.3.1 |
| | Subsidence | • Extent of subsidence and impact on benthic communities | Sections 12.3 and 13.3.3 |
| | | • Impacts on existing and proposed infrastructure | Section 12.3.3 |
| | Noise and vibration | • Consideration of prevailing winds | Section 9.3.2 |
| | | • Proposed monitoring locations | Section 9.4 |
| | Community | • Design, implementation and management of community trust | Section 22.4.2 |
| | Traffic and transport | • Road maintenance contribution requirements to WSC | Section 22.4.2 |
| | | • Impact from change in hours for coal haulage | Sections 9.3.6 and 11.3 |
| | Air quality | • Proposed monitoring locations | Section 10.4.3 |
| Community information session | Ecology (terrestrial and aquatic) | • Impacts on seagrass | Section 13.3.2 |
| | | • Impacts on terrestrial vegetation from civil works | Section 14.3.1 |
| | Consultation | • Incorporation of matters raised from neighbouring suburbs | Section 5.5 and Table 5.3 |
| | Employment | • Number of employees | Table 2.1 |
| | | • Source of employees | Section 22.2.1 |
| | Subsidence | • Property damage from subsidence | Section 4.5.4 and 12.3 |
| | | • Impacts to the bed of Lake Macquarie | Sections 12.3 and 13.3.2 |
| | Proponent | • Ownership of LakeCoal | Section 1.3 |
| | Mining technique | • Mining technique to be employed | Section 2.2.2 and 3.1.1 |
| | Transport | • Approvals for the haul road | Sections 3.3.5 and 11.2.2 |

Table 5.3 Community and special interest groups

| Stakeholder | Theme | Matters Raised | EIS reference |
|--|-------------------------|--|-------------------------|
| Lake Munmorah and Chain Valley Bay Community Precinct Committee | Business and employment | <ul style="list-style-type: none"> Maintaining employment of workforce to activate northern Wyong LGA | Section 22.3.6 |
| | | <ul style="list-style-type: none"> Flow-on effects for local business with job retention | Section 21.3.2 |
| Mannering Park, Gwandalan and Summerland Point Community Precinct Committees | Subsidence | <ul style="list-style-type: none"> Extent of mine extension under Lake Macquarie | Figure 3.1 |
| | | <ul style="list-style-type: none"> Extension of mining under existing residential areas | Section 3.3.1 |
| | | <ul style="list-style-type: none"> Extent of subsidence and potential impacts | Section 12.3 and 13.3.2 |
| | Transport | <ul style="list-style-type: none"> Ongoing coal haulage arrangements | Section 11.2.3 and 11.4 |

5.5 Consideration of matters raised

In recognition of community and government concern over truck haulage of coal on public roads, LakeCoal has committed to ensuring the additional 300,000 tpa of coal to be extracted under the Proposal is transported to VPPS. This ensures that the additional product is transported via private roads and truck movements on public roads are not increased under the Proposal. As discussed in Section 3.3.4, LakeCoal is investigating alternate transport options to reduce or eliminate truck haulage from public roads. Further information on these alternative options is provided in Appendix H.

LakeCoal holds mine leases for coal reserves under Summerland Point, Chain Valley Bay, Mannering Park and Kingfisher Shores. The Proposal, however, has been designed to ensure all secondary extraction is confined to areas under the Lake Macquarie water body.

LakeCoal chose not to pursue mining under land as part of this application, as it is considered that the potential impacts of subsidence on land based infrastructure resulting from underground mining could not be properly assessed and mitigated within the limited timeframe for approval of additional mining areas. Further, mining under land is considered to have the potential for greater levels of impact and is considered a less desirable alternative than mining under Lake Macquarie at the present time. The preferred mine design was selected as it finds the appropriate balance between maximising recovery of reserves and minimising the potential for adverse safety and environmental impacts.

Assessment methods were developed with due consideration to matters raised during stakeholder engagement. For example, the scope of the SIA was modified to accommodate matters raised by WSC, LMCC and a community information session was held prior to lodgement of the EIS for exhibition. All matters raised during stakeholder engagement were considered in the EIS as demonstrated in Tables 5.2 and 5.3.

6 Issues identification

6.1 Introduction

A preliminary environmental risk assessment was undertaken to determine the Proposal's potential environmental impacts, the risk of them occurring and the consequence of occurrence. The identification of risks enabled the determination of assessment priorities for the EIS and further amelioration measures to be incorporated into the design of the Proposal. This chapter presents the preliminary risk ratings and residual risk ratings based on the outcomes of the EIS.

6.2 Environmental issue identification

The potential environmental impacts were categorised in the preliminary environmental risk assessment and then described in EMM 2012a. Each category was divided into components, which were assessed for risk using the method described in Section 6.3, consistent with the requirements of the DGRs. The categories are shown in Table 6.1 in order of descending risk.

Table 6.1 Preliminary environmental risk assessment

| Risk level | Potential environmental impact category |
|-------------------|--|
| High | Socio-economic |
| | Groundwater |
| | Surface water |
| Moderate | Noise |
| | Air quality |
| | Traffic |
| Low | Subsidence |
| | Ecology |
| | Aboriginal and historic heritage |
| | Wastes |
| | Visual |
| | Soils |

6.3 Environmental risk assessment

At the inception of the environmental assessment process for the Proposal, an environmental risk workshop was held to determine potential environmental impacts from the Proposal and the likelihood that these would occur. The workshop was attended by representatives from LakeCoal, EMM and technical specialist consultants. The workshop process was based on the LDO's environmental risk assessment template which was prepared in accordance with the then current *Australian Standard/New Zealand Standard 4360:2004 Risk management* and *HB 203: 203: 2006 Environmental Risk Management – Principle and Process*.

The assessment of risks assumes the adoption of controls and mitigation measures that are standard throughout the coal mining industry. Risks were determined using the following variables:

- the potential severity or consequences of the impact, described in Table 6.2; and
- the likelihood of the impact occurring, described in Table 6.3.

Table 6.2 Qualitative measures of consequence

| Level | Descriptor | Description |
|-------|---------------|--|
| 5 | Critical | Regional environmental impact/ecosystem damage. Impact causing mine or business closure. For example, major release off-site with long term detrimental effect. |
| 4 | High | Substantial environmental damage which could result in major financial loss and/or prosecution For example, off-site release resulting in local ecosystem damage. |
| 3 | Medium | Substantial temporary or minor long term damage, release immediately contained with outside assistance. For example, a minor water discharge or large hydrocarbon spill. Legal non-compliance. |
| 2 | Low | Temporary or minor damage, non-compliance with internal environmental target, no legal breach For example, a minor spill. |
| 1 | Insignificant | No detrimental effect, low financial loss, negligible environmental impact. |

Table 6.3 Qualitative measures of likelihood

| Level | Descriptor | Description |
|-------|----------------|---|
| A | Almost certain | Almost certain to happen during the lifetime of the project. |
| B | Likely | Impact that is likely to happen at some point during the lifetime of the project. |
| C | Moderate | Impact that is possible; heard of so it might occur during the lifetime of the project. |
| D | Unlikely | Impact that is not likely to occur during the lifetime of the project. |
| E | Rare | Impact that is practically impossible during the lifetime of the project. |

Each of the risk sources were then allocated a risk rating based on the related likelihood and consequence measure using the environmental risk matrix in Table 6.4. The resultant risk ratings are presented in Table 6.5 and were used to determine environmental impact assessment priorities for this EIS.

Table 6.4 Environmental risk assessment matrix

| | | <i>Consequence</i> | | | | |
|-------------------|---------------------|--------------------|----------------|----------------|-----------------|-----------------|
| | | 1 Insignificant | 2 Low | 3 Medium | 4 High | 5 Critical |
| <i>Likelihood</i> | A Almost certain | 15 (Medium) | 10 (High) | 6 (High) | 3 (Critical) | 1 (Critical) |
| | B Likely | 19 (Low) | 14 (Medium) | 9 (High) | 5 (High) | 2 (Critical) |
| | C Moderate | 22 (Low) | 18 (Low) | 13 (Medium) | 8 (High) | 4 (High) |
| | D Unlikely | 24 (Low) | 21 (Low) | 17 (Low) | 12 (Medium) | 7 (High) |
| | E Rare | 25 (Low) | 23 (Low) | 20 (Low) | 16 (Low) | 11 (Medium) |

Table 6.5 **Risk ratings**

| Level | Descriptor | Description |
|-------|------------|---|
| 1-3 | Critical | Risks that can trigger stop work procedures, necessitate immediate action and informing of senior management. |
| 4-10 | High | Risk assessment required, action plan required and senior management attention needed. |
| 11-15 | Medium | Risks that require specific monitoring of procedures and management responsibility specified. |
| 16-25 | Low | Risks that can be managed through routine procedures. |

6.4 Results

The results of the preliminary environmental risk assessment (with the adoption of standard safeguards) are shown at the left side of Table 6.6. These show that the majority of environmental risks from the proposal were considered to be low or medium, with the exception of three high risk areas. The high risks identified were:

- loss of groundwater from aquifers – which can be attributed to seepage caused by mining activity and the cumulative impact of over 60 years of mining in the area;
- water quality impacts on terrestrial ecology – resulting from potential pollutant loads and/or quantity of mine water which is discharged off site; and
- direct and indirect employment impacts of closure – which would result if the Proposal was not approved and the Colliery was forced to cease operations.

The outcomes of the preliminary environmental risk assessment have been updated at the right side of Table 6.6 to reflect the outcomes of this EIS. The updated risk assessment found the following:

- the risk of loss of groundwater from aquifers was reduced from high risk to low risk;
- the risk of water quality impacts on terrestrial ecology was reduced from high risk to low risk; and
- the risk of direct and indirect employment impacts arising from premature closure remained high.

Table 6.6 Preliminary risk assessment and environmental risk assessment

| Risk description | Preliminary environmental risk assessment (June 2012) | | Environmental risk assessment (November 2012) | | | | |
|--|---|---|--|--------------|-------------|-------------|--|
| | Preliminary risk rating | Preliminary impact assessment | Controls | Consequences | Probability | Risk rating | Predicted impacts |
| Subsidence | | | | | | | |
| Impacts on structures (e.g., jetties, cabling and pipes) | 23 (low) | A HWMSB is currently in place which prevents subsidence impacts on foreshore infrastructure such as jetties. This barrier is proposed to be retained. The EIS will investigate potential subsidence impacts on the submerged electricity cable in Chain Valley Bay. | The mine design would be adjusted if necessary to prevent adverse impact. | 2 | E | 23 (low) | Adaptive management in response to subsidence monitoring and monitoring of other environmental attributes affected by subsidence would ensure impacts are managed acceptably. |
| Geological structure interaction (e.g., dykes and faults) | 21 (low) | The mine plan would include a barrier around significant geological features. Previous subsidence modelling predicted rock surface cracking of less than 40 mm wide under the lake bed, which is likely to be naturally infilled with sediment. | As above. | 2 | D | 21 (low) | As above. |
| Alteration of wave forcing conditions resulting in foreshore erosion | 21 (low) | Lake Macquarie has a low energy wave climate. Predicted subsidence is unlikely to alter wave forcing conditions. Therefore, no additional wave energy would be introduced and foreshore erosion would not increase. | As above. | 1 | E | 25 (low) | As above. |
| Groundwater | | | | | | | |
| Interactions between workings | 18 (low) | There are only minor connections between shallow and deep aquifers, mining does not affect shallow aquifers. Mining only has minor impacts on deep aquifers as these have been substantially dewatered due to previous mining. | The proposed underground workings have been designed to prevent the risk of potential connective fracturing to the lake. | 3 | D | 17 (low) | Hydraulic connection over the proposed workings is not likely as the minimum depth of cover is 130 m and hydraulic connection does not occur at heights over 115 m above extracted workings. |
| Loss of groundwater from aquifers | 10 (High) | Subsidence induced fracturing could lead to hydraulic connection between coal seams and overlying aquifers. This could lead to loss of groundwater from shallow aquifers. The EIS will assess potential subsidence impacts on aquifers in detail. | As above. | 3 | D | 17 (low) | Based on subsidence predictions for the Proposal, the upper overburden enhanced recharge is not anticipated to hydraulically connect with the goaf based fracture zone. Further, no adverse interconnection of aquifers and aquitards is anticipated within 20 m of the lake bed as there are no recorded aquifers in this area. |

Table 6.6 Preliminary risk assessment and environmental risk assessment

| Risk description | Preliminary environmental risk assessment (June 2012) | | Environmental risk assessment (November 2012) | | | |
|---|---|--|--|--------------|-------------|---|
| | Preliminary risk rating | Preliminary impact assessment | Controls | Consequences | Probability | Predicted impacts |
| Impacts to other groundwater users and groundwater dependent ecosystems | 23 (low) | Impacts to other groundwater users are predicted to be low. This is due to existing dewatering and depressurisation arising from past mining and the absence of beneficial users of the deep bedrock measures. | If private bore yield reduce, the Colliery will provide an alternative water source until the yield recovers. The Colliery will lower the bore, drill a new one or provide compensation for increased pumping costs if yields do not recover. | 3 | D | 17 (low) The extent of drawdown will not impact any terrestrial alluvial systems or groundwater dependent ecosystems (GDEs). Registered private bores within the drawdown extent are predicted to experience a maximum drawdown of less than 0.1 m in the alluvium and less than 1 m in the deeper basement. |
| Contamination of groundwater | 25 (low) | Mining does not contaminate beneficial shallow aquifers as these occur above workings. Therefore, there is a low probability that mining would contaminate groundwater. | Pre-mining surveys of active bores will assess the baseline water quality prior to mining induced drawdown. Measures in the Colliery's WMP and/or Emergency Management Standard would be activated if there is a chemical/fuel spill, leak or overflow. Water quality in sedimentation dams will be monitored. Refer to the measures above if groundwater quality in private bores is affected by the Proposal. | 3 | D | 17 (low) There are no reports of changes to water quality of private bores as a result of past mining activities. The groundwater quality under the Proposal is expected to have less salinity than observed in decommissioned workings. However, it will remain unsuitable for potable, livestock or irrigation use. |
| Ecology | | | | | | |
| Impacts on threatened aquatic flora species | 17 (low) | No threatened seagrass species or populations, such as <i>Posidonia australis</i> , have been recorded in the study area. However, such species or populations in the region could be indirectly impacted by pollutants etc. The EIS will assess these potential indirect impacts. | As per LakeCoal's current commitments, a SPB would be implemented for Area 1 to protect against any potential impacts from underground mining at the Colliery. | 3 | E | 20 (low) There is habitat at the site for one threatened flora species; <i>Posidonia australis</i> . However, the Proposal would not impact this species due to the SPB. Water quality is predicted to be similar or better to historical discharges due to lower salinity levels in the water discharged from the underground workings. |

Table 6.6 Preliminary risk assessment and environmental risk assessment

| Risk description | Preliminary environmental risk assessment (June 2012) | | Environmental risk assessment (November 2012) | | | | |
|---|---|--|--|--------------|-------------|-------------|---|
| | Preliminary risk rating | Preliminary impact assessment | Controls | Consequences | Probability | Risk rating | Predicted impacts |
| Impacts on benthic communities | 18 (low) | Increases in lake bed depth from subsidence could impact benthic invertebrates by reducing the amount of sunlight received at the lake bed. However, impacts are predicted to be low as fauna are mobile and can move out of impacted areas and there are no threatened benthic invertebrates in the Site. | Mine plan designed to control mine subsidence effects and impacts to protect the lake and its environs. In addition, the existing BCMP would be extended to incorporate Area 1. | 3 | D | 17 (low) | All of the species identified are commonly occurring benthic invertebrates typical to estuarine communities. The species are highly tolerant to dynamic environmental conditions and are mobile in nature. Were subsidence, or any other gradual change to existing environmental condition, to occur it is considered that overall the impacts would likely be in line with or within the levels of impacts that would be naturally occurring parameters of natural disturbance regimes in such a dynamic environment. |
| Impacts on threatened aquatic flora and fauna species | 21 (low) | Eleven species listed under the EPBC Act, TSC Act and FM Act were identified as potentially occurring within Area 1. Two of these species (Loggerhead turtle and Green turtle) were considered to have a high potential to occur within Area 1. | As per LakeCoal's current commitments, an SPB would be implemented. | 3 | D | 17 (low) | Impacts on listed marine fauna species in Lake Macquarie are unlikely based on the habitat present and the implementation of the SPB. Further, the mobile nature of the two turtle species would mean that changes to depth profiles are unlikely to impact these species. |
| Impacts on foreshore ecology | 23 (low) | A HWMSB is currently in place which has been developed to protect foreshore areas and the boundary of water bodies from mining induced subsidence. This barrier is proposed to be retained. Therefore, impacts to foreshore ecology are highly unlikely. | As per LakeCoal's current commitments, an HWMSB would be implemented for Area 1 to protect foreshore areas and the boundary of water bodies from mining induced subsidence. | 2 | E | 23 (low) | No impacts to foreshore ecology are anticipated from the Proposal. |
| Impacts on water quality from discharge | 18 (low) | Impacts on water quality are predicted to be low as they would continue to be managed in accordance with the Colliery's existing water management system and discharge water quality is expected to improve under the Proposal. | The Colliery's WMP will be updated to incorporate the Proposal. In addition, the proposed upgrade of the Colliery's sedimentation dam will prevent leaks and improve the efficiency of the sedimentation dam thereby resulting in an improvement to the quality of water discharged from the Colliery. | 2 | D | 21 (low) | The quality of water flowing into the underground workings and pumped to the surface under the Proposal is expected to be similar or better (less saline) quality to existing water quality. Therefore, no detrimental impacts to the surrounding environment are expected to occur under the Proposal. |

Table 6.6 Preliminary risk assessment and environmental risk assessment

| Risk description | Preliminary environmental risk assessment (June 2012) | | Environmental risk assessment (November 2012) | | | | |
|--|---|---|--|--------------|-------------|-------------|---|
| | Preliminary risk rating | Preliminary impact assessment | Controls | Consequences | Probability | Risk rating | Predicted impacts |
| Noise | | | | | | | |
| Extension of operational noise impacts until 2027 | 14 (medium) | There would not be any significant additions to plant or equipment. Therefore, there would not be any additional production of noise. However, increased mine life would lead to an extension of noise emissions to approximately 2027. | Continued implementation of the Colliery's NMP. The NMP commits to the development of a noise reduction program. | 2 | D | 21 (low) | Operational noise under worst case conditions and with noise control would satisfy criteria under MP10_0161 at all assessment locations, except three which may experience exceedences under existing operations. Modelling predicts a slight reduction in noise emissions at some locations when the Colliery's dozer, the main contributor to noise, is not operating which occurs approximately 95% of the time. |
| Noise impacts on sensitive receivers from increased rate of production and haulage hours | 14 (medium) | Increased haulage truck movements and 24 hour haulage to VPPS via the existing private roads may increase noise impacts. | All of the 300,000 tpa of additional product coal produced under the Proposal would be transported to the VPPS via private internal roads. | 2 | D | 21 (low) | As above. |
| Increase truck movements on site and private haul road | 18 (low) | Increased haulage truck movements and 24 hour haulage to VPPS via the existing private road will increase noise impacts. | Continued implementation of the Colliery's NMP will be implemented, including a noise reduction program which would identify the main contributors to noise and ways to reduce their impact. | 1 | B | 19 (low) | Modelling predicts night truck haulage to VPPS would result in marginal increases of up to 2 dB to existing night time noise levels. Noise level changes lower than 2 dB are imperceptible. |
| Noise from public haulage | 22 (low) | Noise production from haul trucks on public roads. | Utilisation of trucks compliant with noise standards. | 2 | D | 21 (low) | Existing traffic noise levels for Ruttleys Road and Doyalson Motorway Link Road were calculated to be above the day and night criteria. Traffic noise level emissions associated with the Proposal would result in imperceptible increase to existing road noise emissions. |
| Air quality | | | | | | | |
| Operational dust impacts on sensitive receivers | 21 (low) | There would not be any significant additions to plant or equipment and an AQGHGMP is currently being prepared. Therefore, impacts are predicted to be low. | Continued implementation of the Colliery's AQGHGMP and the Coal Mine Particulate Matter Control Best Practice Pollution Reduction Program (PRP) (PAE Holmes 2012). | 2 | D | 21 (low) | Air quality predictions at all assessment locations are well below the relevant criteria. |

Table 6.6 Preliminary risk assessment and environmental risk assessment

| Risk description | Preliminary environmental risk assessment (June 2012) | | Environmental risk assessment (November 2012) | | | | |
|--|---|---|--|--------------|-------------|----------------|---|
| | Preliminary risk rating | Preliminary impact assessment | Controls | Consequences | Probability | Risk rating | Predicted impacts |
| Greenhouse gas emissions from continued operations | 15 (medium) | GHGs such as fugitive methane (CH ₄) from exposed coal, carbon dioxide (CO ₂) from the combustion of fuel in combustion engines and indirect GHG emissions from the combustion of coal produced as a result of the Proposal. | GHG measures in the Colliery's AQGHGMP would continue to be implemented for the life of the Proposal. | 2 | B | 14 (medium) | The GHG emissions intensity of the Proposal is approximately 0.39 t CO ₂ -e/t saleable coal (this includes all Scope 1 emissions) which is generally lower than levels generated at typical Australian gassy underground mines. |
| Traffic | | | | | | | |
| Impacts on local and regional road networks | 14 (medium) | The Proposal does not seek approval to increase the daily or annual export coal traffic movements on public roads or the number of Colliery employees. It does, however, propose an extension of mining activities for 14 years from approval, to approximately 2027. | The Colliery's RTP, which comprises a TMP and Code of Conduct for truck drivers, will be updated as required to incorporate the Proposal. LakeCoal will continue to provide contributions to public infrastructure and services by contributing \$0.035/t of ROM coal produced from the Colliery. LakeCoal will also provide payments in accordance with a road maintenance agreement to be reached with WSC to cover coal haulage related impacts to Ruttleys Road. | 2 | D | 21 (low) | By the year 2027, future background traffic increases on the road network along the export coal transport route towards would continue to occur at growth rates of between +2.3% to +3.0%. This would be primarily due to continuing residential population growth and new commercial and industrial developments. The proposal's truck movements in future years along the export coal transport route would subsequently decline as a percentage of total traffic movements. The assessment confirmed that the road network generally has adequate capacity to accommodate this traffic growth in addition to the Proposal's truck traffic. |
| Impacts on intersections | 22 (low) | As above. | As above. | 2 | D | 21 (low) | Performance of intersections is generally acceptable with the exception of the F3/Sparks Road Interchange and Ruttleys Road/Construction Road intersections which are predicted to decline in the future but this is due to increases in local residential traffic. |

Table 6.6 Preliminary risk assessment and environmental risk assessment

| Risk description | Preliminary environmental risk assessment (June 2012) | | Environmental risk assessment (November 2012) | | | | |
|--|---|---|--|--------------|-------------|-------------|--|
| | Preliminary risk rating | Preliminary impact assessment | Controls | Consequences | Probability | Risk rating | Predicted impacts |
| Surface water | | | | | | | |
| Impacts on capacity of surface water management system | 21 (low) | It is assumed that any increase in mine water discharges would be below 12 ML per day. The surface water management system can accommodate this increase. Risk would be revisited if discharges are predicted to be more than this and surface water management would be amended accordingly. | The worst case average mine water discharge volumes exceed the daily discharge limit of 12.161 ML/day at licensed discharge point (LDP) 1 under EPL 1770. The Colliery can switch off pumps in the Great Northern Seam and store water temporarily in the historic underground workings. Therefore, the increase in water volumes can be managed so the discharge limit in EPL 1770 is not exceeded. | 2 | D | 21 (low) | As mitigated, the Proposal is not expected to exceed the EPL discharge limit for water discharged from the pit top area. |
| Water quality impacts on terrestrial ecology | 9 (high) | Treated surface water currently discharges into an endangered ecological community (Swamp Oak Floodplain Forest). The EIS will assess potential impacts from changes in the quantity and quality of discharge water. Alternative discharge locations and/or methods will be investigated. | The sedimentation dam wall adjacent to the Swamp Oak Floodplain Forest area will be upgraded preventing future leakage through the wall, and formalising the discharge location (spillway) and incorporating a new discharge monitoring system. | 2 | C | 18 (low) | Sedimentation dam wall upgrades may decrease the extent that the mine water discharge enters the Swamp Oak Floodplain Forest which could have a beneficial impact on the vegetation, by reducing the area inundated by saline water. |
| Flood risk to infrastructure from climate change | 20 (low) | The majority of mine infrastructure is approximately 8 m above sea level and is very unlikely to be impacted by climate change related sea level rises. | No controls required | 3 | E | 20 (low) | There is no risk of flooding at the pit top area due to climate change over the Proposal period. |
| Socio-economic | | | | | | | |
| General amenity impacts on local community | 18 (low) | Potential impacts to community amenity from dust, noise, visual and traffic. | Controls as outlined in the above sections would be implemented to minimise potential impacts to amenity. | 3 | D | 17 (low) | The Proposal would not significantly impact community amenity. |
| Direct and indirect employment impact of closure | 10 (high) | The mine would cease operations if approval is not granted for extension of the existing mining area. This would result in the permanent lay-off of mine employees and contractors. | The Proposal has been designed to minimise environmental risks. Incorporate high environmental performance standards to increase the likelihood of it being approved. | 3 | A | 6 (high) | The mine would cease operations if approval is not granted for extension of the existing mining area. This would result in the permanent lay-off of mine employees and contractors. |

Table 6.6 Preliminary risk assessment and environmental risk assessment

| Risk description | Preliminary environmental risk assessment (June 2012) | | Environmental risk assessment (November 2012) | | | |
|--|---|---|--|--------------|-------------|--|
| | Preliminary risk rating | Preliminary impact assessment | Controls | Consequences | Probability | Predicted impacts |
| Economic impact of closure | 10(high) | The mine would cease operations if it does not gain approval to extend the existing mining area. This would result in a reduced supply of competitively priced coal to domestic customers and economic contributions to local communities and government. | See above. | 2 | A | 10 (high) The mine would cease operations if approval is not granted for extension of the existing mining area. This would result in a reduced supply of competitively priced coal to domestic customers and economic contributions to local communities and government. |
| Heritage* | | | | | | |
| An item or items of Aboriginal or historic heritage damaged or destroyed | 18 (low) | Aboriginal and historic heritage are not considered to be significant issues, given that all areas of secondary extraction are located under Lake Macquarie. | Management and monitoring of Aboriginal and historic heritage would be undertaken as detailed in the Colliery's HMP. If unanticipated Aboriginal or historic heritage artefacts are found during construction works, work would cease and the site assessed by an archaeologist. | 3 | E | 18 (low) No items of historical heritage significance or areas of potential archaeological significance have been identified within potential impact areas. It is unlikely that the Proposal would impact Aboriginal or historic heritage. |
| Wastes* | | | | | | |
| Creation of new waste streams | 18 (low) | The Colliery is preparing a Waste Management Standard which seeks to avoid waste wherever possible. | The Colliery will continue to reduce waste volumes through waste management practices to target its objective of 60% of all wastes generated at the Colliery (excluding wastewater) to be recycled or reused. | 2 | D | 21 (low) Upgrades and modifications to infrastructure may reduce waste streams. |
| Visual* | | | | | | |
| Some minor upgrades and modifications to infrastructure could slightly alter visual aspects of the site. | 18 (low) | The type and scale of modifications proposed would mitigate against any significant visual impacts. | The visual and lighting impacts of the Proposal would be managed as per existing management measures. Additional surface lighting at the Colliery would comply with AS4282 in accordance with Condition 36 of MP10_0161. | 2 | C | 18 (low) Minor infrastructure upgrades, additional truck movements and additional surface lighting proposed under the Proposal would have minor to negligible visual and lighting impacts above those from the existing operations. Existing visual and lighting management measures would continue under the Proposal. |

Table 6.6 Preliminary risk assessment and environmental risk assessment

| Risk description | Preliminary environmental risk assessment (June 2012) | | Environmental risk assessment (November 2012) | | | | |
|---|---|---|---|--------------|-------------|-------------|---|
| | Preliminary risk rating | Preliminary impact assessment | Controls | Consequences | Probability | Risk rating | Predicted impacts |
| Soils * | | | | | | | |
| Site upgrades and modifications could cause erosion and sediment deposition | 21 (low) | Some minor upgrades and modifications to infrastructure could have implications, albeit of a very minor nature, especially in relation to erosion and sediment. | Management measures to control soil erosion and sediment loss are currently contained in the Colliery's WMP which will be updated to include relevant aspects of the Proposal following the determination. | 2 | D | 21 (low) | Potential impacts include soil erosion and sediment loss, interaction with ASS soils and soil contamination. The implementation of specific plans to deal with these areas would ensure impacts are prevented or mitigated to acceptable levels. The Colliery's existing WMP would be updated to include the recommended management measures. |
| Acid Sulfate Soils (ASS) could be encountered during construction activities on site. | 21 (low) | Any ASS issues that emerge could be handled with appropriate plans of action. | During construction activities involving soil, disturbance of ASS would be prevented where practicable. Where ASS has the potential to be disturbed, an Acid Sulfate Soils Management Plan (ASSMP) would be prepared. Any ASS disturbed would be tested and handled in accordance with the ASSMP and would be treated or disposed of to an appropriately licensed facility. | 2 | D | 21 (low) | An ASSMP will be prepared and implemented if ASS are encountered. |

*Note: * Risks from these environmental attributes were not assessed at the June 2012 workshop, as there were minimal implications for these attributes from the Proposal, with minimal terrestrial surface disturbance being proposed and subsidence to be tightly controlled. The attributes have been included in this table to align the table's contents with the environmental attributes canvassed in this EIS.*

7 Groundwater

7.1 Introduction

A groundwater assessment for the Proposal was prepared by GeoTerra Pty Ltd. This chapter provides a summary of the groundwater assessment which is provided in full in Appendix D.

The chapter describes the existing groundwater environment, including the current status of the groundwater systems overlying Area 1, and presents potential impacts from the Proposal. It also includes management and monitoring measures that would be implemented to prevent or minimise potential impacts.

7.2 Existing environment

7.2.1 Geology and hydrogeology

Site geology is described in Section 2.2.1. The stratigraphy in the local area comprises the Permian coal measures overlain by the Triassic Narrabeen subgroup and Quaternary lacustrine and terrestrial alluvial/colluvial deposits.

There are a number of faults and dykes which have been mapped or are inferred within the Site and its surrounds. The current Fassifern Seam workings have intersected some of these geological structures, which have impacted on approved mining activities. However, no significant groundwater inflows were observed when these structures were encountered while installing the main headings.

The hydrogeological regime of the Site and its surrounds comprises a Quaternary terrestrial and marine/estuarine alluvial/coalluvial aquifer system which is underlain by Permian strata comprising low permeability and yielding sandstone, siltstone, conglomerate and tuff, and low to moderately permeable coal seams. The coal seams are the predominant water bearing strata.

7.2.2 Groundwater users

There are 14 registered bores located within the predicted extent of drawdown under the Proposal as detailed in Table 7.1 and shown in Figure 7.1. The majority of the bores are shallow, with all private bores potentially used for supply of water for domestic gardens or limited irrigation. One of the registered bores is a coal exploration bore converted for use as a domestic water supply.

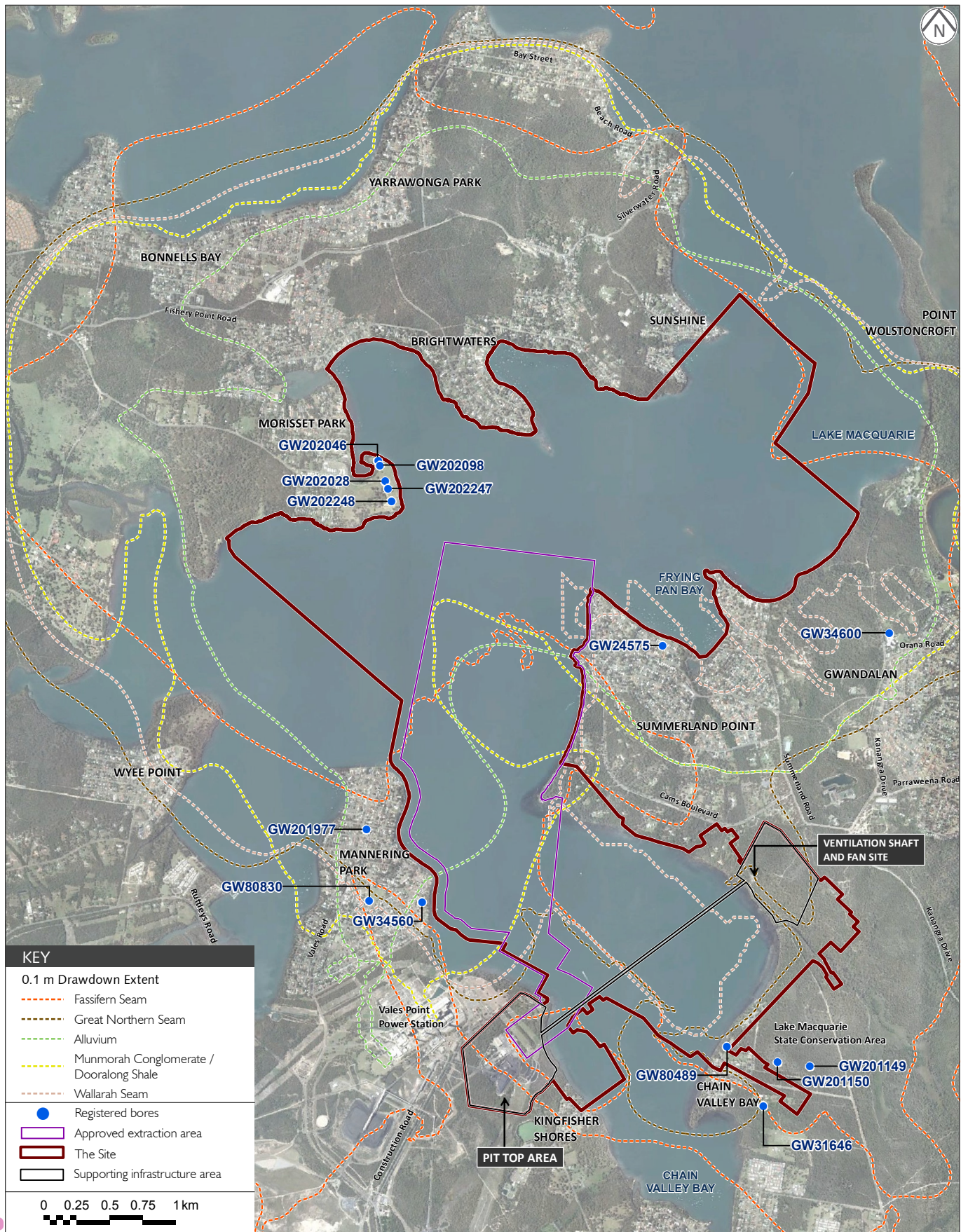


Figure 7.1

Table 7.1 Registered local bore data

| Bore reference | Coordinates | | Year drilled | Depth (m) | SWL (m) | Aquifer (mbgl) | Yield (L/s) | Bore purpose |
|----------------|-------------|---------|--------------|-----------|---------|----------------|-------------|-----------------------------|
| | East | North | | | | | | |
| GW24575 | 365969 | 6332788 | 1965 | 15.2 | - | - | - | Domestic |
| GW31646 | 366742 | 6329317 | 1960 | 277.5 | 3.0 | 3.0 – 10.6 | 0.13 | Domestic / Coal Exploration |
| GW34560 | 364130 | 6330883 | 1970 | 18.3 | 5.5 | 5.5 | - | Domestic |
| GW34600 | 367678 | 6332873 | 1971 | 61.0 | 5.7 | 18.2 | 0.06 | Waste disposal |
| GW80489 | 366441 | 6329674 | 2003 | - | - | - | - | Domestic |
| GW80830 | 363757 | 6330850 | 2004 | - | - | - | - | Test bore |
| GW201149 | 367104 | 6329608 | 2006 | 4.0 | 1.0 | 1.0 – 4.0 | 1.50 | Irrigation spear |
| GW201150 | 366840 | 6329640 | 2006 | 4.0 | 1.0 | 1.0 – 4.0 | 1.50 | Irrigation spear |
| GW201977 | 363730 | 6331388 | 2008 | 7.1 | 6.0 | 6.0 – 7.0 | - | Monitoring |
| GW202028 | 363872 | 6334034 | 2007 | 5.5 | 1.6 | - | - | Test bore |
| GW202098 | 363829 | 6334141 | 2007 | 4.0 | 0.8 | - | - | Test bore |
| GW202246 | 363834 | 6334174 | 2007 | 3.5 | 1.2 | 0.6 – 3.5 | - | Test bore |
| GW202247 | 363899 | 6333964 | 2007 | 5.0 | 3.6 | 2.0 – 5.1 | - | Test bore |
| GW202248 | 363918 | 6333881 | 2007 | 5.0 | - | 2.0 – 5.0 | - | Test bore |

Notes: - = no data available

SWL = standing water level

EC = electrical conductivity

7.2.3 Groundwater inflows

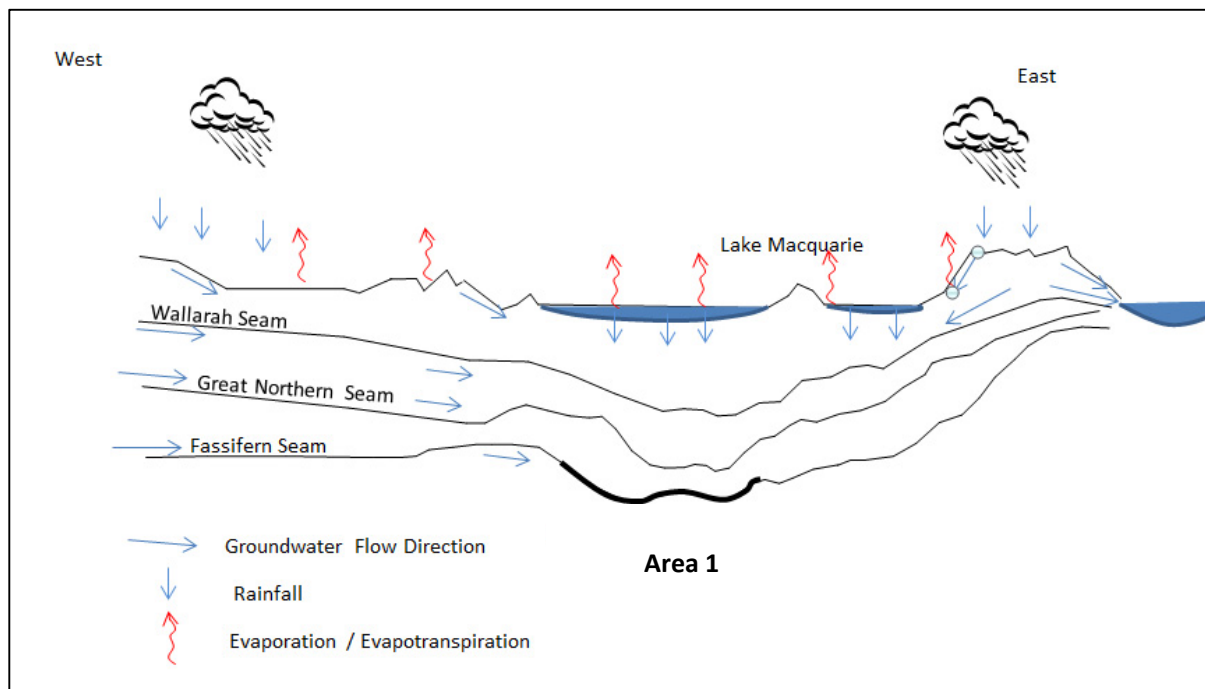
Groundwater flows from the various coal seams into the underground workings at the Colliery. The groundwater is pumped from the Fassifern Seam to the Great Northern Seam and then subsequently to the surface from two pumps within the Great Northern Seam. The combined total maximum pumping capacity is approximately 11.75 mega litres per day (ML/day). The median annual groundwater make for the current workings is estimated at 2,773 ML/year or 7.6 ML/day based on water extraction records from the Colliery between April 2006 and October 2009. In general, the Fassifern Seam has been the driest seam mined at the Colliery. Mining of the overlying Wallarah and Great Northern Seams has been conducted without major adverse impacts to the overlying aquifers or inrush of water from Lake Macquarie.

Figure 7.2 presents a conceptual cross section showing regional flow patterns.

To allow for groundwater extraction at the Colliery, LakeCoal applied for a 4,443 ML/year licence under the Water Act. The application for this licence was lodged with NOW on 5 October 2011 and was subsequently issued on the 12 March 2013. The licence, 20BL173107, is valid until 11 March 2018 for the purposes of mine dewatering and industrial use, with a volumetric limit of 4,443 ML in any 12 month period. As detailed in Section 4.5.8, no approvals under the WM Act are required for the Proposal.

Total inflow (recharge) to the local area groundwater system was determined to be approximately 54 ML/day predominantly sourced from rainfall and leakage from Lake Macquarie. Any water carried by ephemeral streams has a negligible contribution to groundwater recharge through leakage.

Figure 7.2 Conceptual cross-section of regional flow patterns



Source: Geoterra 2013, *Groundwater Impact Assessment (Appendix D)*.

7.2.4 Groundwater chemistry

Groundwater in the bedrock overburden aquifers is generally of poor quality with salinity ranging from 1,950 to 4,550 milligrams per litre (mg/L) and, therefore, is not suitable for potable, livestock or irrigation use.

Groundwater monitored within the current and decommissioned Colliery workings is brackish to saline with salinity levels recorded at between 11,800 mg/L and 28,200 mg/L. This indicates inflow from Chain Valley Bay in subsided areas of the Great Northern Seam workings.

Groundwater seepage recorded from a dyke at the northern end of the current Fassifern Seam workings, over the unsubsided main headings, recorded a brackish salinity of 2,390 mg/L.

Geoterra undertook sampling of groundwater within the Fassifern and Great Northern Seams as well as surface water within Karignan Creek (shown on Figure 1.2) and Chain Valley Bay in 22 June 2012. Water sampled from the Colliery's underground workings is significantly above the ANZECC 2000 default trigger values for physical and chemical stressors in south-east Australian estuaries and 95% protection trigger values for marine species in regard to:

- pH (Fassifern dyke);
- electrolytical conductivity (all samples);
- total nitrogen (all samples except Chain Valley Bay);
- total phosphorous (most samples);

- dissolved copper (most samples); and
- dissolved zinc (Great Northern Seam sump and Fassifern Seam dyke).

Since the mine water is not suitable for reuse, it is discharged from the Colliery's single licensed discharge point (LDP 1) on Swindles Creek which is shown on Figure 8.1. The impacts to water quality from mine water discharge are discussed in Section 8.3.3.

Records obtained from registered private bores, where available, show no changes to water quality as a result of past mining activities at the Colliery.

7.2.5 Depressurisation

Mining has occurred within proximity of the Site since the 1940s and, since that time, the various mines in the area have interacted with the groundwater regime within the Fassifern and other seams which has contributed to localised depressurisation of the coal seams and interburden, a low yielding sequence of essentially dry conglomerates and shales.

7.2.6 Hydraulic connection

Numerous groundwater studies have been undertaken for underground mines within the Site and surrounds. This includes an extensive study by Forster and Enever (1992), which assessed the impact of longwall mining at the Mannering Colliery on the hydrogeological properties of the overburden. The assessment found that the intermediate and upper strata layers would form a barrier to vertical drainage and that aquifers 65 m to 115 m above workings were not vertically connected hydraulically to the workings and, therefore, were not drained as a result of subsidence. Aquifers greater than 115 m above the mine workings were not impacted at all.

It should be noted that the Forster and Enever study related to 150 m wide longwalls. The maximum total extraction width under the Proposal is 97 m with 32.6 m to 95 m wide pillars. Therefore, the predicted subsidence and height of fracturing over the proposed workings would be significantly less than observed over the Mannering Colliery longwalls.

7.3 Impact assessment

7.3.1 Methodology

The groundwater assessment included development of a model, prepared by Groundwater Exploration Services in association with Geoterra, to predict the potential effects on the local groundwater and surface water systems due to mining activities under the Proposal. The detailed modelling report forms an appendix to groundwater impact assessment report (Appendix D).

A MODFLOW SURFACT model structure, modelling approach and simulations were developed for the Proposal. The model complexity is considered adequate to simulate contrasts in hydraulic properties and gradients that may be associated with changes to the groundwater system as a result of the Proposal.

The model was calibrated primarily against the Colliery's water pump out records and sensitivity analyses were run to address the potential effect of various parameters on the model outcome. The pre-Proposal hydraulic parameters were obtained from the Colliery's and surrounding mines' previous groundwater modelling assessments. Post-Proposal fracture development, vertical and horizontal propagation and overburden permeability distribution was obtained from subsidence modelling undertaken for the Proposal by Ditton Geotechnical Services (Appendix I). Assumptions regarding the interactive effect of adjoining mines on the overburden and alluvial strata within the Site were incorporated into the model.

A conceptual hydrogeological system was developed for the model based on the existing environment summarised in Section 7.2. The hydrogeological system was sub-divided into 11 layers comprising coal seams, interburden, overburden and alluvial/colluvial layers within the model area, with the proposed Fassifern Seam workings located at the base of the model. The extent of the model area was 20 km by 19 km around the Colliery. Results from the modelling formed the basis of the impact assessment presented in the following sub-sections.

7.3.2 Predicted impacts

i Hydraulic connection

The maximum vertical subsidence resulting from mining activities under the Proposal is predicted to range from 620 mm where no overseam working exist (MWs 1 to 40) to 886 mm where historic overseam workings are present (MWs 41 to 45) (refer Chapter 12). As all secondary extraction would occur under a tidal marine zone, vertical subsidence would not change stream bed leakage as all the lake bed sediments and upper regolith are fully saturated with seawater. Further, there are no terrestrial stream or alluvial aquifers that would be affected by the predicted vertical subsidence.

Subsidence impacts to groundwater may occur from the height of connective fracturing that may develop in the overburden above the proposed workings and the potential for hydraulic connection between the workings and Lake Macquarie resulting in seawater inflow to the Colliery. LakeCoal has designed the proposed underground workings to prevent the risk of potential connective fracturing to the Lake, as per the findings of Forster and Enever (1992) discussed in Section 7.2.6. The height of fracturing would be limited to between 66 m to 89 m within a rock height above the workings of 130 m to 214 m and a lake bed alluvium height of 6 m to 20 m thick.

ii Aquifer/aquitard interconnection

Aquifer/aquitard interconnection can occur as a result of mining induced cracking and vertical subsidence of strata. Based on subsidence predictions for the Proposal, the upper overburden enhanced recharge is not anticipated to hydraulically connect with the goaf based fracture zone. Further, no adverse interconnection of aquifers and aquitards is anticipated within 30 m beneath the lake bed or 10 m below the rock head as there are no recorded aquifers in this area.

iii Groundwater depressurisation

It is predicted that the Proposal would result in further pressure losses up to a distance of 1.5 km in the alluvium and up to 2.5 km in the Fassifern Seam. However, groundwater levels within the Fassifern Seam have already been extensively impacted by mining in the area and, therefore, the Proposal is unlikely to have significant additional impact, if any. Predicted impacts are:

- a likely increase in groundwater flow rates within caved and fractured areas of deeper aquifers due to greater hydraulic connectivity between horizontal and vertical fractures;

- a temporary lowering of the regional piezometric surface due to horizontal dilation of strata resulting in an increase in secondary porosity and permeability;
- a reduction of mid-depth strata groundwater levels by up to 15 m. These reduced levels may persist until maximum subsidence develops;
- the shallow or surficial groundwater levels are unlikely to change as they would be constantly recharged by Lake Macquarie; and
- recovery of groundwater levels over a few months as the deep bedrock aquifer is recharged by lake water and rainfall infiltration from overlying aquifers.

No permanent post mining reduction in groundwater levels is anticipated under the Lake as no new hydraulically connected outflow paths are anticipated to develop within the overburden, on the basis that connective fracturing to the Colliery does not develop.

There are no anticipated observable adverse effects on terrestrial alluvial systems as there are none present over the proposed workings and terrestrial aquifers and streams are a sufficient distance from the proposed workings that the extent of regional surface depressurisation would not impact them.

iv Private bores

No private bores are located within Area 1 and accordingly subsidence impacts or adverse groundwater level depletion is irrelevant within this area. Further, no beneficial users of the deep bedrock/coal measures aquifers have been identified in the vicinity of the proposed workings.

Registered bores within the drawdown extent of the Proposal are predicted to experience a maximum drawdown of less than 0.1 m in the alluvium and less than 1 m in the deeper basement materials. Figure 7.1 shows the 0.1 m contour for the extent of predicted drawdown in the alluvium.

v Groundwater inflow

Seepage of connate overburden groundwater (water stored within overburden) along with limited delayed seepage of lake water into the Colliery's workings, and other mine workings within the local area, has been observed. However, signs of hydraulic connection between the lake and mine workings, such as direct and significant influx of lake water, have not been observed and are unlikely to occur due to the presence of the Dooralong Shale and Mannering Park Tuff aquitards which restrict direct vertical hydraulic connection.

It is not anticipated that the proposed workings would generate significant additional groundwater seepage. The steady state model predicted mean inflows of up to approximately 3,823 ML/year or approximately 10.5 ML/day, an increase from the median annual groundwater make of 7.6 ML/day. It should be noted that the median inflow rate of 7.6 ML/day is not entirely representative of historical inflow rates where, for example, higher inflow rates averaging about 8.5 ML/day were seen during 2008 potentially as a result of repressurisation in the Wallarah Seam. Further, as this average daily volume was calculated as an 'end of mining' estimate, it can be considered a 'worst case' prediction of groundwater inflow rates and is not expected to occur for the majority of the Proposal life.

vi Groundwater dependent ecosystems

No marine based GDEs are assessed to be present in Area 1. Further, there are no aquifers that provide a beneficial use or sustain GDEs within coal measures in Area 1. Given the limited lateral and vertical extent of drawdown within terrestrial areas resulting from the Proposal, adverse impacts to terrestrial based GDEs that may be present in the area beyond the Site are likely to be negligible. Therefore, no measurable adverse impacts would occur as a result of the Proposal.

vii Groundwater quality

It is anticipated that groundwater seepage to the proposed workings in the Fassifern Seam would be less saline than is observed in the decommissioned workings. This is because there is no subsided overburden over the Wallarah and Great Northern Seam workings (apart from possibly over panels MW41 – 45) that would be significantly re-activated and, as a result, could provide an additional high salinity input.

The bulk extraction water quality would lie between a salinity of 3,500 mg/L to 40,000 mg/L and a pH of 7.3 to 8.6. There may also be increased iron hydroxide precipitation and a lowering of pH if the groundwater is exposed to “fresh” surfaces in the strata and dissolution of unweathered iron and sulphides or iron carbonate occurs, though this has not been reported in the Colliery’s current and historic workings to date. Changes in iron hydroxide and pH may result in discolouration of the groundwater which does not pose a health hazard but, in extreme cases, can cause clogging of pumping and piping. Bores in the local area may already have naturally elevated iron hydroxide levels and pre-mining surveys of active bores would assess the baseline water quality prior to mining induced drawdown. Acidity (pH) changes of up to one order of magnitude could occur. However, the change would be reduced if there are sufficient bicarbonate levels, as observed in samples from the Fassifern Seam. It is noted that, under such a reduction, the water would remain essentially neutral (pH 6.7 to 7.6).

viii Acid Sulfate Soils

There will be no anticipated adverse effects on terrestrial areas that contain ASS due to the very low predicted drawdown in those areas. Further discussion on impacts to ASS is provided in Section 19.3.3.

ix Regional cumulative effects

Cumulative effects on alluvium, shallow coal and deep coal measures are not anticipated to occur or be significant under the Proposal. Related effects would be limited as:

- there are no anticipated observable adverse effects on terrestrial alluvial systems as there are none present over the proposed workings. Furthermore, the terrestrial aquifers are a sufficient distance from the proposed workings that the extent of regional surface depressurisation would not impact them;
- the predicted height of fracturing, and the associated lack of direct hydraulic connection in the shallow coal measures to the Colliery, indicate the shallow coal measures are hydraulically separated from the deeper fractured zone/ goaf, and therefore the degree of depressurisation within the shallow coal measures due to subsidence is not anticipated to be significant; and
- subsidence over the proposed workings would not adversely affect the beneficial use of the groundwater system to either local water users or the environment.

7.4 Management and monitoring

7.4.1 Existing management and monitoring

Groundwater impacts associated with the approved operations are currently managed under a WMP prepared in accordance with Schedule 3, Condition 28 of MP10_0161 and approved in November 2012. In addition, a groundwater monitoring program, prepared in accordance with Schedule 3, Condition 32 of MP10_0161, has been designed to provide data that enables:

- comparison of anticipated versus observed impacts on the groundwater system through miniwall extraction of the Fassifern Seam at the Colliery and any associated subsidence effects; and
- development of procedures to assess, manage or rehabilitate any adverse effects that exceed specified trigger levels.

The WMP will be reviewed and updated to incorporate the monitoring program and other management measures committed to under the Proposal. These include:

- assessing whether abnormal or significant groundwater inflow changes occur in to the active panels;
- having water flow monitoring appliances, in place to measure pumped water volume from the underground workings, in good working order;
- recording and documenting daily total Colliery water pumping records and reporting of this data on the Colliery website along with an annual interpretation of the data in the Annual Review;
- measurement of water levels and quality within private bores, where access is permitted, in relevant areas to obtain baseline data and quantify any adverse effects that occur due to subsidence from the Proposal; and
- ongoing refinement of groundwater assessment criteria and triggers, response protocols and contingency measures, if required, within an updated WMP.

7.4.2 Additional commitments

Although it is not anticipated that private bore yields would be impacted due to subsidence, in the event of such an event, the Colliery would provide an alternative water supply until the impacted bore recovers.

Monitored or reported adverse impacts on the yield, saturated thickness or quality of a private registered bore would be investigated by LakeCoal. In the event of a groundwater level drop of over 5 m for a period of three months or more, a notable increase in iron hydroxide, or an adverse change in salinity, as a consequence of subsidence, LakeCoal would enter into negotiations with the affected landowners and the Mine Subsidence Board with the intent of formulating an agreement which provides for one, or a combination, of the following compensatory measures:

- re-establishment of saturated thickness in the affected bore(s) through bore deepening;
- establishment of additional bores to provide a yield at least equivalent to the affected bore prior to mining;
- provision of access to alternative sources of water; and

- compensation to reflect increased water extraction costs (e.g., due to lowering pumps or installation of additional or alternative pumping equipment).

7.5 Conclusion

Extensive past mining in the area surrounding the Colliery has resulted in localised depressurisation of the coal seams and interburden and the Proposal is anticipated to result in minimal additional impact, if any.

The total mean groundwater inflows to the underground workings in Area 1 are predicted to increase from 7.6 ML/day to approximately 10.5 ML/day. LakeCoal will monitor and maintain records of actual pumping volumes of groundwater from the Colliery. The groundwater quality within the Fassifern Seam is expected to be less saline than observed in decommissioned workings. However, as areas of the Wallarah and Great Northern Seams are still dewatered to permit continued use of required infrastructure in these seams, the groundwater extracted would remain unsuitable for potable, livestock or irrigation use.

Further pressure losses up to a distance of 1.5 km in the alluvium and up to 2.5 km in the Fassifern Seam are predicted to occur under the Proposal. This extent of drawdown would not impact any terrestrial alluvial systems or GDEs. Registered private bores within the drawdown extent are predicted to experience a maximum drawdown of less than 0.1 m in the alluvium and less than 1 m in the deeper basement materials. LakeCoal will monitor potentially affected bores, where access is permitted, to measure bore yields, saturated thickness and water quality to detect changes that occur as a result of the Proposal. In the unlikely event that significant impacts occur as a result of the subsidence from the Proposal, LakeCoal would enter into negotiations with the affected landowner(s).

The proposed workings have been designed to ensure that predicted subsidence levels are not likely to result in direct hydraulic connection with Lake Macquarie. No direct hydraulic connection to Lake Macquarie has been previously observed in the Colliery's, and other mines', workings. Aquifer/aquitard interconnection is also unlikely to occur.

The Colliery's WMP and groundwater monitoring program will be revised and updated as required to incorporate commitments made under the Proposal.

8 Surface water

8.1 Introduction

A surface water impact assessment (SWA) was undertaken for the Proposal by GSS Environmental. The findings of the SWA are summarised in this chapter and provided in full in Appendix E.

The chapter describes the existing surface water environment, including water management at the Colliery, and presents potential impacts from the proposal. It also includes a detailed site water balance and management and monitoring measures that would be implemented to prevent or minimise adverse impacts.

8.2 Existing environment

8.2.1 Climate

The climate of the Site is borderline oceanic/humid subtropical with warm summers, mild winters and heavy precipitation in late autumn and early winter. A review of Bureau of Meteorology (BOM) weather stations in the Lake Macquarie region undertaken in 2012 found that the average annual rainfall at the Site is 1,206 mm with an average annual evaporation of 824 mm.

8.2.2 Surface water management

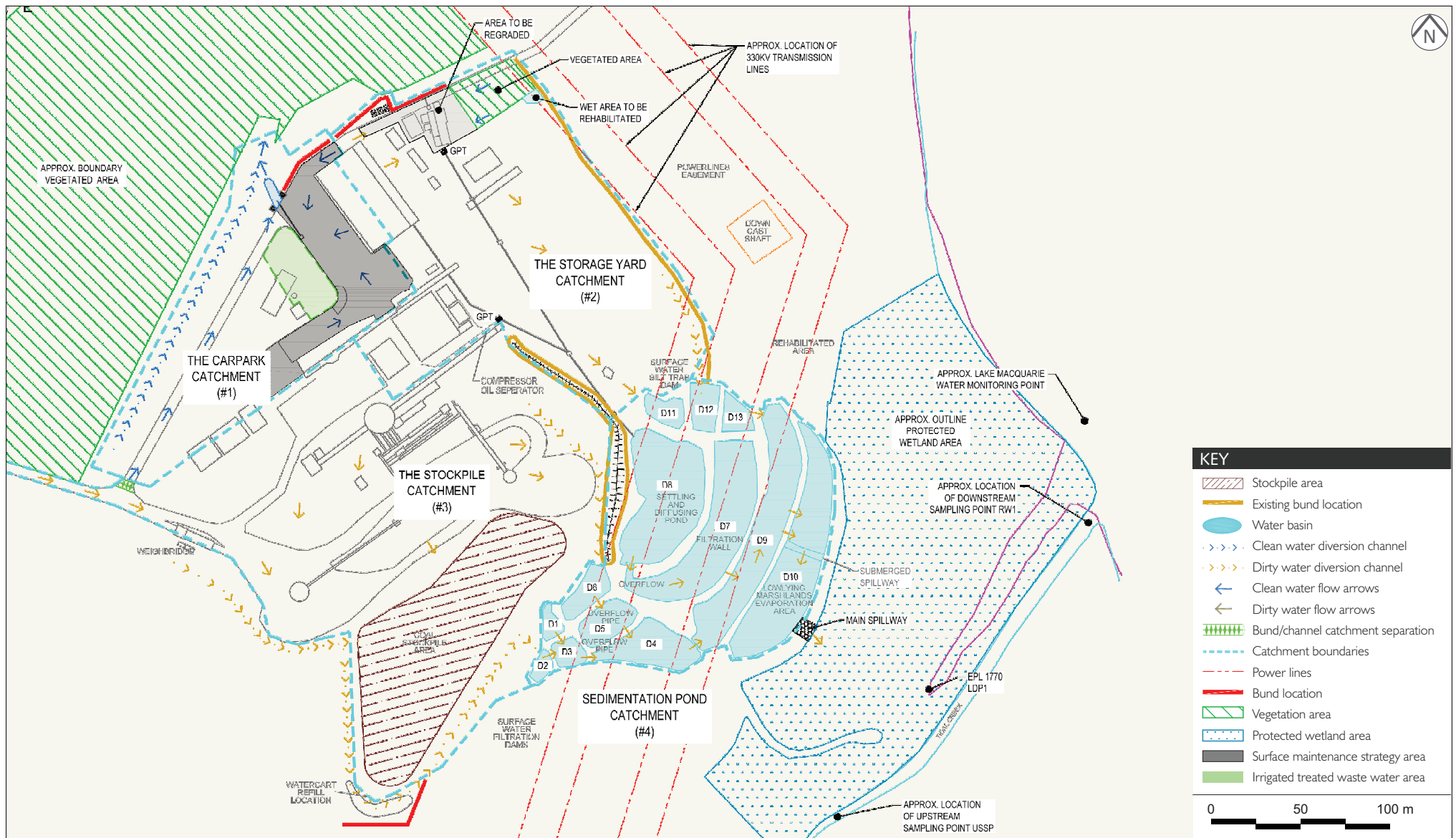
Runoff from the Colliery's pit top is captured in four main catchment areas, shown in Figure 8.1, comprising:

- Catchment 1 – The carpark, office building and partial runoff from the workshop roof;
- Catchment 2 – The rear storage yard and oil water separator and the remaining workshop roofed area;
- Catchment 3 – The coal stockpile area, entry road and bathhouse; and
- Catchment 4 – The sedimentation dams.

Runoff from the catchment areas, except for Catchment 1, flows east via diversion drains into the sedimentation dams. Runoff from Catchment 1 is generally considered clean water and drains off-site to the north of the pit top, not discharging into the sedimentation dams.

The Colliery has a series of 13 sedimentation dams (see Figure 8.1) into which flows surface runoff from Catchments 2 to 4, septic treated bathhouse wastewater, treated water from the oil water separator and underground mine water. These dams treat the wastewater and runoff through settlement of fines and suspended solids prior to discharge from the Site. The dams have been constructed with a mixture of earth, crushed road base and crushed recycled brick and stone, and are interconnected through a series of overflow pipes and spillways.

The discharge of surface water from the sedimentation dams via LDP 1 is regulated under EPL 1770, administered by the EPA. The current limits for LDP 1 under EPL 1770 are provided in Table 8.1.



Overview of water management system

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Figure 8.1

Table 8.1 EPL 1770 limits for LDP 1

| Category | Limit |
|-------------------|------------------------|
| Daily discharge | 12,161 kL |
| <i>Pollutants</i> | |
| pH | 6.5 – 8.5 ¹ |
| TSS | 25 mg/L ¹ |

Notes: 1. 100th percentile concentration limit

Clean water runoff is segregated from dirty water runoff through catchment separation and diversion via diversion banks and channels away from disturbed areas. Clean water runoff from the carpark and hardstand adjacent to the main office is passed through a basin to the north of the carpark (shown on Figure 8.1) to allow the settlement of any sediment prior to discharge.

8.2.3 Water quality and sampling

Generally, the main potential pollutants in runoff from the Colliery's pit top area comprise sediment and coal fines, though there is potential for hydrocarbons to be present in runoff from areas such as the storage yard. Sediment loads and coal fines in the surface water runoff are treated in the sedimentation dams, while water potentially containing hydrocarbons is initially passed through separators. Groundwater pumped from the underground, which also discharges to the sedimentation dams, is characteristically highly saline with some levels of heavy metals above *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000) criteria for slightly to moderately disturbed estuaries and marine environments in NSW.

Water sampling has historically been taken at LDP 1 to determine compliance with the EPL 1770 limits. Monitoring of potential pollutants identified in the EPL including a range of metals and microbiological indicators has also been undertaken, though no concentration limits are specified. Since September 2011, LakeCoal has expanded the water quality monitoring program to include sampling at locations upstream and downstream of LDP 1 to gain a better understanding of background water quality in Swindles Creek in the absence of Colliery discharges, and the nature of any change resulting from those discharges. The monitoring is also being undertaken to develop site specific trigger values which require at least two years of sampling data. The monitoring program would continue during the life of the Proposal and the necessity for and value of site specific trigger values determined based on the data collected.

The sampling data from the monitoring program to date shows that levels of some metals exceed the ANZECC guidelines. However, it has not yet been established whether the results are indicative of on-site sources, upstream sources and/or background conditions. This would be determined through continued monitoring and establishment of site specific trigger values.

Compliance with the daily discharge limits of EPL 1770 is determined from monitoring and calculation of underground pumping rates and surface flow meters. The Proposal involves the upgrade of the sedimentation dam embankment to reduce leaks which are currently occurring from Dam 10 (indicated as D10 on Figure 8.1). The upgrade will also include construction of a metered spillway which will be able to obtain direct measurements of daily discharges from the Site.

8.2.4 Additional water management systems

Approximately 132 ML/year of potable water is obtained from WSC and used at the Colliery to support the underground and pit top operations, with approximately 20 ML/year (15%) and 112 ML/year (85%) used by the pit top and underground operations, respectively. Groundwater pumped from the coal face is not suitable for potable or operational purposes due to its high salinity.

Potable water is used in the underground operations for:

- reduction of respirable dust and the propensity for frictional ignition when cutting coal at the coal face;
- dust suppression when transferring coal along the underground conveyor system and at transfer points;
- cleaning and equipment use; and
- emergency fire fighting purposes.

Potable water is used in the pit top operations in the amenities, for dust suppression and wash down of plant and equipment.

Sources of wastewater generated at the Colliery's pit top area includes the administration office building and the bathhouse and operations area. Wastewater from the administration office building is treated by an aerated wastewater treatment system and then used to irrigate the landscaping surrounding the office building via an irrigation system. Wastewater from the bathhouse and operations area is treated by three traditional septic tank systems and discharged into the sedimentation dams.

Runoff from the oil storage facilities, diesel tank storage, workshop/maintenance areas and wash bay is directed to and treated by an oil water separator. Waste oil is collected in a container and the treated water flows to the sedimentation dams.

8.3 Impact assessment

8.3.1 Site water balance

A site water balance was developed as part of the SWA to understand water demands and flows around the Colliery's pit top area and to demonstrate compliance with licence conditions. The water balance for the Proposal was developed through a detailed investigation of water use at the Colliery's pit top. A comparison with the water balance undertaken by AECOM in 2011 was undertaken for verification of some model inputs. The model used to represent the water balance was GoldSim Version 10.50 (GoldSim Technology Group LLC). GoldSim is commonly used to undertake 'daily time step' water balance simulations for coal mines within NSW due to its enhanced modelling capability and flexibility compared to spreadsheet models that have predominately been used in the past.

A schematic of the Colliery's water cycle under the Proposal is shown in Figure 8.2.

The water balance model incorporated the following data:

- meteorological data, including annual average rainfall and annual average evaporation rate;

- volumes of water generated at the Colliery, including surface runoff and underground water extraction;
- sedimentation dam surface area and volumes;
- volumes of water lost through coal export;
- volumes of potable water consumed; and
- rainwater tank capacity.

Under the Proposal, the average daily water volumes pumped from the mine workings would increase from the current rate of approximately 7.6 ML/day to 10.5 ML/day. Additionally, two dewatering pumps from the Great Northern Seam currently pump at a maximum rate of 72 L/sec and 64 L/sec, respectively. This equates to a total pumping rate from the underground of approximately 11.75 ML/day. However, within 12 months of the Proposal being approved, LakeCoal will commit to limiting the main underground pumps to a maximum pump out rate of 10.5 ML/day (equivalent to the predicted average daily volume that will need to be pumped from the mine workings during the later stages of the Proposal). The timing of this commitment to limit the pumped volume from underground is due to the substantial upgrades required to fully automate the pumps and have them controlled by a SCADA system.

To determine the volumes of daily discharge from LDP 1, the predicted total mean daily volume of water pumped from the underground under the Proposal of 10.5 ML/day was added to historic variations in pumping rates assuming that the pumps from the underground are constantly pumping at their maximum rate. In reality, this scenario rarely occurs. The worst case daily discharge limit from LDP 1 calculated in GoldSim was 14.394 ML/day with the 95th percentile volume of 13.171 ML/day. The worst case volumes exceed the daily discharge limit under EPL 1770 of 12.161 ML/day at LDP 1 approximately 4% of the time (equivalent to 15 days per year). To manage the discharge volumes from the underground under the Proposal, the historic underground workings would be used to store water temporarily; a common water management practice in Hunter Valley coal mines. The Colliery has adequate capacity to store the additional volumes thereby ensuring that the discharge limit under EPL 1770 is not exceeded.

Given the above, the Proposal is not expected to result in any increase in the daily discharge from the pit top area beyond that authorised under EPL 1770 unless storm surge conditions occur (see Section 8.3.4). Therefore, the Proposal is not expected to have any negative impacts on the surrounding environment including cumulative impacts, long term impacts or impacts to riparian corridors and creeklines. However, it is noted that additional investigations are required to confirm this to be the case as described in Section 8.4.2. A number of commitments for management of discharge rates are also detailed in Section 8.4.2.

8.3.2 Potable water consumption

Schedule 3, Condition 31(d) of MP10_0161 requires LakeCoal to investigate practical measures to minimise potable water consumption and maximise recycled water use. Potential initiatives currently being investigated include:

- the use of water sourced from the sedimentation dams for dust suppression on the ROM stockpile, haul roads and storage yard;
- the use of water carts for dust suppression as opposed to the existing sprinkler system which is less water efficient and currently not operational; and

- potential alternative water sources such as from surrounding unutilised bores or implementation of a comprehensive rain water harvesting system.

Should these water saving measures provide to be economically and environmentally justifiable the GoldSim model predicted a reduction in potable water at the Colliery's pit top area from 55.9 kL/day to up to 23.7 kL/day which equates to an overall saving of up to 11.8 ML/year, which is a reduction in use of potable water at the pit top area of 60% and total Colliery use of 9%. It should be noted that the use of non-potable water in all operational activities is not possible due to its quality, OH&S and equipment requirements and, therefore, continued use of potable water will be required at the Colliery.

8.3.3 Water quality

Given the presented levels of hydraulic connection between the underground workings in Area 1 and Lake Macquarie due to the dilution of inflows from the Wallarah and Great Northern Seams, the overall water quality of inflow into the underground workings under the Proposal is expected to improve. In the event of a hydraulic connection the quality would be similar to existing (see Section 7.3.2).

The upgrade of the sedimentation dam will prevent leaks and improve the efficiency of the sedimentation dam thereby resulting in an improvement to the quality of water discharged from the Colliery.

Given that the Proposal is not expected to change peak flow rates and water quality, detrimental impacts to the surrounding environment, including cumulative, long term impacts and impacts to riparian creeks and corridors are not expected to occur. Existing water quality management and monitoring at the Colliery would continue under the Proposal.

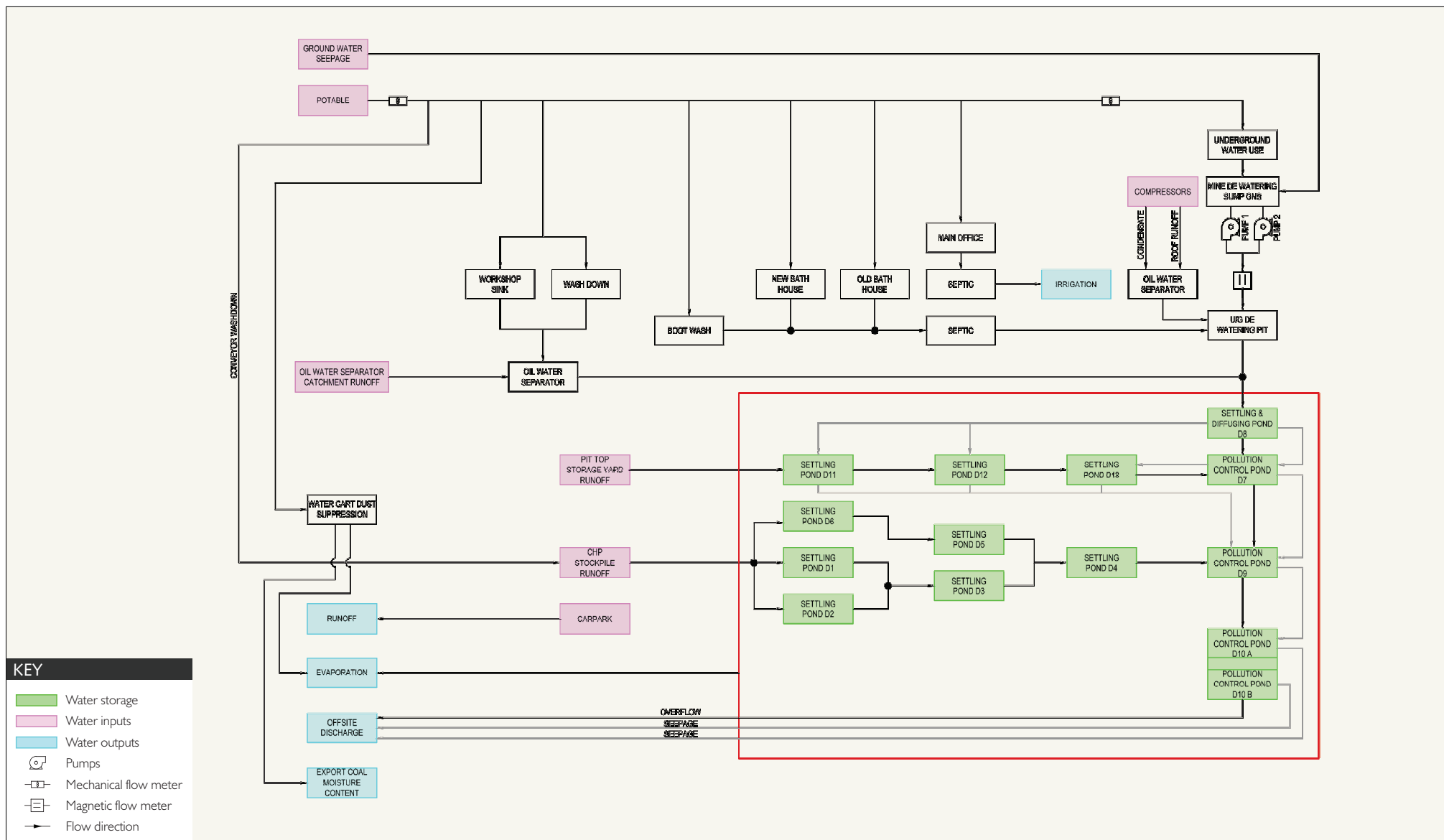
8.3.4 Storm surge capacity

Due to the regular pumping from underground and no existing procedures relating to the active dewatering of the sedimentation dams, the water balance completed indicates the Colliery currently does not have sufficient storm surge capacity to comply with the daily discharge limit of 12.161 ML/day at LDP 1. It is believed that the daily discharge limit was originally based on mine dewatering data with no consideration given to surface water runoff volumes. Additionally, as the Environmental Assessment for the Continuation Project (AECOM 2011a) only considered average runoff volumes and not maximums, this issue was not identified for MP10_0161.

Assuming a maximum pumping rate from underground of 10.5 ML/day, calculations within the GoldSim water balance model indicate that the 12.161 ML/day daily discharge limit at LDP 1 would be adhered to for up to and including a 17 mm rainfall event over a 24 hour duration. Therefore, as part of the Proposal LakeCoal will seek an amendment to EPL 1770 to include a condition on the daily discharge volume limit stating that:

"Exceedence of the volume limit for Point 1 is permitted only if the discharge from Point 1 occurs solely as a result of rainfall at the premises exceeding 10 mm during the 24 hours immediately prior to commencement of the discharge".

This proposed amendment to the EPL would resolve the storm surge capacity issues. The rainfall exceeding a level of 10 mm will ensure compliance, providing a buffer against the inherent uncertainties associated with modelling. EPL conditions consistent with the above are not uncommon in the Lake Macquarie region with both Mandalong Mine and Mannering Colliery containing similar conditions within their respective EPLs.



Source: GSS Environmental

Proposed water management system schematic

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Figure 8.2

8.4 Management and monitoring

8.4.1 Water management plan

The Colliery's WMP incorporates the following components:

- Site Water Balance (based on work by AECOM 2011a);
- Erosion and Sediment Control Plan;
- Surface Water Management Plan;
- Groundwater Monitoring Program; and
- Surface and Ground Water Response Plan.

The site water balance presented in the existing WMP is a summary of the water balance completed for the Colliery's existing operations (AECOM 2011a) with some minor updates. This water balance has been updated for this SWA as described in Section 8.3.1.

The WMP outlines the water management currently undertaken on site and documents potential methods for minimising potable water consumption, increasing recycled water use, and improving management of surface rainfall runoff and wastewater.

The WMP also includes a detailed monitoring program for both surface and underground waters. These programs include a method for the development and maintenance of baseline water quality data, a review of site appropriate assessment criteria and a program to monitor mining related impacts on the receiving environment.

A review of the existing WMP will be required in line with the findings of this SWA for the Proposal and the commitments detailed in Section 8.4.2. Updates to the WMP would also be required following the determination of site specific trigger values for those parameters identified within the EPL that do not have discharge limits which can only be undertaken once sufficient data has been collected. Determination of site specific trigger values will require at least two years of sampling data.

The existing water quality monitoring program would not require amendment as a result of the Proposal. Water quality monitoring would continue to be undertaken in accordance with EPL 1770 and the WMP, which includes monitoring of the parameters identified in Table 8.2, in accordance with *Approved Methods for Sampling and Analysis of Water Pollutants in NSW* (Department of Environment and Conservation (DEC) 2004) and the ANZECC guidelines for 'slightly to moderately disturbed systems'. The water quality monitoring data is collected and published on LakeCoal's website with the results reported on in the Colliery's Annual Return and made available to the CCC, LMCC and WSC. The monitoring locations included in the water quality monitoring program are shown in Figure 8.3.

Existing programs for monitoring of effluent, creek line channel stability, stream health and riparian vegetation would not require amendment as a result of the Proposal.



Surface water monitoring locations

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Figure 8.3

Table 8.2 Water management plan monitoring parameters

| Identification | Type of Monitoring Point | Pollutants (µg/L) ¹ | Frequency | Sampling Method |
|----------------|------------------------------------|--|------------------------|-----------------|
| Dam 10 Outlet | Outlet of Final Sedimentation Dam | Aluminium (dissolved) Aluminium (total) Arsenic (dissolved) Arsenic (total) | Monthly (min 4 weeks). | Grab sample |
| LDP1 | Licensed Discharge Point | Beryllium (dissolved) Beryllium (total) Cadmium (dissolved) | | |
| USSP | Baseline Data (Upstream of Site) | Cadmium (total) Chromium (dissolved) | | |
| DSSP | Baseline Data (Downstream of Site) | Chromium (total) Cobalt (dissolved) Lead (dissolved) Lead (total) Mercury (dissolved) Mercury (total) Molybdenum (dissolved) Molybdenum (total) Nickel (dissolved) Nickel (total) Nitrogen (ammonia) pH (pH) Phosphorus (mg/L) Selenium (dissolved) Selenium (total) Silver (dissolved) Silver (total) Total suspended solids (mg/L) Vanadium (dissolved) Vanadium (total) Zinc (dissolved) Zinc (total) Anionic Surfactants as MBAS (mg/L) BOD5 (mg/L) ^{2*} Faecal Coliforms (cfu/100ml)* Enterococci (cfu/100ml)* Total Oil and Grease (mg/L) | | |

Table 8.2 Water management plan monitoring parameters

| Identification | Type of Monitoring Point | Pollutants (µg/L) ¹ | Frequency | Sampling Method |
|----------------------|--------------------------|--------------------------------|-------------|-----------------|
| Lake Macquarie | Water Quality | Temperature (°C) | Six Monthly | In Situ |
| | | pH | | |
| | | Turbidity (NTU) | | |
| | | Dissolved Oxygen (%) | | |
| | | Total phosphorus (mg/L) | Six Monthly | Grab sample |
| AWTS Effluent Stream | Water Quality | Total nitrogen (mg/L) | | |
| | | Total suspended solids (mg/L) | Quarterly | Grab sample |
| | | Total Dissolved solids (mg/L) | | |
| | | Total phosphorus (mg/L) | | |
| | | Total nitrogen (mg/L) | | |
| | | Total Oil and Grease (mg/L) | | |
| | | BOD5(mg/L) ² | | |
| | | pH | | |
| | | Faecal Coliform (cfu/100ml) | | |
| | | SAR (v me/L) | | |

Notes: 1 Pollutant concentration measurements will be determined in micrograms per litre and within ANZECC concentration limits unless noted otherwise.

2. BOD5 – 5 day Biological Oxygen Demand.

* These values are specifically for monitoring effluent, if effluent is not irrigated or discharged they would not be required.

8.4.2 Additional commitments

In addition to existing surface water management and monitoring measures, the following measures will be implemented at the Colliery:

- Undertaking daily measurements of discharge volumes and reporting publically on a monthly basis via LakeCoal's website;
- continued collection of baseline water quality data to aid in the development of appropriate pollution trigger values;
- investigating water saving measures to minimise the amount of potable water required from WSC to service the underground and pit top operations;
- more accurate quantification of storage capacity in the Great Northern and Wallarah seams;
- amendment of EPL 1770 to include a condition on the daily discharge volume limit stating that "Exceedence of the volume limit for Point 1 is permitted only if the discharge from Point 1 occurs solely as a result of rainfall at the premises exceeding 10 mm during the 24 hours immediately prior to commencement of the discharge";
- limit the main underground pumps to a maximum pump out rate of 10.5 ML/day within 12 months of approval;

- continue effluent monitoring of receiving soils from the AWTS and septic water treatment systems in accordance with the parameters and testing frequencies identified in Table 8.2. The results of this monitoring program will be reviewed by a suitably qualified expert and used to determine the appropriateness of the existing irrigation area to receive this effluent;
- development of a program to monitor creek line channel stability and the health of riparian vegetation within Swindles Creek. Monitoring will be undertaken in accordance with Section 8.5.2 of the Surface water Impact Assessment (Appendix E) and incorporated into the WMP or BMP. The monitoring program will comprise:
 - documentation of general observations of water quantity and quality;
 - documentation of the locations and dimensions of significant erosive or depositional features so that any subsequent changes can be evaluated quantitatively;
 - establishment of multiple photographic points at representative locations, so that photos can be taken over multiple inspections in a repeatable manner;
 - provision of written descriptions of the stream at each of the photographic points, focussing on evidence of erosion and exposed soils; and
 - documentation of general indicators of stream health, including abundance of flora and fauna.
- recording of monitoring data will be undertaken in accordance with the Colliery's WMP and EPL 1770. Monitoring data will be interpreted as it is received to ensure appropriate operational guidance on monitoring water quality within desired parameters. Results of water quality monitoring will be reported in the Annual review and made available to the CCC, as well as Wyong and Lake Macquarie Councils; and
- engagement of a suitably qualified expert to conduct an assessment of the metals contained within discharge waters in accordance with the ANZECC water quality guidelines and issue this assessment to the EPA by 31 December 2013.

The Colliery's WMP will be revised and updated to incorporate the above.

8.5 Conclusion

The Proposal would result in an increase in the daily water volumes pumped from underground to 10.5 ML/day. In combination with surface runoff, discharge of water from the underground pumped to the surface at this rate would result in an exceedence of the current EPL daily discharge limit, according to worst case predictions toward the end of the mine life. A combination of underground storage utilisation, an amendment to the daily discharge volume condition within EPL 1770 and the commitment to limit the maximum daily pump rate to 10.5 ML/day, is required to effectively manage water at the pit top area.

Potable water, sourced from WSC, is currently used in the underground and pit top operations at the Colliery. LakeCoal is currently, or proposes, introducing measures to minimise potable water consumption and maximise recycled water use that are expected to result in a reduction in potable water use by 11.8 ML/year.

The quality of water flowing into the underground workings and pumped to the surface under the Proposal is expected to be similar to, or potentially better than, existing water quality. Further, the volumes of water discharged off site would not exceed the current limits. Therefore, no additional impacts to the surrounding environment are expected to occur under the Proposal.

The Colliery's existing WMP will be revised and updated in accordance with the findings of the Proposal's SWA. LakeCoal would also investigate and, where practical, implement additional surface water management and monitoring measures as described in Section 8.4.2.

9 Noise

9.1 Introduction

A noise impact assessment (NIA) for the Proposal was undertaken by EMM. The findings of the NIA are summarised in this chapter and provided in full in Appendix F.

The chapter includes the assessment methodology, a description of the existing noise environment and the potential impacts from the Proposal. The chapter concludes with management and monitoring measures that would be implemented to prevent or minimise potential impacts.

9.2 Existing environment

The discussion of noise uses a number of technical terms which are explained in Table 9.1 along with other terms used in this chapter and the NIA.

Table 9.1 Glossary of acoustic terms

| Term | Description |
|-------------------------------------|---|
| CoRTN | Calculation of Road Traffic Noise method developed by the UK Department of Transport. |
| Day period ¹ | Monday – Saturday: 7.00 am to 6.00 pm, and on Sundays and public holidays: 8.00 am to 6.00 pm. |
| dB(A) | Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the ‘A-weighted’ scale. This attempts to closely approximate the frequency response of the human ear. |
| ECRTN | <i>Environmental Criteria for Road Traffic Noise</i> (EPA 1999) |
| Evening period ¹ | Monday – Saturday: 6.00 pm to 10.00 pm, and on Sundays and public holidays: 6.00 pm to 10.00 pm. |
| INP | <i>Industrial Noise Policy</i> (EPA 2000) |
| L ₁ | The noise level exceeded for 1% of the time. |
| L ₁₀ | The noise level which is exceeded 10% of the time. It is roughly equivalent to the average of maximum noise level. |
| L ₉₀ | The noise level that is exceeded 90% of the time. Commonly referred to as the background noise level. |
| L _{eq} | The energy average noise from a source. This is the equivalent continuous sound pressure level over a given period. The L _{eq(15min)} descriptor refers to an L _{eq} noise level measured over a 15-minute period. |
| L _{max} | The maximum sound pressure level received during a measuring interval. |
| Night period ¹ | Monday – Saturday: 10.00 pm to 7.00 am, and on Sundays and public holidays: 10.00 pm to 8.00 am. |
| PSNL | The project-specific noise levels (PSNL) are criteria for a particular industrial noise source or industry. The PSNL is the lower of either the intrusive criteria or amenity criteria. |
| RBL | The rating background level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the average background levels. |
| RNP | <i>Road Noise Policy</i> (Department of Environment, Climate Change and Water (DECCW) 2011) |
| Shoulder period | Monday – Saturday 5.00 to 7.00 am, and on Sundays and public holidays: 6.00 am to 8.00 am. |
| Sound power level (L _w) | A measure of the total power radiated by a source. The sound power of a source is a fundamental property of the source and is independent of the surrounding environment. |
| Temperature inversion | A meteorological condition where the atmospheric temperature increases with altitude. |

Note: 1. excludes road traffic noise where Day: 7.00 am – 10.00 pm, Night: 10.00pm to 7.00am.

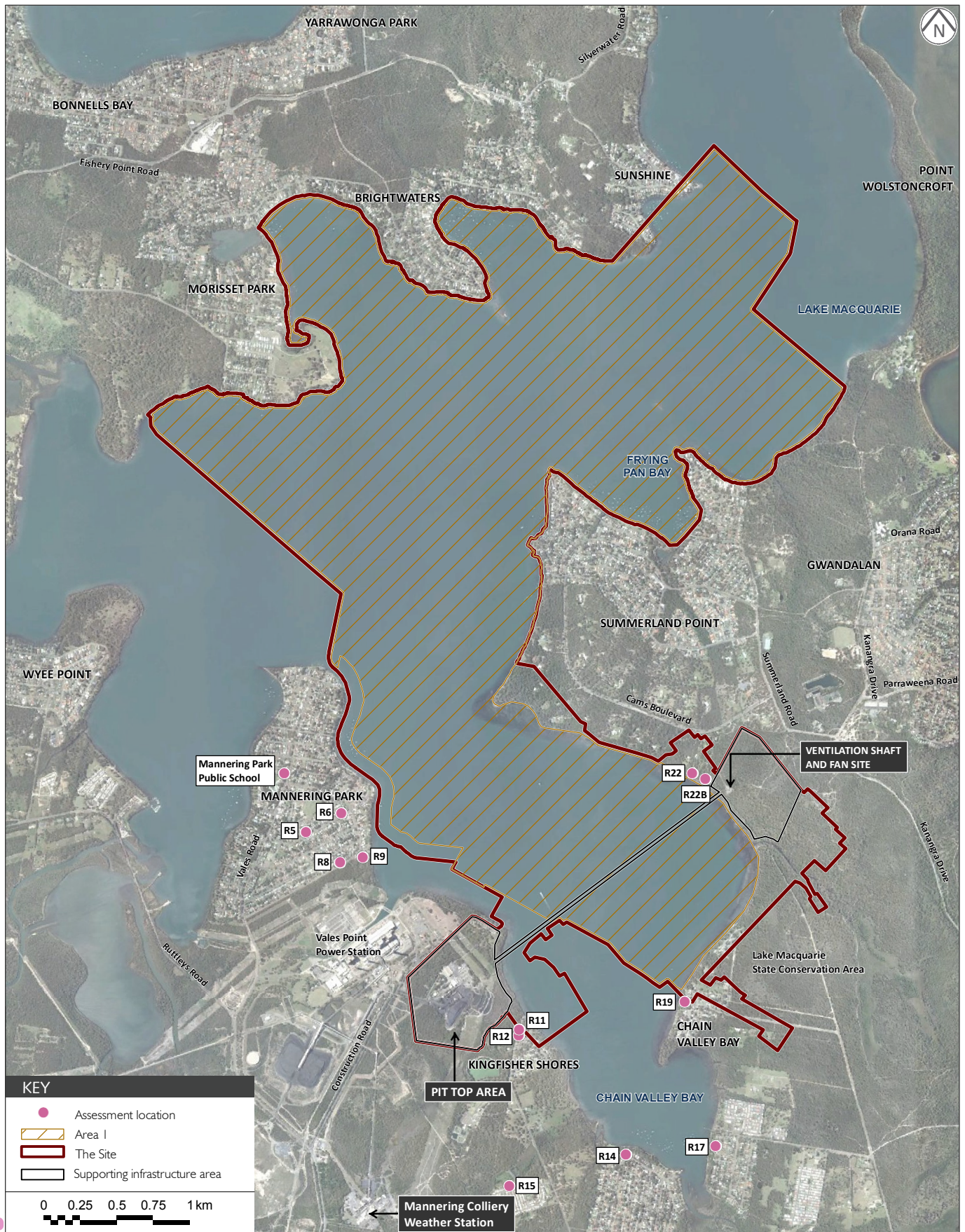
The acoustic environment of the Site and its surrounds is influenced by industrial sources, primarily the VPPS with contributions from the Colliery and Mannering Colliery. Sensitive areas potentially affected by noise emissions from the Colliery and other industrial sources are shown on Figure 9.1 and include the residential areas of Mannering Park, Kingfisher Shores, Chain Valley Bay and Summerland Point.

Assessment locations adopted for the NIA represent the most potentially affected sensitive receivers and are generally consistent with the locations specified in Schedule 3, Condition 9 of MP10_0161. The assessment locations are listed in Table 9.2 and shown in Figure 9.1 and include 12 residential locations and one non-residential location, the Mannering Park Public School, which is approximately 1.8 km to the north-west of the Colliery.

Table 9.2 Assessment locations and MGA coordinates

| Assessment location | MGA coordinates | |
|--|-----------------|----------|
| | Easting | Northing |
| Residential | | |
| Receiver 5 (R5) ¹ – 20 Spencer Road, Mannering Park | 363758 | 6330736 |
| Receiver 6 (R6) – 56 Spencer Road, Mannering Park | 364001 | 6330867 |
| Receiver 8 (R8) – 92 Griffith Street, Mannering Park | 363990 | 6330529 |
| Receiver 9 (R9) – Griffiths Street, Mannering Park | 364145 | 6330566 |
| Receiver 11 (R11) – 35 Lakeshore Avenue, Chain Valley Bay | 365218 | 6329388 |
| Receiver 12 (R12) – Kingfisher Shores Residential Development | 365213 | 6329347 |
| Receiver 14 (R14) – 20 Lloyd Avenue, Chain Valley Bay | 365949 | 6328530 |
| Receiver 15 (R15) – Macquarie Shores Mobile Home Village | 365145 | 6328317 |
| Receiver 17 (R17) – 74 Teragalin Drive, Chain Valley Bay | 366560 | 6328590 |
| Receiver 19 (R19) – Sunset Parade, off Chain Valley Bay Road | 366350 | 6329578 |
| Receiver 22 (R22) – 275 Cams Boulevard, Summerland Point | 366401 | 6331137 |
| Receiver 22B (R22B) – 275 Cams Boulevard Summerland Point (converted barn) | 366492 | 6331099 |
| Non-residential | | |
| Mannering Park Public School | 363610 | 6331139 |

Notes: 1. Assessment locations R1 – R4 referenced in Schedule 3, Condition 9 of MP10_0161 have been excluded from this assessment, as it is expected, (according to AECOM 2011b, Part I Final Chain Valley Colliery Submissions Report Appendix D, Noise), that noise limits will be satisfied at R5 and R6, which are located between the Colliery and these receivers. Similarly, R18 has been excluded from the assessment as it is expected that noise limits will be satisfied at R17, which is located between the Colliery and this receiver.



Noise assessment locations

The ambient and background noise levels for the Colliery, as determined in *Part I Final Chain Valley Colliery Submissions Report Appendix D, Noise* (AECOM 2011b) which was prepared in support of the application for MP10_0161, are summarised in Table 9.3. It should be noted that the industrial noise contribution at all assessment locations is controlled by the VPPS. Assessment locations located in north Mannering Park (R5, R6, R8 and R9) experience a reduced noise impact from the VPPS than those in south Mannering Park.

Table 9.3 RBL and industrial contribution in the Chain Valley area

| Assessment location | Time period | RBL dB(A) | Ambient L_{eq} , dB(A) | Industrial contribution $L_{eq(15-min)}$, dB(A) |
|--|-------------|-----------|--------------------------|---|
| R5, R6, R8, R9 ¹ | Day | 33 | 51 | 35 |
| | Evening | 32 | 39 | 35 |
| | Night | 32 | 44 | 35 |
| R11, R12, R14, R15, R17, R19, R22, R22B ² | Day | 36 | 57 | 35 |
| | Evening | 37 | 42 | 35 |
| | Night | 41 | 47 | 43 |

Notes: 1. Levels used in AECOM (2011b) for all Mannering Park assessment locations.
2. Level adopted is the same as for R22.
3. The rating background level (RBL) is an overall single value background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the average background levels

Prevailing meteorological conditions in the local area with the potential to influence noise propagation are summarised in Section 9.3.2.

9.3 Impact assessment

Potential noise impacts resulting from the Proposal include:

- truck haulage of product coal to VPPS via the private haul access road and Construction Road and internal roads within VPPS;
- continuation of existing operational activities;
- continuation of existing truck and staff vehicle movements on public roads; and
- minor upgrades and modifications to infrastructure.

Assessment criteria, methodology and results are provided in the following sections.

9.3.1 Assessment criteria

There are a range of criteria that apply to noise generated by industrial operations such as mines. This section summarises the relevant criteria that apply to the Proposal.

i Operational criteria

The OEH provides guidelines for assessing operational noise generated by industrial facilities, including mines, in its INP. Assessment criteria depend on the existing noise levels of areas potentially affected by a proposed development and the category of land use.

The operational criteria for the Proposal are derived from the applicable noise limits for the Colliery specified in Table 3 of MP10_0161 and are reproduced in Table 9.4. MP10_0161 does not include criteria for R22B and Mannering Park Public School. The criteria adopted for R22B in Table 9.4 are consistent with those for the same parcel as land, R22, and the criteria adopted for Mannering Park Public School (internal) are derived from the INP. It is noted that 'long term' criteria, as specified in Schedule 3, Condition 10 of MP10_0161, also apply for several assessment locations as shown in Table 9.4.

Table 9.4 Operational noise assessment criteria

| Assessment location | Noise criteria $L_{eq(15-min)}$ | | | |
|-------------------------------|---------------------------------|-------------------|-------------------|------------------|
| | Day | Evening | Night (10pm-5am) | Shoulder (5-7am) |
| R5 | 35 | 35 | 35 | 35 |
| R6 | 35 | 35 | 35 | 37 |
| R8 | 38 | 38 (37 long term) | 38 (37 long term) | 40 |
| R9 | 35 | 35 | 35 | 35 |
| R11 | 51 (41 long term) | 50 (41 long term) | 50 (41 long term) | 51 |
| R12 | 49 (41 long term) | 49 (41 long term) | 49 (41 long term) | 50 |
| R14 | 36 | 36 | 36 | 37 |
| R15 | 37 | 37 | 37 | 39 |
| R17 | 36 | 36 | 36 | 38 |
| R19 | 40 | 40 | 40 (41 long term) | 42 |
| R22 | 40 | 40 | 40 | 41 |
| R22B ¹ | 40 | 40 | 40 | 41 |
| School classroom ² | 35 | N/A | N/A | N/A |

Notes: 1. Criteria adopted is the same as for R22.

2. Internal and during noisiest 1-hour period, derived from the INP (EPA 2000).

ii Sleep disturbance criteria

Operational noise criteria which consider the average noise emission of a source over 15 minutes are appropriate for assessing noise from relatively steady-state sources, such as engine noise from mobile plant and other pit equipment. However, noise from sources such as reversing alarms or track plates is intermittent (rather than continuous) in nature and, as such, needs to be assessed using the L_1 (1 minute) or L_{max} noise metrics.

The most important potential impact of intermittent noise that needs to be considered is the potential for sleep disturbance of nearby residents. The INP does not specify a criterion for assessing sleep disturbance. However, the ECRTN indicates that levels below 50 – 55 dB(A) inside residential dwellings are unlikely to wake sleeping occupants. If bedroom windows are open, this corresponds to an external maximum noise level of approximately 60 – 65 dB(A) L_{max} . By comparison, the World Health Organisation (WHO 1999) suggest that levels below 45 dB(A) inside residential dwellings are unlikely to wake sleeping occupants.

The sleep disturbance noise limits referenced in Table 3 of MP10_0161 are reproduced in Table 9.5.

Table 9.5 Sleep disturbance criteria

| Assessment location | Time period | L_{\max} or $L_{1(1-\min)}$ dB(A) |
|---------------------|-------------|-------------------------------------|
| R5 | Night | 45 |
| R6 | Night | 45 |
| R8 | Night | 45 |
| R9 | Night | 45 |
| R11 | Night | 54 |
| R12 | Night | 53 |
| R14 | Night | 45 |
| R15 | Night | 45 |
| R17 | Night | 45 |
| R19 | Night | 45 |
| R22 | Night | 45 |
| R22B ¹ | Night | 45 |

Notes: 1. Criteria adopted is the same as for R22.

iii Cumulative noise criteria

To limit continuing increases in industrial noise within a particular area, ambient industrial noise should not exceed the levels specified in Table 2.1 of the INP. There are several existing industrial sources in the vicinity of the Colliery, including VPPS and Mannering Colliery. Therefore, cumulative operational noise has been considered in this assessment and compared against the INP's acceptable and maximum amenity criteria levels for urban areas. As discussed in Section 9.2, assessment locations in north Mannering Park have a reduced industrial noise contribution and this assessment has adopted the suburban amenity criteria for these receivers. For assessment locations in south Mannering Park there is potential for application of the urban/industrial criteria due to the close proximity of VPPS. However, the urban amenity criteria levels have been adopted for these assessment locations in this assessment and are, therefore, deemed conservative. The acceptable and maximum amenity criteria levels are reproduced in Table 9.6.

Table 9.6 Recommended L_{eq} noise levels from industrial noise sources

| Assessment locations | Indicative noise area | Time period | Recommended L_{eq} (period) noise level, dB(A) | |
|---|-----------------------|-------------|--|---------|
| | | | Acceptable | Maximum |
| R5, R6, R8, R9 | Suburban | Day | 55 | 60 |
| | | Evening | 45 | 50 |
| | | Night | 40 | 45 |
| R11, R12, R14, R15, R17, R19, R22, R22B | Urban | Day | 60 | 65 |
| | | Evening | 50 | 55 |
| | | Night | 45 | 50 |

iv Road noise criteria

The principle guidance for assessment of the impact of road traffic noise on residential premises in NSW is the RNP. The roads most likely to be affected by traffic generated under the Proposal are Ruttleys Road, the Pacific Highway and Doyalson Motorway Link Road. The traffic noise criteria for these roads have been derived from the RNP criteria for sub-arterial and arterial roads and are presented in Table 9.7.

Table 9.7 Traffic noise criteria

| Road | Day | Night |
|--|--------------------|-------------------|
| | L_{eq} (15 hour) | L_{eq} (9 hour) |
| Ruttleys Road (sub arterial) | 60 | 55 |
| Pacific Highway and Doyalson Motorway Link Road (arterial) | 60 | 55 |

Additionally, where existing road traffic noise criteria are already exceeded, the RNP states that any additional increase in total traffic noise level should be limited to 2 dB.

9.3.2 Methodology

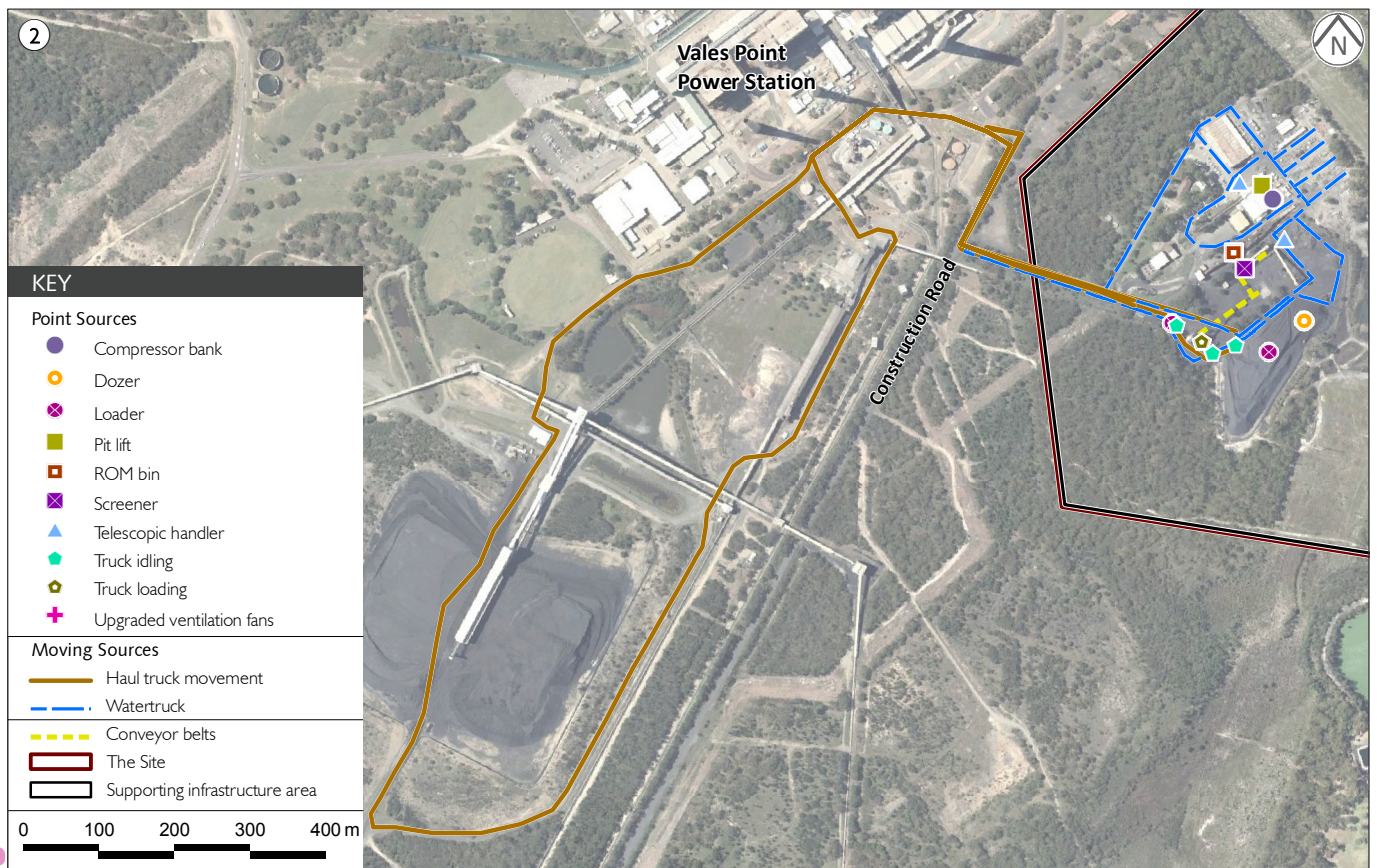
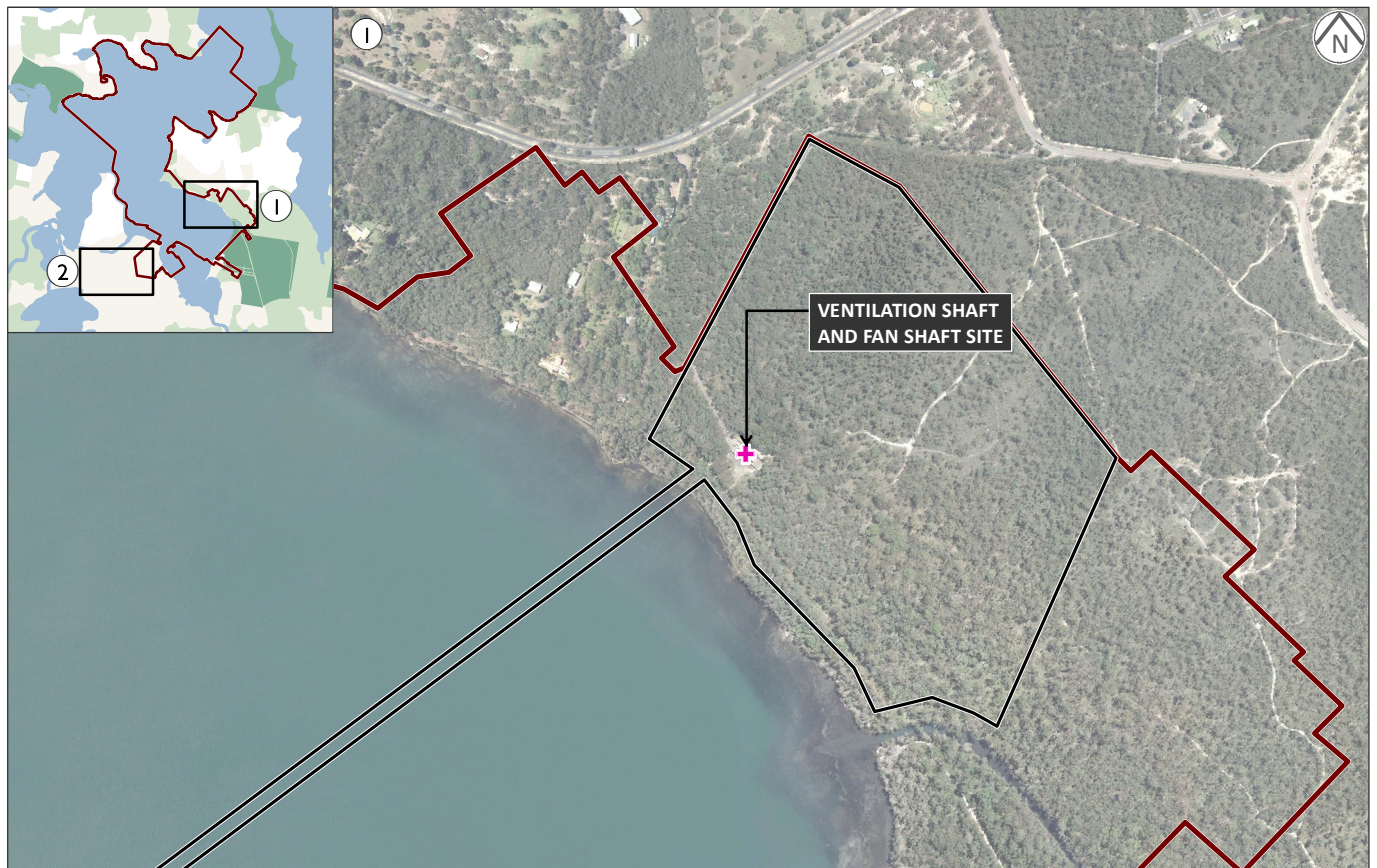
i Modelling

The prediction of noise levels ($L_{eq(15-min)}$) from the Proposal at each assessment location was undertaken using the ISO 9613 and CONCAWE algorithms in Brüel and Kjær Predictor Version 8.11 noise prediction software. Noise modelling was based on three-dimensional digitised ground contours for the Colliery and surrounds. Three operational scenarios were modelled to represent emissions from the Colliery at the assessment locations, namely:

- Scenario 1 – existing noise emissions that reflect operations currently approved under MP10_0161;
- Scenario 2 – future noise emissions under the Proposal (all plant); and
- Scenario 3 – future noise emissions under the Proposal without the dozer.

The scenarios contain plant and equipment placed at various locations and heights, representing realistic operating conditions. The model assumed all plant and equipment were operating simultaneously and at full power which, in practice, is very unlikely to occur, or would occur very infrequently and for very short durations. Therefore, noise predictions are considered to be worst case and conservative. This is particularly the case for the ventilation fans which were modelled operating at 100% capacity which would rarely occur.

The main noise sources and associated sound power levels of plant and equipment proposed to be used as part of the Proposal are presented in Table 9.8. Operational noise sources at the pit top area are shown in Figure 9.2.



Operational noise sources within the Site

Table 9.8 Typical equipment and sound power levels

| Typical fleet/item | Representative Leq(15-min) sound power level, dB(A) |
|---|---|
| Compressor bank | 101 |
| Pit lift conveyor | 103 |
| ROM bin | 96 |
| Screener/shaker | 107 |
| Conveyor belts (per metre) | 86 |
| Road truck loading from coal bin | 104 |
| Road truck idling (x3) | 97 |
| Road truck moving in and out of site | 104 |
| Front end loader (WA500) | 105 |
| Dozer (D9) | 107 |
| Water cart | 96 |
| Telescopic handlers (x2) | 96 |
| Upgraded ventilation fans (@ 100% capacity) | 105 |

Road traffic noise levels were predicted using the CoRTN method which incorporates consideration of traffic flow volume, average speed, percentage of heavy vehicles, and road gradient to establish noise source strength, and includes attenuation due to distance, ground absorption and screening from buildings or barriers.

ii Meteorological conditions

The three operational scenarios were modelled incorporating potential worse case meteorological conditions in the model - winds and temperature inversions. The following meteorological scenarios were used in the model:

- calm: zero wind speed and no temperature gradient;
- prevailing winds: all wind directions were determined to be feature winds for the Site and, therefore, eight wind scenarios from 45° to 360° ($\pm 22.5^\circ$) with a representative seasonal wind speed were modelled for each direction; and
- temperature inversion: stability class F (night time only) with a temperature gradient of 3°C/100 m.

During wind and temperature gradient conditions (such as temperature inversions), mining noise levels at assessment locations may increase or decrease compared with noise during calm conditions. This change is due to refraction caused by the varying speed of sound with increasing height above ground. Noise levels increase when the wind blows from source to assessment locations or under temperature inversions. Conversely, the noise level decreases when the wind blows from assessment locations to source or under temperature lapse conditions.

A summary of the meteorological conditions relevant to the Site, determined from Mannering Colliery's weather station (approximately 1.6 km to the south-west of the Colliery shown in Figure 9.1) data, is provided in Table 9.9.

Table 9.9 Relevant site specific meteorological parameters

| Assessment condition | Wind Direction | Highest 10 percentile Wind Speed (>30% occurrence) | Temperature gradient |
|-----------------------|----------------|--|----------------------|
| All periods | | | |
| Calm | n/a | n/a | n/a |
| Prevailing Winds | 45 °±22.5 ° | 2.0 | n/a |
| | 90 °±22.5 ° | 1.2 | n/a |
| | 135 °±22.5 ° | 1.3 | n/a |
| | 180 °±22.5 ° | 1.3 | n/a |
| | 225 °±22.5 ° | 1.3 | n/a |
| | 270 °±22.5 ° | 1.2 | n/a |
| | 315 °±22.5 ° | 1.1 | n/a |
| | 0 °±22.5 ° | 1.6 | n/a |
| Temperature Inversion | n/a | n/a | 3°C/100 m |

9.3.3 Operational noise assessment

Table 9.10 provides a summary of the noise levels at the assessment locations for the three operational scenarios modelled.

It is noted that for Scenarios 2 and 3, site operations would be consistent 24 hours a day. Therefore, only one assessment period was adopted with assessment against the more stringent noise criteria, i.e., night time, with the exception of the school which only has criteria for the day period.

Predicted noise levels that are more than marginally (2 dB) above criteria are bolded, as changes in noise levels of 2 dB or less are imperceptible to the human ear and are generally considered an acceptable noise level increase.

Under Scenario 1, modelling predicts that existing emissions satisfy, or are marginally (2 dB) above, the relevant criteria at all assessment locations with the exception of R9, R22 and R22B during the day period and R22 and R22B during the evening, night and shoulder periods.

Existing noise emissions are marginally higher during the day period at all assessment locations due to the operation of haul trucks. The Colliery dozer is the main contributor to noise levels at most assessment locations, with the exception of R22 and R22B where the ventilation fans are the dominant source. It is noted that in 2011 the dozer operated for a total of 419 hours which equates to 4.8% of the total hours that the Colliery was operational. Similarly, it is expected that the ventilation fans would rarely operate at 100% capacity. Therefore, as previously discussed, the noise modelling predictions are worst case based on the assumption that all equipment will be running simultaneously and at 100% capacity.

Scenario 2 provides emissions that reflect the Colliery operations under the Proposal (modified hours for the hauling of product coal on private roads to VPPS). Given this scenario assumes that site operations would be consistent 24 hours a day, only one scenario was adopted for all assessment periods: day; evening; and night. Further, the more stringent night time noise criteria for all assessment locations are provided for comparison, with the exception of the school.

Table 9.10 Predicted operational noise levels at assessment locations

| Assessment location | Criteria, $L_{eq}(15\text{-min})$ | | | Predicted operational noise levels ($L_{eq}(15\text{-min})$, dB(A)) | | | |
|---------------------|-----------------------------------|---------------|------------------|---|---------------|------------|------------|
| | Day | Evening/Night | Shoulder (night) | Scenario 1 | | Scenario 2 | Scenario 3 |
| | | | | Day | Evening/Night | Night | Night |
| R5 | 35 | 35 | 35 | 34 | 33 | 34 | 33 |
| R6 | 35 | 35 | 37 | 35 | 33 | 35 | 33 |
| R8 | 38 | 38 | 40 | 39 | 38 | 39 | 37 |
| R9 | 35 | 35 | 35 | 39 | 37 | 39 | 38 |
| R11 | 51 | 50 | 51 | 49 | 49 | 49 | 46 |
| R12 | 49 | 49 | 50 | 49 | 49 | 49 | 46 |
| R14 | 36 | 36 | 37 | 35 | 35 | 35 | 33 |
| R15 | 37 | 37 | 39 | 36 | 35 | 36 | 34 |
| R17 | 36 | 36 | 38 | 32 | 31 | 32 | 29 |
| R19 | 40 | 40 | 42 | 37 | 36 | 37 | 35 |
| R22 | 40 | 40 | 41 | 46 | 46 | 46 | 46 |
| R22B | 40 | 40 | 41 | 51 | 51 | 51 | 51 |
| School classroom | 35 ¹ | N/A | N/A | 32 | N/A | 32 | 31 |

Notes: 1. Internal criteria for daytime.

Bold indicates noise criteria exceedence of more than 2 dB.

Under Scenario 2, modelling predicts that emissions satisfy or are marginally (2 dB) above the relevant criteria at all of the assessment locations with the exception of R9, R22 and R22B. No exceedences of the criteria additional to those for Scenario 1 (existing case) are predicted to occur as a result of the Proposal. However, it is noted that modelling predicts night truck haulage of coal to VPPS would result in marginal increases of up to 2 dB to existing night time noise levels at assessment locations in Mannering Park and Chain Valley Bay. Other observations include no change for locations R22 and R22B, as compared to Scenario 1 (existing case), where noise is predominantly influenced by the ventilation shaft fans which are closest to these assessment locations.

As noted, the Colliery dozer is the main contributor to received noise levels at assessment locations under Scenarios 1 and 2. Under the Proposal it would continue to be used for a small percentage of time, mostly during the day and on occasion during the night.

Scenario 3 was completed to determine potential noise levels from the Colliery, as proposed, for periods when the dozer is not in use (approximately 95% of the time). This scenario is considered to provide a more realistic representation of noise levels from proposed operations.

Modelling predicts a slight reduction in noise emissions at the majority of locations. Emissions without the dozer operating would be below, at or marginally (2 dB) above relevant criteria for all assessment locations, with the exception of R9, R22 and R22B. The results at R22 and R22B remain unchanged from Scenarios 1 and 2 as they are predominately influenced by the noise from the ventilation fans and not the dozer.

Modelling predicts that residual emissions from the Site are controlled by multiple sources with similar sound power levels. Therefore, further noise reductions on-site would require multiple sources to be treated. This is proposed to be undertaken in accordance with the Colliery's ongoing noise reduction program being implemented as per the Colliery's NMP prepared in accordance with Schedule 3, Condition 11 of MP10_0161 (refer to Section 9.4.1).

9.3.4 Sleep disturbance assessment

The results of the sleep disturbance noise assessment for the Proposal are presented in Table 9.11.

Table 9.11 Predicted maximum noise at each receiver

| Receiver | L _{max} criteria | Predicted L _{max} noise level, dB(A) | |
|------------------|---------------------------|---|-----------|
| | | Calm | Inversion |
| R5 | 45 | 37 | 39 |
| R6 | 45 | 37 | 40 |
| R8 | 45 | 39 | 42 |
| R9 | 45 | 39 | 42 |
| R11 | 54 | 47 | 49 |
| R12 | 53 | 47 | 49 |
| R14 | 45 | 36 | 39 |
| R15 | 45 | 39 | 42 |
| R17 | 45 | 34 | 36 |
| R19 | 45 | 43 | 46 |
| R22 | 45 | 39 | 42 |
| R22B | 45 | 39 | 42 |
| School classroom | N/A | N/A | N/A |

Noise modelling demonstrates that L_{max} noise levels associated with the Colliery would be below the sleep disturbance criteria specified in MP10_0161 at all assessment locations with the exception of R19 during temperature inversion conditions where a marginal 1 dB exceedence is predicted. As noise level changes lower than 2 dB are imperceptible in practice, no significant impacts to sleep disturbance are likely as a result of the Proposal.

9.3.5 Cumulative noise assessment

The cumulative noise assessment has quantified existing industrial noise using R12 as a reference location to determine if proposed changes related to the continuation of mining at the Colliery impact existing total industrial noise levels. R12 was used as a reference location as it is the closest to the Colliery and, therefore, would have the greatest potential to be impacted by the Proposal and other cumulative sources. Furthermore, suitable existing monitoring data was available at this location.

The noise contribution to the existing ambient industrial noise from the Proposal is presented in Table 9.12.

Predicted noise levels under the Proposal would not change the overall cumulative industrial noise for R12 and would satisfy the maximum cumulative noise criteria for all periods. Further, it is anticipated that other surrounding assessment locations would not see an increase in cumulative industrial noise as a result of the Proposal, as they are situated at greater distances from the Colliery or are significantly closer to other industries, for example, Mannering Park and VPPS.

Table 9.12 Individual industrial contributions to cumulative night time noise levels at R12

| Source | Existing Colliery operations | Future Colliery operations as mitigated |
|--|------------------------------|---|
| | Estimated emissions | Estimated emissions |
| VPPS ¹ $L_{eq(15-min)}$ | 45 | 45 |
| Mannering Colliery $L_{eq(15-min)}$ | 41 | 41 |
| Chain Valley Colliery $L_{eq(15-min)}$ | 49 | 49 |
| Cumulative night time $L_{eq(15-min)}$ ² | 51 | 51 |
| Cumulative night time $L_{eq(period)}$ ² | 48 | 48 |
| Acceptable (and maximum) cumulative criteria $L_{eq(period)}$ ² | 45(50) | 45(50) |

Notes: 1. Based on measured levels from SLR 2012 and AECOM 2011b.

2. Takes into account the correction for an $L_{eq(15-min)}$ interval to night $L_{eq(period)}$.

() = maximum amenity noise levels.

9.3.6 Road traffic noise assessment

Traffic movements on public roads associated with the Colliery would not increase under the Proposal. Existing daily traffic movements are described in Chapter 11. It is noted that no truck movements occur between the hours of 5.30 pm and 5.30 am on public roads. Truck movements on private roads during the day and night period were considered in the operational noise assessment in Section 9.3.3.

There are no residential receivers along Ruttleys Road with the exception of one residence before the intersection between Ruttleys Road and the Pacific Highway, located approximately 30 m from the road. Two receivers on the Doyalson Motorway Link Road and Pacific Highway were identified as being the closest receivers, and potentially the most impacted receivers by the Colliery's coal transportation activities on the public road network. These receivers are located in the communities of Doyalson and Blue Haven and situated 10 m and 20 m from the road, respectively.

Traffic volumes on public roads will not increase as a result of the Proposal. Table 9.13 shows the predicted noise levels associated with the traffic volume generated on Ruttleys Road, the Pacific Highway and Doyalson Motorway Link Road under the Proposal.

Table 9.13 Road traffic noise levels under the Proposal

| Assessed residential receivers (distance from road) | Assessment criteria, dB(A) | Existing traffic noise levels (excluding Site) | Site related traffic noise (trucks and employees) | Future (including Site traffic) | Noise difference due to Site traffic |
|---|----------------------------|--|---|---------------------------------|--------------------------------------|
| Day $L_{eq\ 15\text{-hour}}$ dB(A) | | | | | |
| Ruttleys Road (30 m) | 60 | 65.6 | 58.2 | 66.3 | 0.7 |
| Doyalson (10 m) | 60 | 74.9 | 63.4 | 75.2 | 0.3 |
| Blue Haven (20 m) | 60 | 71.9 | 60.4 | 72.2 | 0.3 |
| Night $L_{eq\ 9\text{-hour}}$ dB(A) | | | | | |
| Ruttleys Road (30 m) | 55 | 59.2 | 49.1 ¹ | 59.6 | 0.4 |
| Doyalson (10 m) | 55 | 68.4 | 54.4 ¹ | 68.6 | 0.2 |
| Blue Haven (20 m) | 55 | 65.4 | 55.6 ¹ | 65.8 | 0.4 |

Notes: 1. Includes export coal trucks during night time (i.e., 5.30 am to 7am).

The results identify that Doyalson and Blue Haven residential receivers in close proximity to Doyalson Motorway already experience noise levels which exceed the assessment criteria but would experience no perceivable change in road traffic noise levels with or without Colliery related traffic. The marginal increase in noise levels of less than 1 dB is predicted during day and night time periods as a consequence of coal haulage, although this increase would be imperceptible. The minor increases are within the RNP's 2 dB limit where existing road traffic noise criteria are already exceeded.

9.4 Management and monitoring

9.4.1 Existing monitoring

The Colliery's NMP provides for the management and monitoring of noise generated by the Colliery. The NMP is provided as Appendix C of the NIA (Appendix F to this EIS) and includes:

- detail of the noise impact assessment criteria applying to the Colliery;
- detail of the long term noise goals at nearby receivers;
- the noise monitoring, including real-time monitoring, and reporting requirements;
- detail of the noise management measures;
- the requirements for incident or exceedence reporting and reviews of the document; and
- persons responsible for the implementation of requirements.

9.4.2 Additional commitments

LakeCoal is committed to considering additional noise management measures. Attended compliance monitoring has commenced on site and would be used to identify potential hot spots and primary sources of noise. Also, a real-time noise monitoring system has been installed in accordance with the NMP, to provide real-time alerts to site personnel so rapid noise management initiatives can be implemented. The management of potential non-compliance with a noise complaint handling and response system, including the ability for remote monitoring of real time audio, enables the identification of responsible sources so remedial actions can be targeted. To date, all recorded results from the real-time noise monitor have been assessed and were determined to be from sources other than the Colliery.

9.4.3 Long term goals

Long term goals are used to encourage a reduction of noise emissions from the Colliery. The development of a noise reduction program is to be incorporated in the NMP with the aim of identifying main contributors to noise generation and reducing their impacts. The minor upgrades and modifications to surface infrastructure proposed under the Proposal are consistent with the objective of the noise reduction program. Long term options include, but are not limited to:

- modification to belt/movement alarms;
- investigation of surface conveyor and coal preparation equipment, to see if modifications are possible to reduce noise emissions from this plant;
- identifying sound attenuation options for the surface bulldozer and front end loader;
- strategic placement of acoustic barriers;
- attenuation options for the surface screener/shaker;
- use of quiet rollers for surface conveyor belts;
- acoustic treatments around compressors; and
- the use of a conveyor stacker for product coal stockpiling.

9.5 Conclusion

The noise assessment indicates that operational noise under the Proposal during worst case weather conditions would satisfy the relevant criteria under MP10_0161 at all assessment locations, with the exception of three which are currently predicted to experience exceedences under the existing operations. Modelling predicts a slight reduction in noise emissions at the majority of locations when the Colliery's dozer, the main contributor to noise, is not operating.

Sleep disturbance noise emissions are expected to remain below the relevant criteria, with the exception of one assessment location where a marginal 1 dB exceedence during temperature inversion conditions is predicted.

Existing traffic noise levels for Ruttleys Road and Doyalson Motorway Link Road were calculated to be above the day and night criteria, even in the absence of any Colliery related traffic. Traffic noise level emissions associated with the Proposal would result in imperceptible increase to existing road noise emissions.

In summary, the Proposal would not result in significant noise impacts additional to those under existing conditions. LakeCoal has committed to managing and monitoring noise emissions from the Colliery as well as long term goals to reduce noise emissions.

10 Air quality and greenhouse gases

10.1 Introduction

An air quality and greenhouse gas impact assessment (AQIA) was undertaken for the Proposal by Pacific Environment Limited. The findings of the AQIA are summarised in this chapter and provided in full in Appendix G.

This chapter summarises the region's climate and existing air quality, levels of particulate matter and odour predicted to be experienced at nearby receivers, and greenhouse gas (GHG) emissions generated by the Proposal. This chapter also considers the potential environmental impact of the Proposal and details management and monitoring measures that will be implemented to prevent or minimise potential impacts.

10.2 Existing environment

10.2.1 Existing airshed and dust sources

The airshed of the Site and its surrounds is influenced by industrial sources, including the Colliery, VPPS, Mannering Colliery and vehicle movements. Five representative assessment locations were selected for the assessment from the potentially sensitive residential areas surrounding the Colliery's surface facilities, namely Mannering Park, Kingfisher Shores, Chain Valley Bay, the Macquarie Shores village and Summerland Point (Figure 10.1).

The surface based activities at the Colliery have the potential to generate fugitive dust emissions in the form of particulate matter. Particulate matter consists of dust particles of varying size and composition and is referred to as deposited dust, total suspended particulate matter (TSP), and particles which have a diameter of 10 micrometres (μm) or less (PM_{10}), or 2.5 μm or less ($\text{PM}_{2.5}$).

Other air emissions resulting from activities at the Colliery include GHGs such as fugitive methane (CH_4) from exposed coal, CO_2 from the combustion of fuel in combustion engines underground and indirect GHG emissions from the combustion of coal produced and sold. Odour emissions can also be emitted from the ventilation fans.

10.2.2 Air quality monitoring

Air quality monitoring has recently commenced at the Colliery as part of its AQGHGMP, prepared in accordance with Schedule 3, Condition 17 of MP10_0161. At the time of writing the AQIA only one month of data was available and, therefore, data used in the AQIA was obtained from regional air quality monitors.

Dust deposition data was collected from five dust monitors at Mannering Colliery, shown as DG1 – DG5 on Figure 10.1. Dust deposition results from these monitors between 2006 and 2012 were all below the EPA annual average assessment criteria of 4 $\text{g}/\text{m}^2/\text{month}$ for total deposited dust.

Monitoring data for maximum 24-hour average (no annual average data) PM₁₀ and PM_{2.5} levels, and annual TSP levels was obtained from the Delta Electricity operated monitoring stations at Wyee, Lake Munmorah Public School and Morisset. These are located approximately 6 km west, 3.5 km south-east and 8 km north-west of the Colliery, respectively. Recorded concentrations between 2008 and 2010 were below EPA assessment criteria/standards except for maximum 24-hour averages for PM₁₀ and PM_{2.5} during 2009 when dust storms across eastern Australia deposited high levels of particulate matter (Delta Electricity 2011).

The EPA operates an ambient air meteorological monitoring station at the Newcastle City Council Swimming Pool in Wallsend, 32 km north-east of the Colliery. Data for PM₁₀ has been collected since 1994 using a tapered element oscillating microbalance (TEOM) and PM_{2.5} has been collected since 1997 using a fine particle nephelometer. No exceedences of the PM₁₀ annual average criterion have been recorded. Levels of PM_{2.5} were below the EPA standards except in 2002 and 2009, which were likely associated with the droughts and dust storms experienced in the respective years. Data for 24-hour PM₁₀ and PM_{2.5} concentrations was available at Wallsend for the period April 2011 to March 2012. During this period there were no exceedences of the PM₁₀ 24-hour maximum assessment criterion or the PM_{2.5} 24-hour maximum advisory reporting standard.

Monitoring of GHG emissions from the Colliery is undertaken by LakeCoal through the monitoring of the main ventilation stream at the ventilation shaft.

The nearest BOM weather station is 18 km south-east of the Colliery at Norah Head. Data collected from this station up to 2012 shows that the annual mean maximum and minimum temperatures are 22.1°C and 15.1° and annual mean relative humidity at 9 am is 71%. The nearest wind gauge is at Mannering Colliery. The predominant winds at this gauge between May 2011 and June 2012 were from the south-west in autumn, winter and spring and from the south-south-east in summer.

10.2.3 Dust management and controls

A *Coal Mine Particulate Matter Control Best Practice Pollution Reduction Program (PRP)* was prepared by PAEHolmes (2012) for the Colliery as required under the EPL. The PRP identifies the potential for implementation of best practice air quality mitigation measures based on the recommendations of the *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (Donnelly et al. 2011).

Existing control measures at the Colliery are detailed in Section 10.4.1. A full summary of best practice controls for the Colliery which were investigated, are to be implemented or are already in place is detailed in Table 6.2 of the AQIA in Appendix G.

10.3 Impact assessment

10.3.1 Methodology

i Air quality assessment criteria

Proposed developments in NSW must demonstrate that cumulative air pollutant concentrations and dust deposition levels will be within EPA ambient air quality criteria at applicable receptors. For some pollutants there are no EPA air quality criteria and, in these cases, the National Environment Protection Council (NEPC) goals apply. The EPA criteria and NEPC goals have been set to protect the general health and amenity of the community in relation to air quality.

Air quality criteria for dust deposition, TSP, PM₁₀ and PM_{2.5} are shown in Table 10.1. The criteria also apply to the cumulative airborne particulates concentration (i.e., the total of the Proposal-generated and background concentrations).

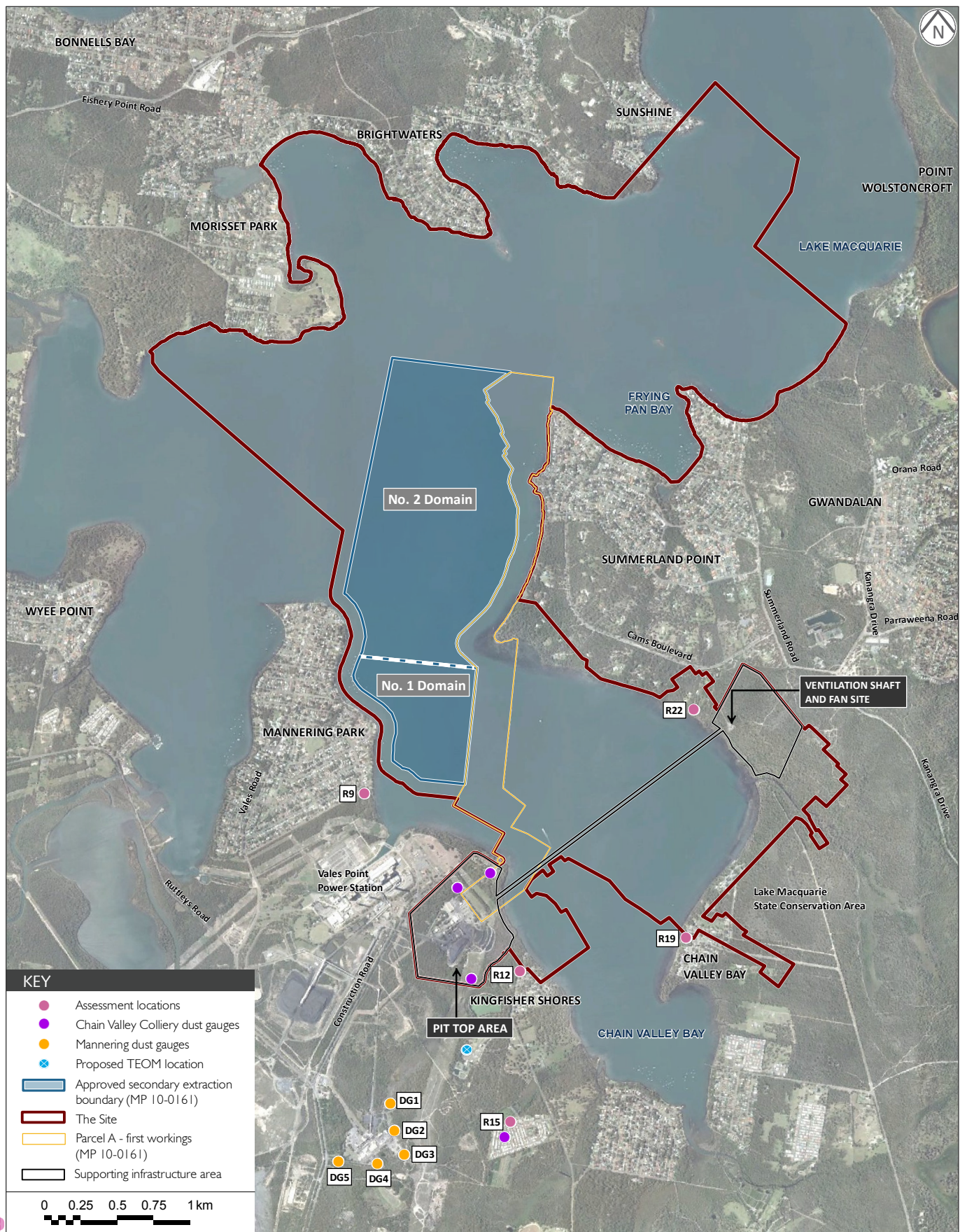
Table 10.1 Airborne particulate criteria

| Pollutant | Averaging period | Concentration | Agency |
|---|----------------------|---------------------------|--|
| Deposited dust (assessed as insoluble solids) | Annual (incremental) | 2 g/m ² /month | EPA impact assessment criterion. |
| | Annual (total) | 4 g/m ² /month | EPA impact assessment criterion. |
| TSP | Annual mean | 90 µg/m ³ | National Health and Medical Research Council. |
| PM ₁₀ | 24 hour maximum | 50 µg/m ³ | EPA impact assessment criterion, Ambient Air National Environmental Protection Measures (NEPM) reporting goal - allows five exceedences per year for events such as bushfires and dust storms. |
| | Annual mean | 30 µg/m ³ | EPA impact assessment criterion. |
| PM _{2.5} | 24 hour maximum | 25 µg/m ³ | Ambient air NEPM advisory reporting advisory reporting standard. |
| | Annual mean | 8 µg/m ³ | |

Odour criteria take into account population density in an area. The odour assessment criteria, which must not be exceeded more than 1% of the time, for different population densities are shown in Table 10.2.

Table 10.2 Impact assessment criteria for complex mixtures of odorous air pollutants

| Population of affected community | Odour performance criteria (nose response odour certainty units at the 99 th percentile) |
|--------------------------------------|---|
| Single residence (≤~2) | 7 |
| ~10 | 6 |
| ~30 | 5 |
| ~125 | 4 |
| ~500 | 3 |
| Urban (>2,000)/schools and hospitals | 2 |



Air quality assessment locations and Mannering dust gauges

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Figure 10.1

ii Modelling

Potential air quality impacts were assessed in accordance with *The Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2005). The air dispersion modelling conducted for the Proposal is based on an advanced modelling system using the models TAPM and CALMET/CALPUFF.

The Air Pollution Model, or TAPM, is a three dimensional meteorological and air pollution model developed by the CSIRO Division of Atmospheric Research. The TAPM model generated three dimensional meteorological data for 42 grids out to 30 km from the Colliery to predict airflows important to local air pollution. Data from six BOM weather stations and cloud observations from Williamstown was used in the CALMET model to simulate meteorological conditions over a 70 km by 60 km area.

CALMET is a meteorological pre-processor that includes a wind field generator containing objective analysis and parameterised treatments of slope flows, terrain effects and terrain blocking effects. The CALMET outputs were used by the CALPUFF dispersion model. CALPUFF is a multi-layer, multi-species, non-steady state 'puff' dispersion model that can simulate the effects of time and space varying meteorological conditions on pollutant transport, transformation and removal.

The CALPUFF model simulated dispersion of Colliery-sourced air pollutants over a 15 km by 15 km grid. Predicted concentrations at the assessment locations are tabulated in Table 10.3 and presented as isopleths in Appendix G.

iii Existing air quality levels

The following existing air quality levels were adopted for the AQIA based on the monitoring data described above:

- annual average dust deposition concentration of 1 g/m²/month;
- annual TSP concentration of 44.8 µg/m³;
- annual average PM₁₀ concentration of 17.9 µg/m³;
- annual average PM_{2.5} concentration of 6.1 µg/m³; and
- maximum 24-hour average PM₁₀ and PM_{2.5} concentrations vary daily.

iv Emissions calculations

The aspects of the Proposal that will result in particulate matter emissions are primarily from coal handling activities at the pit top and the ventilation fans. Total dust emissions were estimated for the Proposal by analysing the types of dust generating activities taking place at the site. TSP, PM₁₀, and PM_{2.5} emission rates were calculated using emission factors derived from the US Environment Protection Agency (1995) and the National Energy Research and Demonstration Council (1988).

The emissions estimates take into account existing air pollution controls such as watering of haul roads and use of water sprays on transfers. The emissions estimates also assume that all activities would occur 24 hours per day, seven days per week which is very unlikely in practice and, therefore, can be considered conservative. The assessment also assumes that all product coal will be stockpiled before it is transported off-site, which is similarly very unlikely in practice as a proportion of coal will be hauled off-site directly from the product bins during normal operations. The predicted emission results are, therefore, the worst case scenario and must be considered conservative.

For particulate matter emissions from the ventilation shaft, the site was modelled as two vertical discharge points and the adopted in-stack pollutant concentrations were used to derive emission rates. TSP emissions from the ventilation shaft are unlikely to exceed 5 mg/m³ so this value was modelled to remain conservative. PM₁₀ and PM_{2.5} would be a portion of this, however, to remain conservative the emission rate for TSP was modelled for all three particle sizes. Odour concentrations from the ventilation shaft were estimated from a recent assessment of shaft odour concentrations at a number of underground mines in the southern coalfields (PAE Holmes 2010). The assessment found that odour concentrations range from 54 OU to 335 OU, with an average of 188 OU. An odour concentration of 200 OU was chosen for the Proposal to be conservative.

Emissions from neighbouring sources were identified from the monitors at the EPA's Wallsend site and Mannering Colliery.

v Cumulative impacts

In the absence of continuous 24-hour average PM₁₀ and PM_{2.5} monitoring data for the area, a statistical approach was implemented for cumulative 24-hour impacts. Monitoring data from Wallsend was entered into a Monte Carlo Simulation, run using the Oracle Crystal Ball software (Version 11.1.1.2), to randomly generate a daily 24-hour PM₁₀. The random background concentration was added to the modelled Proposal-only predicted concentrations, and repeated 250,000 times to generate a probability distribution of cumulative 24-hour PM₁₀ concentrations. The results of the simulation were extracted and the predicted number of days that cumulative 24-hour PM₁₀ concentrations would exceed the 24-hour PM₁₀ criterion were determined for each assessment location. This was repeated for cumulative 24-hour PM_{2.5}.

For cumulative annual TSP, PM₁₀, PM_{2.5} and dust deposition, the predicted pollutant concentrations at each of the assessment locations were added to the adopted existing air quality levels.

vi GHG assessment methodology

Three emission scopes are used for GHG accounting and reporting. The scope of an emission is relative to the reporting entity with indirect Scope 2 and Scope 3 emissions for one entity being reportable as direct Scope 1 emissions from a different entity.

The three GHG scopes are described below.

- Scope 1 – direct GHG emissions, i.e., those from sources that are owned or controlled by the reporting entity. Such emissions are from electricity, heat or steam generation; physical or chemical processing; transportation of materials, products, waste; employee generated, and fugitive emissions.
- Scope 2 – energy product use indirect GHG emissions, i.e., those from energy products purchased from a different entity.

- Scope 3 – other indirect GHG emissions, i.e., those which are a consequence of the activities of an entity, but which arise from sources not owned or controlled by that entity, such as extraction, processing and transport of diesel purchased, and the transportation and combustion of product coal.

The following tools were used to estimate GHG emissions:

- Greenhouse Gas Protocol *The Greenhouse Gas Protocol – A Corporate Accounting and Reporting Standard Revised Edition* (World Resources Institute/World Business Council for Sustainable Development 2004);
- *National Greenhouse and Energy Reporting (Measurement) Determination 2008*; and
- *National Greenhouse Accounts (NGA) Factors* (Commonwealth Department of Climate Change and Energy Efficiency (DCCEE) 2011).

Major sources of the above emission types from the Colliery are:

- fuel consumption (diesel) used during mining operations (Scope 1);
- release of fugitive CH₄ and CO₂ during mining (Scope 1);
- emissions from electricity consumption (Scope 2 and 3);
- indirect emissions from the production and transport of fuels (Scope 3);
- emissions from coal transportation (Scope 3); and
- emissions from the use of the product coal (Scope 3).

10.3.2 Air quality assessment

i Proposal only

Air quality predictions are shown in Table 10.3 for the Proposal only. Predictions at all assessment locations are well below the relevant criteria for particulate matter and odour concentrations.

Table 10.3 Predicted Proposal only emissions

| Assessment location | Air quality parameter | | | | | | |
|---------------------|---------------------------------------|--------|--|--------|--------------------------|---|-----------------------|
| | PM ₁₀ (µg/m ³) | | PM _{2.5} (µg/m ³) | | TSP (µg/m ³) | Dust deposition g/m ² /month | Odour (OU) |
| | Averaging period | | | | | | |
| | 24 hr | Annual | 24 hr | Annual | Annual | Annual | 99%-ile nose response |
| | Assessment criteria | | | | | | |
| | 50 | 30 | 25 | 8 | 90 | 2 | 2 |
| R12 | 33 | 4.1 | 3.2 | 0.4 | 16 | 1.1 | 0.1 |
| R15 | 20 | 1.6 | 1.7 | 0.2 | 5 | 0.2 | 0.1 |
| R19 | 13 | 1.4 | 1.4 | 0.2 | 4 | 0.2 | 0.1 |

Table 10.3 Predicted Proposal only emissions

| Assessment location | Air quality parameter | | | | | | |
|---------------------|--------------------------|--------|---------------------------|--------|-------------|----------------------------|-----------------------|
| | PM ₁₀ (µg/m³) | | PM _{2.5} (µg/m³) | | TSP (µg/m³) | Dust deposition g/m²/month | Odour (OU) |
| | Averaging period | | | | | | |
| | 24 hr | Annual | 24 hr | Annual | Annual | Annual | 99%-ile nose response |
| | Assessment criteria | | | | | | |
| | 50 | 30 | 25 | 8 | 90 | 2 | 2 |
| R22 | 12 | 0.8 | 2.4 | 0.2 | 2 | 0.1 | 0.3 |
| R9 | 16 | 1.5 | 1.5 | 0.1 | 4 | 0.4 | 0.1 |

Note: The PM_{2.5} criteria are advisory.

ii Cumulative

The Monte-Carlo simulation for cumulative 24-hour PM₁₀ and 24-hour PM_{2.5} concentrations showed that there is a very low probability that further exceedences of the criteria would occur, above those that may occur in the absence of the Proposal.

Predicted annual cumulative concentrations from the Proposal are shown in Table 10.4.

Table 10.4 Predicted annual cumulative concentrations at assessment locations

| Assessment location | Air quality parameter | | | |
|---------------------|---------------------------------------|--|--------------------------|---|
| | PM ₁₀ (µg/m ³) | PM _{2.5} (µg/m ³) | TSP (µg/m ³) | Dust deposition g/m ² /month |
| | Assessment criteria | | | |
| | 30 | 8 | 90 | 4 |
| Background | | | | |
| | 17.9 | 6.1 | 44.8 | 1 |
| R12 | 22 | 6.5 | 60.8 | 2.1 |
| R15 | 19.5 | 6.3 | 49.8 | 1.2 |
| R19 | 19.3 | 6.3 | 48.8 | 1.2 |
| R22 | 18.7 | 6.3 | 46.8 | 1.1 |
| R9 | 19.4 | 6.2 | 48.8 | 1.4 |

Notes: The PM_{2.5} criteria are advisory.

The annual cumulative concentrations modelling predicted no exceedences of the assessment criteria when the Proposal is added to existing concentrations at each of the assessment locations. Modelling also demonstrates that the Proposal would make only a minor contribution to overall air quality concentrations at these locations.

10.3.3 GHG assessment

A summary of the estimated carbon dioxide equivalent (CO₂-e) emissions from the Proposal is provided in Table 10.5.

Table 10.5 Summary of estimated CO₂-e

| Year | Scope 1 Emissions (t CO ₂ -e) | | | Scope 2 Emissions (t CO ₂ -e) | Scope 3 Emissions (t CO ₂ -e) | | | | |
|--------------|--|------------------|------------------|--|--|---------------|----------------|-------------------|-------------------|
| | Diesel | Fugitive Gas | Total | | Electricity | Diesel | Electricity | Transport | Coal Burning |
| 2013 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| 2014 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| 2015 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| 2016 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| 2017 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| 2018 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| 2019 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| 2020 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| 2021 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| 2022 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| 2023 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| 2024 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| 2025 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| 2026 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| 2027 | 1,560 | 588,630 | 590,190 | 17,760 | 119 | 3,633 | 7,809 | 3,581,415 | 3,592,976 |
| Total | 23,400 | 8,829,447 | 8,852,847 | 266,394 | 1,784 | 54,490 | 117,138 | 53,721,225 | 53,894,638 |

Notes: Totals may differ to the sum of the columns due to rounding and significant figures.

Average annual direct, or Scope 1, GHG emissions from the Proposal were estimated to be 0.59 Mt of carbon dioxide equivalent (Mt CO₂-e). The Proposal's contribution to projected climate change, and the associated impacts, would be in proportion with its contribution to global GHG emissions. Average annual Scope 1 emissions from the Proposal (0.59 Mt CO₂-e) would represent approximately 0.1% of Australia's commitment under the Kyoto Protocol (591.5 Mt CO₂-e) and a very small portion of global greenhouse emissions, given that Australia contributed approximately 1.5% of global GHG emissions in 2010 (Commonwealth Department of Climate Change 2010).

The GHG emissions intensity of the Proposal is approximately 0.39 t CO₂-e/t saleable coal (this includes all Scope 1 emissions) which is generally lower than levels generated at typical Australian gassy underground mines.

Emissions from the Colliery are required to be reported under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act) as it releases more than 25,000 t of Scope 1 emissions per year. A portion of emissions will be liable under the *Clean Energy Act 2011*. On 10 July 2011, the Australian Government released its *Clean Energy Legislation Package*, which incorporates a Carbon Pricing Mechanism. Under this policy, since 1 July 2012, the eligible entities in Australia are required to pay for every tonne of carbon dioxide equivalent emissions released to the atmosphere. The Clean Energy Legislative Package is expected to cut pollution by a minimum of 5% below 2000 levels by 2020 and by 80% below 2000 levels by 2050.

10.4 Management and monitoring

The Colliery's AQGHGMP provides for the management and monitoring of dust, odour and GHG generated by the Colliery. The management and monitoring measures contained in the Colliery's AQGHGMP will continue to be implemented under the Proposal.

10.4.1 Air quality management

Air quality management measures contained in the AQGHGMP include:

- use of a water cart around pit top areas;
- water sprays on coal cutting equipment underground;
- restriction of vehicle speeds;
- primary sizing of coal underground;
- enclosure or partial enclosure of the underground coal crushers, screens and surface coal transfer points;
- minimising drop heights;
- prioritising direct loading over stockpiling;
- revegetation of bare surface areas where appropriate; and
- utilising the Colliery's complaints system to record and action dust related community complaints.

Best practice measures have been, or are to be, implemented at the Colliery in accordance with the PRP. These measures, as well as the potential for a number of other measures currently being investigated, were considered in the AQIA. Potential measures currently being investigated include the use of a stacker to replace hauling between current conveyor system and stockpiles. The minor upgrades and modifications to surface infrastructure proposed under the Proposal, detailed in Section 3.1.4, are consistent with the objectives of the potential measures.

No additional air quality management measures beyond those described above are considered warranted as a result of the Proposal.

10.4.2 GHG management

GHG management measures in the AQGHGMP, include:

- use of electric winders for underground transport where possible;
- sealing of miniwalls upon completion of extraction;
- installation of ventilation control devices;
- investigation of rail haulage options to PWCS;
- direct loading of coal haulage trucks, where possible, in preference of stockpiling and reclaiming;

- real time monitoring of gasses, temperature, pressure and volumetric flow of ventilation shaft emissions;
- maintenance, calibration and record keeping on the ventilation shaft and fans to allow calculation of GHG emissions;
- maintenance of monthly electricity use and ROM coal production records to allow calculation of GHG emissions; and
- reporting under the NGER Act and involvement in the *Clean Energy Legislative Package*.

10.4.3 Monitoring

The air quality monitoring program described in the AQGHGMP comprises five dust deposition gauges and one real time PM₁₀ monitor. Data will be summarised monthly to measure compliance, and results of monitoring would be made available online.

Meteorological data would be sourced under agreement from Mannering Colliery or a weather station would be installed by LakeCoal.

GHG monitoring would comprise measurement of carbon dioxide and methane at the ventilation shaft. Additionally, annual diesel, oil, grease, acetylene and electricity use would be recorded to fulfil National Greenhouse and Energy Reporting Scheme requirements.

LakeCoal will report the results of the GHG emissions monitoring annually to the Australian Government's Clean Energy Regulator, in accordance with the requirements of the NGER Act.

10.5 Conclusion

The AQIA found that the incremental, PM₁₀, PM_{2.5}, TSP and dust deposition would be well below the impact assessment criteria at all assessment locations. Additionally, modelling predicts that the Proposal would not result in any exceedences of cumulative impact assessment criteria at the assessment locations.

Odour from the recently upgraded ventilation shaft and fans would be below the threshold for odour detection at all assessment locations.

Average annual Scope 1 GHG emissions under the Proposal would represent approximately 0.1% of Australia's commitment under the Kyoto Protocol (591.5 Mt CO₂-e) and a very small portion of global greenhouse emissions.

Dust and GHG emissions would continue to be managed in accordance with the PRP and AQGHGMP completed in 2012 and GHG emissions would be reported in accordance with the NGER Act.

11 Traffic and transport

11.1 Introduction

A TIA was undertaken for the Proposal by EMM. The findings of the TIA are summarised in this chapter and provided in full in Appendix H.

The Proposal does not seek approval to increase the daily or annual export coal traffic movements on public roads or the number of Colliery employees. It does, however, propose an extension of mining activities for 14 years from approval, to approximately 2027. Consequently, the investigations undertaken for the Proposal include a review of the predicted future road network base traffic growth projections to 2027.

The chapter also describes the existing traffic environment and presents potential impacts from the Proposal on the surrounding road network intersections, road safety, road pavement condition, car parking and public transport, pedestrian and cyclist access and includes management and monitoring measures that would be implemented to prevent or minimise potential impacts. The chapter also makes reference to the investigation of alternative export coal haulage options.

11.2 Existing environment

11.2.1 Road network

i Local road network

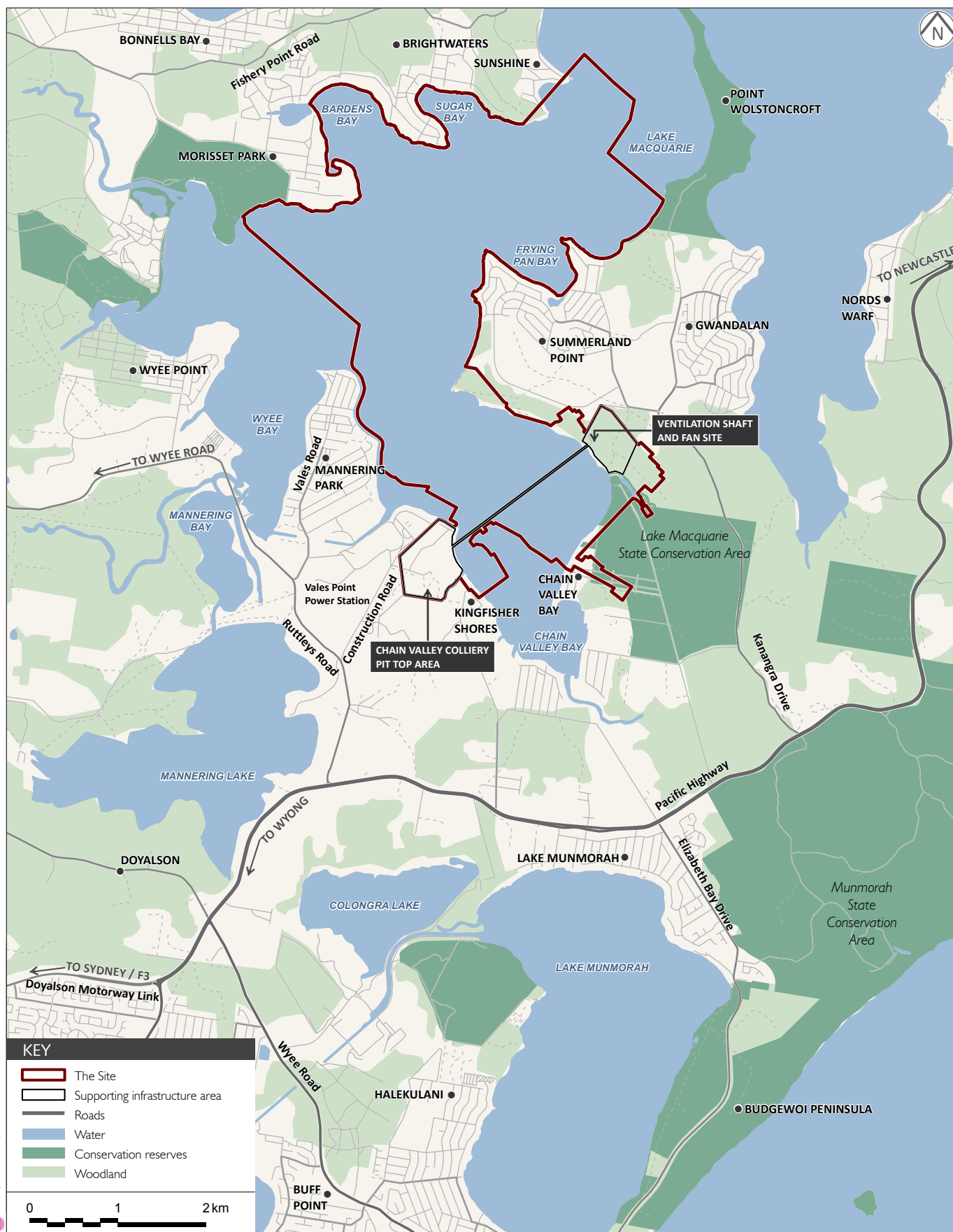
Figure 11.1 presents the road network in the vicinity of the site. Employee and coal transportation vehicles accessing the Colliery pit top area travel via Ruttleys Road and the private Construction Road and mine access road.

Ruttleys Road is the major local road in the area and provides access to the Pacific Highway at Doyalson North, 1.4 km south of the southern end of Construction Road. To the north and west of the Colliery, Ruttleys Road continues for 7 to 8 km, past a number of dispersed residential and industrial developments to connect with Wyee Road, between Wyee and Morisset. The ventilation shaft and fans site at Summerland Point is accessed from the Pacific Highway via Kanangra Drive, Summerland Road and a gated private access road.

Access to the Colliery is via Construction Road which also provides access to VPPS, a flyash cement processing plant (Morgan Ash) and some residential dwellings (owned by LakeCoal). Construction Road is straight and level in the vicinity of the three access driveway intersections and the sight distances for vehicular traffic meet all safety requirements.

ii Strategic road network

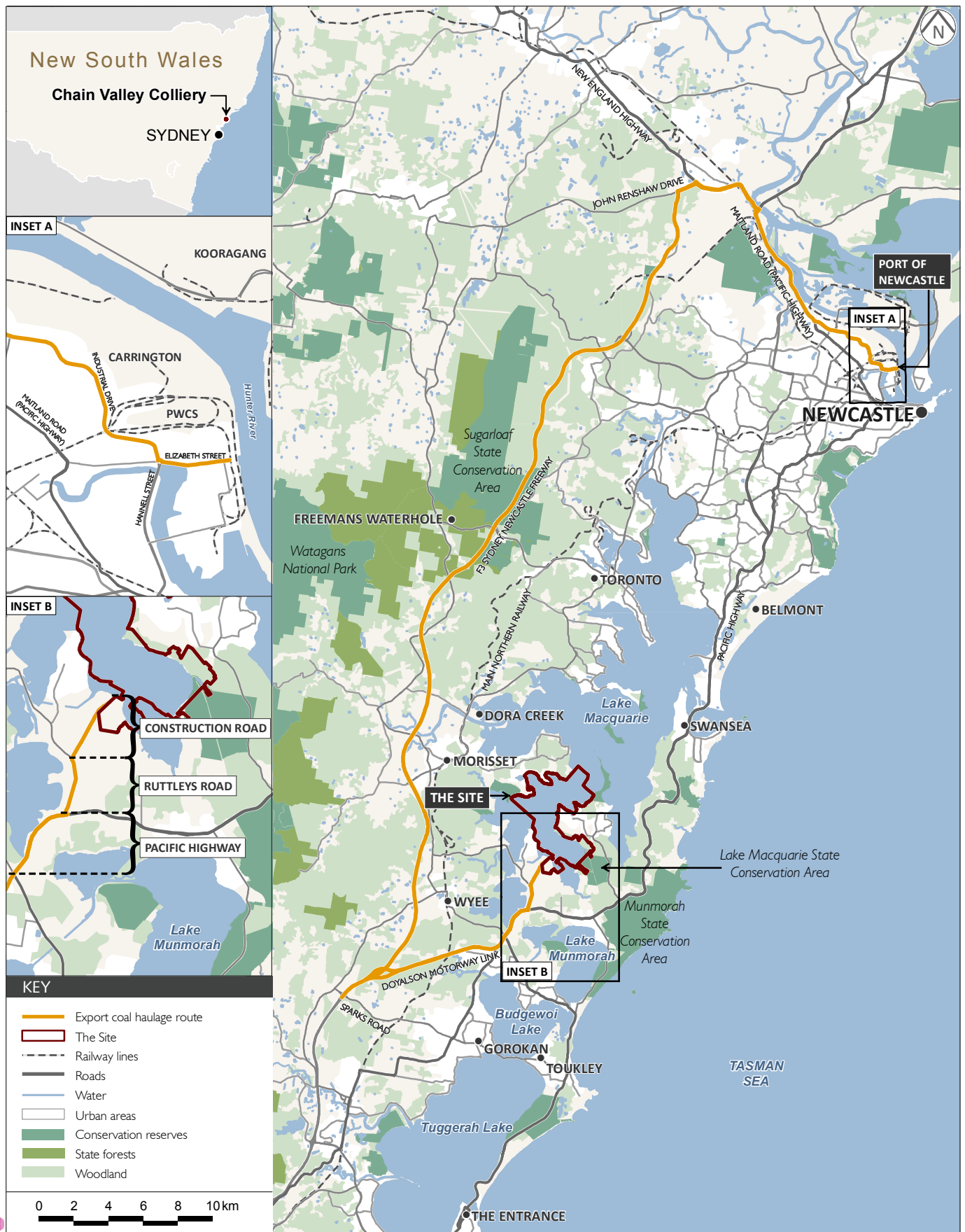
The existing haulage route for export coal between the Colliery and PWCS follows a set route which is approved under MP10_0161. The transport route is depicted in Figure 11.2 and comprises: Construction Road; Ruttleys Road; Pacific Highway; Doyalson Motorway Link; F3 Freeway; Sparks Road Interchange; F3 Freeway; John Renshaw Drive; New England Highway; Maitland Road; Industrial Drive and Elizabeth Street.



The Site and surrounding road network

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Figure 11.1



Export coal haulage route

iii Regional road network improvements

A number of regional road network improvements within the Lower Hunter Region of NSW have been considered as part of the TIA. These projects are either currently under construction or are due to be completed within the next 5 to 10 years (i.e., due prior to the end of the Proposal's life). These projects would have a significant effect on improving the transport capacity along most sections of the Colliery export coal haulage route and include:

- the Hunter Expressway (National Highway connection) from the F3 Freeway at Minmi to Branxton;
- the Hexham to Raymond Terrace extension of the F3 Freeway/Pacific Highway route; and
- the completion of the State Highway 23 Shortland to Sandgate, Newcastle Inner bypass route.

11.2.2 Alternative export coal haulage options

As discussed in Section 3.3.4, consistent with its commitment to reduce or eliminate truck haulage on public roads, LakeCoal is investigating alternative options for transporting export coal by rail to PWCS. Both engineering and environmental investigations are underway for the preferred rail transport option, which would involve use of the Vales Point rail loop and coal unloading facility through the construction of either a private haul road (Option 1) or a part conveyor/part haul road system (Option 2) with the requisite infrastructure upgrades to enable coal to be loaded onto trains for transport to PWCS.

The agreements between LakeCoal and the relevant landowners whose properties must be accessed to enable construction of the haul road are yet to be reached. Given this, the investigations being at pre-feasibility stage only, and in consideration of the Proposal's critical timeframe, the preferred rail loading option does not form part of the current Proposal.

A detailed economic assessment of the alternatives is presented in the TIA (Appendix H). Two types of economic assessment were undertaken: a NPV assessment, and a BCA. NPV assesses the capital costs and annual operating and externality cost savings (the project benefits) of a project each year in undiscounted and discounted valuations. BCA determines the benefit cost ratio (BCR) of a project. Generally, projects with a BCR greater than one (at a 7% discount rate) are considered economically feasible. If more than one option has a BCR greater than one, then the option with the highest BCR should be selected. The costs of a project are considered to outweigh the benefits if the BCR is less than one.

The outcomes of the NPV assessment show that, using the current base capital and operating cost assumptions, both Option 1 and Option 2 will have negative NPVs even at the lowest discount rate of 4%. However, the NPV analysis of $\pm 20\%$ costs sensitivity assumptions for project costs shows that both options are still sensitive to the accuracy of the capital and operating cost assumptions, with both options returning a positive NPV for the -20% project costs sensitivity analysis when using a 4% discount rate.

The outcomes of the BCA for the alternative export coal haulage options at the Colliery show that Option 1 has net positive undiscounted benefits of around \$9.0 million and Option 2 results in a net negative undiscounted benefit of approximately \$8.3 million. For both options the BCR is less than one though the BCR for Option 1 is very close to one (0.985) at the 4% discount rate. Both Option 1 and Option 2 are sensitive to a 20% change in assumptions such that, if costs increase by 20%, both options have a BCR of less than one under all discount rates. However, if cost savings can be identified whereby costs can decrease by up to 20%, then both options have the potential to achieve net undiscounted benefits of between \$29.6 million (Option 1) and \$ 15.7 million (Option 2), resulting in a BCR greater than one at all discount rates for Option 1 and a BCR greater than one at the 4% discount rate for Option 2 respectively.

As a consequence of the above assessments, more detailed feasibility studies will be required to more precisely determine the future capital and operating costs of both options. These must include the application of lower uncertainty values (i.e., less than 4%).

An economic assessment of the options is a critical component in determining the feasibility of alternative transport options. However, it is not the only consideration with a number of other factors having the potential to impact the overall feasibility of a rail transport option. Other considerations include:

- resources, reserves and mine life;
- land ownership, access and operation;
- rail network constraints and agreements; and
- environmental impacts.

In undertaking further detailed feasibility studies, LakeCoal will take account of all relevant issues to ensure that any future decision to implement a rail transport option will be both justified, possible and practical having considered all necessary stakeholders, constraints and benefits.

11.2.3 Traffic volumes

i Daily traffic volumes

Daily traffic volumes on Ruttleys Road were surveyed during August 2012 by a tube traffic count survey, as part of the Colliery investigations for the Ruttleys Road dilapidation report (Lyle Marshall & Associates 2013). The Annual Average Daily Traffic (AADT) surveyed for Ruttleys Road was 8,507 with 7.7% heavy vehicles (e.g., 653 heavy vehicle movements per day). The Colliery external coal transport, which was operating during the survey week, represents on average approximately 80 truck loads (160 heavy vehicle movements) per day.

AADT traffic volume counts undertaken by the RTA (now RMS) for Ruttleys Road in the years 1998, 2001 and 2004, recorded daily traffic volumes of 6,508, 6,603 and 7,812, respectively. The traffic growth trend from these traffic counts, when projected forward to the year 2012, represent an underlying linear traffic growth rate of +2.3% annually. This traffic growth rate can be used to predict future traffic growth for Ruttleys Road and other roads in the locality.

The historic growth trends and future growth projections for the daily traffic volumes on the regional road network have also been determined from RMS daily traffic volume AADT surveys, as summarised in Table 11.1.

Table 11.1 Summary of AADT traffic volume surveys on the regional road network

| Traffic counter location ¹ | Year 1998 | Year 2001 | Year 2004 | Year 2012 estimate ² (linear growth projection) | % per annum growth rate from 2012 ¹ | Future trend estimate ² in Year 2027 |
|--|-----------|-----------|-----------|--|--|---|
| Doyalson Motorway Link Road (MR675) at Doyalson | 12,240 | 14,283 | 16,130 | 21,317 | +3.0 | 31,043 |
| F3 Freeway at Wyee (Hue Hue Road overpass) | 29,463 | 32,702 | 38,494 | 50,535 | +3.0 | 73,112 |
| F3 Freeway at Beresfield, south of John Renshaw Drive | 23,514 | 27,917 | 32,997 | 45,641 | +3.5 | 69,349 ³ |
| John Renshaw Drive (MR 588) west of New England Hwy | 20,217 | 22,228 | 28,020 | 38,424 | +3.4 | 57,932 ² |
| New England Highway (SH 9) at Hexham, north of Pacific Hwy | 43,337 | 45,783 | 48,879 | 56,268 | +1.6 | 70,122 ² |
| Pacific Hwy (SH 10) at Hexham, south of New England Hwy | 48,397 | 48,220 | 52,833 | 58,748 | +1.3 | 69,839 ³ |
| Pacific Hwy (SH 10) at Sandgate, south of Wallsend Road | 38,062 | N/A | 40,947 | 44,794 | +1.1 | 52,007 ² |
| Industrial Drive (MR 316), west of Werribi Street | 29,549 | 30,334 | 30,717 | 32,274 | +0.6 | 35,193 ³ |
| Industrial Drive (MR 316), north of Woodstock St | 21,608 | 21,559 | 23,339 | 25,647 | +1.1 | 29,975 ³ |

Note: 1. MR & SH refers to Main Road and State Highway classification number.
2. The traffic growth rate is calculated from the current base year 2012 and the year 2027, using the linear growth projection from most recent actual surveys between the years 1998 and 2004.
3. Future year 2027 daily traffic volumes on these roads will be substantially reduced following the completion of the Hunter Expressway Project and other regional road improvements.

ii Peak hourly traffic volumes

A peak hour intersection traffic count was undertaken at the intersection of Construction Road and Ruttleys Road on Friday 22 June 2012. The intersection traffic count results are included in Appendix B of the TIA (Appendix H). The peak hourly traffic volumes on the road network and the proportions of heavy vehicles which have been determined from this intersection traffic count are summarised in Table 11.2.

iii Heavy vehicle traffic

The proportion of heavy vehicle traffic on Construction Road and Ruttleys Road is currently influenced by the Colliery export coal road haulage, which was operating at 10 to 15 trucks per hour in each direction on the day of the intersection traffic survey. The effect of the current coal haulage can be seen in the higher peak hour heavy vehicle traffic proportions on Construction Road and Ruttleys Road south of the intersection, in comparison to Ruttleys Road north-west of the intersection where the coal haulage is not undertaken (Table 11.2).

Table 11.2 Summary of local road peak hour traffic and heavy vehicle traffic volumes

| Road | Direction | Morning peak hour (6.30 am – 7.30 am) | | | Afternoon peak hour (3.00 pm – 4.00 pm) | | |
|---|-----------|---------------------------------------|----------------|---------|---|----------------|---------|
| | | All traffic | Heavy vehicles | % Heavy | All traffic | Heavy vehicles | % Heavy |
| Construction Road (north-east of Ruttleys Road) | N'bound | 122 | 9 | 12.9 | 23 | 10 | 29.0 |
| | S'bound | 33 | 11 | 33.3 | 70 | 17 | 2.4 |
| Ruttleys Road (south of Construction Road) | N'bound | 377 | 25 | 7.5 | 384 | 27 | 6.6 |
| | S'bound | 266 | 23 | 8.6 | 495 | 31 | 6.3 |
| Ruttleys Road (north-west of Construction Road) | E'bound | 271 | 14 | 5.7 | 427 | 14 | 3.9 |
| | W'bound | 293 | 18 | 6.1 | 390 | 18 | 4.6 |

The daily and heavy vehicle traffic proportions on the major regional road routes were surveyed in 2008 for the Lower Hunter Transport Needs Study (Hyder 2008) for the Roads and Traffic Authority (RTA) (now RMS) and NSW Department of Premier and Cabinet and are summarised in Table 11.3 below.

Table 11.3 Year 2008 heavy vehicle traffic proportions on the major regional roads

| Location | Daily Traffic Volume (all vehicles) | Daily Traffic Volume (heavy vehicles) | Proportion of heavy vehicles in daily traffic |
|--|-------------------------------------|---------------------------------------|---|
| F3 Freeway, north of Morisset | 34,710 | 7,462 | 21.5% |
| F3 Freeway, south of Beresfield | 31,620 | 5,754 | 18.2% |
| Pacific Highway, between Sandgate and Hexham | 60,860 | 11,990 | 19.7% |

The existing proportions of heavy vehicles in traffic on the major regional roads are relatively high, in particular on the F3 Freeway and the Pacific Highway (Maitland Road) route into Newcastle from the north-west, where the heavy vehicle traffic is generally in the range of 18% to 22% of all traffic.

11.2.4 Intersections

The performance of a road network is generally a function of the performance of key intersections. Performance of intersections is quantified by RMS in terms of 'level of service' and 'degree of saturation'. Level of service is an index of the operational performance of traffic at an intersection and is based on the average delay per vehicle. Degree of saturation provides an overall measure of the capability of the intersection to accommodate the traffic levels.

The current RMS intersection operation standards for level of service are summarised in Table 11.4. A degree of saturation of 1.0 indicates that the intersection is operating at capacity; however, a satisfactory degree of saturation is considered to be 0.90 or lower at traffic signal controlled intersections and 0.80 or lower at other intersections.

Table 11.4 Intersection level of service standards

| Level of Service | Average delay (seconds per vehicle) | Traffic signals, roundabout | Priority intersection ('Stop' and 'Give Way') |
|------------------|-------------------------------------|--|---|
| A | Less than 14 | Good operation. | Good operation. |
| B | 15 to 28 | Good with acceptable delays and spare capacity. | Acceptable delays and spare capacity. |
| C | 29 to 42 | Satisfactory. | Satisfactory, but accident study required. |
| D | 43 to 56 | Operating near capacity. | Near capacity and accident study required. |
| E | 57 to 70 | At capacity. At signals, incidents would cause excessive delays. Roundabouts require other control mode. | At capacity; requires other control mode. |
| F | Greater than 71 | Unsatisfactory with excessive queuing. | Unsatisfactory with excessive queuing; requires other control mode. |

Source: Guide to Traffic Generating Development (RTA 2002)

A SIDRA analysis of the existing (year 2012) morning and afternoon peak hour base traffic situation was undertaken at four existing intersections where the existing traffic conditions are potentially most affected by Colliery-related traffic, namely:

- Ruttleys Road/Construction Road;
- Pacific Highway/Ruttleys Road;
- F3 Freeway/Sparks Road Interchange (east side); and
- F3 Freeway/Sparks Road Interchange (west side).

The intersection analysis results are summarised in Table 11.5.

Table 11.5 Existing peak hour performance at intersections (including Colliery traffic)

| Intersection | Peak Hour Period | Degree of saturation | Average Delay (seconds/vehicle) | Level of Service |
|---|---|----------------------|---------------------------------|------------------|
| Ruttleys Road and Construction Road (stop signs) | Morning peak hour (6.30 am – 7.30 am) | 0.162 | 21.7 | B |
| | Afternoon peak hour (3.00 pm – 4.00 pm) | 0.235 | 28.3 | B |
| Pacific Highway and Ruttleys Road (traffic signals with two westbound bypass lanes) | Morning peak hour (7.30 am – 8.30 am) | 0.455 | 13.6 | A |
| | Afternoon peak hour (4.30 pm – 5.30 pm) | 0.521 | 12.3 | A |
| F3 Freeway and Sparks Road Interchange (east side) unsignalised-with stop signs | Morning peak hour (7.45 am – 8.45 am) | 1.051 | 138.5 | F |
| | Afternoon peak hour (4.00 pm – 5.00 pm) | 0.907 | 122.2 | F |
| F3 Freeway and Sparks Road Interchange (west side) Traffic signals | Morning peak hour (7.45 am – 8.45 am) | 0.450 | 27.1 | B |
| | Afternoon peak hour (4.00 pm – 5.00 pm) | 0.514 | 28.9 | C |

Three of the four assessed intersections are currently operating at generally good peak hour operating conditions (level of service either A, B or C). The exception is the F3 Freeway (east side) entry and exit ramps intersection which have an F service level. The corresponding intersection on the west side of the F3 Freeway has recently (March 2011) had traffic signals installed, which has significantly improved the traffic delays and queuing at that intersection.

11.2.5 Summary of the approved colliery traffic operations

Two AECOM reports (Road Safety Audit Report and Traffic Impact Assessment Report) were prepared in April and May 2011 which assessed the current mining approval (AECOM 2011c). These reports undertook detailed investigations of the future road network capacity and traffic safety impacts of external coal transport activity for the Colliery for the period to 2016, which is the period to which the Colliery's existing approval relates.

A further two GHD reports (Independent Traffic Audit and second Independent Traffic audit) were prepared from January-July and August-December 2012 (GHD 2012) as a condition of MP10_0161. These reports were undertaken to assess the impacts from the coal haulage operations on local communities and the road network.

The findings from these reports are summarised below.

i Traffic impact assessment report findings (May 2011)

The approved project was predicted to produce up to a total of 270 trucks per day, resulting in 32 truck loads per peak hour (an equivalent of 64 truck movements per peak hour). This was considered to be a worst case scenario as, in reality, LakeCoal's Traffic Management Plan- Haulage Services for Chain Valley Colliery (March 2010) stipulates that trucks generated by the operation of the project would be loaded and run at two minute intervals, resulting in a maximum of 30 truck loads per hour.

The Pacific Highway/Ruttleys Road intersection and the F3 Freeway/Sparks Road interchange were assessed under three scenarios to determine the impact of the Project generated traffic on the road network, namely:

- existing conditions without the Project generated traffic (2010);
- future conditions without the Project generated traffic (2016); and
- future conditions with the additional Project generated traffic (2016).

Minor construction traffic as a result of the option to relocate the ventilation fan was not expected to have a significant impact on the road network. However, it was recommended that a Construction Traffic Management Plan be put in place to manage the traffic generated during the construction phase.

Analyses of the intersections with the addition of the Project generated traffic found that the Project would have a negligible impact on the Ruttleys Road/ Pacific Highway intersection and the F3 Freeway/ Sparks Road interchange operations. Therefore, no mitigation measures were recommended at these intersections.

Analysis of the impact of the Project generated traffic on the broader road network including the haulage route to PWCS Carrington Coal Terminal was also undertaken. The analysis concluded that the Project would have a negligible impact on the broader road network.

ii Road safety audit report findings (April 2011)

The Road Safety Audit covered all aspects of road safety including, but not limited to, intersection sight distances, stopping sight distances, entering sight distances and pavement condition for the intersections along the route.

The Road Safety Audit concluded that, in general, the route posed no significant safety concerns to haulage operations, or the public at large, that should result in the Proposal not being approved. The Road Safety Audit observations were undertaken during daylight hours only, which is consistent with the Colliery's external coal transport operating hours at most times of the year. The four key recommendations from the report comprised the need for:

1. intersection safety improvements at the Ruttleys Road and Construction Road, including line marking improvements, localised road pavement reconstruction to address areas of poor drainage and the installation of stop signs;
2. improved driver behaviour with trucks keeping within lanes, in particular on the Pacific Highway and Industrial Drive sections of the external coal transport route;
3. staggering of vehicle movements to avoid queue bunching issues when trucks travel in groups at the F3 Freeway/Sparks Road intersection; and
4. improved turning access for large articulated vehicles to and from the PWCS terminal driveway at Elizabeth Street in Carrington.

Items 1 to 3 of these road safety recommendations are within the ability of LakeCoal to address and have been implemented and incorporated into the most recent Road Transport Protocol for the Colliery. A revised intersection design for the Ruttleys Road and Construction Road intersection has been prepared by engineers for LakeCoal (Figure 3.3), and will be completed following WSC's approval for the works.

iii Independent traffic audits findings

The two independent traffic audits were undertaken at six month intervals (January-July and August-December) in accordance with MP10_0161. The audits considered all impacts from coal haulage operations on local communities and the road network.

The January-July audit involved: consulting with stakeholders; reviewing haulage records; investigating accidents on the haulage routes; reviewing and assessing the effectiveness of the Code of Conduct; observing and assessing the impact of haulage operations on the performance of the road network; and recommending measures to reduce or mitigate any potential adverse impacts. The August-December audit involved aforementioned methods and included a component of reviewing weighbridge records to ensure laden trucks were not in excess of their legal limit.

The audits also included a component fieldwork that involved observing numerous truck trips over random days. Generally, during these inspections the auditor did not report any behavioural problems or impacts to the travelling public or road network functionality as a result of the increased and ongoing coal haulage operation.

The auditor did observe some minor infringement with regard to exceeding the sign posted speed limit and signage on the rear of trucks. In response, LakeCoal has arranged for all truck drivers to be issued with a Tool Box Talk (TBT) informing them of audit findings along with their responsibilities in regard to any of these findings. Specifically, in relation to the signage, an instruction was issued to replace all damaged signs and the following are in place to ensure signs are replaced as required:

- replacement signs are available at all times from weighbridge (i.e., where trucks must pass through before departure); and
- all drivers complete a Road Coal Delivery Form before departing site, part of this sheet requires checks for signage.

Some issues regarding the coal haulage operation were raised by the Colliery's CCC during stakeholder consultation for the Proposal. Concerns expressed included: the queuing of laden Colliery trucks at specific locations; trucks observed to convoy at specific locations; coal observed falling from laden trucks; the detail of the Code of Conduct; and concern about the long term damage to Ruttleys Road due to coal haulage truck traffic.

The auditor considered all raised issues and noted that no breach of the Code of Conduct or road rules, related to the above concerns, had occurred. Further, the auditor did not witness any loose coal fall from laden or empty trucks, particularly near the Chain Valley Colliery. All trucks observed by the auditor appeared to have canopies in place and in reasonable condition. In addition, it is noted that LakeCoal require all trucks to complete a daily Road Coal Delivery Form for each load transported from site. This form requires all drivers to check, amongst other items, the truck tarps/covers prior to leaving.

11.3 Impact assessment

11.3.1 Methodology

The Proposal has been assessed in accordance with the DGRs together with matters that were raised by RMS, WSC and LMCC with respect to MP10_0161, and by the community during consultation.

Although overall production of coal at the Colliery is proposed to increase from 1.2 to 1.5 Mtpa, the additional 0.3 Mtpa produced would exclusively supply the domestic market demand at the nearby VPPS. This would result in additional road transport of coal via private haul roads, including a short section (100 m) of Construction Road between the Colliery and the VPPS truck access driveway. Construction Road is, however, a private road owned by Delta Electricity, the operator of VPPS and is maintained under agreement by LakeCoal.

As noted in Section 3.1, site access and traffic generated by the Colliery on external public roads would not change under the Proposal as there would be no increase in either the number of employees or amount of export coal being transported to the PWCS or other domestic customers. As currently approved there may, however, be some variations to the future destination of the "other domestic" coal (0.18 Mtpa) which is produced at the Colliery. Historically, the majority of this coal was supplied to the Munmorah Power Station (MPS), which is currently not operational. In the future, other domestic coal is likely to be supplied to a range of customers both in close proximity to the Colliery and further afield, i.e., to customers in Newcastle or elsewhere. Should MPS reopen at some point in the future, it is possible that the Colliery may again supply coal to this facility.

The structure of the TIA is based on the *Guide to Traffic Generating Development* (RTA 2002), the standard RMS template for the preparation of traffic impact studies for major projects. As part of the TIA, investigations that were conducted included:

- a site inspection and photographic survey of the existing Colliery access and the 90 km export coal haulage route to the PWCS;
- a review of road safety audit reports prepared by AECOM in 2011 for MP10_0161 (AECOM 2011c). Relevant current information regarding the road network and traffic safety implications of the previous project were incorporated into the latest TIA (Appendix H);
- a morning and afternoon peak hour intersection traffic survey and vehicle classification count at the intersection of Construction Road and Ruttleys Road at Vales Point. The earlier (year 2010) peak hour intersection traffic counts which were undertaken by AECOM at three other intersections (Ruttleys Road/Pacific Highway, F3 Freeway /Sparks Road Interchange (east side) and F3 Freeway /Sparks Road Interchange (west side)) were also utilised in assessing the existing (year 2012) and future (year 2027) traffic conditions at these three intersections; and
- application of the SIDRA intersection traffic analysis program to assess the existing and future intersection traffic capacity at those intersections along the export coal haulage route where trucks hauling coal from the Colliery represent a potentially significant component of the daily and peak hour heavy vehicle movements.

11.3.2 External traffic movements

Site access and traffic generated by the Colliery on public roads would not change under the Proposal as there would be no increase in either the number of employees or amount of export coal being transported to the PWCS or other domestic customers. The following sections present a summary of the Proposal's predicted impacts on the capacity, safety and efficiency of the road network.

The identified destinations for both the current approved and proposed future export and domestic coal transport operations are summarised in Table 11.6.

Table 11.6 Approximate product coal distribution

| Destination | Current approximate supply (AECOM 2011a) | | Proposed supply | |
|--------------------------|--|--------------------|--------------------|--------------------|
| | % split (1.2 Mtpa) | Approximate tonnes | % split (1.5 Mtpa) | Approximate tonnes |
| Export coal via PWCS | 55% | 660,000 | 44% | 660,000 |
| VPPS | 30% | 360,000 | 44% | 660,000 |
| Other domestic customers | 15% | 180,000 | 12% | 180,000 |

Export coal haulage over the coal transport route to PWCS would remain unchanged under the Proposal. The export coal transport operation currently requires road transport to PWCS on approximately 160 days per year at an average rate of 125 truckloads per day (assuming 33 t truckloads typically). Under the Proposal, there would be no change to the hours per day during which trucks would be loaded at the Colliery, which would remain limited to 5.30 am to 5.30 pm, Monday to Friday (excluding public holidays).

The export and other domestic coal trucks are currently loaded at the Colliery at rates of between 10 – 15 truckloads per hour typically over a ten hour period on weekdays. However at peak times, the loading rate can increase to up to 30 truckloads per hour which may occur at any hour during the 12 hour dispatch window. The future coal transport impacts of the Proposal on the main external coal transport route to Newcastle are therefore conservatively assessed on the basis that the peak rate of 32 truck movements per hour both outbound from and inbound to the Colliery could occur at any intersection along the haulage route during any daytime hour within the 12 hour dispatch window.

In addition to the main domestic coal supply to VPPS and the export coal supply via PWCS, up to 180,000 tpa of coal is supplied to other domestic customers. As previously noted, the main other domestic coal customer has historically been the MPS. However, since the closure of the MPS this 180,000 t has been sold to a range of domestic customers. In 2011, coal delivered to other customers was approximately 48,000 t. The volumes sold during any year to individual domestic consumers would vary according to demand at the time; however, the overall tonnage would not change as a result of the Proposal.

It should be noted, however, that the transportation of the other domestic coal transport generally occurs on days when export coal transport is not occurring, so the two transport operations do not frequently coincide. Irrespective of the transport destination, movements would be limited to the maximum of 270 truckloads (540 truck movements) per day on public roads which formed the basis of the TIA for MP10_0161.

It should be noted that, although the aforementioned TIA assessed coal dispatch at the rate of up to 270 truckloads per day, there was only one day during the calendar year 2011 when the Colliery external coal haulage exceeded 200 truckloads per day (229 truckloads on 2 June 2011) with the next highest day recording 179 truckloads. The traffic impacts of the Proposal presented in this chapter which relate to heavy vehicle movements are, therefore, conservative.

11.3.3 Haulage routes

i Traffic impact on road network

The impacts of the Proposal on road network traffic are presented in Table 11.7. The calculations in Table 11.7 are adjusted to remove the current average daily Colliery truck movements (160 truck movements from an average of 80 truck loads each weekday) from the existing base traffic.

Table 11.7 Maximum daily impact of the Colliery external truck traffic on the road network

| Road | Existing daily traffic volume (year 2012) | Existing daily heavy vehicle traffic movements using the road (excluding existing Colliery trucks) | Maximum daily truck traffic movements generated by the Proposal | % increase due to the Proposal in daily heavy vehicle traffic on the road |
|--|---|--|---|---|
| Ruttleys Road north of the Pacific Highway | 8,507 | 493 | 540 | 110% |
| Doyalson Motorway Link | 21,317* | 1,439* | 540 | 38% |
| F3 Freeway at Hue Hue Road | 50,535 | 10,705 | 540 | 5% |
| F3 Freeway at Beresfield | 45,641 | 8,147 | 540 | 7% |

Table 11.7 Maximum daily impact of the Colliery external truck traffic on the road network

| Road | Existing daily traffic volume (year 2012) | Existing daily heavy vehicle traffic movements using the road (excluding existing Colliery trucks) | Maximum daily truck traffic movements generated by the Proposal | % increase due to the Proposal in daily heavy vehicle traffic on the road |
|--------------------------------------|---|--|---|---|
| New England Highway, north of Hexham | 56,268 | 10,925 | 540 | 5% |
| Pacific Highway, south of Hexham | 58,748 | 11,413 | 540 | 4% |
| Industrial Drive at Mayfield | 32,374* | 2,261* | 540 | 24% |

Note: * The proportions of heavy vehicles in daily traffic on these roads are estimated to be between 5-10% (7.5% mid range estimate).

Along the majority of the export coal transport route, the maximum effect of the Proposal's daily truck traffic will be a 4 – 7% increase in the daily total of heavy vehicle traffic movements on these roads. This increase will be effectively one additional truck movement, for every 20 existing truck movements on the road, which will not generally be noticeable to other road users and will not generally have any noticeable effect on the base traffic flow conditions on these roads.

On the other main roads at either end of the external coal transport route at Doyalson, Mayfield and Carrington, where the existing levels of daily truck movements are lower than on the F3 Freeway, the Colliery truck traffic will potentially represent 25 – 40% increases above the existing base level of heavy vehicle traffic movements and the impact of the Colliery truck haulage will be more noticeable to other road users. These proportions, although noticeable, will generally only have a minimal future impact on the operational traffic characteristics of the road or the road pavement life during the lifetime of the Proposal.

It will effectively be only on the local section of Ruttleys Road, between Construction Road and the Pacific Highway near Doyalson, where the Proposal's daily truck traffic will have a pronounced impact on the overall traffic flow characteristics with potentially up to 110% increases in the existing base daily truck traffic volumes.

Over the life of the Proposal, background traffic levels on the public road network are projected to continue to occur at growth rates of between +2.3% to +3.0% based on the recorded traffic growth rates from daily traffic counts at the relevant locations on the major road network. This would be primarily due to continuing residential population growth and new commercial and industrial developments. In future years, as the general daily truck traffic volumes from other sources on these roads increase, the Colliery's relative contribution to truck traffic would reduce in proportional terms. Also, as the Colliery truck traffic is already currently operating at similar levels to those which are proposed on these roads, there will generally be no observable change in the current traffic operation on these roads as a result of the Proposal.

The ongoing road maintenance requirement for Ruttleys Road will be affected by the Colliery truck traffic. This impact is acknowledged by LakeCoal who is currently negotiating a Road Maintenance Agreement with WSC whereby the Colliery will make a contribution to the annual road maintenance cost for the affected section of Ruttleys Road.

ii Traffic impact at intersections

The future impacts from the traffic operations of the Proposal in the year 2027 were assessed at the four intersections previously assessed in Table 11.5. The analysis assumes that the existing intersection layout configurations at these intersections will not change significantly between 2012 and 2027. The results are summarised in Table 11.8.

Table 11.8 Comparison of year 2027 peak hour performance at intersections (including the Proposal traffic) to existing performance in 2012

| Intersection | Peak Hour Period | SIDRA Result | 2012 Existing Situation | 2027 with no project truck traffic | 2027 with average day 15 truck loads/hour | 2027 with peak day 32 truck loads/hour |
|---|---|--------------|-------------------------|------------------------------------|---|--|
| Ruttleys Road and Construction Road (stop signs) | Morning peak hour (6.30 am - 7.30 am) | Dos | 0.162 | 0.225 | 0.225 | 0.225 |
| | | Delay | 21.7 | 29.4 | 30.5 | 32.0 |
| | | Los | B | C | C | C |
| | Afternoon peak hour (3.00 pm - 4.00 pm) | Dos | 0.235 | 0.342 | 0.357 | 0.384 |
| | | Delay | 28.3 | 51.2 | 53.6 | 57.8 |
| | | Los | B | D | D | E |
| Pacific Highway and Ruttleys Road (traffic signals with two westbound bypass lanes) | Morning peak hour (7.30 am - 8.30 am) | Dos | 0.455 | 0.589 | 0.615 | 0.631 |
| | | Delay | 13.6 | 13.8 | 14.2 | 14.8 |
| | | Los | A | A | A | B |
| | Afternoon peak hour (4.30 pm - 5.30 pm) | Dos | 0.521 | 0.730 | 0.750 | 0.778 |
| | | Delay | 12.3 | 14.6 | 15.5 | 16.2 |
| | | Los | A | B | B | B |
| F3 Freeway and Sparks Road Interchange (East Side) unsignalised-with stop signs | Morning peak hour (7.45 am - 8.45 am) | Dos | 1.051 | 2.938 | 3.773 | 5.623 |
| | | Delay | 138.5 | 1,813 | 2,570 | 4,252 |
| | | Los | F | F | F | F |
| | Afternoon peak hour (4.00 pm - 5.00 pm) | Dos | 0.907 | 1.559 | 2.404 | 3.000 |
| | | Delay | 122.2 | 623.5 | 1,369 | 1,891 |
| | | Los | F | F | F | F |
| F3 Freeway and Sparks Road Interchange (West Side) Traffic signals | Morning peak hour (7.45 am - 8.45 am) | Dos | 0.450 | 0.656 | 0.705 | 0.753 |
| | | Delay | 27.1 | 30.1 | 31.6 | 33.8 |
| | | Los | B | C | C | C |
| | Afternoon peak hour (4.00 pm - 5.00 pm) | Dos | 0.514 | 0.766 | 0.799 | 0.834 |
| | | Delay | 28.9 | 33.3 | 35.1 | 37.3 |
| | | Los | C | C | C | C |

Notes: Dos is the intersection degree of saturation
 Delay is the intersection average delay (seconds per vehicle).
 Los is the intersection level of service

The intersections at the Pacific Highway/Ruttleys Road and F3 Freeway/Sparks Road Interchange (west side) have sufficient spare capacity to accommodate the predicted background traffic growth by 2027, as well as having spare capacity to accommodate the Proposal's external peak hourly truck traffic movements. The peak hour intersection delays would not increase significantly above their current levels by the year 2027 at these intersections.

Traffic signals were recently installed in March 2011 at the F3 Freeway/Sparks Road Interchange intersection (west side) which has significantly improved the intersection operation and traffic delays. In future years, the intersection's peak hour traffic delays would remain at level of service C in the afternoon and increase from B to C in the morning through to the year 2027, including with the Proposal's truck traffic.

At the F3 Freeway/Sparks Road Interchange intersection (east side) there are high traffic delays currently (level of service F and significant average vehicle delay). These high traffic delays would continue to increase in future years, directly as a result of the prevailing background traffic growth. An improvement at this intersection, such as the replacement of the existing stop sign control with either traffic signals or a roundabout, is warranted at current traffic levels and would become more necessary in future years. As discussed above, installation of traffic signals on the corresponding intersection on the west side of the F3 Freeway/Sparks Road Interchange has significantly improved the traffic delays and queuing at that intersection. However, there are no current plans by RMS to upgrade the east side of the intersection.

At the Ruttleys Road/Construction Road intersection, the future predicted traffic increases with the projected year 2027 locality background traffic growth and the Proposal's external peak hourly truck traffic movements, indicate that there would be a change to the future peak hour levels of service from B to C in the morning peak hour and from B to E in the afternoon peak hour. These predicted changes are primarily due to the continuing prevailing background traffic growth on these roads from the ongoing residential and industrial type development in the surrounding localities, with only minimal influence from the Colliery's truck traffic movements.

iii Construction traffic

Construction activities at the Colliery will be limited to minor equipment upgrades and modifications to existing surface infrastructure. Traffic associated with these upgrades, along with ongoing maintenance activities, are considered part of the Colliery's normal operational traffic. On an average daily basis during construction activities, the number of associated daily traffic movements operating on the main Colliery access route via Construction Road will be minimal. This traffic, which is likely to constitute a maximum of 10 car or truck vehicle visits to the site per day (up to 20 daily vehicle movements), is well within the natural variability experienced in day to day movements. This level of daily construction and/or maintenance traffic will be an order of magnitude lower than the Colliery's current traffic movements and within the maximum daily truck movements assessed for the Proposal. Consequently, a detailed assessment of the potential project construction traffic impacts on Construction Road, Ruttleys Road and other surrounding roads, is not warranted as the potential cumulative impact is considered negligible.

11.3.4 Road safety

As the Proposal would not increase the number of export coal truck movements or haulage days to the PWCS, no additional road safety impact would result from the Proposal.

The Colliery has implemented, or is in the process of implementing, the recommendations made by the Road Safety Audit Report described in Section 11.2.5.

11.3.5 Road pavement condition

In order to determine the potential impact of LakeCoal's coal haulage activities on the road pavement of the affected 1.4 km section of Ruttleys Road, a detailed dilapidation report and future road pavement life assessment has been undertaken as requested under MP10_0161. The dilapidation report concluded that whilst there are a number of surface defects, the road pavement is structurally sound (Lyle Marshall and Associates 2013). Notwithstanding this conclusion, remediation works consisting of *"cold milling the existing AC wearing course and constructing a new 40 mm AC wearing course"* are recommended to be provided in 2013 and again in 2025 as part of a future cycling program of road maintenance and rectification works for the road.

Based on the dilapidation report and LakeCoal's impact on Ruttleys Road, an agreement is being negotiated between LakeCoal and WSC, with LakeCoal to contribute an annual sum towards the Council's maintenance costs of Ruttleys Road proportionate to the impacts caused.

On other sections of the export coal haulage route, the existing road pavements have been adequately constructed for significant volumes of heavy truck traffic and are currently in good condition. These roads are maintained with funding from the NSW State and Commonwealth Governments where annual truck registration costs are now set to recover costs associated with the necessary road maintenance requirement which are generated by significant volumes of heavy truck traffic usage.

11.3.6 Car parking

There would be no changes to the Colliery site layout, truck loading or car parking areas. The capacity of the site car parking area (approximately 130 car parking spaces) is adequate for the current and future peak Colliery workforce of 143 persons on weekdays (spread over 3 shifts) and is not proposed to be expanded.

11.3.7 Public transport access

The local area is currently serviced by Busways routes 95 and 97 bus services which operate a small number of trips each weekday along Ruttleys Road between Wyee, Morisset and other destinations. These services provide a basic minimum level of public transport accessibility for residents and the workforce in the locality.

The nearest bus stops on these bus routes are located over a 1 km walking distance from the Colliery and are expected to be rarely used by the Colliery workforce. The Proposal does not result in any increase in Colliery employee numbers; therefore, it is unlikely to place any additional demand on public transport services in the area.

11.3.8 Pedestrian and cyclist access

The road shoulders of the private and public roads which provide access to the Colliery, including both Construction Road and Ruttleys Road, do not have adequate width and surface treatments for safe regular use by either pedestrians or cyclists travelling to or from work at the Colliery. Further, current patterns of urban development in the area are such that pedestrian and cyclist usage of roads is unlikely. Improvements to road shoulders, or the provision of separate pedestrian footpaths and/or cycleways alongside these roads, would not be required as a result of the Proposal.

11.4 Management and monitoring

In accordance with Schedule 3, Condition 20 of MP10_0161, a RTP has been prepared for the Colliery in consultation with the RMS, NCC, DRE and the CCC. The RTP includes a TMP and a Code of Conduct for truck drivers. The protocol provides for the management of potential traffic impacts associated with the current haulage operations and is considered adequate to manage the traffic associated with the continued operations at the Colliery.

Specifically, the TMP includes:

- procedures to ensure that drivers adhere to the designated haulage routes;
- measures to maximise the use of a low frequency (regular) trucking schedule rather than an intermittently high frequency (campaign) trucking schedule;
- contingency plans to apply when the designated haulage route is disrupted;
- procedures to ensure that all haulage vehicles associated with the Colliery are clearly distinguishable;
- procedures for receiving and addressing complaints from the community; and
- measures to ensure the provisions of the TMP and the associated heavy vehicle driver's "Code of Conduct" are complied with.

The Code of Conduct for truck drivers addresses:

- adherence to NSW road rules and travelling speeds;
- departure times and staggering of truck departures to ensure a regular trucking schedule throughout the day and minimise convoys;
- instructions to drivers not to overtake each other on the export coal haulage route, as far as practical, and maintain appropriate distances between vehicles;
- adherence to the designated export coal haulage route;
- instructions to drivers to be safety conscious and to strictly obey all traffic regulations; and
- appropriate penalties for infringements of the code.

In accordance with Schedule 3, Condition 21 of MP 10_0161, a six monthly independent traffic audit of the coal haulage must be undertaken. The independent traffic audit of the coal haulage, must:

- be undertaken without prior notice to the Proponent and in consultation with RMS, NCC, WSC and CCC;
- review haulage records;
- assess the impact of the project on the performance of the road network;
- investigate the accident records on the haulage route and any incidents involving haulage vehicles from the project;

- assess the effectiveness of the Code of Conduct; and
- recommend measures to reduce or mitigate any adverse (or potentially adverse) impacts.

These audits would be supplemented by internal and external audits required under the TMP.

The first Independent Traffic Audit for the Colliery was completed on 28 September 2012 and did not identify any adverse impacts which required recommended measures to reduce/mitigate impacts from truck movements associated with the Colliery.

There are no additional specific management and monitoring requirements as a result of the Proposal. However, the RTP would be reviewed and updated as required to incorporate the Proposal. In addition, LakeCoal will continue to investigate alternative options for transporting export coal to the PWCS, specifically the preferred rail transport option, requiring the construction of a private haul road to the VPPS coal unloading facility and associated infrastructure upgrades. In particular, LakeCoal will:

- provide a detailed feasibility report of rail transport options to DP&I as part of the next coal transport options report to be submitted, by 31 December 2014;
- should the above report identify that coal transport via rail is feasible, LakeCoal will prepare and lodge an application to modify the relevant approval so as to permit the installation and operation of facilities necessary to undertake rail transport of coal to PWCS; and

discuss the potential to utilise proposed rail loading facilities associated with the Wallarah 2 Coal Project, following this project receiving approval.

In accordance with Schedule 3, Condition 19 of MP10_0161, Colliery haulage data is made publically available on LakeCoal's website on an annual basis or more frequently. The data will continue to be made available throughout the life of the Proposal.

11.5 Conclusion

Light and heavy vehicle movements on the public road network would not change under the Proposal as there would generally be no increase in either the number of employees or amount of coal being transported to PWCS or to other domestic customers. The Proposal would, however, result in the extension of mining operations at the Colliery through to the year 2027.

The assessment of the impact of the continued haulage of coal on public roads assumed the current maximum limit of 270 truck loads per day is maintained. In recent years, however, the Colliery has typically operated well below the maximum daily truck load limit and, therefore, results presented are conservative. It is also noted that future year 2027 daily traffic volumes on roads discussed within this assessment would be substantially reduced following the completion of the Hunter Expressway Project and other regional road improvements.

Over the life of the Proposal, background traffic levels on the public road network are projected to continue to occur at growth rates of between +2.3% to +3.0% based on the recorded traffic growth rates from daily traffic counts at the relevant locations on the major road network. Given that the maximum number of coal truck movements along the export coal transport route would not increase as a consequence of the Proposal, the percentage contribution to overall and heavy vehicle movements would decline. The assessment also confirmed that, with one exception, the road network has adequate capacity to accommodate this traffic growth, including the Proposal's truck traffic.

The SIDRA intersection analysis has identified that the F3 Freeway /Sparks Road Interchange intersection (east side) is currently performing poorly, with significant delays (level of service F). Future upgrade of this intersection is likely to be required, regardless of whether the Proposal is approved, which would significantly improve the existing traffic situation for the benefit of general traffic on the road network.

In addition to the main domestic coal supply to VPPS and the export coal supply via PWCS, approximately 180,000 tpa of coal is supplied to other domestic customers. Domestic coal transport would continue to generally occur on days when export coal transport is not occurring, so the two transport operations do not coincide, ensuring a maximum of 270 truckloads per day on public roads is maintained.

The Colliery has prepared a RTP, comprising a TMP and a Code of Conduct for truck drivers. Regular Independent Traffic Audits of the coal haulage on public roads have commenced and would continue throughout the life of the Colliery. No additional specific measures are required to address any future traffic impacts associated with the Proposal. However, the Colliery's RTP will be reviewed and updated as required to incorporate the Proposal.

12 Subsidence

12.1 Introduction

Ditton Geotechnical Services (DgS) investigated the subsidence that would be expected to occur from the Proposal. The findings of the DgS investigation are summarised in this chapter and provided in full in Appendix I.

The chapter outlines the methodology used in the investigation, the existing subsidence regime, the predicted subsidence levels and the linkages between the subsidence findings and other environmental assessments contained in the EIS. It includes management and monitoring measures that will be implemented to manage subsidence and provides for adaptive measures based on monitoring results.

12.2 Existing environment

12.2.1 Effects of subsidence

After the extraction of a single longwall or miniwall panel, the immediate mine roof collapses into the void or 'goaf' left behind in the seam (i.e., the caved zone). The overlying strata or overburden then sags down onto the collapsed material, which results in a subsidence trough developing at the surface. Fracturing and bedding shear failures occur in the overburden strata above the caved zone and is known as the fractured zone. Provided the cover depth above the proposed workings is sufficient, there will be a zone of strata above the fractured zone that will have fewer fractures and bedding separations and effectively separates the fractured zone from the surface zone. This intermediate zone is called the constrained zone. The extent and hydrogeology of the caved, fractured, constrained and surface zones depend upon the mine geometry and geology. These zones are shown conceptually in Figure 12.1.

Subsidence refers to the vertical downward movement of the land surface. The maximum subsidence usually occurs in the middle of the extracted panel and is dependent on the mining height, panel width, cover depth, overburden strata strength and stiffness, and bulking characteristics of the collapsed strata in the caved and fractured zones. For the case of single seam mining in the Newcastle and Central Coast Coalfields, the maximum subsidence usually does not exceed 60% of the mining height and may be lower than this value due to the spanning or bridging capability of the strata above the collapsed ground (or the goaf). In cases where multiple miniwalls are extracted adjacent to each other, maximum subsidence can develop above the coal pillars (known as chain pillars) if the upper sections of the overburden can span across the void between the pillars.

From the point of maximum subsidence above a longwall or miniwall panel, the subsidence then decreases out to 'zero' subsidence at a finite distance from the limits of extraction. Subsidence less than 20 mm is commonly referred to as 'zero' subsidence and defines the practical limit of the 'angle of draw'. Subsidence of less than 20 mm is widely adopted as being imperceptible for all practical purposes because the magnitude of natural, seasonal variations in ground level is commonly greater than 20 mm.

The impact of subsidence is usually measured in terms of differential ground movements above a completed miniwall panel and is referred to as tilt and horizontal strain.

Tilt is the rate of change of subsidence between two points (A and B) on the surface, and measured at set distances apart (usually 10 m or 20% of the cover depth). Tilt is plotted at the mid-point between the points and is a measure of the amount of differential subsidence across or along a survey line above a completed miniwall. Tilt is usually expressed in mm/m.

Horizontal strain is the change in horizontal distance between two points at the surface after undermining occurs divided by the pre-mining distance between the points. Strain is usually expressed in mm/m.

Where a mine has a massive spanning strata sitting above it, subsidence impacts would be expected to be reduced as the strata acts as a support, taking and distributing the weight of the overburden above it. This is the situation for the Proposal where extensive and thick units of coarse grained sedimentary strata belonging to the Triassic Narrabeen Group (Munmorah Conglomerate) and Late Permian Moon Island Beach Sub-group (Teralba Conglomerate) exist above the workings. Figure 12.2 depicts subsidence under a massive spanning strata scenario.

12.2.2 Geological structures

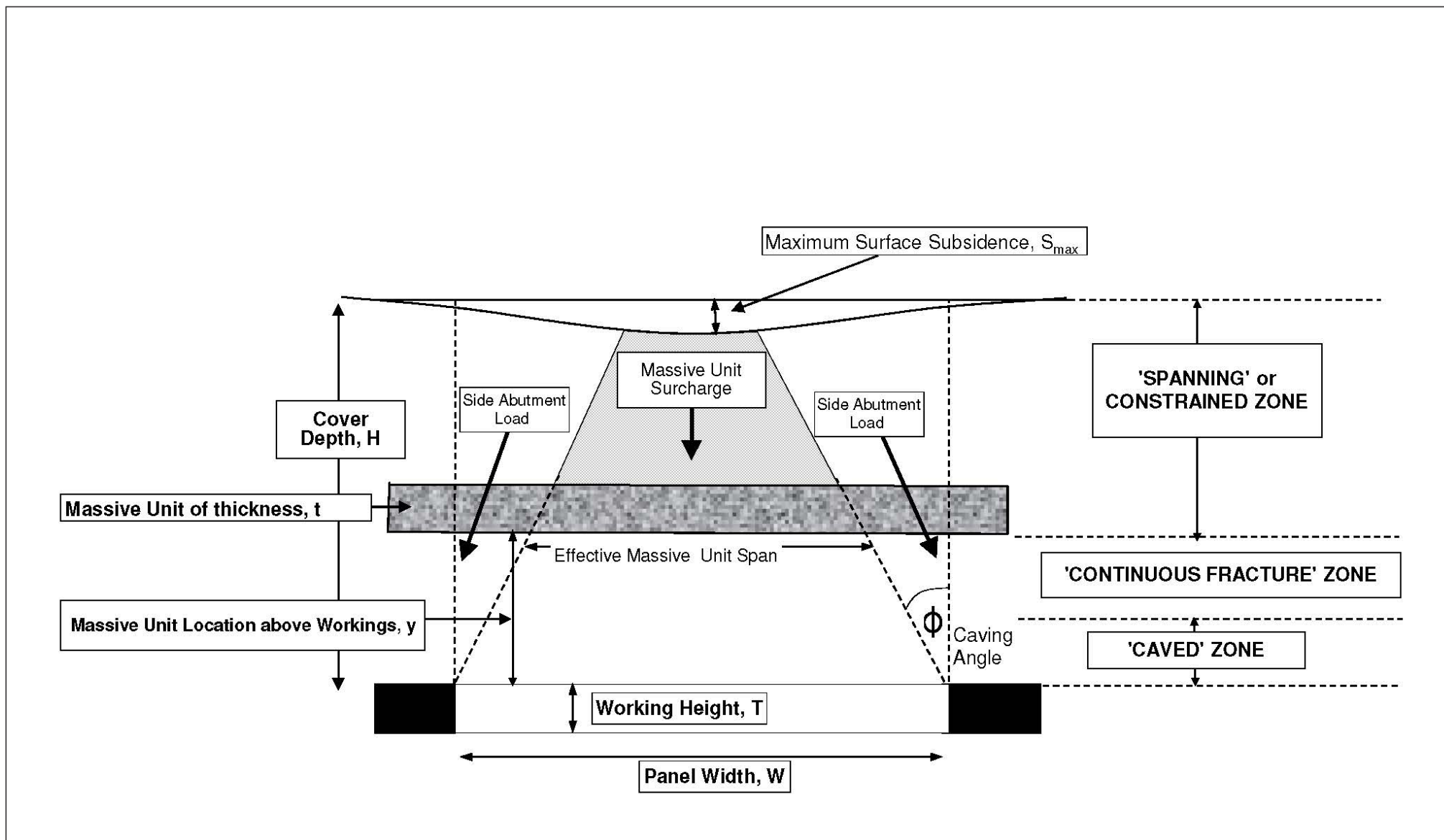
In general, miniwall panels have been extracted across minor and moderate geological structures only (i.e. throws (vertical component of the dip separation) of less than half the mining height of 3.5 m). Major fault structures and hard dykes are avoided by adjusting the miniwall layout to leave a stable barrier pillar of coal directly beneath these features.

The geological structures generally encountered during underground development in the current operations comprise the following:

- minor to moderate north-west and north-east striking normal faults with throws ranging from 10 mm to 1.4 m (average of 0.5 m);
- a major north-west striking fault with a throw greater than 3 m;
- hard dykes (average claystone and mudstone strength of 80 MPa) with a width of 1 m to 2.5 m striking north-west. The dykes were also encountered in the overlying workings in the Great Northern and Wallarah Seams; and
- a major fault (2.5 m throw) has been encountered during development of MW4 which was initially encountered as a 0.5 m fault in the main headings. This has subsequently required the miniwall to be shortened back to 400 m. So far the miniwall has retreated for 30 m through the fault (which is still equivalent to 1.8 m in throw) and the roof conditions have been manageable. After the fault was intersected in MW4, an exploration heading was driven across to MW 5 and no further faulting was encountered within MW5.

It is also noted that a 74 m wide barrier of coal was also originally proposed to avoid what was thought to be a significant dyke structure between MWs 3 and 7. Further investigation by horizontal drilling has found a series of thinner structures of less than 1 m exist that will now enable a 97 m wide panel to be extracted, as per Figure 3.1.

It is likely that similar structures to those already encountered in the current operations area will exist within the limits of Area 1. The detection of these structures and the assessment of the potential risks associated with undermining them are discussed in Section 12.4.1.

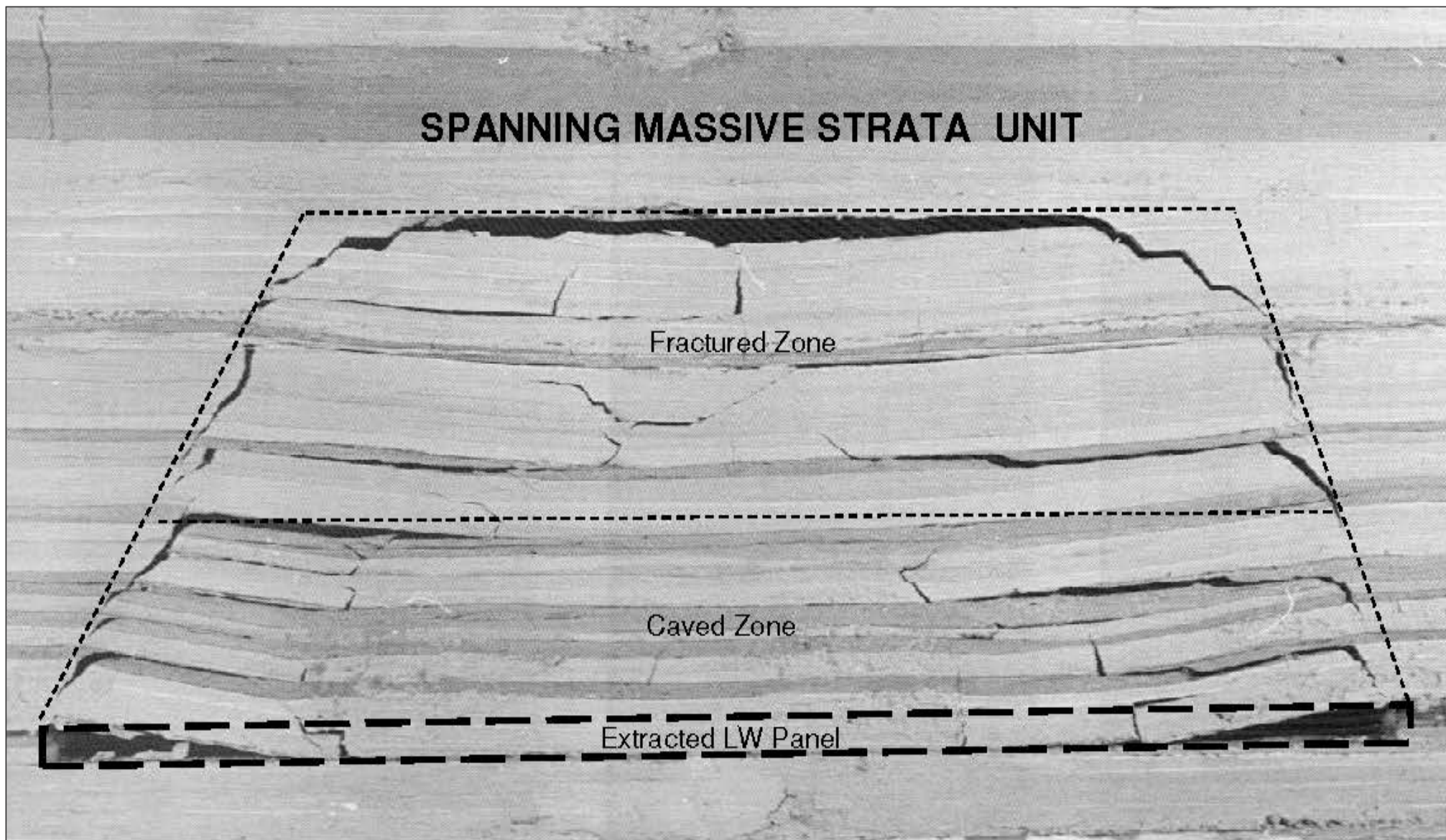


Source: Ditton Geotechnical Services Pty Ltd (2012).

Strata unit behaviour during subsidence

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Figure 12.1



Source: Ditton Geotechnical Services Pty Ltd (2012).

12.2.3 Past subsidence impacts

Bathymetric surveys (i.e., the lake-bed equivalent to an above-water topographic survey) are used to determine subsidence in aquatic environments. LakeCoal has commissioned bathymetric surveys above Domains 1 and 2 before and after mining, with the March 2012 survey results indicating that subsidence of approximately 100 mm has developed above MWs 1 and 2 (see Figure 3.1). The final maximum subsidence is unlikely to be known until at least three to five adjacent miniwalls have been extracted and full loading has developed on the chain pillars.

It is unknown what subsidence has already occurred above the existing pillar extraction and bord and pillar panels in the Wallarah and Great Northern Seams, due to limited bathymetric survey results for the Colliery above Chain Valley Bay. Estimates of previous subsidence above the proposed MWs 41 – 45 have, therefore, been based on model predictions derived from an assessment of the geotechnical conditions and mining geometries within this area of the Site.

Mannering Colliery developed and completed seven longwall panels (LWs 17 – 23) below Lake Macquarie to the south-west of the Proposal. The panels were 130 m to 150 m wide with cover depths ranging from 170 m to 195 m. The measured final maximum panel and chain pillar subsidence levels above the Mannering longwall panels have been compared with the modelled predictions, based on total cover depth and rock cover depth, respectively (see Section 12.3.1 for more information on the models).

The outcome of the Mannering Colliery subsidence review indicates that none of the predictions of maximum single panel subsidence were exceeded by measured values when rock cover depth was assumed as opposed to total cover depth. The chain pillar subsidence predictions also compared favourably to measured values. The implication of the favourable comparison between predicted and measured subsidence levels at Mannering Colliery gives confidence in the subsidence modelling undertaken for the Proposal.

12.3 Impact assessment

12.3.1 Subsidence prediction methodology

Subsidence predictions associated with the Proposal were based on the following:

- the development of a geotechnical model of the overburden and immediate roof-pillar-floor system using available borehole log and testing data;
- prediction of maximum subsidence effect parameters for the proposed miniwalls;
- a review of subsidence data and impacts associated with MWs 1 and 2 and Mannering Colliery's LWs 17 to 23;
- an assessment of multi-seam workings interaction and the long term stability of standing pillars in the Great Northern and Wallarah Seams;
- prediction of first and final subsidence effect profiles and final contours;
- prediction of post-mining surface levels;
- a potential surface cracking zone assessment;

- a prediction of sub-surface heights of continuous and discontinuous fracturing above the proposed miniwall panels;
- identification of potential lake depth increases;
- identification of potential gradient changes along the lake bed and foreshore; and
- recommendation of management strategies to protect the environment.

The subsidence level predictions in the study were based primarily on the Australian Coal Association Research Program (ACARP) 2003 model.

Pre-feasibility studies of appropriate panel widths and set-back distances so as to limit surface impacts to acceptable levels were undertaken prior to the detailed subsidence study. The outcomes of the preliminary analysis resulted in the mining geometry and layout adopted in the study.

Using regression analysis techniques, curves of ‘best fit’ have been used to estimate Mean and Credible Worst-Case (Upper 95% Confidence Limits) for the subsidence effects due to the proposed miniwall layout. The curves are based on measured subsidence data in the NSW Coalfields, key mining geometry parameters and the Colliery’s mining experience to-date.

12.3.2 Subsidence predictions

i Vertical subsidence level predictions

The Proposal includes secondary extraction of miniwall panels MWs 1 to 45 which are located entirely below the bed of Lake Macquarie and in areas where the depth of cover ranges from 150 m to 230 m. The proposed miniwall panels will have widths ranging from 72 m to 97 m. No secondary extraction is proposed to occur beneath the HWMSB and SPB.

It should be noted that MWs 41 to 45 (shown in Figure 3.1) will experience multi-stress conditions where extraction of the Wallarah Seam (circa 1960s – 1990s) and the Great Northern Seam (circa 1980s – 2000s) has occurred. MWs 1 to 40 will experience single panel subsidence only, as there are no historic workings in the overlying seams, and different subsidence levels for these miniwalls are predicted.

Based on the approach outlined above, DgS predicted subsidence levels for the worst case cumulative subsidence scenario. For all areas, the modelling takes account of any previous mining, as well as subsidence above chain pillars and the subsidence interactions between miniwalls. Figure 12.3 shows the predicted incremental subsidence levels for the Proposal without multi-seam mining effects associated with MWs 41 to 45. Figure 12.4 shows the predicted worst-case subsidence contours including multi-seam mining effects associated with MWs 41 to 45.

The predicted credible worst-case (Upper 95% Confidence Limit) vertical subsidence effect results for MWs 1 to 45, as presented in Figure 12.4, are summarised below.

- MWs 1 to 40:
 - final maximum vertical subsidence ranges from 230 mm to 620 mm (average of 430 mm);
 - final maximum chain pillar subsidence ranges from 160 mm to 410 mm (average of 260 mm);

- MWs 41 to 45:
 - final maximum vertical subsidence ranges from 780 mm to 886 mm; and
 - final maximum chain pillar subsidence ranges from 350 mm to 720 mm.

It should be noted that the average predicted subsidence levels for MWs 1 to 40 are generally consistent with the subsidence limit approved under MP10_0161, with slightly higher levels predicted where depth of cover is lower (primarily in the northern area of the Site). Given the proposed timing for extraction of MWs 41 to 45, which occurs towards the end of the Proposal, there is sufficient time to consider further refinement of the panel design in this area if required, for example, on the basis of the outcomes of the benthic communities monitoring program. Adoption of the maximum values has enabled potential worst case impacts to be assessed in the EIS. Any refinement to these panels, via reduction in panel widths or an increase in the chain pillar widths, would reduce the level of subsidence in this area.

ii Tilt predictions

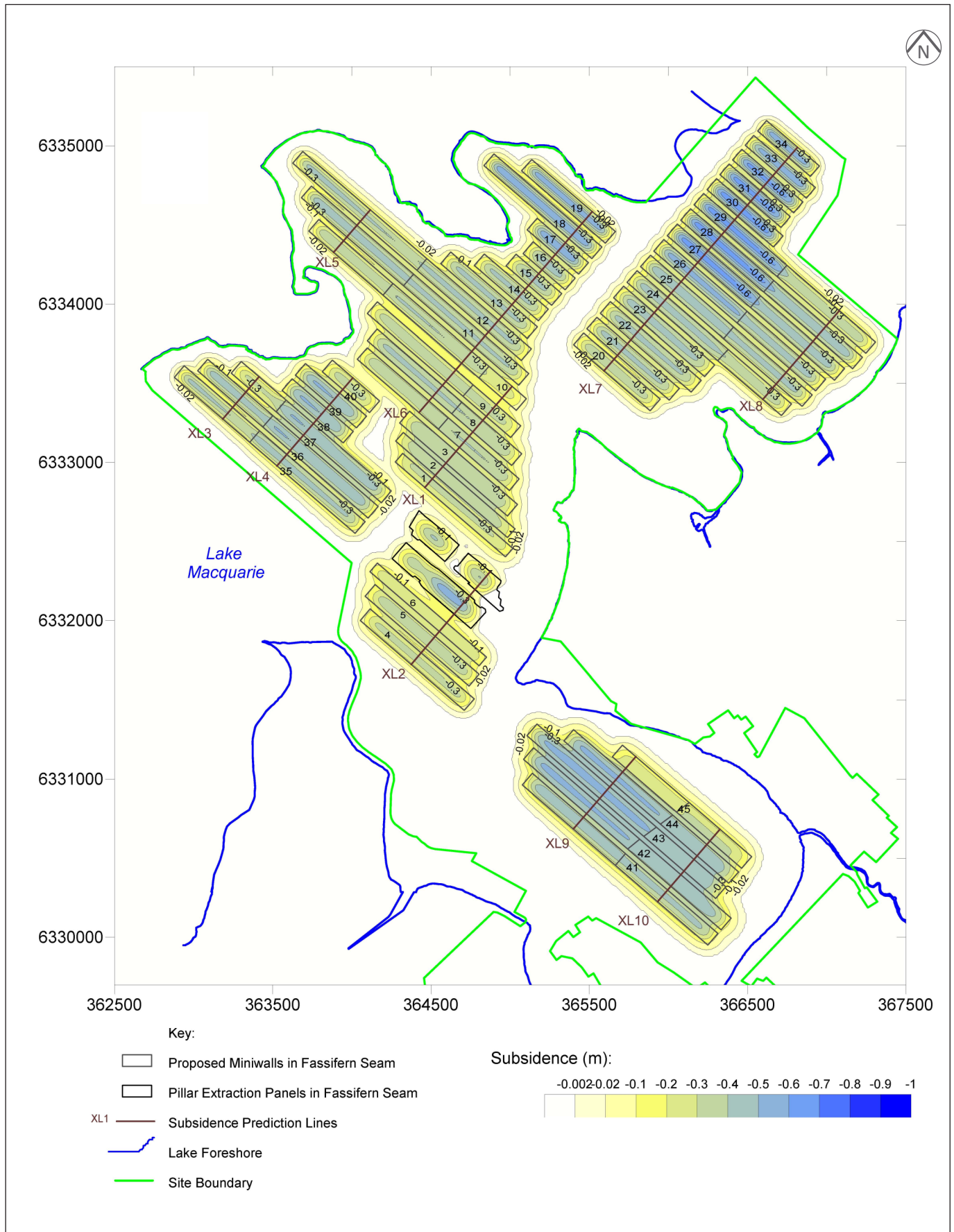
As noted in Section 12.2.1, tilt is the change in slope of the ground between two areas which have subsided by different amounts. Figure 12.5 presents predicted incremental tilt contours for the Proposal without multi-seam mining effects associated with MWs 41 to 45. Figure 12.6 shows the predicted worst-case cumulative tilt contours for the Proposal including multi-seam mining effects. These figures show that the maximum panel tilt is predicted to range from 2 mm/m to 17 mm/m (with an average of 8 mm/m).

iii Strain predictions

Strain is calculated as the change in horizontal distance between two points on the ground, divided by the original horizontal distance between them, presented as mm/m. Compressive strains usually occur in the middle-third of a subsided panel area and represent a decrease in horizontal distance. Tensile strains usually occur adjacent to panel ribs and above chain pillars, and represent an increase in horizontal distance.

Figure 12.7 presents the predicted incremental strain contours without multi-seam mining effects of MWs 41 to 45 for the Proposal. Predicted worst-case cumulative strain contours, including multi-seam mining effects, are shown in Figure 12.8.

The predicted credible worst-case (Upper 95% Confidence Limit) incremental compressive and tensile strains for MWs 1 to 45 range from 1 mm/m to 6 mm/m with an average of 3 mm/m.

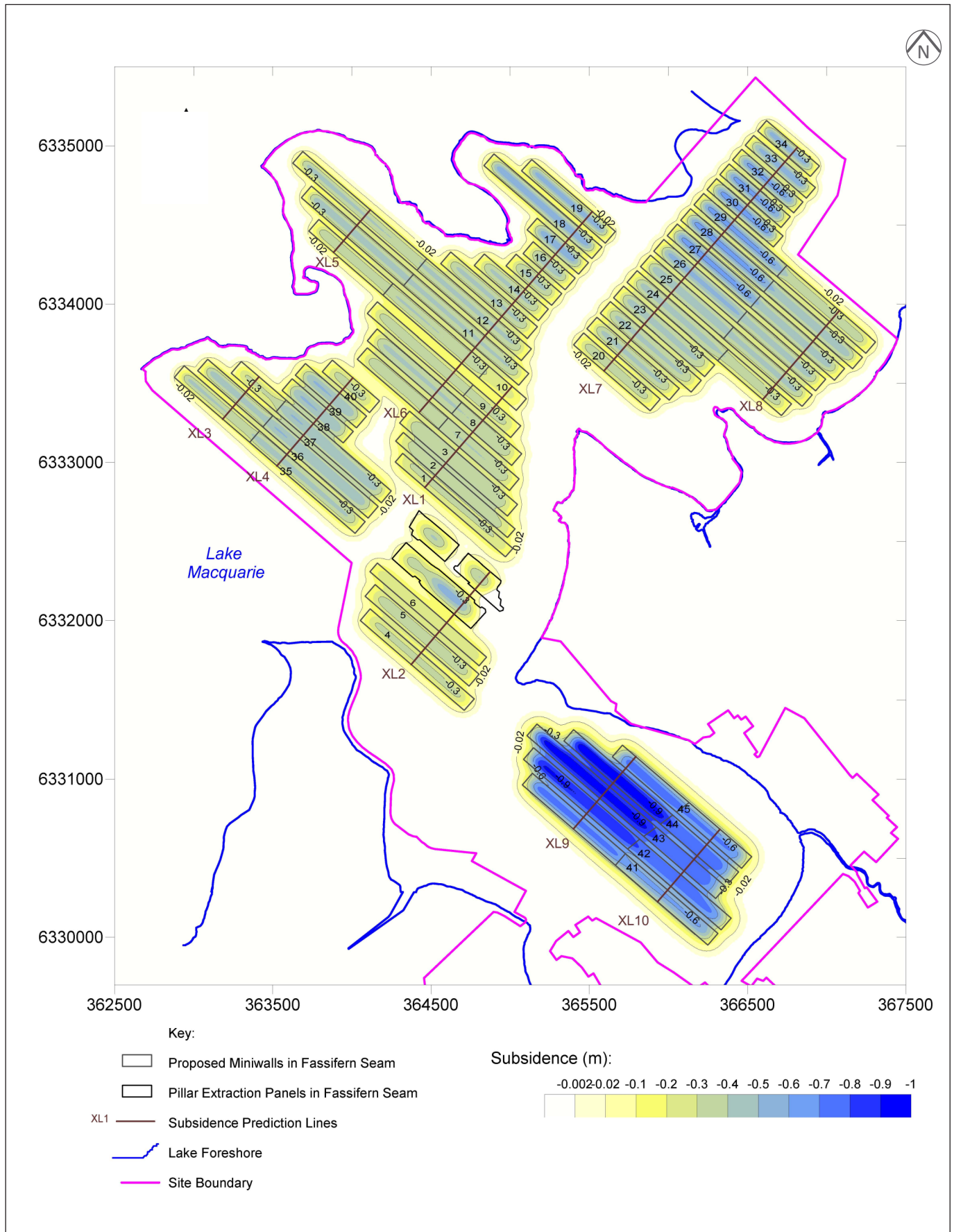


Source: Ditton Geotechnical Services Pty Ltd (2012).

Predicted incremental subsidence contours above proposed miniwall layout without multi-seam mining effects

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Figure 12.3

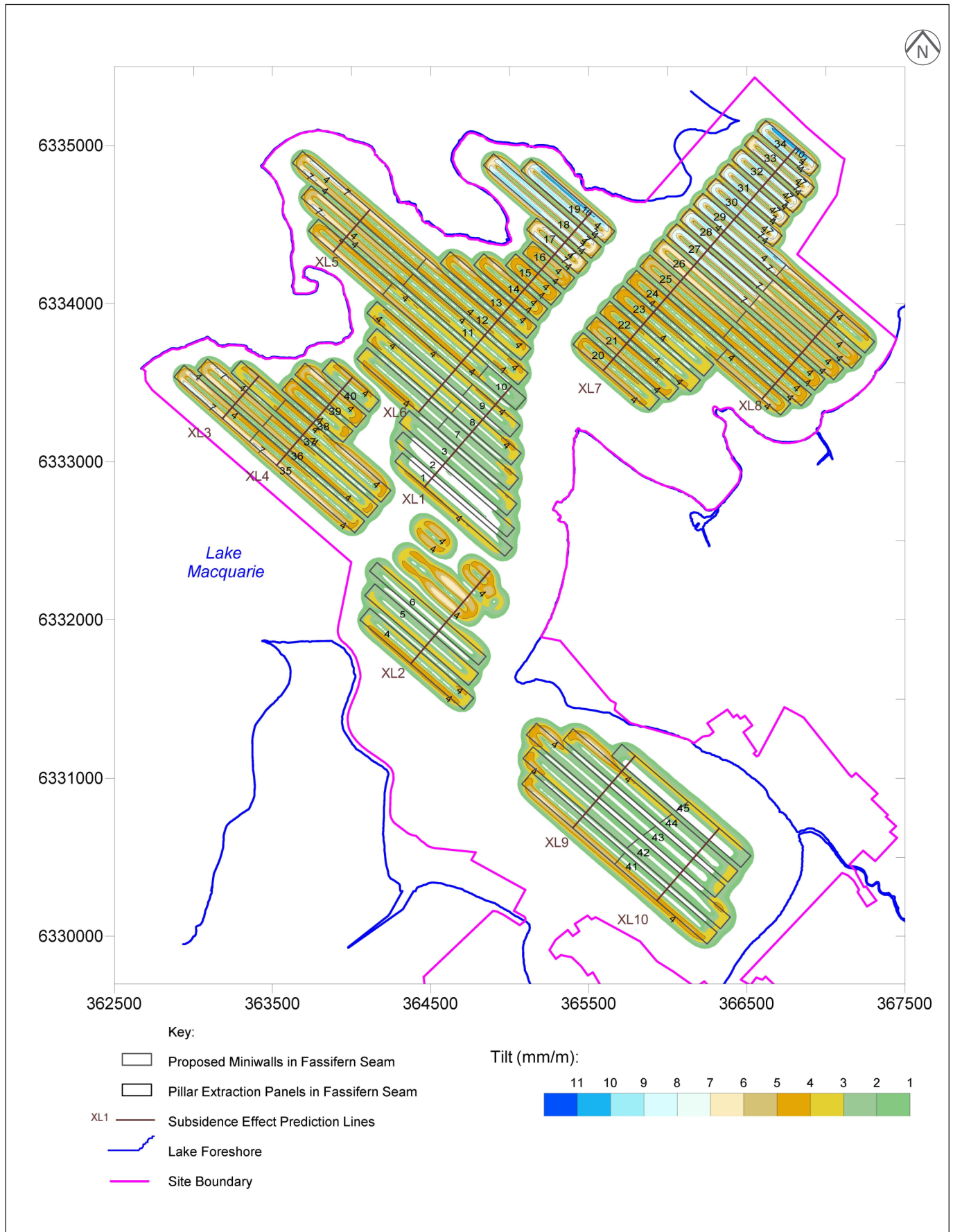


Source: Ditton Geotechnical Services Pty Ltd (2012).

Predicted worst-case cumulative subsidence contours above proposed miniwall layout with multi-seam mining effects

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Figure 12.4

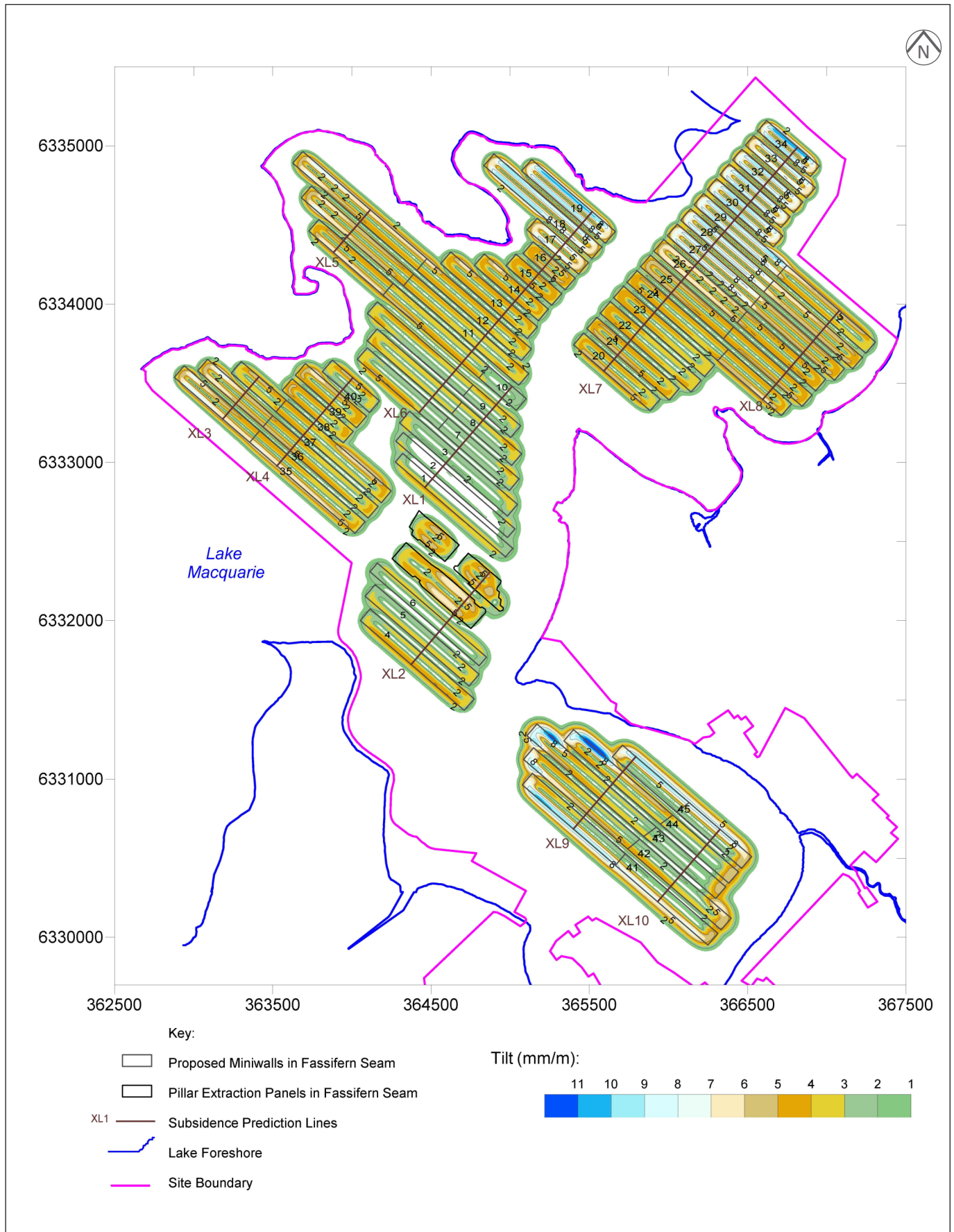


Source: Ditton Geotechnical Services Pty Ltd (2012).

Predicted incremental tilt contours above proposed miniwall layout without multi-seam mining effects

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Figure 12.5

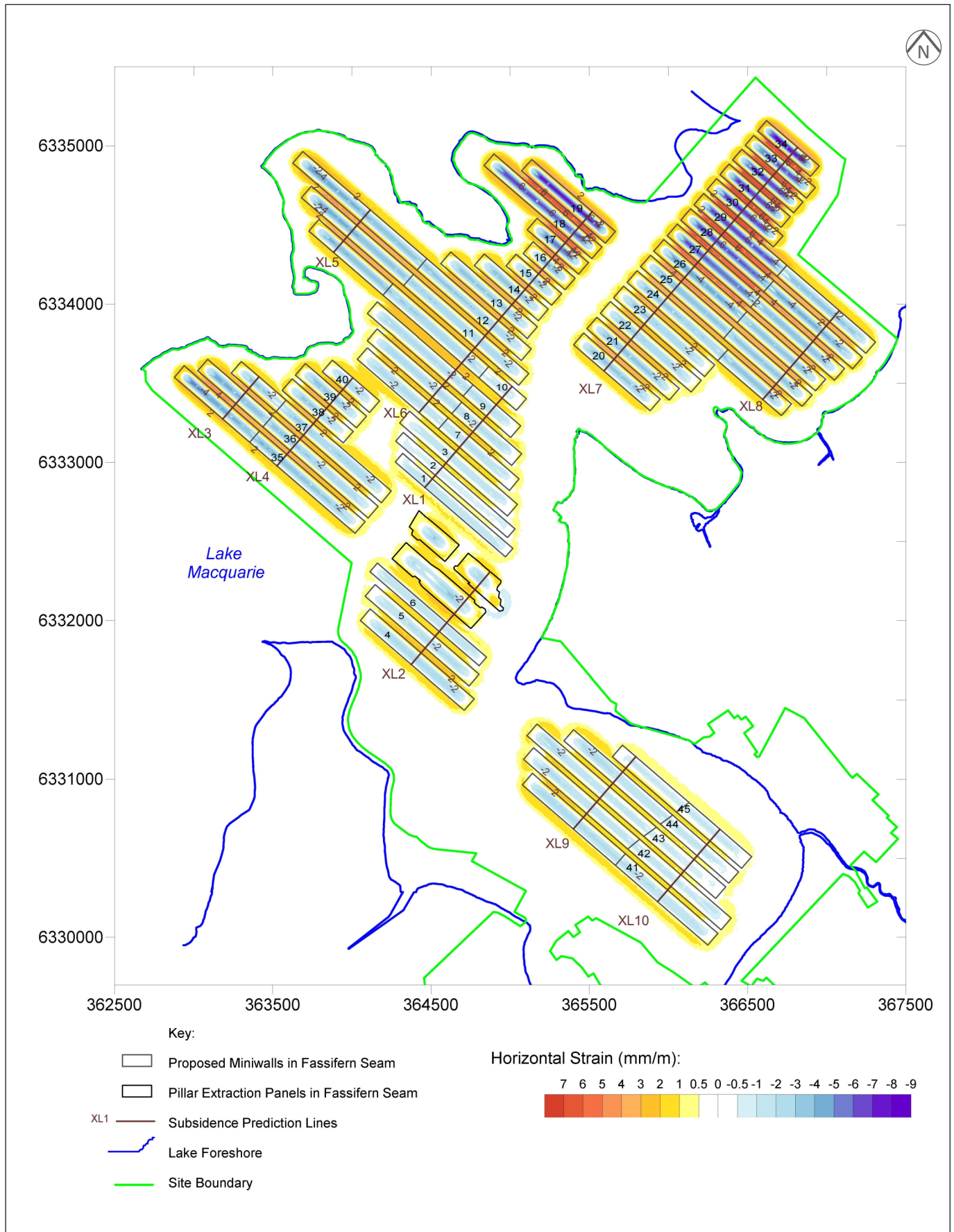


Source: Ditton Geotechnical Services Pty Ltd (2012).

Predicted worst-case cumulative tilt contours above proposed miniwall layout with multi-seam mining effects

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Figure 12.6

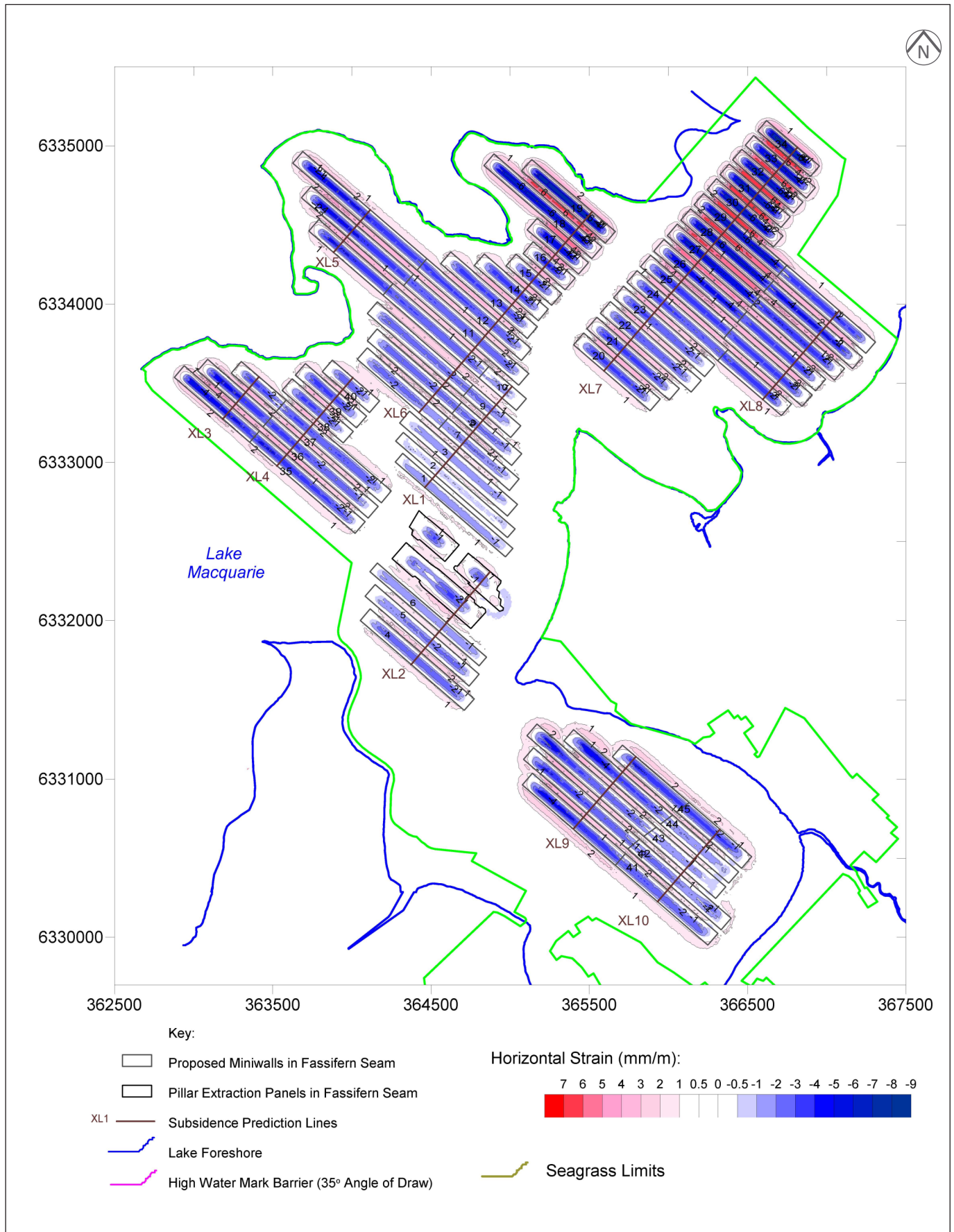


Source: Ditton Geotechnical Services Pty Ltd (2012).

Predicted incremental strain contours above proposed miniwall layout without multi-seam mining effects

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Figure 12.7



Source: Ditton Geotechnical Services Pty Ltd (2012).

Predicted worst-case cumulative strain contours above proposed miniwall layout with multi-seam mining effects

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Figure 12.8

12.3.3 Impacts to existing and proposed infrastructure

An electrical power cable which runs along the lake bed from the pit top area to the Summerland Point ventilation shaft and fans site is now disused and would not be impacted by subsidence from the Proposal. No other existing infrastructure is located above proposed areas of secondary extraction.

A concept plan for the proposed Trinity Point Marina development was approved by the then Department of Planning (DoP) in September 2009 (concept approval 06_0309). The concept plan related to a mixed use marina/tourist/residential development with a 188 berth marina covering an area of approximately 59,000 m². Based on the indicative marina layout approved with the concept plan, the proposed marina may traverse part of MW 11. However, a development application for the marina development has not yet been submitted and the location or specifications of any fixed elements such as a breakwater or pilings are currently unknown. Further, it is possible that a project application may not be submitted prior to mining of MW 11. Should development of the marina commence prior to extraction within MW11, LakeCoal would consult with the proponent to discuss potential subsidence impacts.

12.3.4 Interactions with other environmental assessments

Subsidence will be controlled by the design of the mine so that there are no subsidence impacts on the land around the Lake, thus preventing any structural damage to buildings or other land-based features that could be attributed to subsidence from this Proposal.

Subsidence will, however, have potential interactions with other aspects of the environment, each of which has been addressed in this EIS. For example:

- subsidence can lead to less sunlight reaching seagrasses because of the increased depth of water. The amount of sunlight received can affect seagrass health and the distribution and health of benthic communities. The impacts of subsidence on marine ecology are dealt with in Chapter 13;
- subsidence can induce fracturing in underlying strata which can affect groundwater regimes and flows of water into the underground workings through increased hydraulic conductivity. The interaction between groundwater and subsidence is discussed in Chapter 7; and
- the Lake's wave climate could be altered as a result of increased depths of water in the Lake following subsidence which, in turn, can affect shoreline erosion. This matter is dealt with in Chapter 13.

As noted in Section 12.3.1, pre-feasibility studies of appropriate panel widths and set back distances were undertaken to ensure that mine design provides for acceptable environmental outcomes.

12.4 Management and monitoring

12.4.1 Management

i Adaptive management

It is predicted that the subsidence associated with extraction of the proposed miniwalls within the Site will not have any direct significant environmental impact. Rather it is the indirect environmental impacts that could be significant, such as the impact on the health of seagrasses and benthic communities, groundwater impacts and impacts on wave climate and shore erosion. Each of these environmental areas will have monitoring regimes in place to determine whether actual impacts are acceptable. If an unacceptable impact is found that could be attributed to subsidence, the mine design would be changed to moderate the subsidence impacts. A discussion on acceptable environmental results for the above areas and linkages to subsidence is found in Sections 7.3.2 and 13.3.3.

Independent of the flow-on environmental effects from subsidence, LakeCoal aims to ensure that the maximum predicted and actual subsidence levels reasonably align themselves. In the unlikely event that measured subsidence levels exceed those predicted, the mine design could be altered to ensure compliance with the predicted maximum levels.

LakeCoal will implement an adaptive management approach to ensure performance measures related to subsidence are achieved. Adaptive management will involve the monitoring and periodic evaluation of the consequences of mining, with possible adjustment of the mining layout and/or methods through the Extraction Plan process to achieve or exceed the required measure of performance.

ii Management in response to geological structures

The significance of the geological structures encountered during development may be assessed in regards to its persistence and potential connectivity to the surface based on the following key parameters:

- throw, trace, dip and dip direction;
- groundwater discharge rate change over time; and
- groundwater discharge chemistry.

It is unlikely that a significant structure will go undetected prior to the extraction of a miniwall as development headings will be formed along all sides of the panel prior to extraction (as was the case for the detection of the faulted area within the proposed miniwall MW4 panel).

Potential fault affected areas will be identified through activities associated with development headings. Undermining of significant faults, such as those that may cause higher continuous fracture connectivity will be avoided. Undermining of smaller, undetected faults/ structures will be managed in accordance with existing processes as occurs under approved operations.

12.4.2 Monitoring

Subsidence effects will be determined using annual bathymetric surveys of the lake bed. The surveys will allow the measured subsidence to be reviewed against the predictions. Any significant deviations or exceedences in measured subsidence or impact will be assessed and appropriate panel width or mining height reductions made to limit future impacts to acceptable levels. It should be understood, however, that adjustments to the mine plan requires a reasonable amount of forewarning due to the requirement that panels need to be developed several months in advance of miniwall extraction.

12.5 Conclusion

Subsidence of the bottom of Lake Macquarie will occur as a result of the proposed mining. The panel geometry has been designed to limit the potential for adverse environmental impacts. Although the level of subsidence is unlikely to have significant direct impact on the environment, possible flow-on or indirect effects related to seagrasses and benthic communities, groundwater and the wave climate has been assessed in this EIS. Actual impacts will be monitored and managed in accordance with approved management programs.

A maximum vertical subsidence of 620 mm is predicted for MWs 1 to 40 and 886 mm for MWs 41 to 45. Maximum panel tilts and strains are predicted to be 17 mm/m and 6 mm/m, respectively.

Monitoring of subsidence will generally be undertaken annually using bathymetric surveys. In the unlikely event that significant exceedences of the predicted subsidence levels are identified, the mine design will be adjusted to reduce these to an appropriate level. Separate monitoring arrangements for subsidence-related impacts will be done under the auspices of the marine ecology and groundwater monitoring programs.

13 Marine ecology

13.1 Introduction

A marine ecology assessment was undertaken for the Proposal by JSA Environmental. The findings of the assessment are summarised in this chapter and provided in full in Appendix J.

The chapter describes the existing marine environment, outlines the baseline survey methodology and results, and presents potential impacts from the Proposal. It concludes with management and monitoring measures that would be implemented to prevent or minimise potential impacts.

13.2 Existing environment

13.2.1 General features of Lake Macquarie and Area 1

Lake Macquarie is a large barrier estuarine lake with an open water area of 115 km², an average depth of 7 m and a relatively flat floor characterised by fine soft silt/mud sediments. The Lake is a wave-dominated estuary with a high sediment trapping efficiency, naturally low turbidity and partially mixed circulation where there is likely to be sedimentation (Cardno 2011).

Area 1 is approximately 13 km from the entrance of the Lake where the tidal range and influence is not as pronounced compared to near the Lake Entrance and ocean at Swansea. The average water depth ranges from 0.5 m to 8.5 m, and the depth of sediment varies in thickness up to approximately 10 m (AECOM 2011a).

The *Lake Macquarie Estuary Management Plan* was prepared in 1997 and summarised results of water quality monitoring undertaken since 1983 by the Hunter Water Corporation (Syme *et al.* 1997). The Plan detailed the findings of various relevant literature which are summarised below in addition to the findings of more recent literature.

13.2.2 Water quality

Water quality in Lake Macquarie is generally affected by surface run-off and point source discharges which contribute to a proportion of nutrient input, sediment nutrient release rate, sediment loads, siltation and turbidity (Syme *et al.* 1997; Cardno 2011).

Water quality within the margins of Lake Macquarie in general is classed as 'marginal' with depressed light penetration, small periodic increases in nutrients, periodically elevated algae levels and elevated bacteria. However, the water quality of the Lake margins has excellent dissolved oxygen which is consistent with the overall improvement in water clarity and dissolved oxygen, as well as a decrease in nutrient concentrations within the Lake, since 1994 as a result of improved land management activities (Maunsell Australia Pty Ltd 2008; Eyre 2005).

13.2.3 Benthic substrate and invertebrates

Unvegetated estuarine habitats such as shallow mud flats, sand flats and deeper soft substrate areas can contain significant food sources for many fish species, such as benthic communities and non-vascular plants (algae and cyanobacteria). The benthic communities in the mud basin zone of Lake Macquarie, within which the Site is located, are dominated by polychaetes and bivalve molluscs, with other benthic organisms present at various times in smaller numbers (The Ecology Lab 1991 and 2007; Laxton & Laxton 2009). Large scale extinctions of benthic organisms have been recorded historically, which could be attributed to events such as periodic anaerobic conditions during major rainfall (Macintyre 1959; Roy 1981; The Ecology Lab 1991 and 2007; JSA 2012; Cardno Ecology Lab 2010).

13.2.4 Seagrasses

Lake Macquarie contains approximately 10% of the total area of seagrass beds in NSW (DPI 2007). Four species of seagrass occur in Lake Macquarie: eel grass (*Zostera capricorni*); paddle weed (*Halophila ovalis*); *Ruppia sp.*; and strapweed (*Posidonia Australia*) which is listed as an endangered species under the FM Act. All seagrass species are protected in NSW and a permit under the FM Act is required from Department of Primary Industries (DPI) to undertake works or activities that may harm them.

Seagrass distribution within estuaries is naturally influenced by light penetration, depth, salinity, nutrient status, bed stability, wave energy, estuary type, and the evolutionary stage of the estuary. Light is a major limiting factor for the growth of seagrasses and the effects of shading either by artificial structures or increased turbidity associated with sediment re-suspension are common light reducing factors in estuaries (BioAnalysis 2008).

Seagrass communities in Lake Macquarie appear to have declined since 1953, though there was a general increase in the cover of seagrass in Lake Macquarie between 2000 and 2004 due to a change in light penetration following a period of lower freshwater inputs (King and Barclay 1986; Wellington 2000; Gray and Wellington 2004).

Annual surveys of seagrass communities in Summerland Point, Chain Valley and Crangan Bay have been undertaken on behalf of LakeCoal since 2008 by Laxton & Laxton. Two species of seagrass are present in these areas, namely, eel grass and paddle weed. The most recent surveys, in 2012, identified that the cover and health of these seagrass communities were the best recorded since the surveys began in 2008 and it was considered that no further improvement in community health was possible in subsequent years.

13.2.5 Marine fauna

Past records of marine fauna in Lake Macquarie include 232 species of fish, four species of turtle, and various reports of prawns, crabs, jellyfish, sharks, rays, eels and octopus. Lake Macquarie is mapped as Key Fish Habitat by DTIRIS and was declared a Recreational Fishing Haven in 2002.

13.3 Impact assessment

13.3.1 Baseline survey results

i Methodology

To determine baseline conditions, a comprehensive survey program was implemented specifically for the Proposal. Surveys were undertaken for water quality, benthic substrate and benthic invertebrates at 18 locations of varying depths within Area 1, each with potential to be undermined (sites prefixed with 1A through 1E), as well as at two control locations (sites C1 and C5) and two locations adjacent to discharges of surface water into the Lake (sites D1A and D1B). All sampling locations are shown on Figure 13.1. Seagrass communities were surveyed along the entirety of the beds within Area 1 and at 26 transect locations (Figure 13.2 – three transects had no seagrass present and were not mapped).

General physicochemical water quality parameters, including temperature, pH, turbidity, conductivity, salinity and dissolved oxygen were measured at 0.5 m below the surface at all sampling locations. Chemical water quality sampling was also taken at 0.5 m below the surface for arsenic, cadmium, chromium, copper, nickel, lead, zinc and iron. Water quality sampling was undertaken in accordance with the relevant Australian and New Zealand standards (AS/NZS 6557.1:1998 and AS/NZS 5667.6:1998) and the *Australian Guidelines for Water Quality Monitoring and Reporting* (ANZECC/ARMCANZ 2000).

Benthic sediment and invertebrates were sampled by a diver using a handheld corer, consistent with relevant industry standards and guidelines (Hewitt & Martin 2001; DoP 2003). Invertebrates that were deceased prior to sampling were not included in the species count as time of death was unknown and some deceased mollusca can remain in the environment for years.

Statistical methods used to analyse the data comprised:

- univariate analysis – observation and analysis of a single statistical variable;
- multivariate analysis – observation and analysis of more than one statistical variable at a time;
- multidimensional scaling ordination analysis – graphical display of sampling sites, with those with similar attributes plotted near each other;
- ANZECC guidelines analysis – analysis of water quality results against the ANZECC/ARMCANZ Guidelines trigger values for ‘Slightly-moderately disturbed ecosystems: Estuaries’; and
- NEPC guidelines analysis – analysis of sediment against the ecological investigation levels for ‘Interim Urban Soils’.

These methods were applied to provide a statistically robust assessment of comparison between assessment locations and environmental data from the baseline survey.

A review of relevant literature, the results of prior studies undertaken on behalf of LakeCoal, and government agency databases was undertaken as part of the aquatic ecology study to support the results of the sampling described above.

ii Water quality

Water quality within the middle of Area 1 is characterised by very low nutrient levels and good light penetration, excellent levels of dissolved oxygen (between 85% and 95.4%), and low algae levels. In situ water quality results for temperature, conductivity and pH values from the baseline survey were generally consistent across the sampling locations, and all within the ANZECC guidelines for estuaries. The results of the multivariate analysis identified that the sampling locations fell into four distinct groups that were generally related to depth or adjacent land use.

Chemical water quality results were below the limits of reporting for the variables and below the ANZECC guidelines for toxicants at all sampling locations.

iii Benthic substrate and invertebrates

The benthic sediment composition at all sampling locations largely comprises a mixture of mud and silt with smaller amounts of shell remnants with composition unrelated to depth or general location within Area 1. All benthic sediment chemical results were below the NEPC Guidelines, except for sampling location R2 (Figure 13.1), located within Area 1E, which had a slightly elevated arsenic level (2 mg/kg above NEPC value). There was no correlation between levels of chemicals in the sediment and depth or general location within Area 1, except for sampling location D1B (Figure 13.1) located near the Colliery's discharge point. Transect locations are shown on Figure 13.2.

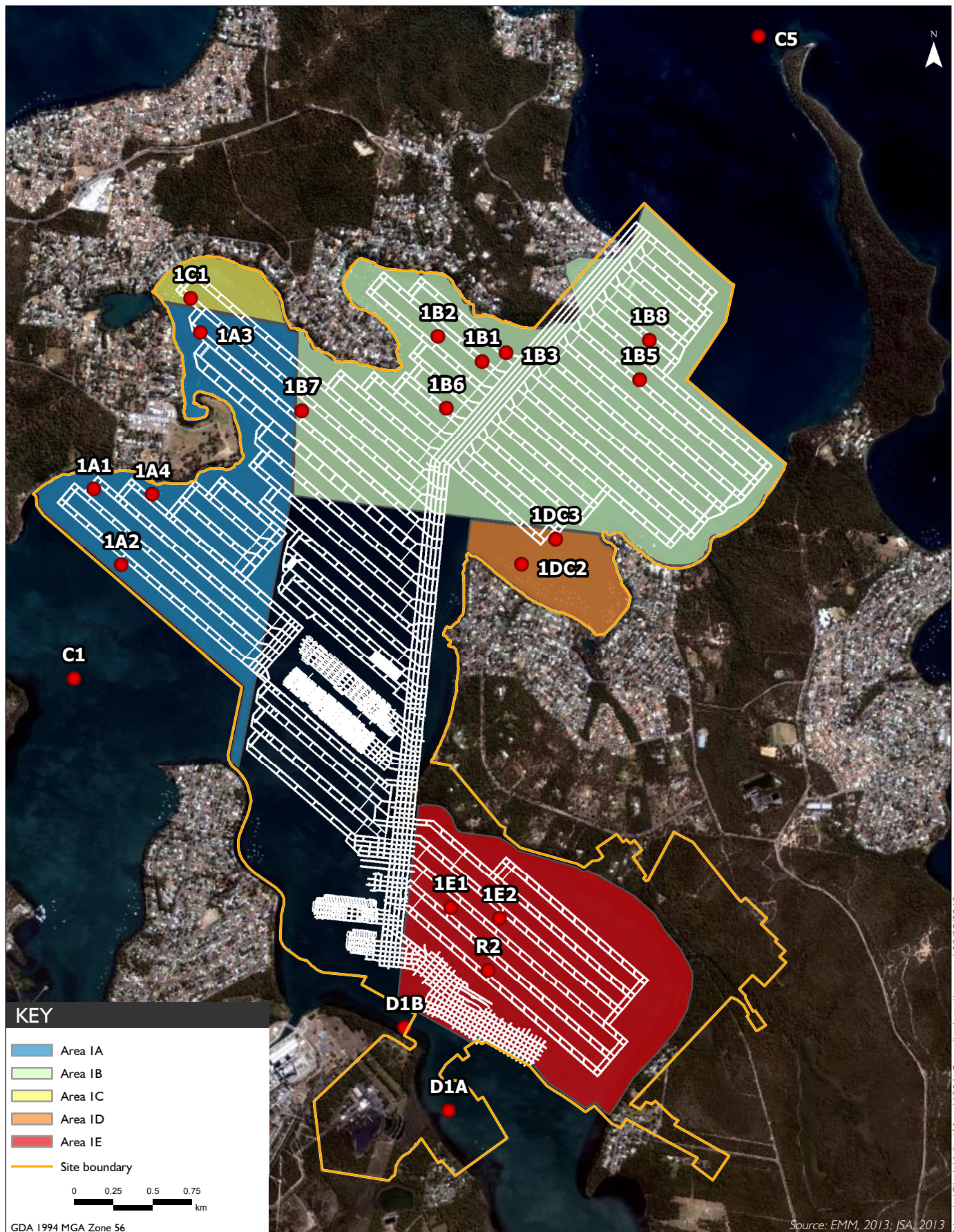
A total of 13 specimens from six taxa were collected from the sampling locations, with the largest number of animals identified at the shallow sites (D1A and D1B (Figure 13.1)). The fauna communities were present in low abundance and diversity. Large numbers of specimens from 10 taxa of previously deceased fauna were also recorded in the sampling.

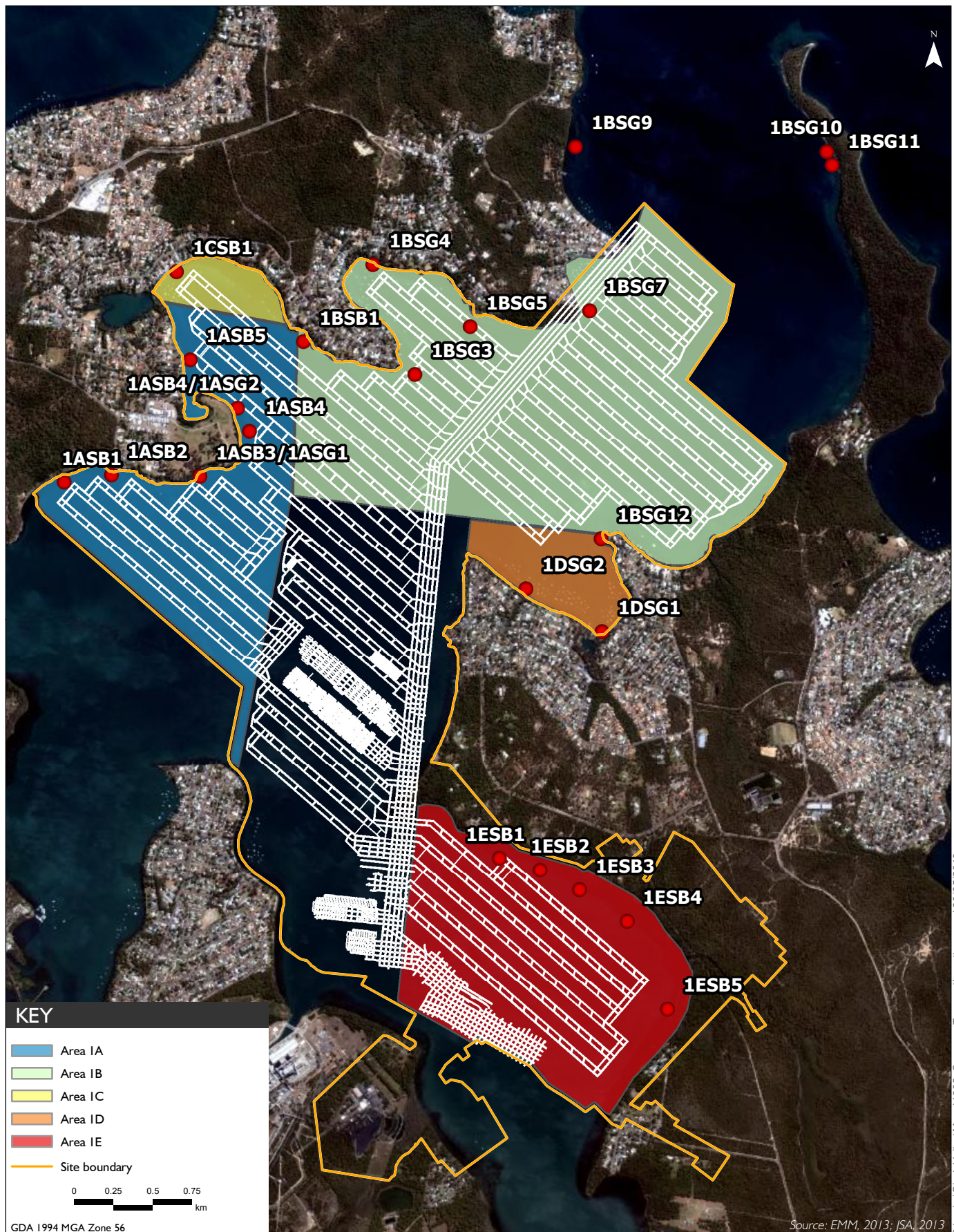
iv Seagrasses

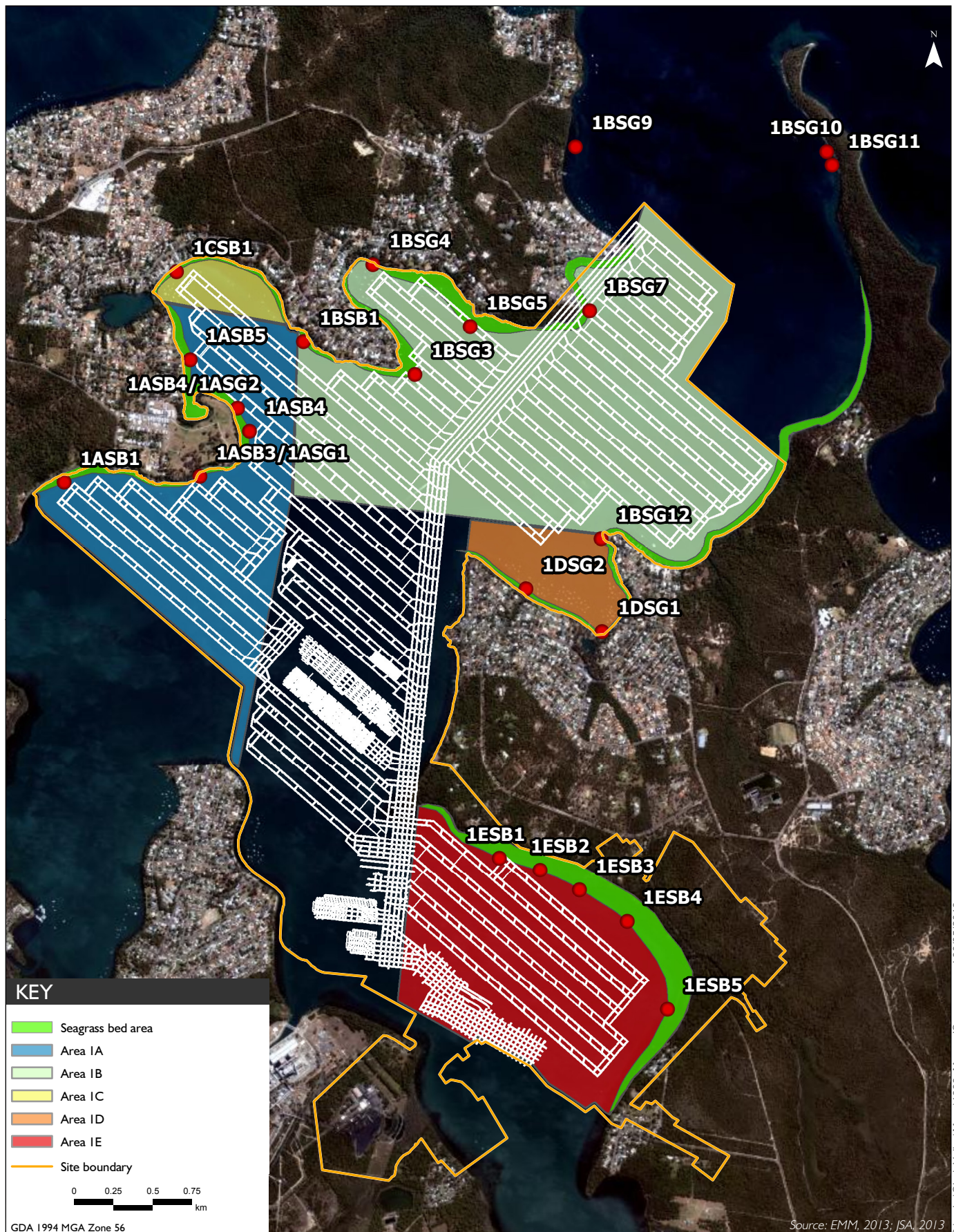
As identified in Section 2.2.2, LakeCoal actively seeks to ensure the protection of seagrass communities in its areas of operation through the implementation of the SPB. A substantial survey program was undertaken for the Proposal to map the cover and health of seagrass communities within Area 1. Based on this mapping, the mine panel layout was modified by applying the SPB to the entire extent of Area 1 to ensure that seagrass communities are protected from subsidence impacts.

Mapping of seagrass communities within Area 1 is shown in Figure 13.3. The survey identified two species of seagrass within the Site, eel grass and *Ruppia sp.* The seagrass communities were generally present as patchy individual plants, particularly in Areas 1C and 1D, though some moderate cover and established beds were present in the remaining areas. Area 1E has the most established seagrass community, in some areas reaching 120 m from the Lake shore. Eel grass was present in all five areas, with *Ruppia* only identified in Area 1E.

A SGMP for the Colliery has been prepared with annual seagrass surveys occurring since 2008. LakeCoal is in the process of updating the SGMP as required under Schedule 3, Condition 6 of MP10_0161. The revised plan would continue ongoing monitoring of seagrasses and a program to predict and manage subsidence impacts and environmental consequences on seagrass beds.







13.3.2 Listed species

A search of relevant databases undertaken 8 August 2012 identified eleven species listed under the EPBC Act, TSC Act and FM Act as potentially occurring within Area 1. Three of these species (Loggerhead turtle, Green turtle and strapweed) were considered to have a moderate or high likelihood to occur within Area 1.

13.3.3 Proposal related impacts

i Subsidence impacts

Subsidence from underground mining activities within Area 1 can result in changes to depth profiles which may directly or indirectly impact on listed species and communities, marine flora including seagrasses, and benthic communities. Predicted subsidence levels were identified in Section 12.3.3 as up to 0.62 m for the majority of Area 1, where there are no overlying historic workings (MWs 1 to 40), and 0.89 m in Area 1E where historic workings overly the proposed panels (MWs 41 to 45).

Subsidence may impact benthic organisms by increasing the depth of the Lake bed and, consequently, decreasing the light penetration of the water column and affecting light dependent biota on which benthic organisms feed. The baseline survey and previous surveys within Area 1 (Laxton & Laxton 2009 and 2011; JSA Environmental 2012) did not indicate a link between community structure and depth, with natural environmental fluctuations in water quality, benthic substrate composition and water depth likely influencing benthic communities. This outcome is consistent with recent studies undertaken for the Colliery, which concluded that subsidence of the Chain Valley Bay floor by around 0.6 m would have minimal impact on benthic organisms (Laxton & Laxton 2009).

It should be noted that previous studies elsewhere have shown a relationship between water depth and benthic species diversity, community structure, distribution and density (Rex 1981; Marine Parks Authority 2008; Aschan 1990; Mackie 2001; White 2008; BHP Billiton 2011). However, these observed differences in depth over which changes to benthic organisms may occur, which varied across studies and differences in depth of between 2 m and 10 m, are not expected under the Proposal where predicted changes in depth are less than 1 m.

Impacts on the three listed marine fauna species that have a moderate or high potential to occur within Area 1 are unlikely based on the habitat present and the implementation of the SPB. Further, no strapweed was identified in the extensive surveys undertaken for the Proposal and the mobile nature of the two turtle species would mean that changes to depth profiles are unlikely to impact these species.

The implementation of the SPB would protect the mapped seagrass communities shown in Figure 13.3 and, therefore, impacts to seagrasses as a result of subsidence are considered highly unlikely. Although the endangered seagrass species strapweed has not been identified within Area 1, the SPB would further ensure there are no potential impacts to this listed species. A slight exceedance ($<1^\circ$) of the 26.5° angle of draw is predicted around the north-eastern limits of MWs 43 and 44. This will result in additional subsidence of less than 10 mm in a 50 m^2 area of the seagrass beds. Monitoring of seagrass beds in this area, undertaken since 2008, has identified the extent and composition of the beds varies naturally over time. This change has generally been greater than 10 mm without any influence from mining. It is, therefore, considered that the slight exceedance of the 26.5° angle of draw is likely to result in negligible impact at this location.

Lake Macquarie has a low energy wave climate as waves are generated by local winds blowing over limited fetches. These waves have a short period and low height. The predicted subsidence would not be significant enough to alter the wave forcing conditions and would not introduce additional energy into the system. Additionally, the implementation of the HWMPB and SPB would ensure no change in depth profiles would occur adjacent to the shoreline. Therefore, no changes to the wave climate, and subsequently shoreline erosion, are predicted to occur as a result of the currently approved level of subsidence or the magnitude of subsidence from the proposed panel layout.

ii Water quality impacts

As indicated in Section 8.3.3, the implementation of the identified surface water management measures is expected to lead to an improvement in the quality of water discharged from the Colliery. Additionally, as only a minor change to peak discharge rates is expected, detrimental impacts to the surrounding environment, including cumulative, long term impacts and impacts to riparian creeks and corridors are not anticipated to occur (see Section 8.3.4).

Monitoring at point D1A, which is located adjacent to where Swindles Creek enters Lake Macquarie, did not indicate any environmental impacts to water quality or sediment quality with results below relevant ANZECC criteria and NEPC guidelines, respectively, for all parameters measured.

13.4 Management and monitoring

In accordance with Schedule 3, Condition 6 of MP10_0161, LakeCoal has developed a BCMP for the Colliery to monitor and mitigate any potential impacts of subsidence on benthic communities. The BCMP includes a monitoring program to verify that Colliery operations only cause minor environmental consequences to benthic communities, and details mitigation measures to be implemented should monitoring determine any adverse impacts.

Commitments relating to the management and monitoring of potential impacts on marine ecology as a consequence of the Proposal are detailed below:

- revise the BCMP to include the sampling locations shown in Figure 13.1;
- undertake the seasonal surveys (spring and autumn) required under the BCMP for the Site;
- undertake additional independent sampling and analysis to validate results obtained during monitoring, if impacts due to subsidence are determined to be moderate or greater. If positively verified, the mine plan would be reviewed for future panels to achieve a minor or lesser impact;
- revise the SGMP to include the transect locations shown in Figure 13.2;
- continue annual seagrass surveys/monitoring;
- continue annual subsidence surveys (bathymetric surveys) and land based surveys;
- include results from the BCMP and SGMP within the Colliery's Annual Review; and
- make the Annual Review and annual subsidence surveys available on LakeCoal's website.

13.5 Conclusion

Subsidence and water quality impacts on marine ecology in Lake Macquarie were assessed for the Proposal.

Benthic communities within the Site have previously been surveyed to determine the potential impacts of subsidence. These surveys have determined that abundance and community assemblage were not strongly linked to site type (including depth). Rather, analysis of the data identified that a complex interaction of environmental variables including depth, dissolved oxygen levels, turbidity and sediment composition were influencing community assemblage. The predicted low levels of subsidence are, therefore, unlikely to impact benthic organisms.

Mapping of seagrass communities within the Site was undertaken to determine the SPB and the mine plan subsequently amended to ensure no subsidence impacts on seagrasses. Further, LakeCoal is in the process of revising the SGMP for the Colliery. This plan would include ongoing monitoring of seagrasses and a program to provide further protection against adverse impacts on seagrass beds. It is therefore concluded that the Proposal would not adversely impact seagrasses.

There is moderate to high potential for three listed marine species to occur within the Site including the Loggerhead and Green turtles and the seagrass, strapweed. These species are unlikely to be impacted by the Proposal given the exclusion of secondary extraction within the SPB and the highly mobile nature of the turtle species which are unlikely to be impacted by the predicted changes in depth.

The Proposal is expected to result in an improvement in the quality of water discharged from the Colliery and detrimental impacts to the surrounding environment are not anticipated to occur.

The BCMP includes a robust monitoring program that will be updated to incorporate the Proposal and will provide a rigorous approach to determining the level of impact from subsidence, if any, on benthic communities. If impacts are positively verified to be moderate or major, i.e. not in accordance with the requirements of MP10_0161, future miniwall panels would be modified to achieve a minor or lower impact.

14 Terrestrial ecology

14.1 Introduction

This chapter provides an assessment of the potential impacts to terrestrial ecology resulting from the Proposal. The chapter identifies the location of sensitive terrestrial flora and fauna within the Colliery's operational areas at the pit top and Summerland Point ventilation shaft and fans and their surrounds (referred to in this chapter as 'the study area'). It also assesses the significance of potential impacts on any sensitive features and provides management and monitoring measures to prevent or minimise potential impacts.

14.2 Existing environment

The Colliery contains two land-based areas that include remnant native vegetation, namely: the pit top area and the ventilation shaft and fans at Summerland Point. The latter lies within a large bushland block that adjoins vegetated land and the Lake Macquarie State Recreation Area. The pit top area, though primarily cleared for buildings, laydown and other hardstand areas, coal stockpiles and miscellaneous infrastructure, contains patches of remnant vegetation, with adjacent areas including the VPPS, power line easements and infrastructure and residential developments.

The VPPS perimeter lands were surveyed for biodiversity in 1995 – 1996 and again in 2010 as part of the management planning for the area. The studies provided information on the local occurrence of significant terrestrial flora and fauna species. One of the survey sites was located within the Colliery's pit top area.

Additional surveys of the study area were undertaken by EMM ecologists in April and May 2012. Surveys at this time were limited to characterising vegetation communities and identifying fauna habitat and signs of use by fauna. Plot-based surveys were conducted within vegetation downstream of the sedimentation dams to provide a baseline for ongoing monitoring, in line with the BMP prepared in accordance with Schedule 3, Condition 34 of MP10_0161.

The description of the existing environment provided in the following sub-sections is based on survey results and searches of the databases listed below.

- OEH 2012a, *NSW Wildlife Atlas* Database for threatened species of the Lake Macquarie 1:25,000 map sheet, requested August 2012;
- OEH 2012b, Threatened species profiles for the Hunter-Central Rivers CMA, www.threatenedspecies.environment.nsw.gov.au, viewed September 2012;
- DSEWPac 2012, Species Profiles and Threats (SPRAT) Database, www.environment.gov.au/epbc, accessed September 2012; and
- The Royal Botanic Gardens and Domain Trust 2011, PlantNET – the Plant Information Network System of The Royal Botanic Gardens and Domain Trust, Sydney, <http://plantnet.rbgsyd.nsw.gov.au>, accessed September 2012.

14.2.1 Terrestrial flora

i Vegetation types

Two broad vegetation communities were identified within the study area: Coastal Open Forests and Coastal Swamp Forests. The components and characteristics of these broad vegetation communities are discussed in the following sections. The relationship of the vegetation communities identified within these broad communities and regional vegetation type databases and other classification schemes are provided in Table 14.1.

Table 14.1 Relationship of EMM identified vegetation communities with regional classifications

| Vegetation community (EMM) | Vegetation formation (Keith 2006) | Vegetation class (Keith 2006) | LHCCREMS (2003) map unit (MU) | Biometric vegetation type |
|-----------------------------|--|--|---|---|
| Coastal Open Forest | | | | |
| Coastal Open Woodland | Dry sclerophyll forests (shrubby subformation) | Sydney Coastal Dry Sclerophyll Forests | MU30: Coastal Plains Smooth-barked Apple Woodland | Smooth-barked Apple - Red Bloodwood open forest on coastal plains on the Central Coast, Sydney Basin |
| Grassy Open Woodland | Dry sclerophyll forests (shrubby subformation) | Sydney Coastal Dry Sclerophyll Forests | MU31: Coastal Plains Scribbly Gum Woodland | Scribbly Gum - Red Bloodwood healthy woodland on the coastal plains of the Central Coast, Sydney Basin |
| Coastal Swamp Forest | | | | |
| Swamp Sclerophyll Forest | Forested Wetlands | Coastal Swamp Forests | MU37: Swamp Mahogany – Paperbark Forest | Forest Red Gum - Rough-barked Apple open forest on poorly drained lowlands of the Central Coast, Sydney Basin |
| Swamp Oak Forest | Forested Wetlands | Coastal Floodplain Wetlands | MU40: Swamp Oak Bushland Forest | Swamp Oak swamp forest fringing estuaries, Sydney Basin and South East Corner |
| Mangroves | Saline Wetlands | Mangrove Swamps | MU47: Mangrove-Estuarine Complex | Mangrove forest in estuaries of the Sydney Basin and South East Corner |

Notes: LHCCREMS = Lower Hunter Central Coast Regional Environmental Management Strategy

a. Coastal open forests

Coastal Open Forests, comprising Coastal Open Woodland and Grassy Open Woodland, occur in both the pit top and ventilation shaft and fans areas (see Figure 14.1). These areas contain a mixture of vegetation types dominated by either Narrow-leaved Scribbly Gum (*Eucalyptus haemastoma*), Red Bloodwood (*Corymbia gummifera*) or Smooth-barked Apple (*Angophora costata*). Within the Chain Valley area these communities generally occur above 5 m AHD (i.e., around 5 m above the high water mark) and are not influenced by tidal movements or inundation by floodwaters.

b. Coastal swamp forests

Coastal Swamp Forests generally occur below 5 m AHD. Several types occur within the study area including:

- Mangroves;

- Swamp Sclerophyll Forest; and
- Swamp Oak Forest.

Patches of Mangroves occur along the tidal Swindles Creek and onto the lake foreshore. The creek is subject to tidal flows from the lake, which has provided suitable conditions for Mangroves to grow. Mangroves are under water for the majority of the time, which limits the ability of other communities such as Saltmarsh and Swamp Oak Forest to occur in these areas.

Swamp Sclerophyll Forest occurs on the deeper alluvial soils where drainage is impeded and standing water occurs after rain (see Figure 14.1) and, within the study area, are not influenced by saline tidal waters or discharge waters associated with the sediment ponds. The community is dominated by Swamp Mahogany (*Eucalyptus robusta*), paperbarks (*Melaleuca sieberi*, *Melaleuca quinquenervia*) and Forest Red Gum (*Eucalyptus tereticornis*).

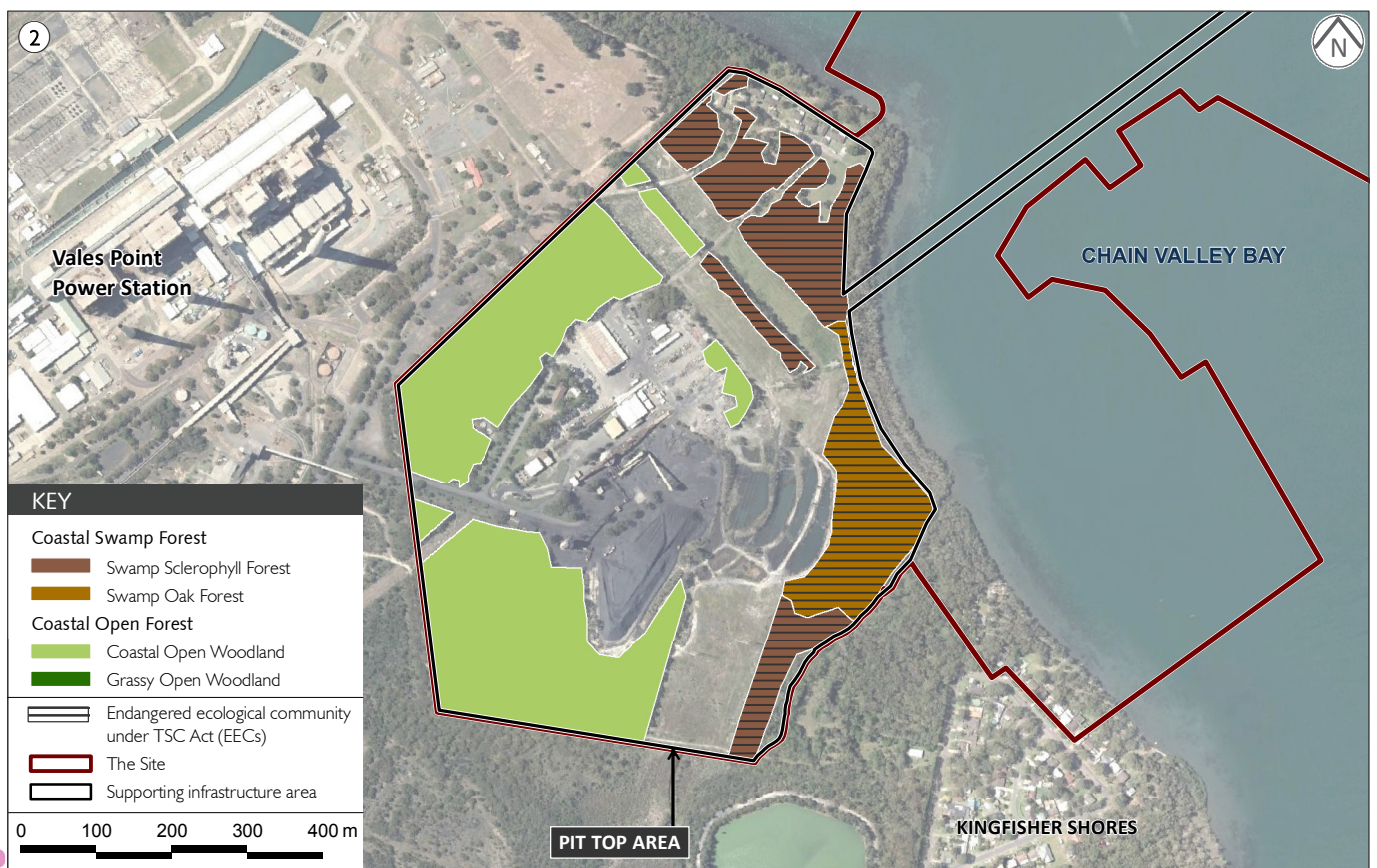
Swamp Oak Forest typically occurs in estuaries where tidal influence has created saline groundwater, but in areas that are not always inundated by saline or freshwater. The understorey is influenced by the amount of tidal influence and salinity within floodwaters. Within the broader Lake Macquarie area, this community typically fringes the lake foreshore and has been subject to clearing for residential developments on the water's edge.

The Swamp Oak Floodplain Forest and Swamp Sclerophyll Forest vegetation types are common within the locality and are both part of much larger remnants associated with Lake Macquarie and its foreshores. Over 5,000 ha of Swamp Sclerophyll Forest and 590 ha of Swamp Oak Floodplain Forest have been mapped within the wider Lower Hunter and Central Coast region (LHCCREMS 2003).

The area to the east of the sedimentation dams has been mapped as containing Swamp Sclerophyll Forest (LHCCREMS 2003). However, the vegetation in this area is considered to be a Swamp Oak Forest community, as it is dominated by juvenile Swamp Oaks (*Casuarina glauca*). Some dead eucalypts do occur in this area and it is likely that it used to comprise Swamp Sclerophyll Forest. Swamp Oak Forest is differentiated from Swamp Sclerophyll Forest by the dominance of Swamp Oak, the low abundance of eucalypt species and position in the landscape (where flooding is periodic and soils show some influence of saline groundwater).

The composition of species in the Swamp Oak Forest appears to have been influenced by the release of saline water from the adjacent sedimentation dams. As the area is relatively flat, but unlikely to be subject to tidal influence, discharged water is currently ponding. Several saltmarsh species, which generally require tidal inundation with saline water, occur throughout the Swamp Oak Forest, including *Selliera radicans*, *Suaeda australis* and *Samolus repens*. Other understorey species include sedges and rushes such as *Juncus spp.*, *Schoenus brevifolius*, *Chorizandra cymbaria* and Water Couch (*Paspalum distichum*).

Without the sedimentation dam water, this area is only likely to be inundated by water from nearby Swindles Creek and runoff from other surrounding areas after large flood events. The immature Swamp Oaks present are likely to have migrated from the lake edge as a result of increased saline influence from the sedimentation dam discharge. The community presently appears to be in transition and generally in poor health, as is evident from the presence of weed species, dominance of sedges and rushes, and the density and health of Swamp Oaks.



Terrestrial vegetation communities and EECs
within the Colliery's supporting infrastructure areas

ii Threatened ecological communities

Several threatened ecological communities (TECs) listed under the TSC Act have been recorded within the region and have the potential to occur within the study area. The vegetation identified within the study area was compared with the identified threatened ecological community descriptions and NSW Scientific Committee final determinations.

The vegetation within the Coastal Open Forest areas is not considered to meet the description of any TECs. However, two vegetation types within the Coastal Swamp Forest areas are considered to meet the description of TECs, namely: Swamp Sclerophyll Forest and Swamp Oak Forest.

The Swamp Sclerophyll Forest community is considered to represent Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, which is listed as an EEC in NSW under the TSC Act. Within the study area, it surrounds some of the ventilation shaft and fans and occurs to the south and north-west of the sedimentation dams.

The Swamp Oak Forest is considered to represent Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions, which is listed as an EEC in NSW under the TSC Act. This community occurs to the east of the sedimentation dams and fringes the estuarine areas of the study area.

iii Threatened flora

Several threatened flora species have been recorded within the VPPS Perimeter Lands (Ecotone 2010) and the immediate locality (5 km radius) (NPWS Wildlife Atlas). These include the Charmhaven Apple (*Angophora inopina*), Leafless Tongue Orchid (*Cryptostylis hunteriana*), Black-eyed Susan (*Tetratheca juncea*), Bynoe's Wattle (*Acacia bynoeana*) and Thick-lipped Spider Orchid (*Caladenia tessellata*)

The potential for these species to occur within the Colliery pit top area has been assessed based on the available habitat and disturbance history of the study area (Appendix K, Table K.1.). All five species are considered to have a low potential to occur within any areas of the study area.

14.2.2 Terrestrial fauna

Surveys of the pit top area undertaken in 2010 recorded 12 birds, 11 mammals (four bats and seven non-flying mammals) and one reptile species (Ecotone 2010). The diversity of terrestrial fauna was much lower within the pit top area than the surrounding sites sampled within the VPPS perimeter lands. This is likely to be a result of the small patches of remnant vegetation and lack of connectivity to larger tracts of native vegetation external to the pit top area. However, the diversity of fauna within the area of the ventilation shaft and fans site is likely to be higher given the connectivity with large remnants including the Lake Macquarie State Recreation Area.

Bat species recorded by Ecotone (2010) in the pit top area comprised Gould's Wattled Bat (*Chalinolobus gouldii*), Chocolate Wattled Bat (*Chalinolobus morio*), Little Freetail Bat (*Mormopterus* sp. 2) and Little Forest Bat (*Vespadelus vulturnus*). The study also detected Brown Antechinus (*Antechinus stuartii*), Swamp Rat (*Rattus lutreolus*), Bush Rat (*Rattus fuscipes*), Common Brushtail Possum (*Trichosurus vulpecula*), Common Ringtail Possum (*Pseudocheirus peregrinus*) and Swamp Wallaby (*Wallabia bicolor*).

The Common Eastern Froglet (*Crinia signifera*) was heard calling during the current survey in a small pool adjacent to the sedimentation dams and the Grass Skink (*Lampropholis delicata*) was recorded in the Coastal Open Forest areas.

Evidence of the presence (i.e., tracks and scats) of pest species was recorded within and surrounding the pit top area. Species recorded included the European Red Fox (*Vulpes vulpes*), Feral Rabbit (*Oryctolagus cuniculus*) and Feral Pig (*Sus scrofa*). However, these feral animals do not appear to be abundant.

i Threatened fauna

Several threatened fauna species have been recorded within the VPPS perimeter lands (Ecotone 2010) and the locality (NPWS Wildlife Atlas). The potential for these species to occur within the study area has been assessed based on the available habitat and disturbance history.

Species of note that have been recorded within the study area include the Squirrel Glider (*Petaurus norfolcensis*) and the Grey-headed Flying Fox (*Pteropus poliocephalus*) (Ecotone 1997), both listed as threatened under the TSC Act, with the latter also listed under the EPBC Act. During the surveys for the Proposal, the Osprey (*Pandion haliaetus*), listed as vulnerable under the TSC Act, was also recorded along the Lake's edge, roosting in mature Swamp Oak Floodplain Forest to the east of the sedimentation dams.

Twenty threatened fauna species have been previously recorded near the study area. However, they are unlikely to occur in, and surrounding, the sedimentation dams due to unsuitable habitat.

The likelihood of occurrence and recorded locations for threatened fauna species is shown in Appendix K, Table K.2.

ii Migratory species

Three migratory species were recorded during the recent surveys for the Proposal: the White-bellied Sea-eagle (*Haliaeetus leucogaster*), Cattle Egret (*Ardea ibis*) and the Osprey. A breeding pair of White-bellied Sea-eagles was observed in bushland surrounding the ventilation shaft and fans on the Lake's edge. It is considered that the study area is within the pairs' home range and, given that the sighting was in August, it is likely that the species is nesting nearby. No nests were identified in proximity to the infrastructure or sedimentation dams within the Site.

The Osprey sighted within the study area was roosting in a large Swamp Oak on the edge of the lake to the east of the pit top area. No nests or killing trees were identified within the area and, given the mobile nature of this species, it is likely that the study area is part of a larger home range for this individual.

The Cattle Egret (*Ardea ibis*) was also identified foraging around the sedimentation dams during the survey. It is likely that this species utilises this area as foraging habitat.

The Ecotone (2010) study identified the Rainbow Bee-eater (*Merops ornatus*) and Great Egret (*Ardea alba*) within the wider perimeter lands area. It is possible that the study area provides some potential foraging habitat for these migratory species.

14.3 Impact assessment

Potential impacts to terrestrial biodiversity as a result of the Proposal comprise:

- direct impacts:
 - sedimentation dam embankment upgrade and diversion works for the discharge point;

- indirect impacts:
 - increased traffic at night between the pit top area and the VPPS as a result of coal truck movements;
 - ongoing release of mine discharge water into and from sedimentation dams;
 - continued and ongoing operational impacts from noise, light, dust and edge effects; and
 - changes to local microclimate from the outputs of the ventilation shaft and fans.

14.3.1 Terrestrial flora

i Threatened Flora

No threatened flora species have been identified within or in proximity to any of the potential impact areas. It is considered unlikely that the sedimentation dam embankment area provides suitable habitat for any threatened flora species identified as occurring within the wider locality.

ii Vegetation clearing and disturbance

The immediate area containing native vegetation that would be directly impacted by the Proposal is on and adjacent to the existing sedimentation dam wall where diversion and upgrade works are proposed. These works would impact on an area identified as containing a degraded form of the Swamp Oak Floodplain Forest and occur adjacent to an area of higher quality Swamp Sclerophyll Forest.

a. Swamp Oak Floodplain Forest EEC

Any changes to the current hydrological cycle (even though it is not natural), may impact on this community. Too much or not enough water could have effects on future species composition in this area. While Swamp Oaks can tolerate saline groundwater, too much saline water may lead to dieback, as is evident from the areas where the sedimentation dams have permanently inundated areas of the community. Conversely, too little inundation may cause changes to the composition of the community allowing further invasion of weeds.

Changes in the quality and quantity of water discharges from the sedimentation dams and seepage through the embankment, could also affect the health of the vegetation in this area. In accordance with the Colliery's BMP, changes in the condition and composition of this community are being monitored to ensure that the vegetation in this area is not negatively impacted by the operations at the Colliery.

The proposed works would upgrade the sedimentation dam wall adjacent to the Swamp Oak Floodplain Forest area, preventing future leakage through the wall, formalising the discharge location (spillway) and incorporating a new discharge monitoring system. This may decrease the extent that the mine water discharge enters the Swamp Oak Floodplain Forest. This could potentially have a beneficial impact on the health of the vegetation present, by reducing the area of the community permanently inundated by saline water.

Approximately 0.25 ha of Swamp Oak Floodplain Forest would be directly impacted from the proposed embankment upgrade, with an additional 0.12 ha of the community directly impacted from the new spillway works. Therefore, up to 0.37 ha of Swamp Oak Floodplain Forest would be directly impacted by the Proposal. The community at this location is shown in Photograph 14.1.

The significance of this impact and additional indirect impacts from the changes to the water regime in this area for the community has been assessed under Part 5A of the EP&A Act (seven-part test – Appendix K). It is considered that the Proposal would not significantly impact on this community as:

- the community is currently in poor health, as is evident from the presence of weed species, dominance of sedges and rushes, and the density and health of Swamp Oaks;
- large remnants of Swamp Oak Floodplain Forest have been mapped within the wider Lower Hunter and Central Coast region;
- the proposed embankment work areas only contain artificial habitat for the community;
- the potential beneficial impacts from reducing mine water discharge to the community; and
- the potential beneficial impacts from the reduced salinity of groundwater discharged under the Proposal to the community.

The greatest threat to the ecological integrity of the threatened ecological communities at the Site and immediate surrounds is the invasion by noxious weeds, particularly when inundation and salinity regimes are changed as a result of the proposed discharge works, which will increase the potential for invasion. The clearing of vegetation for the discharge works is considered to be minor in comparison to the potential effects of noxious weeds on the health of remnant vegetation. It is, therefore, considered that the removal of these weeds would more than compensate for the impacts of the Proposal on the Swamp Oak Floodplain Forest EEC and other remnant vegetation in the local area. Proposed weed management measures are detailed in Section 14.4.3.

Photograph 14.1 Swamp Oak Floodplain Forest adjacent to the sedimentation dams



The monitoring program being undertaken at the Colliery would identify any potential negative impacts to the community from changes to the water regime.

The Colliery's BMP details the management of terrestrial biodiversity within the pit top and ventilation shaft and fans areas and includes a monitoring program for the Swamp Oak Floodplain Forest. As a baseline could not be established for the community prior to the sedimentation dam releases, a baseline (or local benchmark) was established in August 2012 against which the outcomes of the annual monitoring program would be assessed.

The monitoring program would determine if the condition of the vegetation within the EEC area is declining or improving with triggers established to determine if the condition and health of the ecosystem decreases significantly. If condition triggers are exceeded, OEH's BioBanking Credit Calculator would be used to determine the relevant offsetting requirements based on the baseline condition of the community established within the monitoring program. The monitoring program would continue for the life of the mine.

b. Swamp Sclerophyll Forest EEC

The proposed discharge alteration (spillway) works are located adjacent to an area of Swamp Sclerophyll Forest. An unsealed vehicle track to Swindles Creek forms the boundary between this community and the Swamp Oak Floodplain Forest to the north. The Swamp Sclerophyll Forest appears to be on higher topography than the Swamp Oak Floodplain Forest area and is not influenced by sedimentation dam discharge water.

The proposed discharge alteration works would be configured to prevent any direct impacts on this community. However, the discharge channel installation and operation could result in indirect impacts to this community. This may arise from inappropriate sediment and erosion control measures during construction and excessive discharge events from the sedimentation dams resulting in the release of saline water into the Swamp Sclerophyll Forest area. These potential impacts would be mitigated through appropriate design and construction management.

Microclimatic changes to this community in the vicinity of the ventilation shaft and fans site could occur from the outputs of the ventilation fans, which could influence the health of the community. However, a ventilation fan has been operating in this area for over thirty years with little, if any, observable impact. Annual monitoring of the health of vegetation in this area is also identified in the BMP.

An assessment of the significance of potential impacts to this community within the study area has been completed for the Proposal under Part 5A of the EP&A Act (seven part test – Appendix K) and concluded that the Proposal would not significantly impact the Swamp Sclerophyll Forest as:

- it would not isolate or fragment areas of the EEC within the local area;
- the area where the EEC occurs is not considered important to the long term viability of the community in the local area;
- it is not expected to adversely affect extent of the EEC within the locality; and
- there are potential beneficial impacts for the community as a result of reducing impacts from mine water discharge, where it occurs adjacent to the discharge area.

iii Weeds

The proposed sedimentation dam works have the potential to introduce and increase the abundance of weeds in this part of the study area. The Colliery's BMP includes a monitoring program to identify any new and large weed infestations in remnant bushland and provides the management actions required should these be identified. In addition, specific management and monitoring measures (Section 14.4) would minimise the potential for weeds to be spread during the works.

iv Dust

Indirect impacts of coal dust from truck movements and the coal stockpile was raised as an issue during the exhibition of the previous environmental assessment for the Colliery. During the recent site visit, the vegetation surrounding the haul route and the coal stockpile were visually inspected. Coal dust was not influencing the diversity or health of vegetation in these areas, which was in a similar condition to the vegetation in other parts of the study area. The Proposal to extend the mine life, increase truck movements and the amount of coal stockpiled over time is, therefore, considered unlikely to significantly affect the condition of surrounding vegetation.

14.3.2 Terrestrial fauna

i Threatened fauna

No threatened fauna species have been identified within or in proximity to any of the potential impact areas. The Proposal would impact a small area of Swamp Oak Floodplain Forest. As a result of the saline discharge to this area, the juvenile vegetation and the lack of habitat complexity, it is not likely to provide significant fauna habitat for any threatened fauna species.

Several threatened and migratory fauna species have been recorded within and surrounding the pit top and Summerland Point ventilation shaft and fan areas. Assessments of significance were undertaken for these species to determine the significance of any potential indirect impacts (under Part 5A of the EP&A Act (seven part test) and the Significance Impact Guidelines under the EPBC Act).

The assessments for threatened fauna species likely to occur within proximity to the Colliery concluded that the Proposal is unlikely to result in significant impacts as:

- the proposed work areas are not considered to represent important habitat for the Osprey, or suitable habitat for the Grey-headed Flying-fox or Squirrel Glider; and
- indirect impacts to potential nest and feeding trees for these species would be prevented.

Assessments of the significance for migratory species concluded that the Proposal is unlikely to have a significant impact as:

- ecologically significant proportions of the species do not reside in the Site; and
- the proposed work areas do not contain important habitat for the species.

ii Fauna habitat and movement

Potential habitat occurs within the pit top and ventilation shaft and fans areas within the remnant native vegetation for a range of fauna species. The threatened Squirrel Glider and Grey-headed Flying-fox have both been recorded in proximity to the pit top operational area (Ecotone 2010). However, this area is isolated from other remnant vegetation as a result of roads and power line easements.

The Proposal would not require the removal of any remnant native vegetation; however, truck movements within the study area would be extended offsite, including night movements. This has the potential to create additional risk from vehicle strike to fauna species that are moving between habitat patches at night. However, given the short haulage route and the low speed of the vehicles, it is unlikely that any increase in risk would be significant.

Given the current 24 hour operations of the Colliery that has been operating for over 50 years, it is considered that the fauna within the study area are already familiar with the indirect impacts from noise, light spill and dust surrounding the operational areas in the pit top and ventilation shaft and fans. Species using habitat in proximity to the operational areas are likely to have adapted to these indirect impacts. Therefore, ongoing operations as well as potential infrastructure upgrades, including any additional lighting at the pit top area, are unlikely to have a significant impact on fauna or their habitat within the study area.

iii Pest animals

The Proposal is unlikely to increase the abundance or distribution of feral animal species, given the already disturbed nature of the Colliery operational areas and the minor nature of the proposed works. In addition, the works would not create additional shelter or den sites or create tracks or other movement corridors for pest species.

The Colliery's BMP, which includes measures to monitor and manage feral animals, would be extended to accommodate the Proposal. This would ensure that the abundance and distribution of pest animals are monitored and appropriate action is undertaken if triggers are exceeded.

iv Key threatening processes

Key threatening processes (KTPs) are the events and processes that threaten, or could threaten, the survival or evolutionary development of species, populations or ecological communities. Thirty six KTPs are currently listed in NSW under the TSC Act and 19 KTPs are listed under the EPBC Act. Table 14.2 lists the KTPs with the potential to be exacerbated as a consequence of the Proposal. The table also summarises the likely impacts of the Proposal on these KTPs.

Table 14.2 Key threatening processes and significance of threat

| Key threatening process | Relevance to Proposal and Study Area |
|--|---|
| Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands | <p>The Colliery has an existing licence to discharge water into the tidal Swindles Creek which flows into Lake Macquarie. Therefore, the potential impacts to the creek and estuary have already been assessed and approved. However, the proposed works would extend the period over which water is discharged into this system and would also change the discharge point, through a formalised spillway, around 30 m south-west of the current spillway.</p> <p>The works would also likely remove much of the current supply of saline water entering the Swamp Oak Floodplain Forest patch to the east of the sedimentation dams. This has the potential to alter the condition and composition of the community in this location, perhaps returning the vegetation to its original Swamp Sclerophyll Forest community structure. The composition and condition of the community would be monitored in accordance with the BMP, with appropriate actions undertaken should the community be negatively impacted as a result of the changes to the current artificial flow regime.</p> |
| Clearing of native vegetation | Up to 0.37 ha of vegetation representative of the Swamp Oak Floodplain Forest would be removed for the embankment upgrade and spillway works as part of the Proposal. This vegetation is in poor condition and is not considered to provide significant habitat for fauna species. |
| Competition and grazing by the feral European Rabbit | While European Rabbits occur within the study area, their current impact appears to be minor. It is considered that the proposed works would not significantly increase the level of this threat. Feral animal control would be undertaken if required, in accordance with the BMP. |
| Dieback caused by the root-rot fungus (<i>Phytophthora cinnamomi</i>) | This fungus is known to occur on the east coast of NSW. It could be spread to the Site from machinery and workers vehicles, shoes and tools. Appropriate controls will be included within the updated BMP to minimise the potential spread of this disease to and within the study area. |
| Ecological consequences of high frequency fires | No fires will be lit for mine operations, however some small controlled fires may be used on occasions for fire training. In addition, some construction plant may be used that could spark in grasslands on hot days, posing a risk to retained native vegetation. Appropriate bushfire controls would be in place for the Proposal to reduce this threat. |
| Introduction and establishment of Exotic Rust Fungi of the order Uredinales pathogenic on plants of the family Myrtaceae | The area of highest risk in NSW is the coastal zone from the Illawarra north to the Queensland border, particularly Myrtaceae-dominated communities of heath, woodland and forest. Appropriate controls would be included within the updated BMP to minimise the potential spread of this disease to and within the study area. |
| Predation, habitat degradation, competition and disease transmission by Feral Pigs | Feral Pig activity was low in the study area. The abundance and distribution of this pest will be monitored in accordance with the BMP and appropriate actions undertaken for its control should triggers be exceeded. |
| Predation by European Red Fox | Fox activity within the study area was considered to be low and no ground-dwelling threatened fauna species have been identified within the study area. The Proposal is unlikely to increase the risk of predation by the Fox and the abundance and distribution of this pest will be monitored in accordance with the BMP and appropriate actions undertaken for its control should triggers be exceeded. |

v Critical habitat

Critical habitat has not been declared for any species, population or community that occurs within the study area.

14.4 Management and monitoring

14.4.1 Avoidance measures

Avoidance of adverse ecological impacts was considered during the design of the Proposal. An example of the outcomes of this process is all minor upgrades and modifications to surface infrastructure being proposed within existing disturbance areas; with the exception of a section of the proposed sedimentation dam upgrade. Ecological avoidance considerations for the associated minor works are provided in Section 3.3.4 (ii).

14.4.2 General management measures

In accordance with Schedule 3, Condition 34 of MP10_0161, LakeCoal has prepared a BMP for the management and monitoring of impacts to terrestrial ecology. The BMP includes measures for:

- management of retained native vegetation and habitat;
- control of feral animals and weeds;
- management of fire and public access; and
- ecological monitoring of receiving waters of the minewater discharge, the Swamp Sclerophyll Floodplain Forest downstream of the EPL discharge point and the remnant woody vegetation around the Summerland Point ventilation shaft and fan.

Additional management and monitoring measures that will be implemented to minimise any potential impacts arising from the Proposal, include:

- undertaking detailed design of the embankment and spillway works in consultation with an ecologist to minimise potential impacts on the Swamp Oak Floodplain Forest EEC;
- undertaking pre-clearing surveys by an ecologist to minimise the impact to vegetation of conservation significance and survey for fauna prior to clearing works being undertaken within the embankment and spillway area;
- the delineation of the clearance footprint with all surrounding vegetation cordoned off as a 'no go' zone;
- minimising disturbance areas where possible and stockpiling of materials, parking of machinery etc. in previously cleared areas;
- preventing, where possible, the removal of dead standing and fallen timber during any clearing works or, if required to be removed, their relocation into suitable habitat areas nearby;
- monitoring and management of flora and fauna in accordance with the BMP for the life of the mine. This will include monitoring of:
 - the condition and composition of the Swamp Oak Floodplain Forest area;
 - the condition of vegetation adjacent to the ventilation shaft and fans;
 - the location and distribution of weed infestations; and

- the abundance and distribution of feral animal use;
- cleaning of equipment used for the earthworks associated with the embankment and spillway construction to ensure the removal of excess soil potentially containing pathogens and weed seeds prior to entering the Site;
- installation of sediment fencing surrounding the proposed earthwork areas, in accordance with a site-specific erosion and sediment control plan for the works; and
- release of sedimentation dam water from Dam 10 prior to the works being undertaken, if required, in a controlled manner over a number of days to ensure that the release does not result in significant erosion and sedimentation to the Swamp Oak Floodplain Forest.

14.4.3 Weed management

The following weed management measures have been identified to ensure an improved ecological outcome as a result of the Proposal:

- noxious weeds will be removed and continually controlled from the pit top area, allowing for natural regeneration of vegetation;
- weed invasion will be monitored as part of the Colliery's BMP; and
- the condition of the EEC areas will be monitored through the Colliery's BMP.

14.5 Conclusion

The Proposal would result in minimal disturbance to terrestrial ecology as the majority of the works would occur underground. However, the sedimentation dam upgrade works, ongoing discharge of mine water and extension of operational impacts, have the potential to result in limited direct and indirect impacts to terrestrial biodiversity.

No significant impacts on threatened flora or fauna would occur as a result of the Proposal. However, the proposed sedimentation dam upgrade works would be undertaken within an area containing vegetation that is in poor condition, but meets the description of Swamp Oak Floodplain Forest EEC. This vegetation is unlikely to represent the original community in this location, as it has been heavily influenced by the salinity of the mine water discharge from previous operations. Up to 0.37 ha of this community would be directly impacted as a result of the proposed works to upgrade the sedimentation dam wall and formalise a new spillway.

It is possible that the area of Swamp Oak Floodplain Forest EEC, through which the mine water discharges, would be indirectly impacted as a result of the sedimentation dam upgrade works decreasing discharges to this area. This may change the composition and condition of this EEC; however, impacts may be positive as the current condition of vegetation is a consequence of the persistent saline standing water in the area.

The Swamp Oak Floodplain Forest and Swamp Sclerophyll Forest vegetation types are common within the locality and both are part of much larger remnants associated with Lake Macquarie and its foreshores. Over 5,000 ha of Swamp Sclerophyll Forest and 590 ha of Swamp Oak Floodplain Forest have been mapped within the wider Lower Hunter and Central Coast region (LHCCREMS 2003). Therefore, the minor direct and indirect impacts as a result of the Proposal would not significantly impact on the local or regional distribution of the communities.

A comprehensive BMP is in place for the management of terrestrial ecology at the Colliery. Subject to the continued implementation of the BMP and the management and monitoring measures present in Section 14.4, the Proposal would not significantly impact terrestrial ecology.

15 Heritage

15.1 Introduction

This chapter describes the Aboriginal and historic heritage context of the Site and surrounds, assesses the potential impacts on Heritage from the Proposal, and provides management and monitoring measures to prevent or minimise potential impacts.

The following guidelines were used in the assessment.

- *(Draft) Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DEC 2005).
- *NSW Heritage Manual* (Heritage Office 2006).
- *Assessing Significance for Historical Archaeological Sites and 'Relics'* (Heritage Branch Department of Planning 2009).

The DEC Guidelines set out a staged process of identifying whether there are Aboriginal cultural heritage values associated with a site and the consultation requirements if Aboriginal cultural heritage values are identified. Step 1 involves a preliminary desktop assessment including location description and an assessment of the likelihood of Aboriginal heritage values being affected by the Proposal. At the conclusion of the desktop assessment, it was determined that Aboriginal heritage values are not likely to be impacted as a result of the Proposal. Therefore, no further assessment was required. This conclusion is substantiated in the following sections.

Due to the size of the Site being assessed, all distances have been measured from a fixed reference point within the Site; in this case, the Colliery's pit top area.

15.2 Existing environment

15.2.1 Aboriginal heritage

As detailed below, the desktop study of Aboriginal heritage comprised:

- a review of the environmental context of the Proposal including climate, soils, landforms and waterways;
- a review of relevant ethno-historical information about Aboriginal society;
- a review of previous archaeological reports and literature; and
- a search of the Aboriginal Heritage Information Management System (AHIMS) database.

i Environmental context

Climate conditions in the Lake Macquarie area have been stable for approximately 10,000 years and would have provided a good environment for camping and living.

The Site is gently undulating and located within a region known as the Central Coast Lowlands. This region is characterised by low lying terrain, alluvial plains and dune fields in coastal areas. The Central Coast Lowlands are dominated by the coastal Macquarie, Tuggerah and Munmorah Lakes which are to the north, north-east and south of the Site, respectively.

The geology of the area, which includes sandstone, interbedded sandstone and siltstone, would have provided a good range of raw materials to create tools, with sandstone being used for sharpening. Caves and overhangs created in sandstone cliffs and boulders may have been used for shelter.

The soils within the region form part of two soil landscapes: the Doyalson and the Wyong. Characteristics of these soil landscapes are described in Chapter 19.

Lake Macquarie and the creeks that feed into the lake would have provided an abundance of food resources for Aboriginal people.

ii Ethno-history

Information about the socio-cultural structure of Aboriginal society prior to European contact largely comes from ethno-historic accounts made by Europeans. These accounts and observations were made after massive social disruption due to disease and displacement. As a result, this information is often contentious, particularly in relation to language area boundaries.

The dominant Aboriginal language group for the Lake Macquarie region was that of Awabakal people, though little was recorded about their territorial boundaries (Tindale 1974). The information recorded did suggest that the Hunter Valley Aboriginal groups, including the Awabakal, had a high level of interaction and intertribal relationships (Tindale 1974).

Extensive information about the Awabakal is available from the writings of L.E Threlkeld. He established a mission in 1825 at Toronto on the shores of Lake Macquarie and, for seventeen years, recorded the language, traditions and material culture of the Awabakal people. He also observed the rich food resources of Lake Macquarie including fish, molluscs and wildlife. The Awabakal exploited this resource using canoes, spears wood and stone tools (Threlkeld in Gunson 1974).

iii Previous archaeological reports

Extensive previous archaeological studies have been completed in the Lake Macquarie region and the local area. These studies have provided information on the types of sites present and their distribution in the landscape. The most relevant reports are described in Table 15.1.

Table 15.1 Relevant archaeological reports

| Report title and author | Overview |
|--|--|
| Archaeological excavations at Swansea, annual report, Dyall 1975 | A midden located approximately 15 km to the north of the pit top area was excavated. It contained shell, stone tools and bone. A large number of backed blades were recorded in the stone tool assemblage recovered from the midden. During this season, Dyall also excavated twelve burial and cremation sites. |
| Assessment of the Prehistoric Heritage in the Lake Macquarie Area, Haglund 1986 | A review of Aboriginal archaeological sites in the Lake Macquarie area was undertaken with over 150 sites recorded. They included shell middens (48), open campsites (65), rock shelters (some with art) (10), grinding grooves (25), scarred trees (1), quarries (2) and one natural mythological site. As a result of the review a seasonal model for occupation of the area was devised. The seasonal model suggested winter inland occupation and summer coastal occupation. The estuarine area of Lake Macquarie formed the resource bridge between the hinterland and the coast. The implication from this model is that the sites located along the coast of Lake Macquarie may be small transitory camps between the two main occupation areas. |
| Pipeline route between Gwandalan and Mannering Park Sewage Treatment works, Dallas 1986 | The pipeline survey route was located to the south-west and south-east of the Site. During the survey one midden was found in soft black soil on the south side of Tiembula Creek. The midden measured 60 m x 40 m and contained cockle shell material. The area was also disturbed by rubbish dumping, a transmission line easement and vehicle access. |
| Archaeological survey of proposed tourist resort 0020 at Summerland Point Lake Macquarie NSW, Brayshaw 1989 | A survey of the Lake Macquarie foreshore was undertaken for the proposed development of a resort. The study area was located approximately 2 km to the north-east of the Site. The survey identified one midden site, west of Bonny Boy Gully. It contained a thin layer of shell and possible hearthstones. Flaked artefacts were rare or absent. |
| Inspection for Aboriginal Sites and Relics of Proposed Water Sports Club and Holiday Cabins, Kanangra Drive, Gwandalan NSW, Griffiths 1992 | A survey of the proposed club site was completed in an area approximately 4 km to the north of the Site. Midden material, mostly cockle shell, was located in a 200 m area along the Lake Macquarie foreshore. A vehicle track had destroyed much of the site. |
| Archaeological investigation of Morisset Peninsula Sewerage Scheme, Dallas & Navin 1993 | A survey of the proposed Morisset sewerage scheme was completed in an area adjacent to the Site along the Morisset and Sunshine Peninsulas. A number of midden sites were identified, two of which are located within the boundaries of the Site (see Sections 15.2.iv and 15.3), albeit not in areas subject to any direct surface disturbance under the Proposal. |
| Lake Macquarie Aboriginal Heritage Study Stage 1a, Umwelt 2009a, Lake Macquarie Aboriginal Heritage Study Stage 1b Survey, Umwelt 2009b, Sustainable Management of Aboriginal Cultural Heritage in the Lake Macquarie Local Government Area: Lake Macquarie Aboriginal Heritage Management Strategy, Umwelt 2011 | LMCC commissioned a series of reports to understand the Aboriginal heritage of the Lake Macquarie LGA. A two stage Aboriginal heritage study was completed which involved extensive desktop research to predict site distribution and landscape sensitivity, followed by field investigation to refine the desktop results. Umwelt identified 16 areas which were considered able to address gaps in knowledge for Aboriginal heritage in the LGA. These 16 areas fell into five landscape groups. <ol style="list-style-type: none"> 1. Lake foreshore areas, which had an archaeological record of midden sites, artefact scatters and isolated finds. It was considered that these areas were accessed by Aboriginal people due to the fish and shellfish resources available and were stayed at for short periods of time. 2. Major creek catchments, which had an archaeological record of artefact scatters, isolated finds, grinding grooves and scarred trees. These areas were considered to have a high level of cultural sensitivity. It was suggested that places close to both estuarine and freshwater areas would have provided diversity of resources and supported occupation by significant numbers of people. |

Table 15.1 Relevant archaeological reports

| Report title and author | Overview |
|---|---|
| | <p>3. Minor creek catchments, which had an archaeological record of artefact scatters, grinding grooves, middens, rockshelters and Potential Archaeological Deposits (PADs). These areas were considered to contain a diversity of resources.</p> <p>4. Mountainous inland areas, which had an archaeological record of artefact scatters, grinding grooves, crying trees, burial sites, scarred trees, potholes/water wells, stone arrangements/direction markers, rock shelters and Aboriginal pathways. This area had a large proportion of grinding grooves suggesting it was visited due to its sandstone outcrops.</p> <p>5. Coastal areas, which had an archaeological record of midden sites. A lack of ground surface visibility made site identification difficult.</p> <p>The Aboriginal Heritage Study was followed in 2011 by an Aboriginal Heritage Management Strategy which provided guidelines for the management of Aboriginal heritage in the LGA. It also identified areas of high conservation value in the Lake Macquarie area. The majority of the Site is not located within identified sensitive areas however a portion of first workings encroaches on a less than 2 km² area of foreshore identified as sensitive in this study.</p> |
| Cultural Heritage Assessment Mandalong Mine Ventilation Air Methane Abatement Demonstration Project, RPS2011a | A desktop analysis and field survey was undertaken for modifications to the Mandalong Mine ventilation system. This Project was located 10 km to the west of the Site. No Aboriginal sites or objects were identified during the survey and it was hypothesised this was due to evidence of disturbance. |
| Cultural Heritage Assessment Mannering Colliery, RPS 2011b | RPS undertook a cultural heritage study for the extension of mining at Mannering Colliery approximately 2 km to the west of the Site. During the field surveys, two new Aboriginal sites were identified; a midden and a culturally modified tree. In addition, the riparian zone of Wyee Creek was identified as an area of Aboriginal heritage sensitivity. Impacts to these sites were predicted to be low. |
| Myuna Colliery Extension of Mining Cultural Heritage Assessment, RPS 2011c | A cultural heritage assessment was undertaken for the extension of mining at Myuna Colliery. The surveyed area was located adjacent to the Site in the north. The survey identified six new Aboriginal sites with five assessed as of moderate significance and one site assessed as of high significance. The sites included middens, modified trees and cultural sites located on the shores of Lake Macquarie. Management recommendations included the development of an Aboriginal Cultural Heritage Management Plan and archaeological monitoring if mining was to occur under Aboriginal sites. |
| Heritage Impact Assessment Chain Valley Colliery Continuation of Mining, AECOM 2011d. | The impact of the Colliery on historic and Aboriginal heritage was assessed with desktop analysis and fieldwork. Three phases of fieldwork identified five newly recorded shell midden sites along the Lake Macquarie foreshore. Along with the new sites, six previously recorded sites were revisited. The potential for minor subsidence impacts on one site was considered as it was located above an area selected for mining first workings. Although subsidence was predicted to be less than 20 mm, monitoring of the site will be undertaken as detailed within the HMP prepared in accordance with Schedule 3, Condition 35 of MP10_0161. |

iv AHIMS search

An extensive search of the AHIMS register was conducted on 6 August 2012 for an area of 10 km by 10 km surrounding the Site. The search area is sufficient to define the pattern of previously recorded Aboriginal sites in the landscape as it covered adjacent catchments. The search revealed a total of 99 registered sites. The majority of these sites occur along the Lake Macquarie foreshore. As shown in Table 15.1, middens were the most common site type recorded and accounted for 60% of the total sites registered. Isolated finds accounted for 11% of the total sites while scarred trees represented 10%.

Table 15.2 AHIMS registered sites within the search area

| Site type | Number of sites | Percentage |
|--|-----------------|-------------|
| Isolated find | 11 | 11% |
| Open camp site | 3 | 3% |
| Midden | 59 | 60% |
| Scarred tree | 10 | 10% |
| Midden/open camp site | 3 | 3% |
| Unknown | 3 | 3% |
| Grinding groove | 2 | 2% |
| Aboriginal place | 1 | 1% |
| Potential Archaeological Deposit (PAD) | 5 | 5% |
| Ochre quarry | 1 | 1% |
| Aboriginal place/PAD | 1 | 1% |
| Total | 99 | 100% |

The full results of the search are given in Appendix L. Figure 15.1 shows these sites' relationship to the Site. A number of sites are mapped as located within Lake Macquarie; however, this is due to these sites having incorrect coordinates. These sites are actually located on the lake foreshore and would not be impacted by the Proposal.

Two sites are located within Area 1.

- 45-7-0154 – a midden site recorded in 1993 as part of a study for the Morisset sewerage scheme. It was in poor condition and badly disturbed by the construction of housing and a stormwater drain. Consent to destroy the site was issued in June 1994. The majority of the site was removed however approximately one square metre of heavily disturbed shell remains, as identified by Umwelt (2003).
- 45-7-0157 – a midden site recorded in 1993 as part of a study for the Morisset sewerage scheme. It was in poor condition and badly disturbed by a vehicle and boat ramp and foreshore reclamation. Consent to destroy the site was issued in June 1994. The majority of the site was removed however a small portion is likely to remain in the adjacent reserve.

An impact assessment for these sites is provided in Section 15.3.

v Predictive site model

A predictive model of Aboriginal site location is based on:

- the distribution of Aboriginal archaeological sites described in previous reports;
- any archaeological sites listed in the AHIMS register; and
- the landscape features of an area.

Based on the items described above, it is predicted that:

- any sites which occur within the Site are likely to consist of middens and isolated finds adjacent to lakes and creeks;

- stone artefact sites may occur in association with shell middens;
- grinding grooves are rare but may occur where suitable sandstone outcrops are present; and
- Aboriginal scarred or carved trees may be present where mature native trees remain.

The landscape of the Site has been disturbed by clearing of natural vegetation for the timber industry and residential development, Colliery activities, the dumping of soil, flood control and land reclamation. Thus artefacts, if discovered, are likely to be isolated finds in disturbed contexts which do not indicate the presence of an archaeological deposit and, therefore, would be of low significance.

The areas proposed for impact are not considered to contain landscape features identified as having a strong potential for Aboriginal artefacts, such as the Lake Macquarie foreshore. Therefore, it is unlikely that Aboriginal sites will be encountered.

15.2.2 Historic heritage

The desktop study of historic heritage comprised:

- searches of the National, Commonwealth, and State Heritage registers, the State Heritage Inventory and the National Shipwrecks Database;
- a review of the Wyong and Lake Macquarie LEPs;
- a review of relevant historic reports and existing historic heritage assessments for the region; and
- an investigation of archaeological potential using aerial photographs and topographic maps.

i Register searches

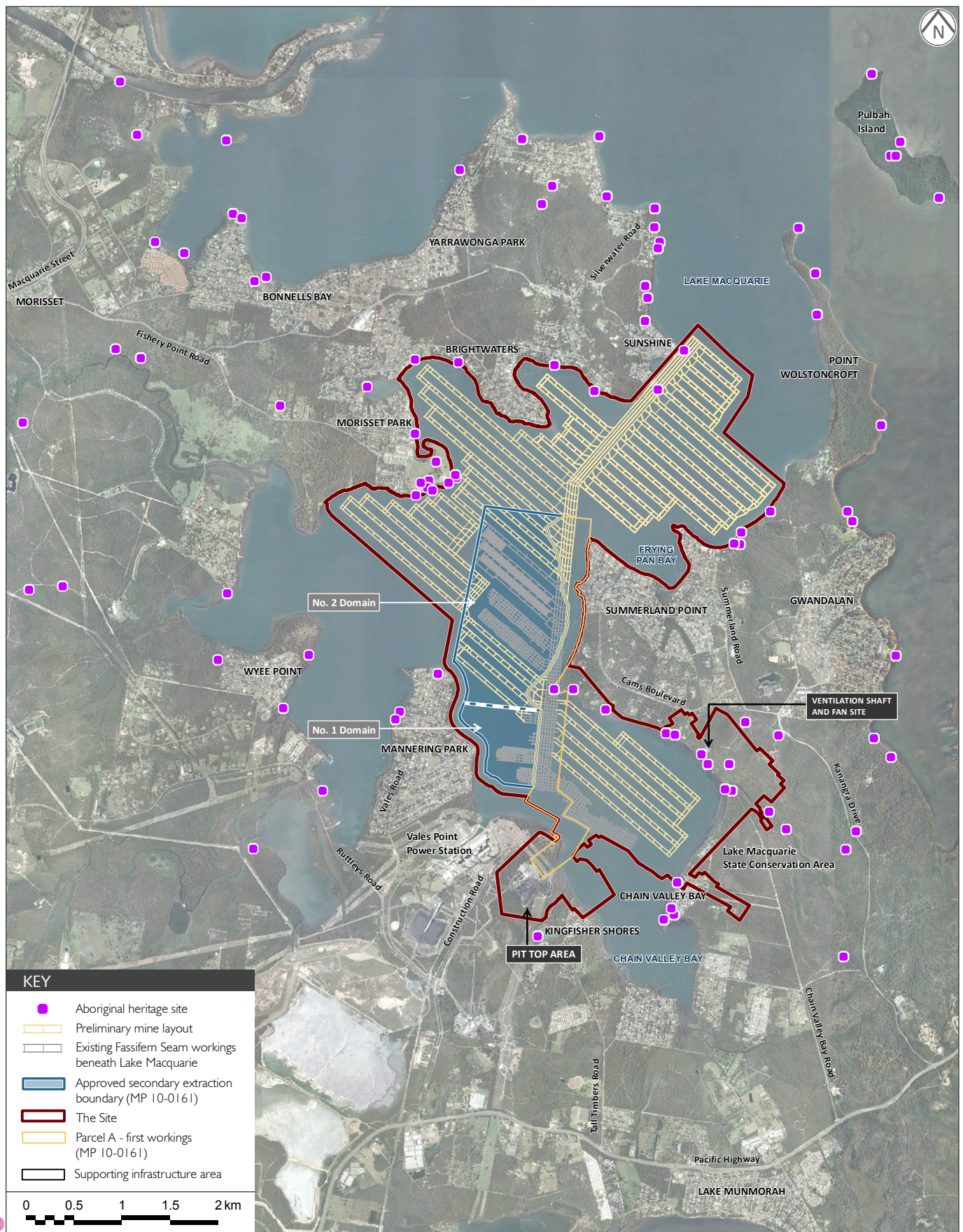
Desktop searches of the aforementioned registers, inventory and database did not identify any items of historical significance within the Site. One State heritage item, the Morisset Hospital Precinct, was identified approximately 4 km from the Site (see Figure 15.2). It consists of over 100 buildings on 1,244 ha of land with important links to 20th century health care.

ii Review of Local Environmental Plans

As identified in Sections 4.4.4 and 4.4.5, the Site falls within the boundaries of the Wyong and Lake Macquarie LGAs and heritage searches for both regions were undertaken.

The Wyong LEP 1991 and the Draft Wyong LEP did not identify any heritage items within the Site. The closest listed item, a Bulk Store Building, is located south of the Site along Ruttleys Road, but no further information on its location could be ascertained.

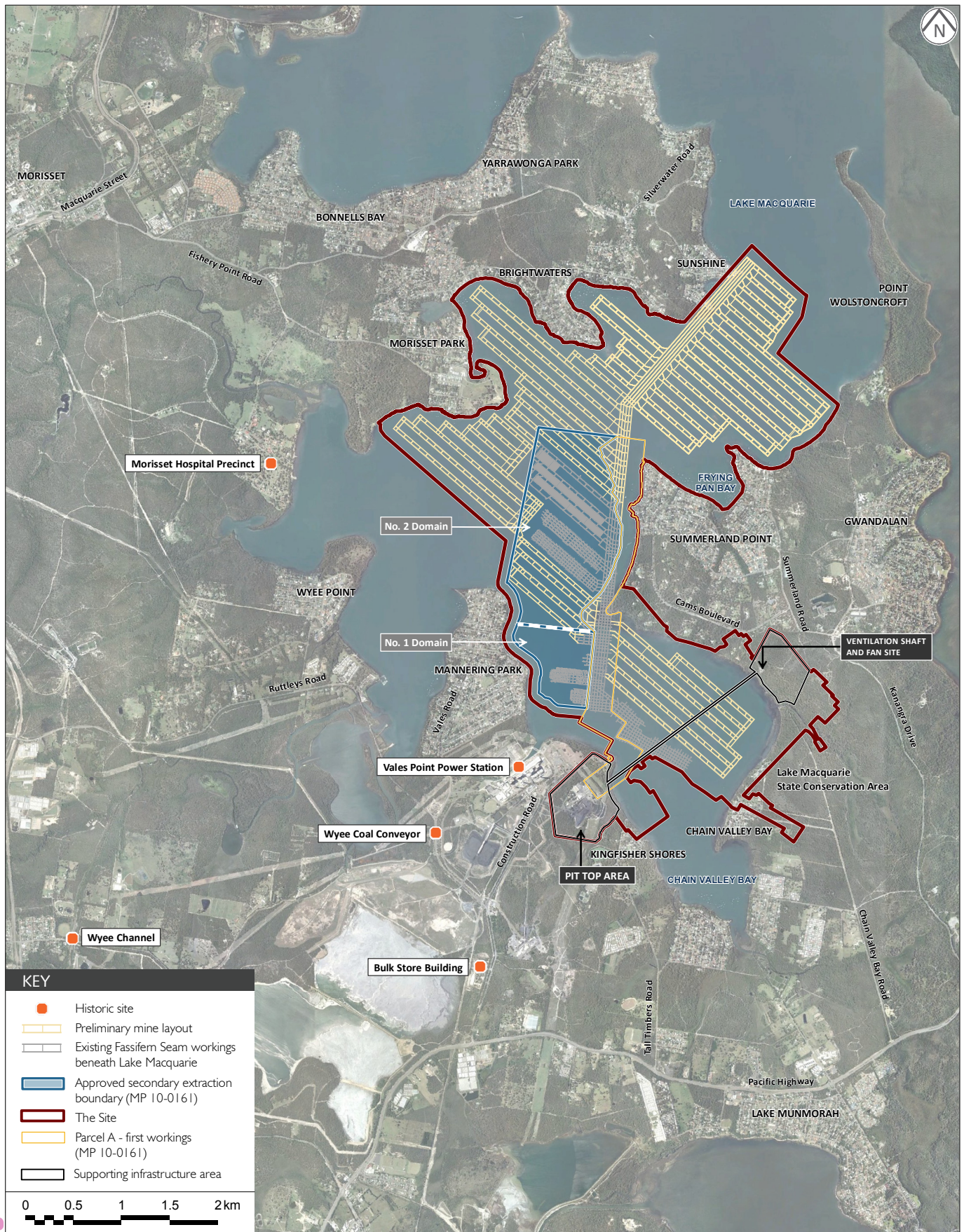
Similarly, the LMLEP 2004 and Draft LMLEP did not identify any heritage items within the Site. A small section of a locally listed heritage item, the Wyee Coal Conveyor to Vales Point, was identified approximately 1 km to the north-west of the Site adjacent to VPPS. Wyee Channel, located 5 km to the west of the Site, is also listed on the LEP as an item of local heritage significance.



AHIMS registered Aboriginal sites surrounding the Site

Chain Valley Colliery Mining Extension | Project - Environmental Impact Statement

Figure 15.1



Historic heritage sites near the Site

iii Historic reports

Heritage studies have been completed of the Wyong and Lake Macquarie LGAs. The Lake Macquarie Heritage Study completed in 1993 by Suters Architects Snell *et al.* detailed a series of historic themes for the Lake Macquarie area. An updated Lake Macquarie City Thematic History was completed by Heritas Architecture in 2010. No heritage items listed in these heritage studies are located within the Site.

The WSC Heritage Review (Scobie Architects Pty Ltd 2010) investigated the historical context of the Wyong LGA and identified areas of historic heritage significance. It identified the VPPS, located approximately 200 m west of the Site as an item of local heritage significance. It was recommended for inclusion in the Schedule of Heritage items within the Draft Wyong LEP by Scobie Architects Pty Ltd (2010) though it was ultimately not listed and is, therefore, not considered to have local or state heritage significance.

iv Archaeological potential

Archaeological potential was investigated using aerial photographs and topographic maps of the Site. No areas of historic archaeological potential were identified.

15.3 Impact assessment

15.3.1 Aboriginal heritage

For the purposes of the assessment of potential impacts to Aboriginal heritage, the Proposal can be considered as two activity areas, namely: Area 1 beneath Lake Macquarie; and areas of disturbance associated with the minor upgrades and modifications to surface infrastructure at the pit top.

Identified Aboriginal sites located near the Summerland Point ventilation shaft and fan, shown in Figure 15.1, would not be impacted by the Proposal. These sites are protected by the implementation of the HMP.

i Area 1

No Aboriginal sites were identified above the secondary extraction area within Area 1. Therefore, there are no predicted impacts to Aboriginal heritage in Area 1. The mine has been designed ensure subsidence does not encroach on the HWMSB. This will ensure Aboriginal sites along the foreshore are protected.

A small portion of Area 1 encroaches under land in the north of the Site near Sunshine. Two registered Aboriginal sites (45-7-0154 and 45-7-0157) have been identified in this area. While they are located above Area 1, secondary extraction is not proposed in this portion of Area 1. These areas would be subject to first workings only with zero subsidence levels (i.e., no greater than 20 mm). Also, as identified in Section 15.2.1iv, both these sites are significantly disturbed with the majority previously removed and consents to destroy issued in 1994. Therefore, no impacts to these sites would occur.

ii Surface infrastructure upgrades

Proposed upgrades and modifications to infrastructure, with the exception of the sedimentation dam embankment upgrade and discharge point spillway works, are restricted to areas previously disturbed by Colliery activities. No Aboriginal heritage sites have been identified in these areas. Therefore, no impacts to Aboriginal sites are predicted.

The vast majority of the disturbance area associated with the sedimentation dam embankment upgrade and diversion works for the discharge point has been previously disturbed. A small area (0.37 ha) between the dam and the proposed spillway would be disturbed by the proposed works. This area, while currently undisturbed, is not considered sensitive to Aboriginal heritage. The outcomes of the desktop assessment show that this undisturbed area is not considered to contain landscape features identified as having a strong potential for Aboriginal artefacts, such as the Lake Macquarie foreshore and no Aboriginal heritage sites have been previously recorded within 200 m of the proposed works. The area of undisturbed land is also part of a swampy floodplain which would have experienced regular inundation. This area would have remained waterlogged between flooding events and is unlikely to have been used for habitation. Additionally, due to regular flooding and sedimentation it is unlikely that any Aboriginal objects, if present, would remain in situ. Thus, there is limited potential for impacts to Aboriginal heritage.

15.3.2 Historic heritage

No items of historical heritage significance or areas of potential historical significance have been identified within the Site.

The desktop study, however, identified five heritage items in the vicinity of the Site, namely:

- VPPS;
- Bulk Store Building;
- Wyee Channel;
- Wyee Coal Conveyor; and
- Morisset Hospital Precinct.

Identified historic heritage items are shown on Figure 15.2. Due to the location of these items there would be no direct or indirect impact from the Proposal. Therefore, it is concluded that the Proposal would not impact historic heritage.

15.4 Management and monitoring

Management and monitoring of Aboriginal and historic heritage will be undertaken as detailed in the HMP which was prepared in accordance with Schedule 3, Condition 35 of MP10_0161. In addition, measures relating specifically to the Proposal comprise:

- an update of the HMP following approval;
- a commitment that should unanticipated Aboriginal or historic heritage artefacts be found during construction works, work must cease and the site assessed by an archaeologist; and
- a commitment that in the unlikely event that skeletal remains are found during any construction works, work must cease immediately in the area and the NSW Police Coroner called to determine if the material is of Aboriginal origin. If determined to be Aboriginal, the OEH and relevant Aboriginal community stakeholders must be contacted to determine management for the remains prior to works re-commencing.

15.5 Conclusion

This chapter has considered the available environmental and archaeological information for the Site including previous reports as well as the nature of the proposed activities.

A review of previous Aboriginal heritage assessments and reports relating to the area incorporating the Site indicated that artefacts have been found in the Wyong and Lake Macquarie LGAs, usually along the Lake Macquarie foreshore, along rivers and creeks or in mountainous areas. Aboriginal sites are usually midden sites, isolated finds or scarred trees.

The record of land use in the Site and the extent of disturbance and modification to the landscape indicated that artefacts were unlikely to occur. The landforms in the Site were also considered to be areas where artefacts or subsurface deposits were unlikely. Due to the lack of sites identified and the high level of disturbance in areas to be impacted by the Proposal, no survey or significance assessment was considered warranted.

The mine design eliminated the potential for impacts to Aboriginal heritage values. No registered Aboriginal heritage sites are located within impact areas of the Proposal and no Aboriginal heritage sites were identified to occur or predicted to occur in areas impacted by the Proposal. Approximately, 0.37 ha of undisturbed land would be disturbed as part of the sedimentation dam upgrade works. However, no evidence of Aboriginal heritage is predicted to occur in the area despite the land being undisturbed. As such, there is no predicted impact to Aboriginal heritage from this Proposal.

In addition, identified Aboriginal sites located near the Summerland Point ventilation shaft and fans would not be impacted by this Proposal. These sites are protected through the measures in the HMP.

No historic heritage items or areas of potential archaeological significance are located within the Site. No nearby historic heritage items would be impacted by the Proposal.

16 Wastes

16.1 Introduction

This chapter describes the existing waste streams and volumes generated at the Colliery, and assesses potential changes to these resulting from the Proposal. It also outlines the existing waste management practices that would continue to be implemented to minimise production of waste on-site and ensure that waste produced is appropriately managed.

16.2 Existing environment

16.2.1 Waste management

LakeCoal is committed to the provisions of the PoEO Act and the principles of the *Waste Avoidance and Resource Recovery Act 2001*, which includes the waste management hierarchy of:

- waste prevention;
- waste reduction;
- waste reuse;
- waste recycling or reclamation;
- waste treatment; and
- waste disposal.

This means that priority is given to the prevention of waste generation in the first instance, rather than options to reuse or recycle. However, as the generation of some waste materials would be unpreventable, actions would be implemented to maximise the diversion of these materials away from disposal in landfill.

A total waste management system has been implemented at the Colliery which provides for segregation and disposal of the waste streams in the most appropriate manner. Three types of waste streams are managed at the Colliery, namely: solid wastes, liquid wastes and other minor wastes. Weekly waste inspections are undertaken by the waste contractor as part of the total waste management system, with the inspection regime designed to ensure waste servicing occurs at required intervals and any improvement opportunities are identified.

As part of the Colliery's environmental management system, a Waste Management Standard is to be prepared as a sub-plan to the Operational Environmental Management Plan taking into account existing environmental controls, the effectiveness of management under the existing MOP and the requirements of Schedule 3, Condition 37 in MP10_0161. The Standard would aim to reduce and manage waste products and waste sources during the normal course of operations at the Colliery and would include procedures for managing specific wastes, a waste removal schedule and waste tracking program.

16.2.2 Solid wastes

Typical solid wastes generated at the Colliery include general wastes, recyclables, and reusable materials. General wastes that cannot be recycled or reused on site are collected in waste bins provided around the pit top area and transferred to the industrial skip bins located within the waste storage area behind the workshop. The skip bins are emptied twice a week by a licensed waste removal company. Recyclables are placed in specified recycle bins or stored in clearly designated areas in the lay-down yard for collection by licensed contractors. Materials such as steel, timber pallets and pipes which can be reused on-site are stored in the lay-down yard until they are reused.

16.2.3 Liquid wastes

Liquid wastes produced at the Colliery include oil generated from the wash-down bay and oil separator, equipment maintenance and residue from oil drums/storage containers. Stormwater runoff from outdoor storage areas flows to the oil separator where oil is removed from the water and pumped to a waste oil storage tank. Waste oil from machinery is either pumped to the waste oil storage tank or to separate waste oil containers for collection and recycling. Waste oils are all stored within bunded areas prior to collection. Waste oil volumes are removed by a licensed contractor for treatment off-site at licensed facilities.

The Colliery manages wastewater and sewerage from its amenities through on-site treatment systems. The main treatment system comprises three septic tanks which treat water from the bathhouse and operations office prior to the treated effluent being transferred into the sedimentation dams. A separate aerated wastewater treatment system services the administration office, with treated effluent irrigated to land surrounding the office area.

The Colliery's WMP includes a monitoring regime inclusive of effluent parameters such as faecal coliforms, enterococci, total nitrogen and total phosphorus which are in place to monitor the operation of the wastewater systems. LakeCoal has also met with WSC to discuss connecting the wastewater effluent into the council sewer main which runs to the adjacent Mannering Park Sewage Treatment Facility.

The management of wastewater from the underground workings and surface runoff is discussed in Sections 7.4, 8.2 and 8.4.

16.2.4 Other wastes

Other minor waste streams include used tyres, oil filters, waste grease, batteries, used hydrocarbon adsorbent, solvents and medical waste. The Colliery currently produces approximately 26 t of hazardous wastes annually. Hazardous materials would continue to be disposed of in accordance with the *Waste Classification Guidelines* (DECCW 2008).

16.2.5 Waste quantities

Approximate quantities of annual wastes generated at the Colliery and disposed off-site or recycled/reused are provided in Table 16.1.

Table 16.1 **Approximate quantities of annual wastes generated**

| Type of Waste | Volume (t/ annum) |
|---|-------------------|
| <i>Off-site disposal</i> | |
| Non-hazardous | 289 |
| Hazardous | 1 |
| <i>Sub-total</i> | 290 |
| <i>Recyclable/reusable materials</i> | 53 |
| Total wastes | 343 |
| % of wastes that are recyclable/reusable | 15.45% |

Wastewater is excluded from the quantities in Table 16.1 as its method of disposal is different from that of other wastes. As discussed in Section 8.3.1, the Colliery currently generates approximately 7.6 ML/day of wastewater from the underground workings which is discharged offsite.

16.3 Impact assessment

The Proposal involves the continuation of existing mining operations and, therefore, no new waste streams would be created. Further, the proposed increase in the maximum rate of extraction, and other aspects of the Proposal, would not result in a significant increase in volumes of waste generated at the Colliery. The exception would be wastewater produced from the underground workings which is predicted to progressively increase to a maximum of 10.5 ML/day. The additional wastewater would be managed as described in Sections 8.3.1 and 8.4.

Proposed upgrades to infrastructure may potentially decrease waste volumes due to improved efficiency and more modern technologies.

Beneficiation of coal product is not currently undertaken at the Colliery nor is it proposed to under the Proposal. Therefore, there would be no coal reject wastes that would require management.

16.4 Management and monitoring

The existing waste management practices, as detailed in Section 16.2, would continue under the Proposal to ensure the effective management of waste streams at the Colliery.

LakeCoal's objective is for 60% of all wastes generated at the Colliery (excluding wastewater) to be recycled or reused. In working toward achieving this objective, LakeCoal introduced a total waste management system in 2012. Some of the key initiatives that were initially introduced as part of this system included;

- colour coded waste bins to allow easy identification of bin types;
- co-location of bin types, for example a general waste and recycling bin are placed next to each other ensuring that the right bin is available for use at the appropriate location;
- introduction of additional waste streams for recyclables such as waste oil filters, waste batteries and waste toner cartridges; and
- the introduction of office recycling bins, designed to co-locate with the typical desk bin to reduce the amount of paper disposed as general waste.

In addition to the above a number of other initiatives have also been undertaken including:

- updating the site waste management training presentation;
- displaying posters on total waste management on site notice boards; and
- tool box talks regarding waste management changes and improvements.

Another of the key drivers for change and continual improvement is the weekly waste inspection that is now undertaken at the Colliery. As a result of this inspection, all waste management facilities are checked weekly with results documented on the Waste Inspection Form and improvement recommendations made where applicable.

Waste tracking is used to appropriately manage the disposal of regulated wastes, with original waste tracking forms returned to site ensuring that both licensed transporters and receivers of waste have been used for these waste streams.

Monthly reporting by the primary waste contractor allows volume, cost, and trend details to be captured and reviewed regularly, including against the target of 60% for reuse and recycling. These reports track a rolling 12 months of data whenever available and break down each waste stream into destination or treatment type (egg disposal (to landfill), reuse or recycling). The Colliery will continue to implement waste management, reuse, and disposal improvements as they are identified.

16.5 Conclusion

LakeCoal is committed to the principles of the *Waste Avoidance and Resource Recovery Act 2001* and provisions of the PoEO Act.

Waste streams at the Colliery include solid, liquid and other minor wastes. These wastes are appropriately collected and stored for disposal, treatment, recycling or reuse. LakeCoal implements a total waste management system through the engagement of a suitable licensed contractor for collection of wastes generated at the Colliery.

Waste streams and volumes currently generated at the Colliery are expected to continue at comparative levels under the Proposal.

Implementation of the Colliery's Waste Management Standard will ensure waste production is minimised and appropriately managed.

17 Hazards

17.1 Introduction

This chapter describes existing hazards that are managed at the Colliery and assesses the potential impacts on each of these arising as a consequence of the Proposal. It also outlines the hazard management measures that would be extended to include the Proposal.

17.2 Existing environment

17.2.1 Bushfire

According to the Wyong Shire LGA – Bush Fire Prone Land Map prepared by the NSW Rural Fire Service (RFS) in accordance with the guideline for *Bush Fire Prone Land Mapping* (RFS 2006a), areas of the Site contain bushfire prone land. The Site contains mostly Category 1 Vegetation (forest, woodlands, heath and wetlands greater than 1 ha) with some Category 2 Vegetation (moist rainforests, shrubland, open woodlands, mallee and grasslands greater than 1 ha), Vegetation Buffer areas and non-bush fire prone land.

LakeCoal's BMP addresses bushfire management and bushfire protection measures at the Colliery. Measures in place at the Colliery are consistent with the *Planning for Bush Fire Protection* (RFS 2006b) and include:

- implementation of a 25 m wide Asset Protection Zone (APZ) around infrastructure at the pit top which is landscaped to minimise fuel loads, reduce potential radiant heat levels, flame, ember and smoke attack to the buildings. It also provides a workable area for fire fighters and emergency services personnel. The APZ is inspected annually prior to the start of the fire season (1 October);
- maintenance of fire trails around the pit top area property boundary to provide access for emergency services personnel. The trails are inspected annually prior to the start of the fire season;
- use of potable water sourced from WSC for fire fighting purposes on the Site via a 100 mm diameter water reticulation line. Fire hydrants, fire reels and depots are also placed in strategic locations around the pit top area for rapid response to fires; and
- the regular training of mine fire fighting crews.

17.2.2 Hazardous chemicals

Oil and diesel fuels at the Colliery are stored within outdoor bunded storage areas designed in accordance with the relevant Australian Standards and regulatory requirements, including the NSW Work Health and Safety Regulations and AS 1940-2004. The storage areas are located behind the main workshop and include a 15,900 L diesel fuel storage tank. Drainage from the storage areas is connected to the main drive-in sump which also contains the oil separator system. In the event of a major spill, the spill would either be contained within the specific bunded area or the main sump. Emergency spill kits, absorbent and hydrocarbon booms are also available on site to contain spills, if required.

Additionally, in accordance with the recent changes to the PoEO Act, the Colliery's Emergency Management Standard (HSSTD-0003) has been updated to include details on responses to pollution incidents which would be enacted in the event of a major spill.

Other hazardous chemicals stored and used at the Colliery include solvents, greases, degreasers and resins. These chemicals are stored in dedicated areas and any wastes are removed from the Site by licensed contractors as required. No hazardous chemicals are allowed on the Site unless approved by management and accompanied by a safety data sheet. A register of approved chemicals is kept onsite electronically and a hardcopy is maintained in the first aid room.

17.2.3 Public safety

Public safety from the operation of the Colliery is generally afforded by the use of fencing and access gates, along with single points of entry and exit (to both the pit top area and the Summerland Point ventilation shaft and fans site) and the use of regular external security monitoring.

Access to the Summerland Point ventilation shaft and fans site is via a locked access road, with the compound having separate locked security fencing surrounding the infrastructure. The pit top area has a single sealed access road with gates that may be locked at times when no visitors or deliveries are expected, for example weekend nights. A suitably qualified person is always present at the pit top while operations are undertaken.

The Emergency Management Standard (HSSTD-0003) would also be used to manage any emergency, including those that may arise involving a visitor or a member of the general public, regardless of whether access was authorised or not.

Unauthorised public access is, and would continue to be, monitored and managed during operation of the Colliery through the standard incident reporting process.

No public safety issues are expected as a result of the underground mining activities due to their location and predicted impacts. However, any potential impacts would be managed in accordance with the Colliery's Mine Emergency Plan.

17.2.4 Spontaneous combustion

Although the Fassifern Seam has a medium propensity for spontaneous combustion, to date there have been no recorded incidents of spontaneous combustion in the Fassifern seam. Accordingly, the risk of spontaneous combustion is considered to be low.

The Colliery implements appropriate management practices to mitigate the risk from spontaneous combustion including:

- keeping coal stockpiling to a minimum and rotating stockpiles to limit risk of combustion;
- sealing of extracted panels;
- consideration of spontaneous combustion issues within the mine design and utilisation of an Authority to Mine Permit;
- the development of Trigger Action Response Plans (TARP-0002 (D-13664) General, TARP (D 13820) Sealed Goaf and TARP (D-13919) Active or Newly Sealed Goaf - Spontaneous Combustion) to manage any deviation from normal operating conditions with respect to indicators of spontaneous combustion;
- segregation of extraction panels by an inter panel pillar;

- monitoring of mine gases using a multipoint tube bundle gas analysis system and a real time gas monitoring system; and
- implementation of a Spontaneous Combustion Management Plan (MSP-0009) and a Slope Stability/Stockpile Management Major Hazard Management Plan (MHP-0004).

17.2.5 Climate change

The DCCEE and Geoscience Australia have prepared maps of the predicted sea-level rise by 2100 in the Hunter and Central Coast region under three sea-level rise scenarios: low – 0.5 m; medium – 0.8 m; and high – 1.1 m. These maps show that inundation of land is predicted to occur along areas of the Lake Macquarie shore line and its tributaries as a result of sea-level rise. The pit top area and Summerland Point ventilation shaft and fans are located approximately 8 m and 4 m above the level of the lake, respectively, and consequently would not be inundated under the high sea-level rise scenario of 1.1 m should the Colliery continue to be operating by the end of the century.

The composition of the Swamp Oak Floodplain Forest EEC, which occurs to the east of the sedimentation dams, is likely to be affected by inundation in the future as a result of sea level rise. However, as this community is part of a dynamic system which is in a continual state of flux from freshwater inputs, saline discharge and tidal ranges, any likely changes would be minor. At present, the understorey of the Swamp Oak Floodplain Forest more accurately resembles a saltmarsh community in response to increased saline inundation. While the proposed drainage works to formalise the dam discharge point would reduce inundation, sea level rise may increase this over time to existing levels and possibly extend tidal inundation for at least half of the community's distribution in the area.

17.3 Impact assessment

The Proposal would not result in any increase in the Colliery's hazard potential as:

- construction of additional infrastructure would be within existing disturbance footprints. Therefore, the existing APZ and fire trails would not be encroached upon and infrastructure would not be located in areas subject to predicted inundation due to sea-level rise;
- there would be no changes in volumes or types of hazardous chemicals used and stored at the Site and all hazardous chemicals would continue to be managed in accordance with the Hazardous Chemicals Standard (STD-0009);
- existing bushfire management measures identified in Section 17.2.1 would not be impacted; and
- existing public safety and spontaneous combustion management practices would continue.

17.4 Management and monitoring

The existing hazard management measures at the Colliery, as described in Section 17.2, will continue to be implemented under the Proposal and no additional management measures are warranted. However, the effectiveness of existing measures would be periodically reviewed in accordance with the Colliery's safety management practices and additional measures implemented, if required.

17.5 Conclusion

Potential existing hazards at the Colliery include bushfire, hazardous chemicals, risks to public safety, spontaneous combustion. It is considered that the Proposal would not result in any additional potential hazards at the Colliery. LakeCoal currently implements various measures to manage these potential hazards which would continue under the Proposal.

18 Visual

18.1 Introduction

This chapter describes the visual character of the area, potentially sensitive viewpoints to the Colliery, and assesses the potential visual impacts of the Proposal. It also outlines the existing visual management measures that would be extended to accommodate the Proposal. It is noted that, given the limited potential for visual impacts from the Proposal, an assessment was not nominated in the DGRs.

18.2 Existing environment

Features of the visual landscape surrounding the Colliery include Lake Macquarie, industrial developments, bushland, wetlands and residential developments. There are a number of industrial developments along the edges of Lake Macquarie with the VPPS the dominant industrial feature of the Colliery's visual landscape. Areas of bushland are interspersed with nearby residential developments, with some wetland areas along the Lake Macquarie foreshore.

The Colliery has been a component of the visual landscape for over 50 years. Potentially sensitive viewpoints are located within the residential suburbs of Summerland Point and Chain Valley Bay. Elements of the Colliery that are potentially visible from these viewpoints include the processing plant, coal stockpile, conveyors and buildings. During night time operations, lighting from stationary equipment and plant within the pit top area may also be visible. The visual and lighting impacts of the Colliery are largely screened from sensitive viewpoints by surrounding vegetation. Additionally, many of the sensitive viewpoints are dominated by the VPPS, which is much larger in scale than the Colliery infrastructure.

In accordance with Schedule 3, Condition 36 of MP10_0161, the Colliery currently employs a number of visual impact management measures, such as: maintaining surrounding vegetation within the property boundaries; selective and sympathetic use of existing lighting and ensuring all associated lighting on site complies with *Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting* (AS4282).

18.3 Impact assessment

Minor changes to surface infrastructure are proposed under the Proposal (see Section 3.1.4). As these changes simply represent upgrades or modification to existing infrastructure, the visual impacts of these are assessed as negligible and likely to be imperceptible from sensitive viewpoints.

Under the Proposal, haulage of coal between the Colliery and VPPS would potentially occur 24 hours a day, 7 days a week. These truck movements, which would occur wholly within land owned by Delta Electricity, would be screened from potentially sensitive viewpoints by surrounding vegetation. Truck lighting at night would also be screened and any residual light would likely be indistinguishable from other lighting sources at the Colliery and VPPS.

Additional surface lighting around buildings and roads at the pit top area is proposed for safety and operational purposes during night time operations. This would result in a slight increase in lighting impacts at the Colliery. However, this increase would be minor and would be predominantly screened by surrounding vegetation. Fixed surface lighting would also be installed around the stockpile area. However, since a diesel light tower is currently used to provide lighting for the stockpile, this is unlikely to increase lighting impacts. Any additional lighting installed as an outcome of the Proposal would, as a minimum, comply with AS4282.

18.4 Management and monitoring

The visual and lighting impacts of the Proposal would be managed as per existing management measures described in Section 18.2. Additional surface lighting at the Colliery would, as a minimum, comply with AS4282 in accordance with Schedule 3, Condition 36 of MP10_0161.

18.5 Conclusion

Existing infrastructure and lighting at the Colliery have minor visual and lighting impacts on the surrounding visual landscape. These impacts are largely managed through maintenance of surrounding vegetation which screens the operations from sensitive viewpoints. Minor upgrades and modifications to infrastructure, additional truck movements and additional surface lighting proposed under the Proposal would have minor to negligible visual impacts above those from the existing operations. Existing visual and lighting management measures would continue under the Proposal.

19 Soils

19.1 Introduction

This chapter describes the existing soil environment and assesses the potential impacts on these from the Proposal. As all of the mining proposed would be underground, with secondary extraction areas confined beneath Lake Macquarie, there would be no direct disturbance of soils from the mining itself. However, impacts to soils potentially arise from land disturbance associated with infrastructure upgrades and modifications.

It is noted that, due to the minimal impact expected to soils from the Proposal, the DGRs do not reference soils.

19.2 Existing environment

The pit top area and surrounds, the only areas where any infrastructure upgrades are proposed, are located on lands comprising the Doyalson and Wyong soil landscapes.

The Doyalson soil landscape is characterised by Yellow Earths, Yellow Podzolic Soils and Soloths on sandstone and conglomerates. Yellow Podzolics, Soloths, and some Red Podzolics occur on fine grained siltstones and claystone while Yellow Leached Earths, Grey Earths, Soloths and Gleyed Podzolics occur along drainage lines (Murphy 1993: 49). Soils of the Doyalson soil landscape are strongly acidic with low fertility and slight to high erodibility.

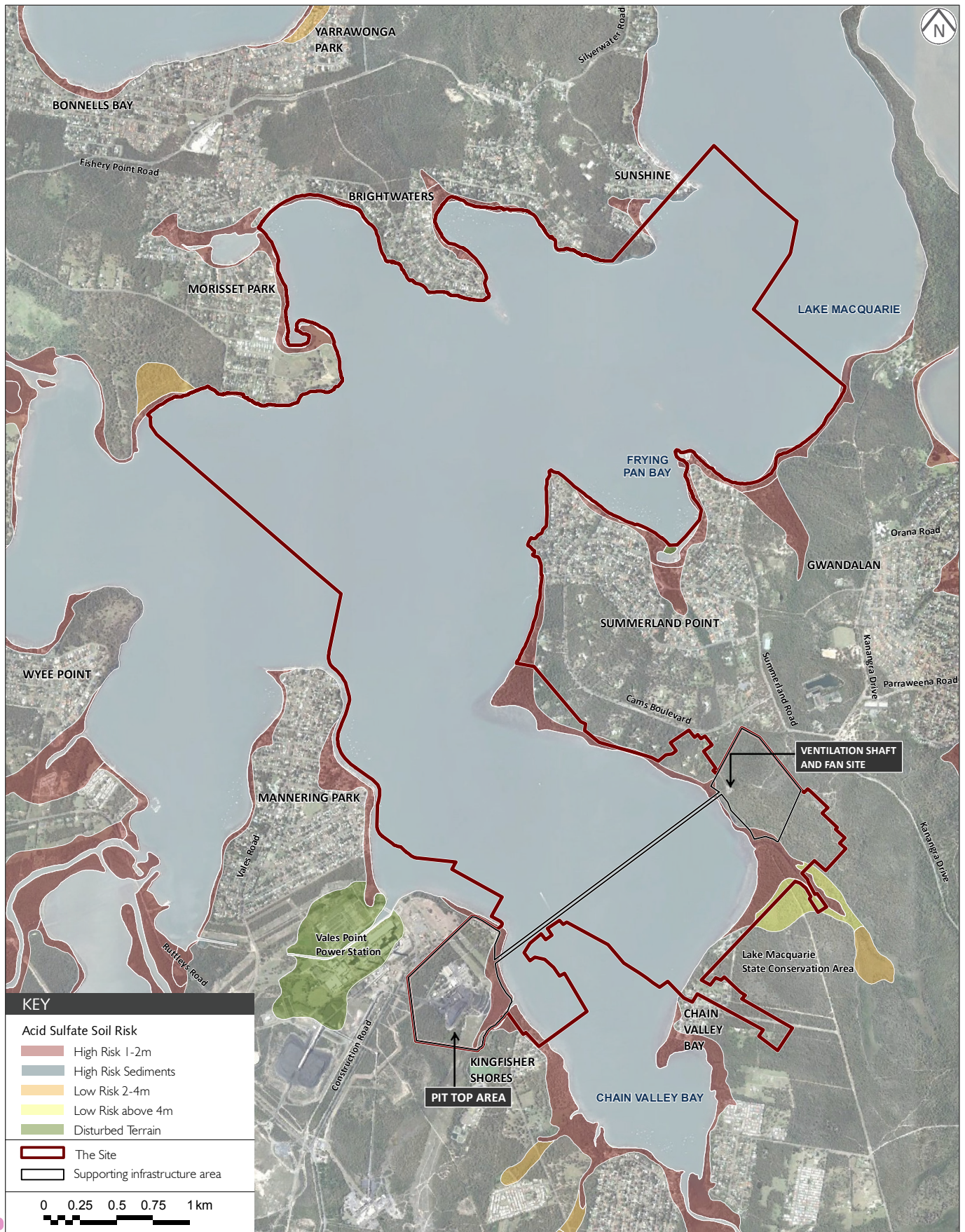
The Wyong soil landscape is characterised by alluvial flats of Quaternary sediments and poorly drained deltaic floodplains. Soils are Yellow Podzolics, Brown Podzolics, Soloths with some Humus Podzols around lake edges. Wyong soils are strongly acidic, poorly drained, impermeable, saline and with very low fertility.

The *NSW Acid Sulfate Soil Risk Maps* for the Lake Macquarie area shows that (potential) ASS are likely to occur at depths of 1 to 2 m along the foreshore of Lake Macquarie adjacent to the pit top area (see Figure 19.1). Potential ASS are waterlogged soil layers rich in iron sulphide, primarily pyrite, that generally occur in low lying areas. When excavation or drainage brings these soils into contact with oxygen, the pyrite is oxidised to form sulfuric acid. If the amount of acid exceeds the neutralising capacity of the soil, and the pH falls below 4, the soils are known as actual ASS. Should sulfuric acid from ASS find its way into local drainage lines and then into the Lake, there could be adverse impacts on aquatic flora and fauna, such as fish kills.

19.3 Impact assessment

Potential soil impacts for the Site are considered to be:

- erosion and sediment loss;
- contamination; and
- ASS.



Source: NSW Department of Land and Water Conservation (DLWC), 1997.

Acid sulfate soils

Chain Valley Colliery Mining Extension | Project - Environmental Impact Statement

Figure 19.1

19.3.1 Erosion and sediment loss

A number of infrastructure upgrades and modifications are included in the Proposal. Some of these would entail the disturbance of soil, for example, sedimentation dam embankment upgrade and diversion works for the discharge point, the sealing of the car park and upgrade and modification of various other site infrastructure.

Exposed soil may be mobilised when such works are undertaken, leading to erosion, and potential sedimentation of Lake Macquarie. The movement of machinery over exposed soil could also increase the potential for erosion to occur.

19.3.2 Contamination

Potential sources of soil contamination from the Proposal would be no different from those that have occurred during the Colliery's operations to date and would include leaks/spills from plant and machinery used for construction and operational activities. The erosion of contaminated soil also creates a potential for contaminant laden runoff to enter local waterways.

19.3.3 Acid Sulfate Soils

ASS would not be disturbed as a result of the underground activities undertaken as part of mining. However, surface works associated with infrastructure upgrades and modifications, such as those nominated above, would require minor earthworks in some areas that may contain ASS.

19.4 Management and monitoring

Management measures to control soil erosion and sediment loss are currently identified in the Colliery's WMP which would be updated to include relevant aspects of the Proposal, if approved. The plan is consistent with the publication *Managing Urban Stormwater – Soils and Construction* (the Blue Book) (Landcom 2004) and includes the use of the Colliery's sedimentation dams.

Soil sampling would be carried out prior to any excavation works that are contained within mapped ASS areas (refer Figure 19.1) in order to locate and categorise the potential for risk of interception of ASS soils. Should ASS be identified, measures to manage and control the disturbance, as well as appropriate removal and disposal methods, would be outlined in an ASSMP.

During construction activities disturbance of ASS would be prevented where practicable. Where ASS has the potential to be disturbed, an ASSMP would be prepared. Any ASS disturbed would be tested and handled in accordance with the ASSMP and would be treated or disposed of at an appropriately licensed facility.

As noted above, the WMP would be updated where required to incorporate any additional management measures to be undertaken. Relevant measures in the current WMP include:

- limiting the area of disturbance and period of exposure;
- implementation of site management procedures such as watering of disturbed areas and exposed stockpiles;
- having relevant licences and management plans in place for the correct storage and handling of hydrocarbons;

- maintain suitable bunding around all hazardous liquid storage areas;
- maintaining oil separation facilities on the wash down sump for the treatment of oily water; and
- removing all waste oil from site and disposing of it by a licensed external waste collection company.

It is envisaged that revisions to the WMP would be in accordance with Schedule 3, Condition 28 of MP10_0161. The ASSMPs would be prepared, as and when required, and the potential need for them to be prepared be referred to in the WMP.

19.5 Conclusion

The Proposal is projected to have minimal consequences for soils. However, some proposed infrastructure upgrades and modifications could adversely impact soils, unless properly managed and monitored. Potential impacts include soil erosion and sediment loss, interaction with ASS soils and soil contamination. The implementation of specific plans to deal with, for example, ASS, would ensure impacts are prevented or mitigated to acceptable levels. The Colliery's existing WMP would be updated to include any additional management measures required.

20 Rehabilitation and mine closure

20.1 Introduction

This chapter describes the existing rehabilitation management strategies at the Colliery including the approach to rehabilitation, objectives for final land use, methodology, performance standards, completion criteria, and monitoring programs. An assessment is also provided of the potential impacts to these from the Proposal which are limited given that no significant land disturbance is proposed additional to that approved for the Colliery.

20.2 Existing environment

The rehabilitation management strategies and final land use objectives for the Colliery are detailed in its MOP and RMP. An overview of these documents was given in Section 2.3.5. Relevant details from these documents are provided below.

20.2.1 Approach to rehabilitation

LakeCoal will undertake a progressive approach to rehabilitation of the mine. Opportunities for progressive rehabilitation are, however, considered limited as surface disturbance will be largely restricted to areas of operational activities. Notwithstanding, should opportunities arise which allow areas of the site to be rehabilitated, then the rehabilitation activities would be planned, undertaken and reported in the Annual Review.

Should the Proposal be approved, rehabilitation of disturbed surface areas at the pit top and Summerland Point would not take place until around 2027. A detailed mine closure plan would be prepared at least two years prior to cessation of mining activities at the Colliery which would consider issues such as the physical rehabilitation of the Colliery site and the decommissioning and removal of plant as well as community engagement and socio-economic issues.

LakeCoal's objectives with respect to rehabilitating the Colliery upon its closure, as described in the Colliery's MOP, are to:

- prevent access to former underground workings;
- remove unwanted infrastructure from surface areas;
- ensure any remaining infrastructure is 'fit for purpose' through identifying and managing associated risks;
- develop final landforms that are safe, permanent and suitable for subsequent land use as determined through consultation with stakeholders, including landowners (principally Delta Electricity), local communities and government departments;
- minimise maintenance requirements for remaining infrastructure and landforms; and
- progressively relinquish leases as rehabilitation is completed and accepted by the Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS).

LakeCoal proposes to revegetate the Site to a near-native ecosystem compatible with the surrounding vegetation communities. As the goal is to return the areas of disturbance to a native plant community (or communities) aligned with the surrounding bushland, no introduced species (e.g., *Melaleuca armillaris*, *Pinus radiata* and non-endemic eucalypts) would be used in the revegetation program. Rather, the focus of the works would be the use of plant material grown from locally sourced species. The Colliery is on land owned by Delta Electricity who will, therefore, be a key stakeholder in determining the final revegetation and landform of the area.

The RMP will work in conjunction with the Colliery's EMS. This will be revisited and updated as the time approaches to prepare a mine closure plan. The RMP will also be influenced by other environmental plans which include the: Biodiversity Management Plan, Water Management Plan, Benthic Communities Management Plan, Seagrass Management Plan and Heritage Management Plan.

20.2.2 Rehabilitation methodology

i Disturbed land

Rehabilitation objectives for disturbed land are discussed in the preceding section. In regards to revegetation, the program will apply a number of methods including:

- topsoil handling with inherent seed load;
- direct seeding;
- the use of sterile cover crops;
- planting of tube stock; and
- hydro seeding for steeper slopes and batters, if required.

Furthermore, a maintenance component of revegetation program will address weed control and plant mortalities.

The lack of topsoil preservation in the past has left a limited amount of stockpiled topsoil available for final rehabilitation activities. Recycled organics may be employed for mine rehabilitation, including fly ash (source of which is available from the VPPS, directly adjacent to the Colliery).

The focus of the works will be the use of plant material grown from locally sourced species or, if possible, seed collection and propagation from the surrounding vegetation for use in rehabilitation activities.

ii Water management

With the removal of large areas of sealed surfaces and buildings, the risk of erosion and sedimentation would initially be increased until a stable vegetative cover is established. The current water management system and sedimentation dams would be retained during the rehabilitation program.

Once the primary earthworks and initial revegetation are completed, a program of progressive dam rehabilitation would be undertaken. Where appropriate, the dams would be used as receptacles for excavated or crushed material. Once each dam is filled, suitable materials from the walls and batters would be used to cap the dams and these surfaces stabilised using a cover crop consisting of a mixture of fast growing sterile species and native longer-lived species.

iii Community

With respect to public safety and the minimisation of adverse socio-economic effects from mine closure, the following principles will be considered:

- with advanced and careful planning, it may be possible to develop capacity to maintain certain infrastructure facilities and services for future community or local government ownership or as part of arising business development opportunities;
- planning for mine closure should be raised with the community as early as possible prior to the planning and design phase of the closure. The planning should consider how to minimise the adverse impacts of mine closure and to optimise the opportunities for community development;
- an early and effective community engagement strategy should be established and the community engaged; and
- planning for mine closure should ensure that the future public health and safety of the community is not compromised; the community's resilience to the adverse impacts of mine closure is strengthened; and the community can maximise opportunities for consequential land use and retain mining infrastructure of value to the community.

iv Closure strategy – decommissioning of infrastructure, plant and buildings

The existing approved MOP sets out a number of actions that the RMP will follow in respect to mine closure. Should certain infrastructure facilities and services for future use not be maintained (see previous subsection) it is proposed that the following actions will be taken during mine closure with respect to the buildings and structures associated with the mining, preparation and transport of the coal:

- the coal bins and surface conveyor plant would be scheduled for demolition once an appropriate and safe working procedure has been prepared in accordance with *AS 2601-20001: The Demolition of Structures*;
- all above-ground buildings and built structures would be demolished or removed, subject to consultation with the landowner and other stakeholders;
- concrete pads and footings would either be covered with at least 300 mm of growth medium or broken up and disposed of in an appropriate place;
- roadways not required for access to the mine site or other areas for purposes such as bushfire management would be rehabilitated;
- below-grade structures such as concrete sumps would be filled and covered with growth medium; and
- sealing of ventilation shafts and service boreholes, in accordance with the DTIRIS guideline *EDG01-Borehole Sealing Requirements on Land: Coal Exploration*, and removal of ventilation shaft and fan infrastructure.

All electricity, water and communications services not required would be disconnected. Underground structures such as cables and pipes would be sealed at each end and remain buried.

These activities could be subject to change during the mine closure process, for example, depending on requests by the landholder and for future land use options. Consultation will be undertaken with Delta Electricity, the present land owner, prior to closure of the Colliery to determine which, if any, structural elements would remain. Other consultation will be undertaken in accordance with the mine closure consultation guidelines or policies that pertain at the time.

20.2.3 Performance standards and success criteria

When final rehabilitation commences, implementation and success will be reviewed, at minimum, on an annual basis to confirm compliance with the relevant approvals. Corrective action would be implemented where results or trends indicate risk of future non-compliance or environmental risk as determined through the monitoring programs described below.

The current MOP identifies three environmental issues as being of 'risk', albeit low, as a result of rehabilitation activities, which could result in an incident or non-compliance to the MP10_0161 criteria. These are:

- air pollution (dust or emissions);
- weed dispersal; and/or
- bushfire ignition.

These 'low risk' issues are addressed in the MOP and proposed to be controlled using routine procedures or corrective actions. All other environmental issues relative to rehabilitation activities were identified in the MOP as being of 'very low risk' and do not require specific measures be put in place.

The main planning criteria for rehabilitation prior to mine closure will be in accordance with the principles outlined in the preceding sections.

20.2.4 Monitoring programs

Management and monitoring programs for final rehabilitation will be formulated closer to the time that the rehabilitation works will be required, currently estimated to be around 2027 (dependent on the approval of the proposed mine extension). The details will be included in both the MOP in force at the time and the mine closure plan which would be prepared at least one year prior to cessation of mining activities.

Detailed monitoring is likely to include the following:

- decommissioning of infrastructure;
- landform;
- excessive erosion or sedimentation from areas with establishing vegetation cover;
- success of initial cover crop or grass cover establishment;
- success of tree and shrub plantings;
- extent of natural regeneration of native species;

- adequacy of drainage controls;
- general stability of rehabilitation areas;
- public safety of all rehabilitated areas; and
- socio-economic effects of closure.

Rehabilitation will be monitored to identify improvements that could be implemented to maximise the level of success for subsequent rehabilitation programs.

Should the existing ventilation shaft be decommissioned, the affected land would be rehabilitated. This rehabilitation would need to be designed and the subsequent rehabilitation efforts monitored.

If monitoring reveals that the Colliery rehabilitation actions have resulted in an environmental issue or that there has been non-compliance in relation to rehabilitation, then LakeCoal will conduct an investigation into the cause of the non-compliance.

20.2.5 Rehabilitation trials and strategies

As the proposed final rehabilitation program activities will draw upon the extensive experience of rehabilitation in coastal areas undertaken by Councils, mineral sand mining and other coal mining companies, no major rehabilitation trials or research programs are currently proposed.

No local or State government rehabilitation or offset strategies are currently relevant to rehabilitation at the Colliery. Further, current closure planning or rehabilitation outcomes for nearby industrial and mining developments (including VPPS, Mandalong Mine, Myuna Colliery and Mannering Colliery) are not in place or publically available. However, at the time of developing the Colliery's final RMP, relevant rehabilitation strategies in the region would be investigated with rehabilitation objectives and methodology integrated, if suitable.

It should be noted that it is the owner of the land, Delta Electricity, who will ultimately guide the final closure and rehabilitation objectives for the Colliery.

20.3 Impact assessment

The Proposal does not seek to disturb significant areas of land additional to the areas currently approved for the Colliery with only minor areas disturbed for the sedimentation dam upgrade works. These areas, as with existing land disturbance, would be subject to the rehabilitation management strategies described in Section 20.2.

Given that all areas which would ultimately be the subject of rehabilitation being required for ongoing operations of the Colliery, no rehabilitation activities of any significance are proposed or could be undertaken until mine closure.

20.4 Conclusion

The principles for final rehabilitation have been established and are set out in the current MOP and RMP. More detailed management and monitoring proposals for the final rehabilitation will be formulated closer to the time that the rehabilitation works would be required, currently estimated to be around 2027. Details will be included in both the MOP in force at the time and the mine closure plan which would be prepared at least two years prior to cessation of mining activities.

The rehabilitated land is intended to be compatible with surrounding vegetation communities. Detailed rehabilitation proposals, including management and monitoring arrangements, would be provided in the MOP applying to the period incorporating mine closure and in the RMP, which would be subject to government regulatory approval. The detailed rehabilitation proposals would be consistent with contemporary expectations.

21 Economic

21.1 Introduction

An economic assessment was prepared for the Proposal by Gillespie Economics. This chapter provides a summary of the economic assessment which is provided in full in Appendix M.

The economic assessment considered two key aspects of the Proposal, namely:

- the economic efficiency of the Proposal (i.e., consideration of economic costs and benefits using BCA; and
- the economic stimulus and its effect on the State and regional economies (i.e., consideration of the economic activity that the Proposal would provide to the regional economy using input-output analysis).

21.2 Economic efficiency – benefit cost analysis

21.2.1 Methodology

The BCA compared the Proposal's present value of aggregate benefits to society (global, national and NSW perspective) with the present value of aggregate costs. The Proposal is considered to improve the economic welfare of society and be desirable from an economic efficiency perspective, if the present value of aggregate benefits to society exceeds the present value of aggregate costs (i.e., a net present value of greater than zero).

The BCA of the Proposal is based on financial, technical and environmental advice provided by LakeCoal, EMM and the technical reports provided in Appendices D – N. The BCA of the Proposal involved the following key steps:

- identification of the “base case” or “without the Proposal” scenario;
- identification of the Proposal and its implications;
- identification and valuation of the incremental benefits and costs;
- consolidation of value estimates using discounting to account for temporal differences;
- application of decision criteria;
- sensitivity testing; and
- consideration of non-quantified benefits and costs.

21.2.2 Identification of benefits and costs

The base case scenario involves the cessation of mining in 2013, which is the estimated time when currently approved reserves would be exhausted. In contrast, the Proposal would provide for an additional 14 year period of operations at the Colliery and extraction at an increased rate of 1.5 Mtpa.

The incremental economic benefits of the Proposal (i.e., those additional to the base case) are outlined in Table 21.1.

Table 21.1 Incremental economic benefits and costs of the Proposal

| Category | Costs | Benefits |
|---|---|---|
| Net production benefits | Opportunity costs of capital and land – 2013 | Avoided decommissioning and rehabilitation costs – 2013 |
| | Capital costs of the Proposal | Value of coal production |
| | Operating costs of mine including mitigation measures | Residual value of capital and land at end of Proposal life - 2027 |
| | Rehabilitation and decommissioning costs at end of the Proposal life – 2027 | |
| Potential environmental social and cultural impacts | Greenhouse gas impacts | Any non-market benefits of employment |
| | Air quality impacts | |
| | Noise impacts | |
| | Subsidence impacts on surface infrastructure | |
| | Surface and groundwater impacts | |
| | Terrestrial ecology impacts | |
| | Marine ecology impacts | |

21.2.3 Valuation of benefits and costs

The majority of the Proposal's environmental impacts are not attributed externality economic costs because of the minimal levels of impact. For greenhouse gas impacts, a shadow price of AUD\$23/t CO₂-e was used rising at 2.5% per year in real terms for three years and then remaining constant. Sensitivity testing assuming a shadow price from AUD\$8/t CO₂-e to AUD\$40/t CO₂-e was also undertaken.

The non-market value of employment (i.e., the estimation of community's willingness to pay for the Proposal providing 120 jobs for 14 years) was determined from the study of a similar proposal in NSW (Gillespie Economics 2009) as \$42M.

The estimated incremental benefits and costs of the Proposal are provided in Table 21.2.

Table 21.2 BCA results of the Proposal

| | Costs | | Benefits | |
|---|--|------------------|--|----------------------|
| | Description | Value (\$AUD M) | Description | Value (\$AUD M) |
| Net production impacts | Opportunity cost of capital equipment and land | \$16 | Avoided decommissioning costs | \$0 |
| | Additional capital costs | \$39 | Value of coal | \$927 |
| | Operating costs excluding royalties | \$657 | Residual value of capital equipment | \$2 |
| | Decommissioning and rehabilitation costs | \$0 | | |
| | Sub-total | \$712 | Sub-Total | \$930 |
| | | | Net Production Benefits | \$218 |
| Environmental, social and cultural impacts | Greenhouse gas impacts | \$143 (\$1) | Non-market values of employment | \$42 |
| | Noise impacts | Insignificant | | |
| | Air quality impacts | Insignificant | | |
| | Subsidence impacts | Insignificant | | |
| | Surface water impacts | Insignificant | | |
| | Groundwater impacts | Insignificant | | |
| | Terrestrial ecology impacts | Insignificant | | |
| | Marine ecology impacts | Insignificant | | |
| | Traffic impacts | Insignificant | | |
| | | Sub-total | Sub-total | \$42 |
| | | | Net Social Benefits – including employment benefits | \$117 (\$258) |
| | | | Net Social Benefits – excluding employment benefits | \$75 (\$217) |

Notes: Monetary values are present values using a 7% discount rate.

Totals may have minor discrepancies due to rounding.

When impacts accrue globally, the numbers in brackets relate to the level of impact estimated to accrue to Australia.

Other potential impacts of the Proposal including heritage, hazards, wastes, visual, soils and rehabilitation are minor to negligible and, therefore, consideration was not warranted.

The Proposal is estimated to have total net production benefits of \$218M which, assuming 100% Australian ownership, would all accrue to Australia. The net production benefits can be used as a threshold value for the consideration of the residual environmental impacts of the Proposal. For the Proposal to be questionable from an economic efficiency perspective, all incremental residual environmental impacts from the Proposal would need to be valued by the community at greater than the estimate for net production benefits (i.e., greater than \$218M). As indicated in Table 21.2, the costs of incremental environmental impacts of the Proposal to Australia are estimated at \$1M. The net social benefits of the Proposal to Australia are estimated to be between \$217M and \$258M and, therefore, the Proposal is desirable and justifiable from an economic efficiency perspective.

The estimated net production benefits of the Proposal would be distributed between numerous stakeholders including:

- LakeCoal in the form of any after tax profits;
- the Commonwealth Government in the form of any company tax;
- the NSW Government via royalties;
- coal-fire power generators through the provision of lower cost coal and, subsequently, NSW electricity consumers; and
- the local community through voluntary contributions to community infrastructure and services.

The environmental, cultural and social impacts of the Proposal may potentially accrue to a number of different stakeholder groups at the local, State, National and global level. The majority of these impacts were deemed as insignificant. Greenhouse gas costs would occur at the national and global level and would be internalised in the future through payment of the Commonwealth Government's carbon tax. Non-market benefits associated with employment provided by the Proposal would largely accrue at the State level.

The non-market costs that accrue to NSW are estimated at less than \$1M. These are considerably less than the net production benefits (and potential non-market employment benefits) that directly accrue to NSW through royalties of approximately \$64M (present value). It should be noted, that NSW will also share some of the benefits that accrue to the Commonwealth through company taxes as well as any direct contributions. Consequently, as well as resulting in net social benefits to Australia the Proposal would result in net social benefits to NSW.

21.2.4 Sensitivity analysis

The values presented in Table 21.2 are based on a range of assumptions around which there is some level of uncertainty. Uncertainty in a BCA can be dealt with through a sensitivity analysis where values of critical variables are changed to determine the effect on values.

The sensitivity analysis for the Proposal indicates that the results of the BCA are not sensitive to reasonable changes in assumptions. In particular, significant increases in the values used for external impacts such as greenhouse gas costs had little impact on the economic desirability of the Proposal. The results were most sensitive to any potential decreases in the economic value of coal, although, a significant and sustained reduction in coal value (28%) would be required to make the Proposal inefficient. This is considered highly unlikely to occur.

21.3 Impact assessment

21.3.1 Methodology

The economic impact assessment is focused on the effect or impact of the Proposal on the economy in terms of a number of specific indicators of economic activity such as gross regional output, value-added, income and employment. The impacting effect of the Proposal was taken to be the production of 1.5 Mtpa ROM coal for a 14 year period. The impacted regional economy was assumed to be the Lake Macquarie and Wyong LGAs in which 90% of the Colliery's current workforce resides.

An input-output analysis was used for the economic impact assessment, consistent with DP&I's *Draft Guideline for Economic Effects and Evaluation in EIA* (James & Gillespie 2002). The input-output analysis involved two steps:

- construction of an appropriate input-output table (using the Generation of Input-Output Table procedure) that can be used to identify the economic structure of the region and multipliers for each sector of the economy; and
- identification of the initial impact or stimulus of the Proposal in a form that is compatible with the input-output equations so that the input-output multipliers and flow-on effects can then be estimated.

21.3.2 Impacts to regional and NSW economies

The regional economy has an estimated gross regional product of \$8,407M and employs a total of 83,602 people. Compared to the NSW economy, the mining, manufacturing, utilities and building sectors are of greater relative importance, while the agricultural sectors and services sectors are of less relative importance. The retail trade sector is the most significant sector for the regional economy in terms of output, value-added and household income, employment, and imports and exports. It is noted that the coal mining sector is the second highest regional export sector behind retail trade.

The total and disaggregated annual impacts of the Proposal on the regional and NSW economies (in 2012 dollars) are shown in Table 21.3.

Table 21.3 Total and disaggregated annual economic impacts of the Proposal on regional and NSW economies

| | Direct effect | Production induced flow-on | Consumption induced flow-on | Total flow-on | Total Effect |
|-------------------------|------------------|----------------------------|-----------------------------|---------------|--------------|
| Regional economy | | | | | |
| Output (\$,000) | 115,300 | 55,182 | 30,951 | 86,133 | 201,433 |
| Value added (\$,000) | 59,888 | 24,666 | 16,245 | 40,911 | 100,799 |
| Income (\$,000) | 17,100 | 15,029 | 8,012 | 23,040 | 40,140 |
| Employment (No.) | 108 ¹ | 184 | 126 | 310 | 418 |
| NSW economy | | | | | |
| Output (\$,000) | 115,300 | 71,955 | 71,893 | 143,848 | 259,148 |
| Value added (\$,000) | 62,288 | 32,530 | 36,619 | 69,149 | 131,437 |
| Income (\$,000) | 19,000 | 22,032 | 20,956 | 42,988 | 61,987 |
| Employment (No.) | 120 | 235 | 280 | 515 | 635 |

Notes: 1. Direct employment of 108 represents average annual employees residing in the region, based on LakeCoal employee data. Contractors are located in production-induced flow-ons.

The revenue, expenditure and employment associated with the operation of the Proposal would stimulate economic activity for the regional economy, as well as the broader NSW economy, for a period of 14 years. The Proposal is estimated to make up the following total annual contribution to the regional economy:

- \$201M in annual direct and indirect regional output or business turnover;
- \$101M in annual direct and indirect regional value added;

- \$40M in annual direct and indirect household income; and
- 418 direct and indirect jobs.

Flow-on impacts from the Proposal are likely to affect a number of different sectors of the regional economy. The sectors most impacts by output, value-added and income flow-ons are likely to include the following:

- road transport sector;
- services to mining sector;
- ownership of dwellings sector;
- other property services sector; and
- retail trade sector.

Business that can provide the inputs to the production process required by the Proposal and/or the products and services required by employees would directly benefit from the Proposal by way of increased economic activity. Indirect businesses would also benefit due to linkages between sectors.

The Proposal is estimated to make up to the following total annual contribution to the NSW economy:

- \$259M in annual direct and indirect regional output or business turnover;
- \$131M in annual direct and indirect regional value added;
- \$62M in annual direct and indirect household income; and
- 635 direct and indirect jobs.

The impacts on the NSW economy are substantially greater than for the regional economy, as the NSW economy is able to capture more direct mine and household expenditure and there is a greater level of linkages between sectors.

21.3.3 Impacts of mine cessation

The Proposal will continue to stimulate demand in the regional and NSW economy for up to 14 years, leading to continued and increased business turnover in a range of sectors and continued and increased employment opportunities. Conversely, the cessation of mining operations at the Colliery, as would occur should the Proposal not be approved, would result in a contraction in regional economic activity. The magnitude of the regional impacts of cessation would primarily depend on whether the workers and their families would leave the region, whether alternative development opportunities arise, and the economic structure and trends in the regional economy at the time. If some or all of the workers remain in the region, then the impacts of Proposal cessation would not be as severe compared to a greater level leaving the region. The decision to leave the region is dependent on a number of factors including the prospects of gaining employment in the local region compared to other regions, the likely loss or gain from homeowners selling, and the extent of “attachment” to the local region (Economic and Planning Impact Consultants 1989).

Should alternative development opportunities arise in the regional economy, the economic impacts associated with mine cessation can be substantially ameliorated and absorbed by the growth of the region.

Ultimately, the significance of the economic impacts of cessation would depend on the economic structure and trends in the regional economy at the time. In a declining economy the impacts of cessation may be significant. In a growing diversified economy, where there are other development and employment opportunities, mine cessation may not be a cause for concern. Nevertheless, the uncertainty around future development and mining opportunities in the region means that it is not possible to foresee the likely economic impacts of mine cessation.

21.4 Conclusion

For the Proposal to be questionable from an economic efficiency perspective, all residual adverse environmental impacts would need to be valued by the community at greater than the total net production benefits. The Proposal would result in an estimated net production benefit of \$218M, compared to estimated externality costs of \$1M. Accordingly, the Proposal is considered to improve the economic welfare of society and be desirable from an economic efficiency perspective.

Production benefits would be distributed amongst a range of stakeholders, including the local community, NSW and Commonwealth Government's and LakeCoal in Australia. Externality costs may accrue to a number of stakeholders at the local, State, National and global level, however it is anticipated that the costs would largely be insignificant.

The regional economic impact analysis estimated that the Proposal would contribute to economic activity in the regional and NSW economies for the 14 year mine life period. If the Proposal did not proceed, a contraction in regional economic activity would occur. The significance of mine cessation impacts would depend on the economic structure and trends in the regional economy at the time, whether other employment opportunities are available for displaced workers, and whether displaced workers and their families remain in the region.

The Proposal would provide economic benefit to the NSW and regional economies. Accordingly, no mitigation measures are considered necessary.

22 Social

22.1 Introduction

A SIA was undertaken for the Proposal by EMM. The findings of the SIA are summarised in this chapter and provided in full in Appendix N.

The chapter describes the existing social environment and presents potential impacts from the Proposal on, amongst other aspects, employment, regional economy, social infrastructure, health infrastructure and social amenity. It includes management and monitoring measures that will be implemented to negate or minimise negative impacts and enhance positive impacts.

Stakeholder engagement is an important part of a social impact assessment as it allows stakeholder values, issues and opportunities associated with the Proposal to be identified. It also assists in refining the Proposal's design and implementation. Together with the DGRs, feedback received during engagement influenced the form of the SIA. Stakeholder engagement is addressed in Chapter 5.

22.2 Existing environment

The Proposal would follow on directly from the Colliery's current operational activities and would not alter the existing workforce numbers of 160 employees. The SIA methodology, a summary of the Colliery's existing workforce profile, and the socio-economic characteristics of people residing in the region are presented below.

22.2.1 Workforce profile

A review of the Colliery's existing workforce profile was undertaken to understand the potential impacts of the Proposal on the existing workforce. As the Colliery has been in operation since 1962, the workforce is likely to have established linkages with the surrounding community. This can include the use of local services (e.g., health and education facilities), participation in sporting events or volunteering with local groups and charities.

EMM prepared and carried out a survey on the Colliery workforce during August and September 2012, which received a 75% response rate from employees. The details of the survey are discussed in detail in the SIA and the results are summarised below.

i Demographics

- approximately 80% of the Colliery workforce are LakeCoal employees, while 20% are contractors to the company;
- approximately 60% have been working at the Colliery for under 2 years, 12% between 3 to 5 years, 15% between 5 to 7 years and 13% greater than 15 years; and
- the largest working age group is 25 to 34 year olds (39%), followed by 45 to 54 year olds (25%) and 35 to 44 year olds (14%).

ii Residential location

- the majority of the Colliery workforce live in Lake Macquarie LGA (60%) followed by Wyong LGA (26%), Newcastle LGA (8%) and other LGAs (6%). It should be noted that actual residential locations, according to LakeCoal employee data, are slightly different than the survey results with 60% of employees recorded as living in Lake Macquarie LGA, 30% in Wyong LGA, 5% in Newcastle LGA and 5% in other LGAs. The figures from the LakeCoal employee data have been adopted in the SIA given that not all employees participated in the survey;
- a high proportion of the Colliery workforce have resided in their locality for more than 15 years (72%) indicating low levels of residential mobility; and
- approximately 85% of the Colliery workforce already lived in the area when they commenced employment at the Colliery, indicating that the Colliery sources employment from the local labour pool.

iii Housing and household composition

- a high proportion of the Colliery workforce have either a mortgage or own their own homes (85%) with a smaller proportion living in rental accommodation (15%);
- approximately 55% of the Colliery workforce had partners in paid employment, while 27% of partners were not working;
- the average family household size for the Colliery workforce is 3.11; and
- the majority of the Colliery workforce (51%) do not have dependent children under 18 years of age that live in their household.

iv Household expenditure and service usage

- the majority of the Colliery workforce purchase their weekly household goods in Lake Macquarie LGA (55%), predominantly at Swansea and Belmont, followed by Wyong LGA (26%), primarily at Lake Haven;
- consistent with the above trend, the Colliery workforce use local medical facilities close to their place of residence (Lake Macquarie LGA – 56% and Wyong LGA – 25%); and
- of all households, 17% have a family member attending high school, 16% attending primary school and 13% attending childcare or preschool.

v Charitable contributions

- over half the Colliery workforce (56%) makes voluntary donations, with 31% making donations to local schools, 17% to Salvation Army, 14% to the local surf club and 13% to local sporting clubs; and
- a small proportion of the Colliery workforce (16%) participates in local voluntary services, and of these, 60% volunteer with the local surf club and 12% with schools and animal rescue groups.

22.2.2 Community profiles

Area 1 is contained within Lake Macquarie LGA. The Colliery's surface facilities, comprising the pit top area at Mannering Park and ventilation shaft and fans at Summerland Point, are located within the Wyong LGA. Potential impacts to infrastructure and amenity from the Proposal are associated with the surface facilities. Therefore, this area is considered to be the 'primary' assessment area, with areas to the north and east beyond the Wyong LGA considered to be the 'secondary' assessment area, as described in the sections below and shown in Figures 22.1 and 22.2, respectively.

The primary assessment area is consistent with the '*Northern Lakes*' catchment as defined by WSC. This includes the communities of Lake Munmorah, Chain Valley Bay, Mannering Park, Gwandalan and Summerland Point (WSC 2010). The primary assessment area is serviced by the regional centre of Wyong.

Wyong LGA lies between the metropolitan centres of Sydney and Newcastle in the Central Coast region. It covers an area of 820 km². The LGA is a growing residential area, with some commercial and industrial land uses. There are substantial areas of national parks, state forests, coastline and lakes. The western half of the LGA is predominantly rural.

The secondary assessment area is defined as the southern lake foreshore localities (north of Chain Valley Bay) in Lake Macquarie LGA, including the communities of Brightwaters, Mirrabooka, Morisset Park, Windermere Park and Sunshine. The secondary assessment area is serviced by the regional centres of Toronto and Morisset. For the purposes of this report, the secondary assessment area is collectively referred to as the 'southern foreshore'. The southern foreshore is characterised by a high number of holiday homes around the foreshore which increases the local population during the busier summer months.

Lake Macquarie LGA is in the lower Hunter region, directly north of Wyong LGA. The LGA has an area of approximately 750 km² comprising mountains, beaches and coastal plains encircling Lake Macquarie, a coastal salt water lagoon. Lake Macquarie is the dominant landscape feature in the region, covering 14.5% of the LGA.

Approximately 60% of the existing Colliery workforce resides in the Lake Macquarie LGA, while approximately 30% reside in Wyong LGA. Therefore, it is envisaged that the majority of direct social and economic impacts would occur in both the primary and secondary assessment areas.

22.2.3 Primary assessment area

i Key socio-economic characteristics

A community profile was developed for the primary assessment area using the latest ABS census data and is summarised in Table 22.1. A summary of the assessment findings is presented in the following sections.

Table 22.1 **Socio-economic characteristics summary: primary assessment area**

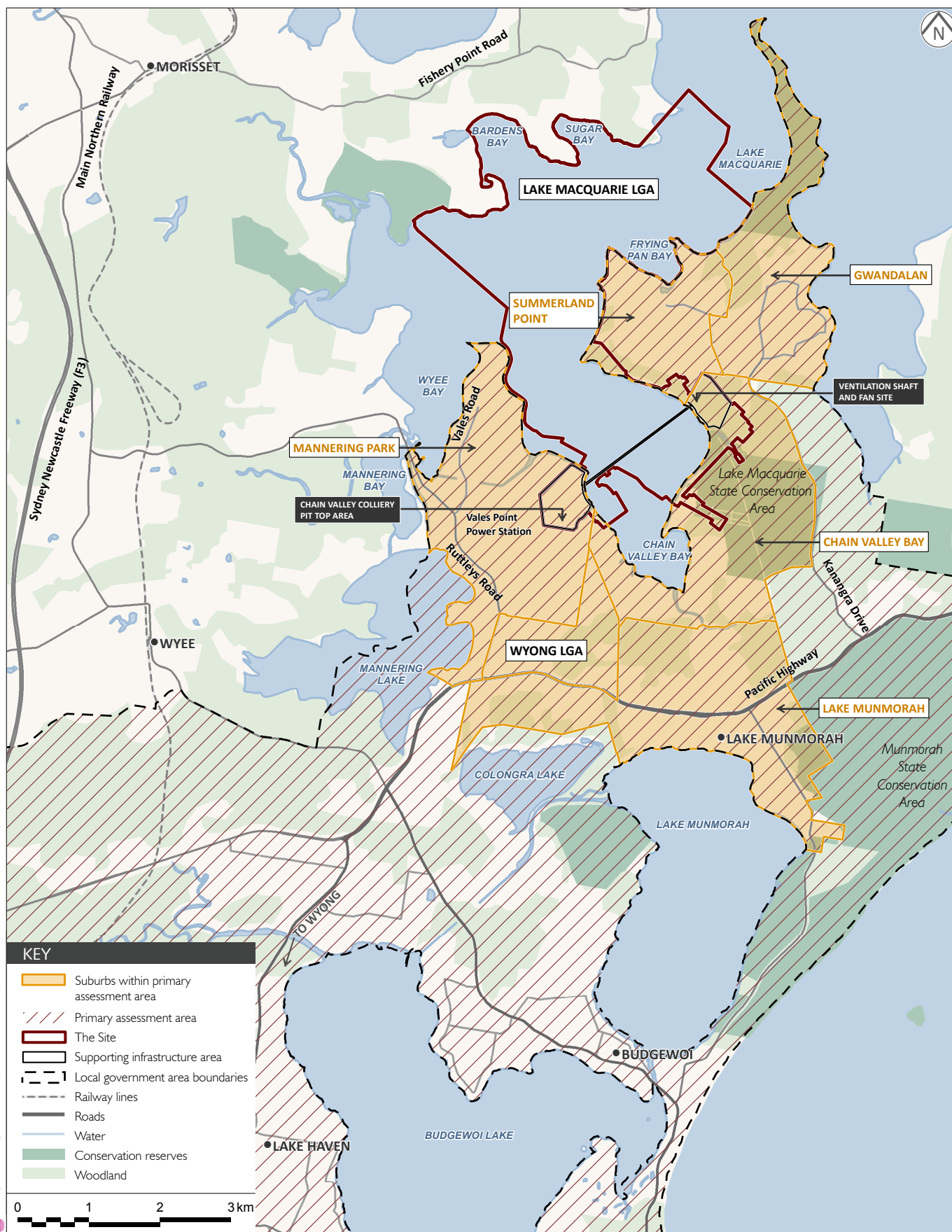
| Socio-economic characteristic | Manning Park | Chain Valley Bay | Lake Munmorah | Gwandalan | Summerland Point | Wyong LGA | NSW |
|---|--|---|---|--|---|---|--|
| Population (2006) | 2,407 | 2,453 | 4,443 | 2,941 | 2,173 | 139,801 | 6,549,178 |
| Population (2011) | 2,398 | 2,452 | 4,802 | 3,035 | 2,358 | 149,746 | 6,917,660 |
| Population growth (2006-2011) (%) | -0.4 | -0.1 | 8.1 | 3.2 | 8.5 | 7.0 | 5.6 |
| Annual rate of population (2006-2011) (%) | -0.1 | 0.0 | 1.6 | 0.6 | 1.7 | 1.4 | 1.1 |
| Indigenous population (%) | 3.8 | 2.5 | 3.4 | 3.7 | 2.4 | 3.7 | 2.5 |
| Population growth (2011-2031) (%) | - | - | - | - | - | 1.5 | 1.2 |
| Younger age (0 to 4 years) (%) | 6.5 | 5.2 | 5.7 | 6.4 | 5.9 | 6.7 | 6.6 |
| Working age (18 to 64 years) (%) | 57.1 | 47.2 | 53.6 | 56.8 | 55.5 | 56.6 | 62.0 |
| People aged 65 +years (%) | 16.7 | 33.5 | 23.6 | 18.6 | 21.0 | 18.2 | 14.7 |
| Median age (2006) | 38 | 46 | 40 | 39 | 43 | 39 | 37 |
| Median age (2011) | 39 | 51 | 44 | 41 | 44 | 40 | 38 |
| Industry structure | Retail trade/ Manufacturing/ Health care & social assistance | Health care & social assistance/ Retail trade/ Construction/ | Retail trade/ Construction/ Health care & social assistance | Health care & social assistance/ Retail trade/ Manufacturing/ | Retail trade/ Construction/ Health care & social assistance | Retail trade/ Health care & social assistance/ Construction | Health care & social assistance/ Retail trade/ Manufacturing |
| Occupational structure | Technicians & trades/ Labourers/ Professionals | Technicians & trades/ Labourers/ Community & personal service workers | Technicians & trades/ Clerical & admin/ Labourers | Technicians & trades/ Clerical & admin/ Community & personal service workers | Technicians & trades/ Professionals/ Clerical & admin | Technicians & trades/ Professionals/ Clerical & admin/ | Professionals/ Clerical & admin/ Managers |

Table 22.1 **Socio-economic characteristics summary: primary assessment area**

| Socio-economic characteristic | Mannering Park | Chain Valley Bay | Lake Munmorah | Gwandalan | Summerland Point | Wyong LGA | NSW |
|-------------------------------------|----------------|------------------|---------------|-----------|------------------|-----------|-------|
| Unemployment rate (%) | 8.0 | 8.0 | 7.6 | 7.0 | 9.1 | 5.1 | 5.9 |
| Average household size (persons) | 2.6 | 2.2 | 2.4 | 2.5 | 2.5 | 2.5 | 2.6 |
| Median weekly household income (\$) | 892 | 676 | 837 | 954 | 919 | 934 | 1,036 |
| Median weekly rent (\$) | 265 | 250 | 270 | 255 | 270 | 260 | 300 |

Source: ABS (2011)

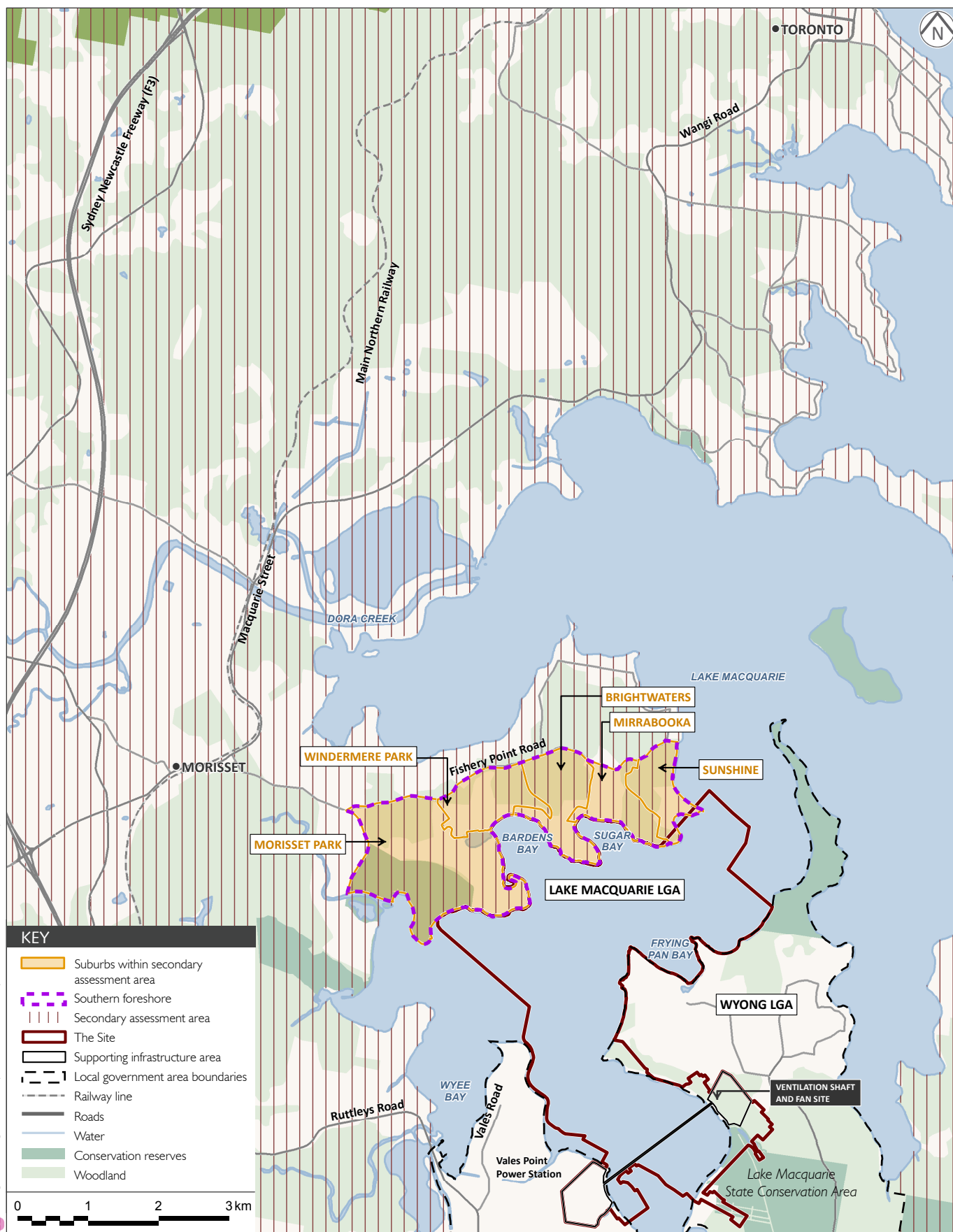
Note: percentages may have some discrepancies due to rounding



Primary assessment area - Chain Valley Bay and surrounds

Chain Valley Colliery Mining Extension I Project - Environmental Impact Statement

Figure 22.1



Secondary assessment area - Southern Lake Macquarie localities

Chain Valley Colliery Mining Extension I Project - Environmental Impact Statement

Figure 22.2

ii Socio-economic profile

a. Population size, growth and future change

The primary assessment area had a total population of 15,045 in 2011. This accounts for 10% of the Wyong LGA population. Lake Munmorah is the largest suburb within the primary assessment area and contains a higher range of services.

Since 2006, the population in the primary assessment area has experienced a population increase of 4.4% (628). This growth is consistent with the trend across Wyong LGA and NSW which experienced population growth of 7% and 5.6%, respectively.

Based on historic growth patterns, Wyong LGA is likely to experience continued population growth through to 2031 of approximately 1.5% annually, 0.3% above the predicted NSW average for the same period (DP&I 2012).

b. Population structure

The largest age group in Chain Valley Bay were people aged 65 years and over (33.5%) and 55 to 64 year olds (12.5%). It had the lowest representation of children aged 0 to 4 years (5.2%), 5 to 11 years (6.8%) and 12 to 17 years (7.3%) across the primary assessment area.

Gwandalan, Summerland Point, Mannering Park and Lake Munmorah are characterised by a 'middle-aged' family structure with a high representation of people aged 45 to 54 years and children aged 5 to 11 years. This is consistent with Wyong LGA.

Consistent with many areas outside of metropolitan centres, there was a lower representation of young working adults (aged 18 to 24 years) in the primary assessment area compared to the NSW average.

All communities in the primary assessment area had an above NSW average median age (38 years). Mannering Park's population was relatively young (39 years) compared to the other communities within the Wyong LGA. Since 2006, Lake Munmorah and Chain Valley Bay have experienced a considerable increase in their median ages (46 to 51 years and 40 to 44 years, respectively).

c. Household structure

The current cost and recent trends in both the median house price and average new rental cost for dwellings in Wyong LGA are outlined below, based on the Quarterly Rent and Sales Report (Housing NSW 2012).

iii Housing demand

The median sales price for a dwelling in Wyong LGA was \$332,000 as of March 2012, representing an 11.8% increase since March 2009 (\$297,000) and a 3.9% annual increase.

According to ABS 2011 census, housing stress (i.e., where households spend more than a third of their income on mortgage repayments) was affecting approximately 10.2% of households, marginally below the NSW average of 10.5%.

iv Rental housing

Median rental cost for a three-bedroom dwelling in Wyong LGA is \$340 per week (June quarter 2012). This represents a 6.3% annual increase from \$320 per week in the June quarter 2011 and a 7.1% annual increase since June 2009 when the median rent was \$280 per week.

According to ABS 2011 census, rental housing stress affected 12.5% of households. This was above the NSW average (11.6%).

v Unoccupied dwellings

Summerland Point, Gwandalan, and Mannering Park had a high proportion of 'unoccupied dwellings' in the area (22.3%, 18.5 % and 13.7%, respectively), as compared to Wyong LGA and NSW (12.2% and 9.7%, respectively). This is an indication of a high number of holiday homes in the area. Chain Valley Bay had the lowest proportion at 6.9%.

a. Economic structure

Retail trade and health care and social assistance industries feature prominently in the primary assessment area (Mannering Park, Gwandalan and Summerland Point). The construction sector is also highly represented in Chain Valley Bay, Lake Munmorah, Gwandalan and Summerland Point localities.

b. Workforce and occupation structure

Technicians and trade workers are the dominant occupations in the primary assessment area. Clerical administration and labourers are also highly represented. Unemployment levels across all the localities are above the Wyong LGA and NSW average. However, with the exception of Summerland Point, all other localities have experienced a decline in the unemployment rate since the 2006 census.

The median weekly household income for all suburbs is below the NSW average (\$1,036) with Chain Valley Bay recording the lowest weekly household income (\$676) by a considerable margin to the next lowest suburb (Lake Munmorah \$837).

vi Community infrastructure and services

A key social indicator in a community is the quality and capacity of existing community facilities and services. A detailed assessment was undertaken for the SIA and addressed education (primary and secondary), tertiary education and training centres, childcare, healthcare, emergency services, community facilities and surrounding development.

22.2.4 Secondary assessment area

i Key socio-economic characteristics

A community profile was developed for the secondary assessment area using the latest ABS statistical data and is summarised in Table 22.2. A summary of the assessment findings is presented in the following sections.

Table 22.2 Socio-economic characteristics summary: secondary assessment area

| Socio-economic characteristic | Southern foreshore | Lake Macquarie LGA | NSW |
|---|---|--|--|
| Population (2006) | 3,334 | 183,138 | 6,549,178 |
| Population (2011) | 3,365 | 189,006 | 6,917,660 |
| Population growth (2006-2011) (%) | 0.9 | 3.2 | 5.6 |
| Annual rate of population (2006-2011) (%) | 0.2 | 0.6 | 1.1 |
| Indigenous population (%) | 2.7 | 3.0 | 2.5 |
| Population growth (2011-2031) (%) | - | 0.7 | 1.2 |
| Younger age (0 to 4 years) (%) | 6.2 | 6.0 | 6.6 |
| Working age (18 to 64 years) (%) | 62.4 | 58.7 | 62.0 |
| People aged 65 +years (%) | 18.4 | 18.4 | 14.7 |
| Median age (2006) | 40 | 40 | 37 |
| Median age (2011) | 41 | 41 | 38 |
| Industry structure (ABS 2006) | Health care & social assistance/ Manufacturing/ Retail trade/ | Health care & social assistance/ Retail trade/ Manufacturing | Health care & social assistance/ Retail trade/ Manufacturing |
| Occupational structure (ABS 2006) | Professionals/ Technicians & trades/ Labourers and Retail trade | Professionals/ Technicians & trades/ Clerical & admin | Professionals/ Clerical & admin/ Managers |
| Unemployment rate 2010 (ABS 2006) | 6.4 | 5.3 | 5.9 |
| Average household size (persons) | 2.5 | 2.5 | 2.6 |
| Median weekly household income (\$) | 1,080 | 1,117 | 1,036 |
| Median weekly rent (\$) | 270 | 255 | 300 |

Source: ABS (2011)

Note: percentages may have some discrepancies due to rounding

ii Socio-economic profile

The southern foreshore is characterised by a stable population. The population of 3,365 at the 2011 census remained almost unchanged from the 2006 census (3,334). Overall, Lake Macquarie LGA had a population growth of 3.2% between 2006 and 2011 which was below the NSW average (5.6%).

Other features of the southern foreshore are as follows:

- the largest age group were people aged 65 years and over (18.4%), followed by 45 to 54 year olds (13.7%) and 55 to 64 year olds (13.5%). The smallest groups were infants, young adults and younger working adults: 0 to 4 year olds (6.2%), 12 to 17 year olds (8.0%) and 18 to 24 year olds (8.4%). Of note, the size of age groups for southern foreshore is reflective of Lake Macquarie LGA as a whole;
- the median age of the southern foreshore communities was 41 years in 2011 as compared to 40 years in 2006. This is consistent with Lake Macquarie LGA but above the NSW average (38 years);
- a higher proportion of families without children (42.3%), followed by families with children (30.6%) and lone person households (23.6%);
- level of home ownership, which includes property being purchased, was 78.6% which is above Lake Macquarie LGA (73.6%) and NSW average (66.6%). The level of renting in the area is 23% compared to 30.1% in NSW;
- a median household income of \$1,080 per week as compared to \$1,237 per week in NSW;
- 'professionals' were the predominant occupation, followed by 'technicians and trades' and 'managers'; and
- 'health care and social assistance', 'manufacturing' and 'retail trade' were the largest employing industries.

iii Community infrastructure and services

As stated in Section 22.2.3, a detailed assessment was undertaken in the SIA for education (primary and secondary), tertiary education and training centres, childcare, healthcare, emergency services, community facilities and surrounding development.

22.3 Impact assessment

This section describes the Proposal's potential social impacts in consideration of the existing social and economic conditions discussed in Section 22.2.

22.3.1 Methodology

The SIA involved the following steps:

- documentation of the social aspects of the Proposal, particularly workforce characteristics and its existing residential distribution;
- documentation of the relevant local and regional policy context;
- development of community profiles for the primary and secondary assessment areas (refer to Section 22.2.4 and 22.2.5);
- consultation with key stakeholders, including landowners, community groups, councils, government agencies and service providers;

- assessment of potential impacts of the Proposal on the primary and secondary assessment areas;
- analysis of potential cumulative impacts of the Proposal and other major projects that would occur concurrently;
- development of appropriate measures to manage and monitor any potential adverse social impacts and provide for the enhancement of positive impacts; and
- identification of ongoing monitoring processes to ensure social impacts are responsively managed and reviewed over time.

22.3.2 Project workforce and population change impacts

The SIA found that approximately 85% of the Colliery workforce already lived in the area when they commenced employment, indicating the Colliery sources employment from the local labour pool. Furthermore, a high proportion of the workforce (72%) has resided in the area for more than 15 years. This indicates low levels of residential mobility. Therefore, it is envisaged that population change in the region is highly unlikely to occur due to the Proposal.

22.3.3 Community infrastructure and services impacts

LakeCoal currently supports the local community through, amongst other means, contributions to public infrastructure and services and community projects at a rate of \$0.035/t of ROM coal produced from the Colliery. The Colliery has also committed to the upgrading of the Ruttleys Road and Construction Road intersection, as required under MP10_0161. Traffic engineering design work has been completed and LakeCoal is now seeking suitable contractors to execute the works. In addition to this, LakeCoal will be entering into a Road Maintenance Agreement with WSC for the maintenance of Ruttleys Road attributable to the coal haulage impacts.

The Proposal would see the continuation of operations at the Colliery for a further period of approximately 14 years. As the Proposal is highly unlikely to increase the region's population, there would be no demand for additional community infrastructure and services (such as childcare, health, education and emergency services) in the primary and secondary assessment areas as a direct result of the Proposal. Therefore, adverse social impacts on community infrastructure and services are considered to be negligible. The Proposal would, however, continue to contribute funding towards local community infrastructure.

22.3.4 Community structure, wellbeing and cohesion

Wyang and Lake Macquarie LGAs have a long tradition of mining. The Proposal involves an extension of existing mining operations at the Colliery, which have been a part of the community since 1962. As stated in Section 22.2, 26% of the existing Colliery workforce resides in primary assessment area while 60% reside in the secondary assessment area, with a high proportion of the Colliery workforce (72%) residing in the area for more than 15 years. It should be noted that LakeCoal employee data shows that 30% and 60% of the Colliery workforce reside in the Wyong (primary assessment area) and Lake Macquarie (secondary assessment area) LGAs, respectively.

The mine extension itself would be solely under Lake Macquarie and would require no acquisition of residential properties. The Proposal would, however, maintain employment at the Colliery, thereby promoting cohesion and wellbeing in the local community.

As identified in Section 22.2, over half the Colliery workforce (56%) makes voluntary donations to local schools and community groups, demonstrating that the workforce does actively promote community wellbeing and cohesion.

22.3.5 Social amenity impacts

As the Proposal would increase the life of mine by approximately 14 years, factors that can influence social amenity are traffic, dust and air quality, noise and visual impacts. As these environmental aspects are addressed in detail in the relevant chapters, a summary of potential amenity impacts is provided in Table 22.3.

Table 22.3 Potential social amenity impacts

| Environmental aspect | Overview |
|----------------------|---|
| Traffic | <p>As described in the TIA, Chapter 11, site access and traffic generated by the Colliery on external public roads would not change under the Proposal as there would be no increase in the existing workforce or the amount of coal being transported to the PWCS.</p> <p>As the Proposal would not increase the number of export coal truck movements or haulage days to the PWCS, no additional road safety impact would result from the Proposal. Given there would be no increase in the existing workforce, no additional demand would be placed on public transport services.</p> <p>Improvements to the road shoulders, or the provision of separate pedestrian footpaths and/or cycleways alongside these roads, would not be required as a result of the Proposal.</p> |
| Dust and air quality | <p>The AQIA, Chapter 10, identifies that dust and air quality was not raised as a key issue amongst local stakeholders as the Proposal's coal extraction activities would be confined to below Lake Macquarie.</p> <p>During operations, the Proposal would result in emissions of particulate matter, primarily from coal handling activities at the pit top and the operation of upcast ventilation shaft and fans. However, the results of the AQIA indicate that these emissions and dust deposition resulting from the Proposal would be well below the impact assessment criteria and would not affect surrounding private residences.</p> <p>The modelling of odour from the recently upgraded ventilation shaft predicted levels is below the threshold for odour detection at all assessment locations.</p> <p>A cumulative assessment, incorporating existing background levels, indicates that the Proposal is highly unlikely to result in any additional exceedences of relevant impact assessment criteria at the assessment locations.</p> |
| Noise | <p>The NIA, Chapter 9, indicates that operational noise under the Proposal during worst case weather conditions would satisfy the relevant criteria under MP10_0161 at all assessment locations, with the exception of three which may currently experience exceedences under the existing operations. Modelling predicts a slight reduction in noise emissions at the majority of locations when the Colliery's dozer, the main contributor to noise, is not operating.</p> <p>Furthermore, the Proposal would not result in any additional cumulative industrial noise within the surrounding community. For the residence most exposed to cumulative noise, no change to cumulative noise levels under the Proposal is predicted.</p> <p>The road traffic noise assessment indicates that noise levels associated with the Proposal would satisfy the relevant RNP criteria at assessment locations along the road network in terms of incremental increases. However, the noise levels at the closest residences already exceed the traffic noise criterion.</p> <p>Noise from the Proposal would continue to be managed and monitored in accordance with Colliery's NMP. This includes the implementation of a noise reduction program which is aimed at the identification of the most effective and efficient means to further reduce noise emissions from the Colliery.</p> |

Table 22.3 **Potential social amenity impacts**

| Environmental aspect | Overview |
|-----------------------------|---|
| Visual | <p>As described in Chapter 18, the Colliery and surrounding industrial infrastructure (such as conveyors, high voltage power lines and VPPS) are visible throughout the southern assessment area.</p> <p>No additional mine infrastructure that would be visible from the Lake foreshore is proposed. Minor surface infrastructure upgrades would be undertaken as existing plant and equipment requires replacement and additional lighting would comply with AS4282. Therefore, the Proposal would not change the existing landscape character of the area.</p> |

22.3.6 Economic impacts

The Colliery is an important part of the local community as 90% of the workforce resides within Wyong and Lake Macquarie LGAs. The Proposal would support approximately 418 and 635 families in the region and throughout NSW, respectively, through direct and indirect employment.

Although the Proposal would not increase the Colliery workforce numbers, continued operations would provide ongoing employment and positive flow-on effects. The continued employment of the Colliery workforce would maintain positive impacts for the local economy due to demand for goods and services and for other services and industries such as retail trade, hospitality, hiring and construction. Significantly, if the Proposal was not approved, the Colliery would cease operations towards the end of 2013 resulting in substantial job losses. This would negatively affect the social wellbeing of the local area with the significance of this depending on the economic structure and trends in the regional economy at the time.

As detailed in Chapter 21, the Proposal would continue to benefit the local area and provide benefits to the overall NSW economy through royalties of approximately \$64M (present value).

22.3.7 Cumulative impacts

Potential cumulative impacts of the Proposal with other proposed projects and existing developments and operations in the area relate to air, noise, water, traffic, greenhouse gas, ecology and land use. The cumulative impacts of the Proposal on these environmental aspects have been considered elsewhere in the EIS. Based on the results of these assessments, cumulative impacts of the Proposal would be minor.

22.3.8 Policy consideration

Strategic policies and plans help guide future development in an area. Relevant State, regional and local strategic policies and plans were considered as part of this SIA. The assessment found:

- that the Proposal would enable the Colliery to continue to comply with the relevant State policies by ensuring it continues to promote the social and economic welfare of the local communities;
- that the Proposal would enable the Colliery to continue to support and strengthen the region's existing employment base by maintaining employment of the existing workforce. This would promote the maintenance of the existing character and lifestyle of the region's communities and localities. The Proposal would ensure coal production can continue while protecting the health of Lake Macquarie and, therefore, is consistent with relevant regional policies; and

- the Proposal meets Councils' community strategic plans which view diverse industries and land uses as a necessity to achieve long term economic security and the need for diversification and depth of labour skills. The Proposal would promote these objectives whilst ensuring potential adverse impacts are negated or minimised through the implementation of environmental considerations during mine design, robust environmental impact assessment, and the development of measures to manage and monitor potential adverse impacts.

22.4 Management and monitoring

22.4.1 Strategies for impact management

i Community engagement

LakeCoal would continue to keep the local community informed of the Proposal, the progress of its mining operations and performance by:

- maintaining open and constructive communication with affected individuals and groups;
- participating in the CCC; and
- providing environmental monitoring data and other relevant information in a timely manner via the LakeCoal website.

ii Social amenity

Section 22.3.4 outlined the factors affecting social amenity, including traffic, dust and air quality, noise and visual. A detailed description and listing of the proposed management and monitoring measures for these environmental aspects can be found in each of the respective EIS chapters.

22.4.2 Monetary contribution

As discussed in Section 22.3.3, LakeCoal is contributing \$0.035/t of coal from the Colliery into a dedicated community fund to improve public infrastructure and for the provision of community projects in the surrounding communities of Chain Valley Bay, Mannering Park, Summerland Point and Gwandalan. This would operate for the life of the mine. Additionally, a road maintenance agreement with WSC is being developed to ensure ongoing maintenance of Ruttleys Road is contributed to by the Colliery consistent with the haulage related damage over the life of the Proposal.

LakeCoal is consulting extensively with WSC, the CCC and DP&I on the preferred management option for the above contributions to ensure that the most appropriate, transparent and efficient mechanism is utilised to hold and distribute funding to suitable projects. A number of options have been considered to date and, while this process has taken longer than expected, LakeCoal is confident that the ultimate outcome will be more acceptable and practical for all stakeholders as a result of the consultation process.

22.4.3 Monitoring

LakeCoal will monitor and review potential impacts associated with the Proposal over time. An important component will be the continued implementation of its existing engagement tools to ensure:

- community issues and actual and/or perceived impacts from the Colliery's activities are understood;
- working partnerships with stakeholders are maintained and established to address community needs; and
- effective management of LakeCoal's social impacts.

Key activities to be undertaken in accordance with LakeCoal's Environment and Community Policy will include:

- regular liaison with relevant government agencies and councils;
- regular Colliery updates with landowners and local residents through the CCC;
- providing regular updates and reporting through the Colliery's website;
- considering individual sponsorship opportunities throughout the life of the Proposal; and
- continued payments, throughout the life of the Proposal, to the community fund established.

22.5 Conclusion

As the Proposal would not increase the region's population, adverse social impacts on community infrastructure and services would be negligible. The Proposal would enable LakeCoal to continue to support the local community as a direct and indirect local employer, economic contributor and community partner.

Approximately 90% of the workforce resides within Wyong and Lake Macquarie LGAs, with a high proportion of the workforce residing in the area for more than 15 years. The Colliery has a workforce of 160 workers and would support 418 and 635 families in the region and throughout NSW, respectively, through direct and indirect employment.

The Proposal would have no noticeable effects on the social amenity of the surrounding areas. LakeCoal has implemented a range of measures to actively communicate and inform local stakeholders of its activities and to ensure it is able to identify opportunities to improve local amenity. LakeCoal would continue to address any Proposal-related concerns with local stakeholders during the EIS process and throughout the life of the mine.

Although the Proposal would not increase the workforce numbers, continued operations would provide sustained income, ongoing employment and positive flow-on effects. The presence of the workforce would also maintain positive impacts for the local economy due to demand for goods and services for other services and industries such as retail trade, hospitality, hiring and construction. Conversely, the job losses that would result from the mine closure, should approval for the Proposal not be granted, would negatively affect the social wellbeing of the local area.

23 Commitments

Environmental management at the Colliery is undertaken in accordance with the Colliery's EMS which was approved by DP&I on 6 November 2012. Implementation of the strategies, plans and programs, as described in Section 2.3 that sit within the EMS framework would continue under the Proposal.

Table 23.1 consolidates the commitments made throughout the EIS to prevent or minimise adverse potential impacts from the Proposal's implementation.

Table 23.1 **Commitments**

| Item | Commitment |
|-------------|--|
| Groundwater | <p>In addition to the management and mitigation measures undertaken at the Colliery for groundwater as described in the WMP, the following commitments specific to the Proposal will be undertaken. Some commitments are already undertaken under the WMP. LakeCoal will:</p> <ul style="list-style-type: none"> • assess whether abnormal or significant groundwater inflow changes occur in the active panels; • maintain the water flow monitoring appliances used to measure pumped water volumes to and from the Colliery in good working order; • maintain and plot records of daily total Colliery water pumping and annually communicate an interpretation of the findings within the Annual Review. A copy of the Annual Review will be supplied to NOW; • measure of water levels and quality within private bores, where access is possible, in relevant areas to assess if any adverse effects occur due to subsidence from the Proposal; and • develop groundwater assessment criteria and triggers, response protocols and contingency measures. <p>Although it is not anticipated that private bore yields would be impacted due to subsidence, should such a situation arise, LakeCoal would provide an alternative water supply until the impacted bore recovers.</p> <p>Any monitored or reported adverse impacts on the yield, saturated thickness or quality of a private registered bore will be investigated by LakeCoal. In the event of a groundwater level drop of over 5 m for a period of two months or more, a notable increase in iron hydroxide, or an adverse change in salinity as a consequence of subsidence, LakeCoal will enter into negotiations with the affected landowners and the Mine Subsidence Board with the intent of formulating an agreement which provides for one, or a combination of:</p> <ul style="list-style-type: none"> • re-establishment of saturated thickness in the affected bore(s) through bore deepening; • establishment of additional bores to provide a yield at least equivalent to the affected bore prior to mining; • provision of access to alternative sources of water; and/or • compensation to reflect increased water extraction costs (e.g., due to lowering pumps or installation of additional or alternative pumping equipment) |

Table 23.1 **Commitments**

| Item | Commitment |
|----------------------|---|
| Surface water | <p>Management and monitoring of surface water will continue to be undertaken in accordance with the Colliery's WMP, which will be reviewed and updated as required to include the commitments made below. LakeCoal will:</p> <ul style="list-style-type: none"> • limit the main underground pumps to a maximum pump out rate of 10.5 ML/day within 12 months of approval; • request an amendment of EPL 1770 to include a condition on the daily discharge volume limit stating that "Exceedence of the volume limit for Point 1 is permitted only if the discharge from Point 1 occurs solely as a result of rainfall at the premises exceeding 10 mm during the 24 hours immediately prior to commencement of the discharge"; • undertake daily measurements of discharge volumes and report publically on a monthly basis via LakeCoal's website; • continue collection of baseline water quality data to aid in the development of appropriate discharge water quality trigger values; • engage a suitably qualified expert to conduct an assessment of the metals contained within discharge water in accordance with the ANZECC water quality guidelines and provide this assessment to the EPA by 31 December 2013; • investigate water saving measures to minimise the amount of potable water required from WSC for Colliery operations; and • quantify the groundwater storage capacity in the Great Northern and Wallarah Seam. • continue effluent monitoring regime of receiving soils from the AWTs and septic water treatment systems in accordance with the parameters and testing frequencies identified in Table 8.2. The results of this monitoring program will be reviewed by a suitably qualified expert and used to determine the appropriateness of the existing irrigation area to receive this effluent. • develop a program to monitor creek line channel stability and the health of riparian vegetation within Swindles Creek. Monitoring will be undertaken in accordance with Section 8.5.2 of the Surface water Impact Assessment (Appendix E) and incorporated into the Water Management Plan or Biodiversity Management Plan. • recording of monitoring data will be undertaken in accordance with the Colliery's WMP and EPL 1770. Monitoring data will be interpreted as it is received to ensure appropriate operational guidance on monitoring water quality within desired parameters. Results of water quality monitoring will be reported in the Annual review and made available to the CCC, as well as Wyong and Lake Macquarie Councils. • engage a suitably qualified expert to conduct an assessment of the metals contained within discharge waters in accordance in accordance with the ANZECC water quality guidelines and issue this assessment to the EPA by 31 December 2013. |

Table 23.1 **Commitments**

| Item | Commitment |
|---|--|
| Noise | <p>Management and monitoring of noise will continue to be undertaken in accordance with the Colliery's NMP, which will be reviewed and updated as required to include the commitments made below. LakeCoal will:</p> <ul style="list-style-type: none"> • continue attended compliance monitoring on site which will be used to identify potential hot spots and primary noise sources; • continue real-time noise monitoring alerts to site personnel to enable implementation of any required rapid noise management initiatives; and • manage potential non-compliance through a noise complaint handling and response system, including the identification of responsible sources to enable targeted remedial action. <p>In addition to the above, LakeCoal is committed to the progressive implementation of feasible measures to target long term noise goals which are designed to reduce noise emissions from the Colliery. Long term options for investigation include:</p> <ul style="list-style-type: none"> • modification to belt/movement alarms; • investigation of surface conveyor and coal preparation equipment, to determine if noise reductions are possible; • identifying sound attenuation options for the surface bulldozer and front end loader; • strategic placement of acoustic barriers; • attenuation for the surface screener/shaker; • installation of quiet rollers for surface conveyor belts; • acoustic treatments around compressors; and • the use of a conveyor stacker for product coal stockpiling. |
| Air quality and greenhouse gases | <p>Management and monitoring of air quality and greenhouse gases will continue to be undertaken in accordance with the Colliery's AQGHGMP, which will be reviewed and updated as required to include the commitments made below. LakeCoal will:</p> <ul style="list-style-type: none"> • investigate the use of a stacker to replace hauling between current conveyor system and stockpiles; • undertake GHG monitoring comprising measurement of carbon dioxide and methane at the ventilation shaft and fans site; and • record and report annual diesel, oil, grease, acetylene and electricity use to fulfil National Greenhouse and Energy Reporting Scheme requirements. |

Table 23.1 **Commitments**

| Item | Commitment |
|------------------------------|---|
| Traffic and transport | <p>Management and monitoring of traffic and transport will continue to be undertaken in accordance with the Colliery's RTP. In addition, LakeCoal will continue to investigate alternative options for transporting export coal to the PWCS, specifically the preferred rail transport option, requiring the construction of a private haul road to the VPPS coal unloading facility and associated infrastructure upgrades. In addition, LakeCoal will:</p> <ul style="list-style-type: none"> • provide a detailed feasibility report of rail transport options to DP&I as part of the next coal transport options report to be submitted, by 31 December 2014; • should the above report identify that coal transport via rail is feasible, and subject to obtaining necessary agreements, LakeCoal will prepare and lodge an application to modify the relevant approval so as to permit the installation and operation of facilities necessary to undertake rail transport of coal to PWCS; and • discuss the potential to utilise proposed rail loading facilities associated with the Wallarah 2 Coal Project, following this project receiving approval. |
| Subsidence | <p>Management and monitoring of subsidence will continue to be undertaken in accordance with the Colliery's SMP, which will be reviewed and updated as required to include the commitments made below. LakeCoal will:</p> <ul style="list-style-type: none"> • undertake annual bathymetric surveys of the lake bed to determine actual subsidence and undertake a comparison with predicted levels. Should measured subsidence significantly exceed predicted levels, LakeCoal will review future panel designs to limit future impacts to acceptable levels; and • complete an annual subsidence report and make this report publically available on the Colliery's website. |
| Marine ecology | <p>Management and monitoring of marine ecology will continue to be undertaken in accordance with the Colliery's BCMP, which will be reviewed and updated as required to include the commitments made below. LakeCoal will:</p> <ul style="list-style-type: none"> • revise the BCMP to include the sampling locations in the assessment of the Proposal; • undertake seasonal surveys (spring and autumn) for the Site as required under the BCMP; • commission additional independent sampling and analysis to validate results obtained during monitoring, and review future panel design if impacts due to subsidence are determined to be moderate or greater; • revise the SGMP to include the transect locations utilised in the assessment of the Proposal; • continue annual seagrass surveys/monitoring; |

Table 23.1 **Commitments**

| Item | Commitment |
|----------------------------|---|
| | <ul style="list-style-type: none"> • continue annual subsidence surveys (bathymetric surveys) and land based surveys; • include results from the BCMP and SGMP within the Colliery's Annual Review; and • make the Annual Review and annual subsidence surveys available on the Colliery's website. |
| Terrestrial ecology | <p>In addition to the management and mitigation measures undertaken at the Colliery for terrestrial ecology as described in the BMP, the following commitments specific to the Proposal will be undertaken. Some commitments are already undertaken under the BMP. LakeCoal will:</p> <ul style="list-style-type: none"> • undertake the design of the dam embankment and spillway works in consultation with an ecologist to minimise potential impacts on the Swamp Oak Floodplain Forest EEC; • ensure pre-clearing surveys are undertaken by an ecologist to minimise the potential impact to fauna and significant vegetation prior to clearing works being undertaken within the embankment and spillway area; • clearly delineate the clearing footprint and cordon off surrounding vegetation as a 'no go' zone during works to the dam embankment and spillway; • minimise disturbance areas where possible by ensuring all stockpiling of materials, parking of machinery etc, is undertaken in previously cleared areas; • ensure that, wherever possible, dead standing timber and fallen timber will be avoided by any clearing works, or if required to be removed, be relocated into suitable habitat areas nearby; • ensure all equipment used for the earthworks associated with the dam embankment and spillway will be cleaned of excess soil potentially containing pathogens and weed seeds prior to entering the Site; • install sediment fencing surrounding the proposed earthwork areas, in accordance with a site-specific erosion and sediment control plan for the works; • ensure that in the event that sedimentation dam water is released from Dam 10 prior to the works being undertaken, it will be undertaken in a controlled manner over a number of days to ensure that the release does not result in significant erosion and sedimentation to the Swamp Oak Floodplain Forest; |

Table 23.1 **Commitments**

| Item | Commitment |
|-----------------|--|
| | <ul style="list-style-type: none"> continue the management and monitoring of flora and fauna in accordance with the BMP for the life of the mine, including: <ul style="list-style-type: none"> the condition and composition of the Swamp Oak Floodplain Forest area; the condition of vegetation adjacent to the ventilation shaft and fans; the location and distribution of weed infestations; and the abundance and distribution of feral animal use. noxious weeds will be removed and continually controlled from the pit top area, allowing for natural regeneration of vegetation; weed invasion will be monitored as part of the Colliery's BMP; and the condition of the EEC areas will be monitored through the Colliery's BMP. |
| Heritage | <p>Management and monitoring of heritage will continue to be undertaken in accordance with the Colliery's HMP, which will be reviewed and updated as required to include the commitments made below. LakeCoal will:</p> <ul style="list-style-type: none"> update the HMP following approval of the Proposal to include the extended area to which it relates; ensure that should unanticipated Aboriginal or historic heritage artefacts be found during dam embankment and diversion works, work will cease and the site assessed by an archaeologist; and ensure that in the unlikely event that skeletal remains are found during dam embankment and diversion works, work will cease immediately in the area and the NSW Police Coroner called to determine if the material is of Aboriginal origin. OEH and relevant Aboriginal community stakeholders will be notified if the remains are positively identified as being of Aboriginal origin to determine their appropriate management prior to works recommencing. |
| Wastes | <p>Management and monitoring of waste will continue to be undertaken in accordance with the Colliery's Waste Management Standard. In addition, LakeCoal will continue to try and improve its waste volumes and waste management practices in line with its objective for 60% of all wastes generated at the Colliery (excluding wastewater) to be recyclable or reusable.</p> |
| Hazards | <p>Management and monitoring of hazards will continue in accordance with the Colliery's existing hazard management measures. Periodic review of the effectiveness of existing measures will occur in accordance with the Colliery's safety management system and additional measures implemented as warranted.</p> |
| Visual | <p>Management and monitoring of visual impacts will continue to be undertaken in accordance with the Colliery's existing commitment. In addition, LakeCoal will: ensure additional surface lighting at the Colliery complies with <i>AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting</i>.</p> |

Table 23.1 **Commitments**

| Item | Commitment |
|--|---|
| Soil | <p>Management and monitoring of soils will continue to be undertaken in accordance with the Colliery's WMP, which will be reviewed and updated as required to include the commitments made below. LakeCoal will:</p> <ul style="list-style-type: none"> • prevent disturbance of ASS where practicable during any construction activities; • prepare an ASSMP where there is potential that ASS will be disturbed; • test and handle any ASS disturbed in accordance with the ASSMP and treat or dispose of to an appropriately licensed facility; • limit the area of any disturbance at the surface infrastructure sites and period of exposure; • implement site management procedures such as watering of disturbed areas and unsecured stockpiles; • ensure relevant licences and management plans are in place for the correct storage and handling of hydrocarbons; • maintain suitable bunding around all hazardous liquid storage areas; • maintain oil separation facilities on the wash down sump for the treatment of oily water; and • remove all waste oil from site and dispose via a licensed external waste collection company. |
| Rehabilitation and mine closure | <p>Rehabilitation will be undertaken in accordance with the Colliery's RMP and the MOP in force at the time. Detailed management and monitoring proposals for final rehabilitation will be included within a Mine Closure Plan to be prepared at least two years prior to cessation of mining activities.</p> |
| Economic | <p>LakeCoal will contribute \$0.035/t of coal from the Colliery into a dedicated community fund to improve public infrastructure and for the provision of community projects in the surrounding communities of Chain Valley Bay, Mannering Park, Summerland Point and Gwandalan.</p> |
| Social | <p>LakeCoal will continue to implement management measures and monitoring programs to prevent or minimise negative impacts and enhance positive impacts in accordance with its Environment and Community Policy. LakeCoal will:</p> <ul style="list-style-type: none"> • maintain open and constructive communication with affected individuals and groups; • participate in the CCC; • provide environmental monitoring data and other relevant information in a timely manner via the LakeCoal website; |

Table 23.1 **Commitments**

| Item | Commitment |
|--------------|--|
| | <ul style="list-style-type: none"> • be responsive to community issues and actual and/or perceived impacts from the Colliery's activities; • work in partnership with stakeholders to address community needs; • ensure effective management of LakeCoal's social impacts; • liaise regularly with relevant government agencies and councils; • provide regular Colliery updates with landowners and local residents through the CCC; • continue payments, throughout the life of the Proposal, to the community fund established; and • consider individual sponsorship opportunities throughout the life of the Proposal. |
| Other | LakeCoal will commit to only carrying out mining operations in the extension areas consistent with the development consent granted pursuant to this Proposal. |

24 Justification and Conclusion

24.1 Introduction

This chapter considers the suitability of the Site and of the Proposal against the objects of the EP&A Act, including ESD principles, and draws conclusions in respect of the Proposal.

24.2 Suitability of the Site

The Colliery is an existing underground operation that has operated successfully for more than 50 years. The 'Site' comprises the surface facilities, passive operational areas, approved mining areas and proposed mining areas at the Colliery. Secondary extraction activities will be confined to areas under the Lake Macquarie water body and the Proposal will require no acquisition of residential properties.

The Colliery's surface facilities are located at the pit top area at Mannering Park, adjacent to VPPS in an existing industrial area. The Colliery's close proximity to VPPS enables the efficient transport of product coal to this location. The additional 0.3 Mtpa of coal to be mined under the Proposal will be transported to VPPS in response to the demand for fuel to generate electricity. In addition, a ventilation shaft and fans are located at Summerland Point, north-east of the pit top area, away from dense residential areas.

The entirety of the Site is within existing mining tenements located within the Lake Macquarie and Wyong LGAs.

Wyong and Lake Macquarie LGAs have a long tradition of mining. The Colliery has mines to the north, east and west including the Mannering, Myuna, Mandalong and Wallarah Collieries, as well as the historic Newvale and Moonee Collieries. The area of proposed mining lies within a regional overburden groundwater system that has been historically, and will continue to be, significantly depressurised by adjacent multi seam underground mines, and the existing Colliery's workings.

A workforce survey undertaken for the Proposal found that approximately 80% of the Colliery's workforce already lived in the area when they commenced employment, with approximately 60% residing in the Lake Macquarie LGA, and 30% residing in Wyong LGA, indicating that the Colliery primarily sources employees from the local labour pool. A high proportion of the workforce has resided in the area for more than 15 years which demonstrates low levels of residential mobility and the importance of the Colliery's role to the community.

An increase to the approved maximum rate of production will involve the orderly use of established infrastructure with no significant additional infrastructure required. It is noted, however, that over the life of the Colliery minor infrastructure upgrades and modifications are proposed to occur. The objective of these is to improve efficiency of some operations and environmental performance.

For the reasons given above, it is concluded that the Site is suitable for the purposes of the Proposal.

24.3 Objects of the Environmental Planning and Assessment Act 1979

The consistency of the Proposal with the objects of the EP&A Act is considered below.

“To encourage the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment”.

The Colliery is a long standing operation that has demonstrated its ability to efficiently extract one of the State’s valuable natural mineral resources for the benefit of a range of stakeholders.

The Proposal would enable the seamless extension of mining from the approved mining area utilising existing equipment, plant and workforce. It would prevent the potential sterilisation of coal reserves that, as demonstrated by this EIS, can be mined with minimal environmental impacts. It is unlikely that extraction of the coal within the nominated areas could be undertaken economically from any other mine other than the Colliery, as is demonstrated by the support of the Proposal by the existing leaseholders, Centennial Coal.

The importance of coal production is described in the ‘need for the proposal’ section of this report. On a local scale, sterilisation of the proposed target reserves would represent a lost opportunity for VPPS to source a reasonably priced long term supply of coal for its energy generation requirements, with potential cost implications to NSW power consumers.

The Proposal will enable the substantial regional and local economic and social benefits from the Colliery’s operation to continue. It will also provide for the continued accrual of economic benefits to the local region from business expenditure, to the NSW Government in the form of royalties, and to the Commonwealth Government in the form of company and income taxes.

The Colliery’s important role in the social welfare of the local community is substantiated in Chapter 22. An example is the Colliery’s workforce of 160 workers and the 418 families the Proposal would support through direct and indirect employment in the region. Continued employment at the Colliery will promote cohesion and wellbeing in the local community.

The mine plan has been designed to ensure protection of sensitive environments such as seagrass beds and foreshore areas, whilst maximising recovery of reserves. This demonstrates the proper development of the State’s natural mineral resources.

“To encourage the promotion and co-ordination of the orderly and economic use and development of land.”

The Proposal encourages the proper management and development of a natural mineral resource, in that it represents the development and extraction of economic coal reserves by the extension of operations at an existing colliery. The mine plan has been designed to enable a seamless transition from the approved to the proposed mining areas.

The Proposal will utilise existing infrastructure and further develop Colliery’s environmental management infrastructure, technologies, experience and systems, and is supported by extensive physical and human infrastructure. It is considered that the Proposal would constitute an orderly and economic use of the land and reserves, already approved for the purposes of mining by way of existing mining leases.

“To encourage the protection, provision and co-ordination of communication and utility services.”

The Proposal will not adversely impact communication and utility services. As previously noted, the Proposal will support an increase in ongoing demand for coal from the adjacent VPPS. It will also facilitate continued electrical supply for domestic users.

“To encourage the provision of land for public purposes.”

The secondary extraction from the mine extension will be solely beneath Lake Macquarie, will require no land acquisition and will have no direct impact on the provision of land for public purposes. The Proposal will, however, enable the continued support of the local community through, amongst other means, contributions to public infrastructure and services via a production related contribution to a community fund. The community fund may use some of these contributions to provide more land for public purposes. Therefore, it is considered that the Proposal is consistent with this object of the Act.

“To encourage the provision and co-ordination of community services and facilities.”

The Proposal will see the continuation of the Colliery for approximately 14 years. As the Proposal is highly unlikely to increase the region’s population, there will be no direct demand for additional community services and facilities (such as childcare, health, education and emergency services). Therefore, adverse social impacts on community infrastructure and services are considered to be negligible.

As noted above, the Proposal will enable the continued contribution of funding towards local community infrastructure. There will also be considerable payments (\$64M present value) to the NSW Government in royalties and to the Commonwealth in company taxes. A proportion of these funds will be available to provide or finance the provision of necessary community services and facilities.

“To encourage the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats.”

The mine plan has been designed to find an appropriate balance between maximising extraction, minimising environmental impacts and negating safety risks. This includes the implementation of the HWMSB to protect foreshore environments and the SPB to ensure the Proposal does not adversely impact seagrass or their dependent fauna communities.

Reduction in the amount of sunlight received at the lake bed from subsidence was identified as a potential impact on benthic communities. The impact assessment found that all benthic species identified during survey efforts are commonly occurring benthic invertebrates typical of estuarine communities, highly tolerant to dynamic environmental conditions, and mobile in nature. Were subsidence, or any other gradual change to existing environmental condition to occur, it is considered that overall the impacts would likely be within the levels of changes that would be naturally occurring parameters of natural disturbance regimes in such a dynamic environment.

The Proposal requires minimal disturbance of terrestrial ecology as the majority of works will occur underground.

The proposed sedimentation dam upgrade works, however, will be undertaken within an area containing vegetation that is in poor condition, but meets the description of the Swamp Oak Floodplain Forest EEC. The dam upgrade works will result in disturbance of up to 0.37 ha of this community.

It is possible that these works will also have indirect impacts to the composition and condition of a small area of Swamp Oak Floodplain Forest EEC as a result of decreasing mine water discharge to this area as a consequence of the upgrade. However, impacts may be positive as the current condition of vegetation is compromised by the persistent ponding of saline water in the area.

The assessment concluded that the minor direct and indirect impacts as a result of the Proposal will not significantly impact on the local or regional distribution of these communities.

A comprehensive BMP is in place for the management of terrestrial ecology at the Colliery. Subject to the continued implementation of the BMP and the management and monitoring measures presented in Section 14.4, the Proposal will not significantly impact terrestrial ecology.

"To encourage ecologically sustainable development"

The principles of ESD are outlined in Section 6 of the NSW *Protection of the Environment Administration Act 1991* and Schedule 2 of the EP&A Regulation. The consistency of the Proposal with each of these principles is discussed below.

Precautionary Principle: in practice this means that development should not cause serious or irreversible environmental impact. Such impact can be avoided by, firstly, understanding the potential for environmental impact to occur by undertaking a full environmental assessment and, secondly, by ensuring effective mitigation or compensation measures are incorporated into development proposals.

As noted above, the Proposal was designed to find the appropriate balance between maximising extraction, minimising environmental impacts and negating safety risks.

A preliminary risk assessment was undertaken based on the initial Proposal design to, amongst other things, enable identification of environmental risks and risk management controls that could be incorporated in the Proposal's design to eliminate or reduce the level of risk.

The EIS was then prepared on the basis of the most recent and accurate scientific data relevant to the Proposal. Technical studies adopted conservative assumptions to enable the upper limit of potential impacts to be determined. Following the initial findings of a number of studies, including subsidence and marine ecology, the detail of some aspects of the Proposal were modified to incorporate further amelioration measures.

Beyond the DGRs, feedback received from the community and government stakeholders also guided the assessment process, ensuring that all potential matters of relevance associated with the Proposal were identified.

LakeCoal has committed to measures to prevent or minimise potential adverse environmental impacts from the Proposal.

This Proposal will be assessed by the Minister or his delegate and conditions imposed as part of any determination to approve the Proposal.

For the reasons given above, the Proposal is consistent with the precautionary principle.

Social equity including intergenerational equity: the suitability of the Site for the Proposal was established in Section 24.2. The Proposal requires no property acquisition, potential impacts to amenity are limited and, therefore, the Proposal will not disadvantage any present or future stakeholder.

The Proposal will produce GHG emissions which may contribute to the acceleration of climate change. However, it is noted that GHG production is generally less than the levels generated at typical Australian gassy underground mines. The Proposal is predicted to produce annual average Scope 1 emissions of 0.59 Mt CO₂-e, which would represent approximately 0.1% of Australia's commitment under the Kyoto Protocol. It is also worth noting that the Proposal would generate less GHG emissions in the supply of product coal to the VPPS than any alternative operation would due to its proximity and, consequently, less emissions relating to diesel usage.

As demonstrated in this EIS, the Proposal will result in minimal adverse environmental impacts. The reserves extracted, however, will be transformed into physical, human and financial capital.

Given the above, it is considered that the Proposal will generally promote social equity.

Conservation of biological diversity and maintenance of ecological integrity: as previously discussed the Proposal will have only minor potential impacts on ecology. Surface disturbance associated with the Proposal is minimal and the mine has been designed to ensure protection of foreshore environments and seagrass communities. Extensive management and monitoring will be conducted to avoid or minimise potentially adverse impacts from the Proposal.

Improved valuation and pricing of environmental resources: resources should be carefully managed to maximise the welfare of society, both now and for future generations. In the past, some natural resources have been misconstrued as being free or underpriced, leading to their wasteful use and consequent degradation.

Consideration of economic efficiency, with improved valuation of the environment, aims to overcome the underpricing of natural resources and has the effect of integrating economic and environment considerations in decision making, as required by ESD. A full benefit cost analysis, prepared for the Proposal, enabled the economic efficiency of the Proposal to be determined.

While historically, environmental costs have been considered to be external to project development costs, improved valuation and pricing methods attempt to internalise environmental costs and include them within Proposal costing. This includes assigning monetary values for a proposal's residual environmental impacts. In the Proposal's case, value was only assigned to the potential socio-economic impacts from climate change associated with GHG emissions, given the minimal potential for adverse environmental impacts from the Proposal as mitigated.

The net social benefits of the Proposal are estimated to be between \$217M and \$258M (when non-market value of employment is considered) and, therefore, desirable and justifiable from an economic efficiency perspective.

The regional economic impact analysis estimated that the Proposal would result in a substantial additional contribution to the regional economy and NSW for the 14 year mine life period. Benefits include 418 and 635 direct and indirect jobs for the regional and NSW economies, respectively.

"To encourage the provision and maintenance of affordable housing."

The Proposal will not change the existing Colliery workforce and, as such, will not increase housing pressures.

As noted in Chapter 22, both the Wyong and Lake Macquarie LGAs, in which 90% of employees reside have been experiencing moderate demographic and land use changes due to steady population growth and recent residential, commercial and industrial developments. Housing stress, however, in both of these localities is below the NSW average, and rental housing stress, is less than 1% above the NSW average in the Wyong LGA and over 3% below the NSW average in the Lake Macquarie LGA.

Over 85% of Colliery employees either have a mortgage or own their own homes and, given the above, the Proposal will not adversely affect the provision and maintenance of affordable housing. It is, therefore, considered that the Proposal is consistent with this object of the Act.

“To promote the sharing of the responsibility for environmental planning between the different levels of government in the State.”

All interested Commonwealth, State and local government agencies have been consulted during the EIS’s preparation. Further consultation will occur during the response to submissions following exhibition and pre-determination phases. Thus all levels of government have been involved to date and this will continue through to determination.

“To provide increased opportunity for public involvement and participation in environmental planning and assessment”.

The EIS has been prepared in accordance with the consultation required by the DGRs. The approvals process also has legislated steps requiring consultation, including the public exhibition of the EIS and response to submissions.

Further opportunities for community and government participation and feedback during the assessment process were provided through the Colliery’s ongoing stakeholder engagement activities and those specific to the Proposal, as outlined in Chapter 5.

It is concluded, therefore, that the Proposal is consistent with this object of the Act.

24.4 Conclusions

The Colliery is a long standing operation that has demonstrated its ability to efficiently extract a valuable natural mineral resource for the benefit of a range of stakeholders.

Previously unforeseen geological constraints will prevent LakeCoal from recovering the full reserves approved under MP10_0161 and operations at the Colliery will cease in late 2013 unless access to additional reserves is approved before this time.

Developing the strategy for extension to mining provided the opportunity to review the Colliery’s existing operations and identify initiatives that could enhance its value and improve efficiencies. These initiatives are reflected in the Proposal.

The proposed mine design has been developed to, amongst other purposes, minimise adverse environmental impacts. This is demonstrated by secondary extraction areas occurring exclusively beneath Lake Macquarie and the application of the HWMSB, SPB and a layout to reduce the height of connective fracturing.

If development consent for this Proposal is granted, it will overlap in part with the Centennial Coal planning approvals. Although consultation between LakeCoal and Centennial Coal regarding mining in areas subject to Centennial Coal's mining authorities is ongoing, Centennial Coal is supportive of the Proposal and an initial agreement has been reached for a sublease to LakeCoal over a 162 ha portion of Area 1. It is noted that the Minister has the legal power to grant overlapping planning approvals.

Residual adverse environmental impacts from Proposal's implementation are limited. There were no high residual levels of risk, with the exception of the economic impacts should operations at the Colliery cease. All residual levels of risk were low with the exception of noise emissions from onsite traffic increases, water quality impacts on terrestrial ecology and GHG emissions.

Although the Proposal will not increase traffic movements on public roads, this matter was raised by stakeholders as a concern. As documented in this EIS, LakeCoal is committed to continuing to pursue alternative transport options to reduce or eliminate the transport of coal from the Colliery on public roads and, although pre-feasibility studies have been completed, for the reasons outlined in Section 3.3.5 it was not possible to include this element in the current Proposal.

The Colliery's economic benefits and its important role in the social wellbeing of the local community are discussed in Chapters 21 and 22, respectively. The Proposal will enable the substantial regional and local economic and social benefits from the Colliery's operation to continue. It will also provide for the continued accrual of economic benefits to the local region from business expenditure, to the NSW Government in the form of royalties and to the Commonwealth Government in the form of company and income taxes. The Colliery is also an important source of coal for VPPS and other customers.

LakeCoal has committed to a range of management and monitoring measures that will be implemented throughout the life of the Proposal to prevent or minimise adverse impacts.

As demonstrated above, the Proposal is consistent with objects of the EP&A Act.

In conclusion, it is considered that, on balance, the Proposal is in the public interest and should be approved subject to conditions.

Acronyms

| | |
|--------------------|---|
| AADT | annual average daily traffic |
| ABS | Australian Bureau of Statistics |
| ACARP | Australian Coal Association Research Program |
| AHIMS | Aboriginal Heritage Information Management System |
| ANZECC | Australia and New Zealand Environment and Conservation Council |
| APZ | Asset Protection Zone |
| AQIA | air quality and greenhouse gas impact assessment |
| AQGHGMP | Air Quality and Greenhouse Gas Management Plan |
| ASS | acid sulphate soils |
| ASSMP | acid sulphate soil management plan |
| BCA | Benefit Cost Analysis |
| BCMP | Benthic Communities Management Plan |
| BCR | benefit cost ratio |
| BMP | Biodiversity Management Plan |
| BOM | Bureau of Meteorology |
| CCC | Chain Valley Colliery Community Consultative Committee |
| CO ₂ -e | carbon dioxide equivalent |
| CoRTN | Calculation of Road Traffic Noise |
| CPP | Coal Preparation Plant |
| DA | development application |
| DCCEE | Commonwealth Department of Climate Change and Energy Efficiency |
| DEC | NSW Department of Environment and Conservation |
| DECCW | NSW Department of Environment Climate Change and Water |
| DGRs | Director-General's Requirements |
| DgS | Ditton Geotechnical Services |
| DoP | NSW Department of Planning |

| | |
|-----------------|---|
| DPI | NSW Department of Primary Industries |
| DP&I | NSW Department of Planning and Infrastructure |
| Draft LMLEP | Draft Lake Macquarie Local Environmental Plan 2012 |
| Draft Wyong LEP | Draft Wyong Shire Council Local Environmental Plan 2012 |
| DRE | NSW Department of Resources and Energy |
| DSEWPaC | Commonwealth Department of Sustainability, Environment, Water, Population and Communities |
| DTIRIS | NSW Department of Trade and Investment, Regional Infrastructure Services |
| EA | Environmental Assessment |
| EC | electrical conductivity |
| ECRTN | Environmental Criteria for Road Traffic Noise (EPA 1999) |
| EEC | endangered ecological community |
| EIS | Environmental Impact Statement |
| EMM | EMGA Mitchell McLennan Pty Limited |
| EMS | Environmental Management Strategy |
| EP&A Act | <i>Environmental Planning and Assessment Act 1979</i> |
| EP&A Regulation | Environmental Planning and Assessment Regulation 2000 |
| EPA | Environmental Protection Authority |
| EPBC Act | <i>Environment Protection and Biodiversity Conservation Act 1999</i> |
| EPIs | environmental planning instruments |
| EPL | Environmental Protection Licence |
| ESD | ecologically sustainable development |
| FM Act | <i>Fisheries Management Act 1994</i> |
| GDEs | groundwater dependent ecosystems |
| GHG | greenhouse gasses |
| ha | hectares |
| HMP | Heritage Management Plan |
| HWMSB | high water mark subsidence barrier |

| | |
|-------------|---|
| IEA | International Energy Agency |
| INP | Industrial Noise Policy |
| km | kilometre |
| KTPs | key threatening processes |
| L | litre |
| LDP | licensed discharge point |
| LGA | local government area |
| LHCCREM | Lower Hunter Central Coast Regional Environmental Management Strategy |
| LMCC | Lake Macquarie City Council |
| LMLEP 2004 | Lake Macquarie Local Environmental Plan 2004 |
| m | metre |
| MSC Act | <i>Mine Subsidence Compensation Act 1961</i> |
| mg/L | milligrams per litre |
| Mining SEPP | State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 |
| ML/day | mega litres per day |
| MOP | Mining Operations Plan |
| MP10_0161 | Major Project Approval 10_0161 |
| MPS | Munmorah Power Station |
| MSC Act | <i>Mine Subsidence Compensation Act 1961</i> |
| Mt | million tonnes |
| Mtpa | million tonnes per annum |
| MW | miniwalls |
| NCC | Newcastle City Council |
| NEPC | National Environment Protection Council |
| NEPM | National Environment Protection Measures |
| NES | national environmental significance |
| NGA | National Greenhouse Accounts |

| | |
|----------|---|
| NGER Act | <i>National Greenhouse and Energy Reporting Act 2007</i> |
| NIA | noise impact assessment |
| NMP | Noise Management Plan |
| NOW | NSW Office of Water |
| NPV | net present value |
| OEH | NSW Office of Environment and Heritage |
| PAD | potential archaeological deposits |
| PoEO Act | <i>Protection of the Environment Operations Act 1997</i> |
| PRP | Pollution Reduction Program |
| PSNL | Project Specific Noise Level |
| PWCS | Port Waratah Coal Services |
| RBL | Rated Background Level |
| RFS | NSW Rural Fire Service |
| RMP | Rehabilitation Management Plan |
| RMS | NSW Roads and Maritime Services |
| RNP | Road Noise Policy (DECCW 2011) |
| ROM | Run-of-mine |
| RTA | Roads and Traffic Authority |
| RTP | Road Transport Protocol |
| SEPP 71 | State Environmental Planning Policy 71 – Coastal Protection |
| SGMP | Seagrass Management Plan |
| SIA | Social Impact Assessment |
| SMP | Subsidence Management Plan |
| SPB | seagrass protection barrier |
| SRD SEPP | State Environmental Planning Policy (State and Regional Development) 2011 |
| SSD | state significant development |
| SWA | surface water impact assessment |
| SWL | standing water level |

| | |
|----------------|---|
| TECs | threatened ecological communities |
| TEOM | tapered element oscillating microbalance |
| TIA | traffic impact assessment |
| TMP | Traffic Management Plan |
| tpa | tonnes per annum |
| TSC Act | <i>Threatened Species Conservation Act 1995</i> |
| TSP | total suspended particulates |
| µm | micrometre |
| VPPS | Vales Point Power Station |
| WM Act | <i>Water Management Act 2000</i> |
| WMP | Water Management Plan |
| WRI/WBCSD | World Resources Institute/ World Business Council for Sustainable Development |
| WSC | Wyong Shire Council |
| Wyong LEP 1991 | Wyong Local Environmental Plan 1991 |

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APPENDIX A

Study team



This EIS was prepared by EMM with the assistance of a number of external specialists. Members of the study team, their roles and qualifications are listed below.

Table A.1 Study team

| Role | Person | Organisation | Qualifications |
|-------------------------------------|---------------------|------------------------------|----------------------------|
| Project direction and review | | | |
| | Chris Ellis | LakeCoal | BEnvSc, GCMInRes |
| | Bob Corbett | LDO Group | BSc (For) |
| EIS production | | | |
| Project director | Luke Stewart | EMM | BAppSc (Hons) |
| Project manager | David Kelly | EMM | BTP (Hons) |
| Project coordinator | Rachael Russell | EMM | BSc, MEnvP |
| Contributing authors | Peter Stewart | EMM | BE (Chem) |
| | Mark Roberts | EMM | BSc, DipEnvStud |
| | Ross Aitken-Smith | EMM | BBusMan, MEnvMan |
| Graphics | Derek Mascarenhas | IDS | BEng |
| | Ana Ouriques | IDS | BSc |
| Document formatting | Jamie Wharemate | EMM | |
| Technical specialists | | | |
| Aboriginal and historic heritage | Neville Baker | EMM | BA (Hons) |
| | Rebecca Moore | EMM | BA (Hons) |
| Air quality | Judith Cox | Pacific Environment Limited | BE (Hons) |
| | Khalia Hill | Pacific Environment Limited | BSc, PhD |
| Economics | Rob Gillespie | Gillespie Economics | BSc, BEc, MPlan, MEc |
| Groundwater | Andrew Dawkins | GeoTerra | BSc |
| Marine ecology | Jemma Sargent | JSA Environmental | BSc |
| | Madison Young | JSA Environmental | BSc |
| Noise | Oliver Muller | EMM | BSc |
| | Teanuanua Villierme | EMM | BAppSc, MEMan |
| Social assessment | Edward Niembro | EMM | BSc, MSc |
| Subsidence | Steve Ditton | Ditton Geotechnical Services | BE (Civil) (Hons) |
| Surface water | Duncan Barnes | GSS Environmental | BE (Env) (Hons) |
| | Andrew Behrens | GSS Environmental | BE (Civil) (Hons), MIEAust |
| Terrestrial ecology | Cassandra Thompson | EMM | BSc, MAppSc |
| Traffic and transport | Tim Brooker | EMM | BSc, PhD |



APPENDIX B

Schedule of lands



APPENDIX 1 SCHEDULE OF LAND

Notes:

1. All proposed mining activity for the Project (Domains 1 and 2) is to occur under Lake Macquarie.
2. The surface facilities for the Colliery are limited to “pit top facilities area” adjacent to Vales Point Power Station, and the “ventilation shaft and fan site” at Summerland Point.
3. Refer to Figure 2.1 of the Environmental Assessment for the Project Boundary.

| Project Related Surface Facilities | | | |
|------------------------------------|----------------|---------------------------|----------------|
| Pit Top Facilities Area | | Ventilation Shaft and Fan | |
| Lot | Deposited Plan | Lot | Deposited Plan |
| A | 379918 | 1 | 226133 |
| B | 379918 | | |
| C | 349733 | | |
| A | 187570 | | |
| 1B | 339441 | | |

| All other areas within Project Boundary | | | | |
|---|----------------|--|-----|----------------|
| Lot | Deposited Plan | | Lot | Deposited Plan |
| 7339 | 1167067 | | 19 | 25593 |
| 7330 | 1148105 | | 20 | 25593 |
| 593 | 727722 | | 21 | 25593 |
| 594 | 727722 | | 22 | 25593 |
| D | 349733 | | 23 | 25593 |
| 1 | 410653 | | 24 | 25593 |
| 23 | 708344 | | 25 | 25593 |
| 21 | 708344 | | 26 | 25593 |
| 20 | 708344 | | 27 | 25593 |
| 19 | 708344 | | 58 | 31306 |
| 18 | 708344 | | 59 | 31306 |
| 17 | 708344 | | 60 | 31306 |
| 34 | 714879 | | 61 | 31306 |
| 33 | 714879 | | 62 | 31306 |
| 32 | 714879 | | 63 | 31306 |
| 31 | 714879 | | 64 | 31306 |
| 2 | 1043151 | | 65 | 31306 |
| 426 | 755266 | | 66 | 31306 |
| 427 | 755266 | | 67 | 31306 |
| 136 | 755266 | | 68 | 31306 |
| 2 | 515214 | | 69 | 31306 |
| 1 | 515214 | | 70 | 31306 |
| 1 | 214300 | | 71 | 31306 |
| 2 | 214300 | | 72 | 31306 |
| 167 | 755266 | | 73 | 31306 |
| 1 | 388154 | | 74 | 31306 |
| 144 | 661695 | | 75 | 31306 |

| All other areas within Project Boundary (continued) | | | | |
|---|----------------|--|-----|----------------|
| Lot | Deposited Plan | | Lot | Deposited Plan |
| 76 | 31306 | | 188 | 31306 |
| 77 | 31306 | | 189 | 31306 |
| 78 | 31306 | | 190 | 31306 |
| 79 | 31306 | | 191 | 31306 |
| 139 | 31306 | | 192 | 31306 |
| 140 | 31306 | | 193 | 31306 |
| 141 | 31306 | | 194 | 31306 |
| 142 | 31306 | | 195 | 31306 |
| 143 | 31306 | | 238 | 31306 |
| 144 | 31306 | | 239 | 31306 |
| 145 | 31306 | | 240 | 31306 |
| 146 | 31306 | | 241 | 31306 |
| 147 | 31306 | | 242 | 31306 |
| 148 | 31306 | | 243 | 31306 |
| 149 | 31306 | | 244 | 31306 |
| 150 | 31306 | | 245 | 31306 |
| 151 | 31306 | | 246 | 31306 |
| 152 | 31306 | | 247 | 31306 |
| 153 | 31306 | | 248 | 31306 |
| 154 | 31306 | | 249 | 31306 |
| 155 | 31306 | | 250 | 31306 |
| 156 | 31306 | | 251 | 31306 |
| 157 | 31306 | | 252 | 31306 |
| 158 | 31306 | | 253 | 31306 |
| 159 | 31306 | | 254 | 31306 |
| 160 | 31306 | | 255 | 31306 |
| 161 | 31306 | | 256 | 31306 |
| 162 | 31306 | | 257 | 31306 |
| 163 | 31306 | | 258 | 31306 |
| 169 | 31306 | | 259 | 31306 |
| 170 | 31306 | | 37 | 31322 |
| 171 | 31306 | | 38 | 31322 |
| 172 | 31306 | | 39 | 31322 |
| 173 | 31306 | | 40 | 31322 |
| 174 | 31306 | | 41 | 31322 |
| 175 | 31306 | | 42 | 31322 |
| 176 | 31306 | | 43 | 31322 |
| 177 | 31306 | | 44 | 31322 |
| 178 | 31306 | | 45 | 31322 |
| 179 | 31306 | | 46 | 31322 |
| 180 | 31306 | | 47 | 31322 |
| 181 | 31306 | | 48 | 31322 |
| 182 | 31306 | | 78 | 31322 |
| 183 | 31306 | | | |
| 184 | 31306 | | | |
| 185 | 31306 | | | |
| 186 | 31306 | | | |
| 187 | 31306 | | | |



APPENDIX C

Director-General's requirements





**Planning &
Infrastructure**

Major Projects Assessment

Mining & Industry Projects

Contact: Colin Phillips

Phone: 9228 6483

Fax: 9228 6466

Email: colin.phillips@planning.nsw.gov.au

Mr Chris Ellis
Environmental Officer
LakeCoal Pty Limited
16 Spitfire Road
RUTHERFORD NSW 2320

Our Ref:

Dear Mr Ellis

**State Significant Development - Director-General's Requirements
Chain Valley Colliery Mining Extension 1 (SSD - 5465)**

I have attached a copy of the Director General's environmental assessment requirements (DGRs) for the preparation of an Environmental Impact Statement (EIS) for the Chain Valley Colliery Mining Extension 1.

These requirements are based on the information you have provided to date. You must also consult with relevant government agencies and affected councils, particularly those listed in the DGRs. You must appropriately address their comments in preparing the EIS. Please note that the Director-General may alter these requirements at any time, and that you must consult further with the Department if you do not lodge a development application and EIS for the development within two years of the date of issue of these DGRs. The Department will review the EIS for the development carefully before putting it on public exhibition, and will require you to submit an amended EIS if it does not adequately address the DGRs.

The input provided by relevant agencies for the Domains 1 and 2 Continuation Project (10_0161) is provided in Attachment 2 for your information. The Department is consulting further with these agencies may revise these DGRs in due course.

Your development may require separate approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Department encourages you to confirm whether such an approval will be required as soon as possible. If an EPBC Act approval is required, I would appreciate it if you would advise the Department accordingly, as the Commonwealth approval process may be integrated into the NSW approval process, and supplementary DGRs may need to be issued.

I would appreciate it if you would contact the Department at least two weeks before you propose to submit the development application and EIS for your development. This will enable the Department to:

- confirm the applicable fee (see Division 1AA, Part 15 of the *Environmental Planning and Assessment Regulation 2000*); and
- determine the number of copies (hard-copy and CD-ROM) of the EIS required for review.

If you have any enquiries about these requirements, please contact Colin Phillips.

Yours sincerely

David Kitto
Director, Mining and Industry Projects
as the Director-General's nominee

Director General's Environmental Assessment Requirements

Section 78A(8A) of the *Environmental Planning and Assessment Act 1979*

State Significant Development

| | |
|-----------------------------|--|
| Application Number | SSD - 5465 |
| Development | <p>The Chain Valley Colliery Mining Extension 1 proposal which includes:</p> <ul style="list-style-type: none"> • extending underground mining operations within and beyond the existing approved mine boundaries to extract up to 1.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal until 2027; • utilising, and upgrading where required, the existing infrastructure at the mine surface facilities site; and • transporting coal by road to domestic markets and the Port of Newcastle. |
| Location | <p>Surface facilities located off Construction Road, Vales Point, about 35 kilometres south of Newcastle, in the Wyong LGA.</p> <p>Underground mining areas for the proposed extension are located under the waters of Lake Macquarie within the Lake Macquarie LGA.</p> |
| Applicant | LakeCoal Pty Limited |
| Date of Issue | 14 August 2012 |
| General Requirements | <p>The Environmental Impact Statement (EIS) for the development must meet the form and content requirements in Clauses 6 and 7 of Schedule 2 of the <i>Environmental Planning and Assessment Regulation 2000</i>.</p> <p>In addition, the EIS must include a:</p> <ul style="list-style-type: none"> • detailed description of the development, including: <ul style="list-style-type: none"> – need for the proposed development; – justification for the proposed mine plan, including efficiency of coal resource recovery, mine safety, and environmental protection; – likely staging of the development - including construction, operational stage/s and rehabilitation; – likely interactions between the development and existing, approved and proposed mining operations in the vicinity of the site, particularly the approved Myuna Coal Project; – plans of any proposed building works; • consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments; • risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment; • detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment, which includes: <ul style="list-style-type: none"> – a description of the existing environment, <u>using sufficient baseline data</u>; – an assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and – a description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage any significant risks to the environment; and • consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EIS. |

Key Issues

The EIS must address the following specific issues:

- Subsidence – including a detailed quantitative and qualitative assessment of the potential conventional and non-conventional subsidence impacts of the development that includes:
 - accurate predictions of the potential subsidence effects and impacts of the development, paying particular attention to the long-term stability of final pillars, including a robust sensitivity analysis of these predictions;
 - predictions of the potential cumulative subsidence effects and impacts from the development in conjunction with overlying and adjacent mining (whether historical, approved or proposed), including a robust sensitivity analysis of these predictions;
 - a detailed assessment of the potential environmental consequences of these effects and impacts on both the natural and built environment, paying particular attention to:
 - Lake Macquarie, including its bed, seagrass beds and foreshores; and
 - other features considered to have significant economic, social, cultural or environmental values; and
 - a detailed description of the measures that would be implemented to avoid, minimise, remediate and/or offset subsidence impacts and environmental consequences (including adaptive management and proposed performance measures);
- Traffic & Transport – including:
 - a detailed assessment of potential impacts of the development on the capacity, safety and efficiency of the local and regional road network, with particular regard to the condition of the existing road network;
 - a description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network in the surrounding area over the life of the development; and
 - an economic justification of transporting coal on public roads, including an assessment of alternative transport methods;
- Water Resources – including:
 - detailed assessment of potential impacts on the quality and quantity of existing surface and ground water resources, including detailed modelling of potential groundwater impacts;
 - a detailed site water balance, including a description of site water demands, water disposal methods (inclusive of volume and frequency of any water discharges), water supply infrastructure and water storage structures;
 - an assessment of proposed water discharge quantities quality/ies against receiving water quality and, if relevant, flow objectives;
 - identification of any licensing requirements or other approvals under the *Water Act 1912* and/or *Water Management Act 2000*; and
 - a detailed description of the proposed water management system (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts;
- Biodiversity – including:
 - a detailed assessment of potential impacts of the development on any terrestrial or aquatic threatened species or populations and their habitats, endangered ecological communities, groundwater dependent ecosystems and benthic communities in Lake Macquarie; and
 - measures taken to avoid, reduce or mitigate impacts on biodiversity;
- Noise – including a quantitative assessment of potential:
 - construction, operational and off-site transport noise impacts;
 - reasonable and feasible mitigation measures, including evidence that there are no such measures available other than those proposed; and
 - monitoring and management measures, in particular real-time and attended noise monitoring;
- Air Quality – including a quantitative assessment of potential:
 - construction and operational impacts, with a particular focus on dust emissions including PM_{2.5} and PM₁₀ emissions;
 - reasonable and feasible mitigation measures to minimise dust

| | |
|----------------------------|--|
| | <p>emissions, including evidence that there are no such measures available other than those proposed; and</p> <ul style="list-style-type: none"> - monitoring and management measures; • Greenhouse Gases – including: <ul style="list-style-type: none"> - a quantitative assessment of potential Scope 1, 2 and 3 greenhouse gas emissions; - a qualitative assessment of the potential impacts of these emissions on the environment; and - an assessment of reasonable and feasible measures to minimise greenhouse gas emissions and ensure energy efficiency; • Rehabilitation – including the proposed rehabilitation strategy for the site, having regard to the key principles in the Strategic Framework for Mine Closure, including: <ul style="list-style-type: none"> - rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria; - nominated final land use, having regard to any relevant strategic land use planning or resource management plans or policies; and - the potential for integrating this strategy with any other rehabilitation and/or offset strategies in the region. • Heritage – both Aboriginal and non-Aboriginal; • Hazards – paying particular attention to public safety, including bushfires; • Waste – including: <ul style="list-style-type: none"> - accurate estimates of the quantity and nature of the potential waste streams of the development; and - a description of measures that would be implemented to minimise production of waste on site, and ensure that that waste produced is appropriately managed; and • Social & Economic – including an assessment of the: <ul style="list-style-type: none"> - potential direct and indirect economic benefits of the development for local and regional communities and the State; - potential impacts on local and regional communities, including: <ul style="list-style-type: none"> ○ increased demand for local and regional infrastructure and services (such as housing, childcare, health, education and emergency services); and ○ impacts on social amenity; - a detailed description of the measures that would be implemented to minimise the adverse social and economic impacts of the development, including any infrastructure improvements or contributions and/or voluntary planning agreement or similar mechanism; and - a detailed assessment of the costs and benefits of the development as a whole, and whether it would result in a net benefit for the NSW community. |
| Plans and Documents | <p>The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the Environmental Planning and Assessment Regulation 2000. These documents should be included as part of the EIS rather than as separate documents.</p> |
| Consultation | <p>During the preparation of the EIS, you must consult with relevant local, State and Commonwealth Government authorities, service providers, community groups and affected landowners.</p> <p>In particular you must consult with the:</p> <ul style="list-style-type: none"> • Commonwealth Department of Sustainability, Environment, Water, Population and Communities; • Office of Environment and Heritage (including the Heritage Branch); • Environment Protection Authority; • Division of Resources and Energy within the Department of Trade and Investment, Regional Infrastructure and Services; • Department of Primary Industries (including the NSW Office of Water, NSW Forestry, Agriculture and Fisheries sections, Catchments and Lands (Crown Lands Division)); |

| | |
|---|--|
| | <ul style="list-style-type: none"> • Transport for NSW (including the Centre for Transport Planning, and Roads and Maritime Services); • Mine Subsidence Board; • NSW Health; • Hunter Central Rivers Catchment Management Authority; • Gosford – Wyong Councils Water Authority; • Wyong Shire Council; • Newcastle City Council; and • Lake Macquarie City Council. <p>The EIS must:</p> <ul style="list-style-type: none"> • describe the consultation process used and demonstrate that effective consultation has occurred; • describe the issues raised by public authorities, service providers, community groups and landowners; • identify where the design of the development has been amended in response to issues raised; and • otherwise demonstrate that issues raised have been appropriately addressed in the assessment. |
| Further consultation after 2 years | If you do not lodge a DA and an EIS for the development within 2 years of the issue date of these DGRs, you must consult further with the Director-General in relation to the requirements for lodgement. |
| References | The assessment of the key issues listed above must take into account relevant guidelines, policies, and plans as identified. While not exhaustive, Attachment 1 contains a list of some of the guidelines, policies, and plans that may be relevant to the environmental assessment of this development. |

ATTACHMENT 1 Technical and Policy Guidelines

The following guidelines may assist in the preparation of the Environmental Impact Statement. This list is not exhaustive and not all of these guidelines may be relevant to your proposal.

Many of these documents can be found on the following websites:

<http://www.planning.nsw.gov.au>

<http://www.bookshop.nsw.gov.au>

<http://www.publications.gov.au>

Policies, Guidelines & Plans

Risk Assessment

AS/NZS 4360:2004 Risk Management (Standards Australia)

HB 203: 203:2006 Environmental Risk Management – Principles & Process (Standards Australia)

Biodiversity

Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians (DECCW 2009)

Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft (DECC 2004)

BioBanking Assessment Methodology and Credit Calculator Operational Manual (DECCW 2008)

The Threatened Species Assessment Guideline – The Assessment of Significance (DECC 2007)

NSW State Groundwater Dependent Ecosystem Policy (DLWC)

Policy & Guidelines - Aquatic Habitat Management and Fish Conservation (NSW Fisheries)

State Environmental Planning Policy No. 44 – Koala Habitat Protection

Water Resources

National Water Quality Management Strategy: Australian Guidelines for Fresh and Marine Water Quality (ANZECC/ARMCANZ)

National Water Quality Management Strategy: Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC/ARMCANZ)

National Water Quality Management Strategy: Guidelines for Sewerage Systems – Effluent Management (ARMCANZ/ANZECC)

National Water Quality Management Strategy: Guidelines for Sewerage Systems – Use of Reclaimed Water (ARMCANZ/ANZECC)

Using the ANZECC Guideline and Water Quality Objectives in NSW (DEC)

State Water Management Outcomes Plan

Surface Water

NSW Government Water Quality and River Flow Objectives (DECC)

Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DEC)

Managing Urban Stormwater: Soils & Construction (Landcom) and associated Volume 2E: Mines and Quarries (DECC).

Managing Urban Stormwater: Treatment Techniques (DECC)

Managing Urban Stormwater: Source Control (DECC)

Floodplain Development Manual (DIPNR)

Floodplain Risk Management Guideline (DECC)

A Rehabilitation Manual for Australian Streams (LWRRDC and CRCCH)

Technical Guidelines: Bunding & Spill Management (DECC)

Environmental Guidelines: Use of Effluent by Irrigation (DECC)

| | |
|---|--|
| Groundwater | National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ/ANZECC) |
| | Draft NSW Aquifer Interference Policy – Stage 1(NSW Govt, 2012) |
| | NSW State Groundwater Policy Framework Document (DLWC, 1997) |
| | NSW State Groundwater Quality Protection Policy (DLWC, 1998) |
| | NSW State Groundwater Quantity Management Policy (DLWC, 1998) |
| | Murray-Darling Basin Groundwater Quality. Sampling Guidelines. Technical Report No 3 (MDBC) |
| | Murray-Darling Basin Commission. Groundwater Flow Modelling Guideline (Aquaterra Consulting Pty Ltd) |
| | Guidelines for the Assessment & Management of Groundwater Contamination (DECC, 2007) |
| Any relevant Water Sharing Plan for groundwater and surface water resources | |
| Air Quality | |
| Protection of the Environment Operations (Clean Air) Regulation 2002 | |
| Approved Methods for the Modelling and Assessment of Air Pollutants in NSW (DEC) | |
| Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC) | |
| Noise & Blasting | |
| NSW Industrial Noise Policy (DECC) | |
| Environmental Noise Management – Assessing Vibration: a technical guide (DEC) | |
| NSW Road Noise Policy (DECCW) | |
| Interim Guidelines for the Assessment of Noise From Rail Infrastructure Projects (DECC) | |
| Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZECC) | |
| Land Resources | |
| Agricultural Impact Assessment Guidelines 2012 (DP&I) | |
| Agfact AC25: Agricultural Land Classification (NSW Agriculture) | |
| State Environmental Planning Policy No. 55 –Remediation of Land | |
| Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites (ANZECC) | |
| Traffic & Transport | |
| Guide to Traffic Generating Development (RTA) | |
| Road Design Guide (RTA) | |
| Heritage | |
| Aboriginal | Draft Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation (DEC 2005) |
| | The Burra Charter (The Australia ICOMOS charter for places of cultural significance) |
| Historic | NSW Heritage Manual (NSW Heritage Office) |
| | The Burra Charter (The Australia ICOMOS charter for places of cultural significance) |
| Greenhouse Gases | |
| National Greenhouse Accounts Factors (Australian Department of Climate Change (DCC)) | |
| Guidelines for Energy Savings Action Plans (DEUS) | |
| Waste | |
| Waste Classification Guidelines (DECC) | |
| Hazards | |
| State Environmental Planning Policy No. 33 – Hazardous and Offensive Development | |
| Hazardous and Offensive Development Application Guidelines - Applying SEPP 33 | |
| Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis | |

Rehabilitation

Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia)

Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia)

Strategic Framework for Mine Closure (ANZMEC-MCA)

Socio-Economic

Draft Economic Evaluation in Environmental Impact Assessment (DoP)

Techniques for Effective Social Impact Assessment: A Practical Guide (Office of Social Policy, NSW Government Social Policy Directorate)



Office of
Environment
& Heritage

Your reference: SSD - 5465
Our reference: DOC12/34373; FIL12/7028; Fil12/7848
Contact: Robert Gibson, 4908 6851

Mr Matthew Riley
Mining and Industry Projects
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Attention: Mr Colin Phillips

Dear Mr Riley

RE: DIRECTOR GENERAL'S REQUIREMENTS FOR PROPOSED MINING EXTENSION 1 FOR CHAIN VALLEY COLLIERY (SSD - 5465)

Reference is made to your email of 17 August 2012 to the Office of Environment and Heritage (OEH). In your email you requested that OEH review of draft Director General's requirements (DGRs) for a new State Significant Development (SSD). The development in question is LakeCoal Pty Ltd's proposal to extend its existing coal mining operations at Chain Valley Colliery (MP10_0161) to the north under the bed of Lake Macquarie (Mining Extension 1 (SSD - 5465). OEH notes that the Department of Planning and Infrastructure prepared its draft DGRs for this new proposal based on OEH's recommended DGRs for similar mining projects in the local area.

A number of OEH's policies have changed since 2009, therefore, some minor amendments to the draft DGRs are recommended. This includes the inclusion in the EIS of an assessment of potential impacts of mine subsidence on lake bed communities and also details on the appropriate provision of biodiversity offsets in the event that unexpected mine subsidence affects threatened biodiversity outside the mine footprint. Further details are provided in **Attachment 1**.

If you have any questions about this letter then please contact Robert Gibson, Regional Biodiversity Conservation Officer, on 4908 6851.

Yours sincerely

31 AUG 2012

RICHARD BATH
Head – Hunter Planning Unit
Conservation and Regulation, North East

Enclosure: Attachment 1 - Recommended Amendments to Draft DGRs

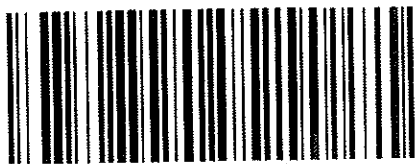
ATTACHMENT 1: RECOMMENDED AMENDMENTS TO DRAFT DGRs

OEH recommends that the following requirements are added to the existing DGRs:

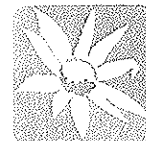
General Requirements:

- | | |
|--------------|--|
| Subsidence | The EIS must include an assessment of how the increase in water depth due to mine subsidence will affect the amount of light reaching the benthos and how this may affect plant productivity (i.e. benthic microalgae and seagrass as well as macroinvertebrate abundance and diversity). |
| Biodiversity | The proposed development is considered unlikely to impact on threatened biodiversity covered by the <i>Threatened Species Conservation Act 1995</i> . However, the EIS should include a specific Statement of Commitments that in the event that subsidence or other impacts from the proposed development do adversely impact on threatened biodiversity, then those impacts will be offset in accordance with OEH policy: either OEH's 'Principles for the use of biodiversity offsets in NSW' (DECC, 2011) or the 'NSW OEH interim policy on assessing and offsetting biodiversity impacts of Part 3A, State significant development (SSD) and State significant infrastructure (SSI) projects' (OEH 2011). |
| Heritage | The proponent must prepare a 'Heritage Management Plan' for the Project in consultation with the registered Aboriginal parties to detail management strategies for Aboriginal cultural heritage values associated with the broader project area. |

ATTACHMENT 2
Agency Input into Key Assessment Issues
Provided for Domains 1 and 2 Continuation Project (10_0161)



PCU015069



Wyong
Shire
Council
GENERAL COUNCIL

JLW/Jenny Webb
F2009/01371
D02361365
28 September 2010

Attn: Colin Phillips
Department of Planning
Mining and Industry Projects
GPO Box 39
Sydney NSW 2001

Department of Planning
Received
30 SEP 2010
Scanning Room

Dear Mr Phillips,

Thank you for the opportunity to provide comment on the Preliminary Environmental Assessment (PEA) for the Chain Valley Colliery Project – Part B Extension (10_0161). Council has reviewed the information for the continuation of mining at the existing Chain Valley Colliery and provide the following comments for your consideration and inclusion in the Director General Requirements:

- 1 The Environmental Assessment should address the relevant Council policies including DCP 2005 Chapter 14 Tree Management, DCP 2005 Chapter 13 Interim Conservation Areas and DCP 2005 Chapter 30 Wetlands.
- 2 The PEA states that an aquatic ecology assessment and terrestrial flora and fauna assessment will be conducted for the project and included in the Environmental Assessment. Flora and Fauna surveys should be conducted in accordance with the Wyong Shire Council (1999) *Flora and Fauna Guidelines for Development* and Department of Environment and Climate Change (2009) *Threatened Species Survey and Assessment Guidelines*. Particular attention shall be given to conducting surveys at the correct time of year to detect cryptic migratory species, such as terrestrial orchids.

Please note: Council has undertaken its own survey of locally significant orchids in 2003. A copy of this report can be obtained upon request from Council.

- 3 The PEA provides a list of the threatened species that have been recorded in the study area according to the NSW wildlife atlas. The study area adopted is questioned as the species list did not include several species that have been recorded in the vicinity of the mine according to Council's copy of the wildlife atlas, including the Glossy-black Cockatoo, Varied Sittella, Southern Myotis and *Genoplesium insignis* or Powerful Owl. It is recommended that the species list be compiled as per the *Threatened Species Assessment Guidelines* (Department of Environment and Climate Change, August 2007).
- 4 Two important considerations for the assessment of the potential impacts on threatened species, populations and ecosystems include impacts to 'groundwater dependent ecosystems' and wildlife corridors. The current *NSW State Groundwater Dependent Ecosystem Policy* (Department of Land and Water Conservation, 2002) should be considered.

- 5 Having regard for subsidence, consideration shall be given to the potential impacts to all natural features including stream banks and beds, riparian zones, wetlands, seagrass beds, saltmarsh and near-shore/lake edge areas.
- 6 The potential impacts on terrestrial fauna from noise and artificial lighting shall be addressed in the flora and fauna assessment.
- 7 A monitoring program shall be developed and subsequently implemented as part of the process to avoid and/or remediate potential impacts on flora and fauna.
- 8 The potential environmental impacts of soil contamination as a result of surface operations, the activation of acid sulphate soils due to lowering of the water table, or surface cracking as a result of subsidence shall be addressed.
- 9 One of the mitigation measures should include an Environmental Management System that sets objectives and targets to achieve continuous improvement.
- 10 Consideration of the cumulative impacts (time and space), for example, from adjoining mines and power stations, as well as cumulative impacts as a result of the continuation of the operation of the mine and the mining of the three seams, shall be considered in the Environmental Assessment. In addition, the potential impacts of future climate change, having regard to DECC's draft policy on Sea Level Rise, shall also be considered in this assessment.
- 11 The assessment states that the method of extraction be "Bord and Pillar" with a predicted subsidence between 175mm and 510 mm. This predicted settlement can have extensive effects on the existing constructed infrastructure i.e. roads, stormwater drainage systems, water and sewer pipelines and structures throughout the suburbs of Chain Valley Bay, Summerland Point, Gwandalan and the road network.

Subsidence under stormwater drainage, water, and sewerage pipelines will incur major disruption to services, potential contamination of environmentally sensitive areas including the lake and its tributaries, create public health and safety issues and major remediation costs to the proponent, Wyong Shire Council and the public. The report should include a study which addresses the effects of the long term operation with a strategy to ensure minimal risk of subsidence to Council's roads, stormwater drainage systems, and water and sewer infrastructure. As such, a report on the anticipated impact from the mining subsidence on Council's infrastructure is required.

Note: Subsidence has a significant impact on drainage and sewage pipes. Adverse slopes on these pipes cannot be tolerated. There are examples where subsidence has occurred and pipes now run backwards. Because of the flat grades on many of the pipes, even "Partial extraction" with subsidence up to 0.25 metres can have significant consequences on some infrastructure. As such, Council is unwilling to support any mining where subsidence will affect its roads, drainage, sewage and other Council infrastructure.

- 12 The submission indicates that the extraction will increase production to a maximum of 1.2 M/tonnes/annum. The carriageway within Ruttleys Road, Pacific Highway and the intersection require a thorough dilapidation analysis of the existing condition and design life expectancy. Recommended rehabilitation and re-construction works, supported by a Geotechnical Report to ensure the continued safe and sufficient service to accommodate the increased demand, shall be included in the submission.
- 13 The Environmental Assessment shall include a Traffic/Transportation Report to detail the proposed haulage routes (RTA endorsed) and impacts including capacity, safety and future year traffic projections. The report shall consider alternative transportation of coal, rather than by road (Highway and Freeway), and the impact at the Pacific Highway/Ruttleys Road and the F3 Freeway/Sparks Road intersections.

- 14 The proposed mining area is within the North Wyong Shire Structure Plan area and should therefore be considered in the context of the draft North Wyong Shire Structure Plan.
- 15 The Coal and Allied residential subdivision proposal at Gwandalan will be located in close proximity to the underground Fassifern Seam proposed mining area. Although this will only increase the underground mining area in relation to the existing workings for the Great Northern Seam mining area, this needs to be considered in the context of any impacts this may have on location and design of this proposed residential subdivision.
- 16 Consideration should be given to exploring ways in which the emission of Greenhouse Gases will be offset. The detailed Greenhouse Gas assessment shall include the following:
 - A description of the measures that would be implemented on site to ensure that the project is energy efficient.
 - Options to minimise greenhouse gas emissions through the capture and re-use of coal seam gas.
- 17 Consideration shall be given to the impact of mine subsidence on the built environment which may involve predictions of the potential subsidence effects of the proposed mine extension plan. Underground mining could mean that surface development plans will need to be altered to enable mining to be completed. Mine subsidence engineering requirements might also impact on the size and design of proposed structures.
- 18 Depending on the proposed works, the Northern Districts Section 94 Contributions Plan 2008 may be applicable.
- 19 The potential impact on Aboriginal and non-Aboriginal heritage shall be considered.
- 20 Details of any change to the existing settling ponds and water control facilities shall be included in the Environmental Assessment.
- 21 The impact on surrounding residential areas shall be explored, particularly in relation to noise, subsidence, traffic and the like.
- 22 The project shall consider sustainable options in relation to the provision of new infrastructure, rainwater reuse etc.
- 23 Details of any change to the Colliery's current potable water use shall be included in the Mine/Water Balance.
- 24 Effective consultation and communication with the community shall be undertaken. The proponent shall be required to conduct public meetings and provide hard copy documents of the proposal in accessible locations within the community e.g. the local post office/ general store (Chain Valley Bay, Mannering Park, Summerland Point, Gwandalan and Doyalson), Lake Haven Library etc. The advertisement should be included in the Central Coast Express Advocate and adequately detail what the proposal is for. It would also be valuable for Peabody to run an advertisement concurrently with the Part 3A notification that included the proposal detail that the DOP advertisement excludes.
- 25 Concern is raised in relation to the predicted level of subsidence. Council considers that these estimates and predicted impacts may be under-estimated. Council recommends that the Department of Planning receive an independent review of these estimates and predicted impacts by appropriately qualified consultants/personnel. It

would be appreciated if this information could be made available to Council for utilisation in our assessment process.

- 26 Information regarding the generation of coal dust and airborne particulates, and any potential impacts on surrounding residential and ecological communities, shall be included in the Environmental Assessment.

Should you have any enquiries, please contact Jenny Webb on (02) 4350 5441.

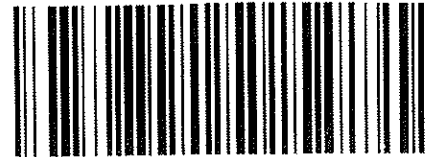
Yours faithfully,


Peter Fryar
Manager

DEVELOPMENT ASSESSMENT



**Environment,
Climate Change
& Water**

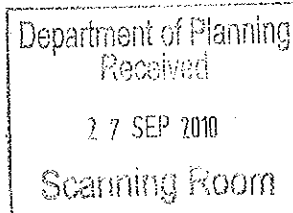


PCU014945

Your reference: S09/01587
Our reference: Part 3A, DOC10/42889,
File No. LIC09/664-02
Contact: Hamish Rutherford,
(02) 4908 6824

NSW Department of Planning
GPO Box 39
SYDNEY NSW 2001

Attention: Mr Colin Phillips



Dear Sir

**CHAIN VALLEY COAL PROJECT – PART B EXTENSION (10_0161)
DIRECTOR-GENERAL'S REQUIREMENTS**

Reference is made to your letter to the Department of Environment, Climate Change and Water (DECCW) dated 16 September 2010 requesting DECCW's Director-General's requirements (DGRs) for the above proposal.

On 3 July 2009 DECCW wrote to the Department of Planning (our reference DOC09/26346, attached) providing DGRs for a continuation of mining activities at the premises (your reference 09_0130). The DGRs provided for this existing project (09_0130) remain current and are applicable to the current project (10_0161).

If you require any further information regarding this matter please contact Hamish Rutherford on (02) 4908 6824.

Yours sincerely

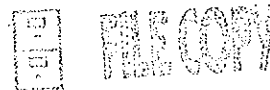
PETER JAMIESON
Head Regional Operations Unit
North East Branch
Environment Protection and Regulation

Encl. DECCW Letter DOC09/26346 dated 3 July 2009.

Our reference:
Contact

DOC09/26346 File: 270737A2, Part 3A
P Hughes 02 4908 6819

L10091664



Director Major Development Assessment
Department of Planning
GPO Box 39
SYDNEY NSW 2001

Attention: Mr Colin Phillips

Dear Mr Phillips

CHAIN VALLEY BAY COLLIERY - ENVIRONMENTAL ASSESSMENT REQUIREMENTS

I refer to your email dated 2 June 2009 seeking comment from the Department of Environment and Climate Change (DECC) regarding the Director-General's Environmental Assessment Requirements (DG EAR's) for the above proposal.

DECC has reviewed the details of the project as provided in the Preliminary Environmental Assessment report and has identified the information it requires to be covered in the Environmental Assessment (EA). In summary, DECC considers that the key environmental aspects of this proposal are:

- Potential impacts on surface water and groundwater systems and the management of surface waters on site; and
- Potential impacts of subsidence.

Surface and Groundwaters

The subject site lies within an area subjected to high rainfall and storm events. The prevailing climate can make water management in this location challenging. DECC therefore requires that all water management issues be addressed in detail.

DECC requires very careful consideration of metal and salt discharges from the premises. The concentrations of metals and salinity in discharge waters should be directly compared with those in the receiving waters and Lake Macquarie using the Guidelines for Fresh and Marine Water Quality (ANZECC 2000). All impacts on receiving waters should then be assessed and mitigation measures proposed where ANZECC criteria can not be met.

Subsidence Impacts

The EA needs to assess and describe the predicted impacts of underground mining in detail. Particular emphasis should be given to sensitive areas such as waterways, wetlands and areas proposed to be transferred to DECC estate under the Coal and Allied Lower Hunter Land Offset Agreement. The proposed development should ensure there is no adverse impact on water resources, habitat values, ecological processes or heritage values within the area.

PO Box 488G Newcastle NSW 2300
117 Bull Street, Newcastle West NSW 2302
Tel: (02) 4908 6800 Fax: (02) 4908 6810
ABN 30 841 387 271
www.environment.nsw.gov.au

Department of **Environment and Climate Change** NSW



General Matters

The proponent should be aware that any commitments made in the EA may be formalised into an environment protection licence or a variation of their existing licence. Accordingly, pollution control measures should not be proposed if they are impractical, unrealistic or beyond the financial viability of the development.

The EA must clarify the relationship between the proposal and the existing Environment Protection Licence (EPL) for Chain Valley Colliery. Should development approval be granted, the applicant may need to make a separate application to DECC to vary the licences under the *Protection of the Environment Operations Act 1997* (POEO Act) to permit the proponent to carry out the increased scale of the proposed scheduled development activities.

Please find attached DECC's Environmental Assessment Requirements in Attachment A. In carrying out the assessment, the applicant should refer to the relevant guidelines in Attachment B and also any industry codes of practice and best environmental management practice guidelines.

DECC requests that four (4) hard copies and one electronic copy of the EA be provided for assessment to the Regional Manager Hunter, PO Box 488G, Newcastle 2300.

If you require any further information on this matter please contact Peter Hughes on (02) 4908 6819.

Yours sincerely



PETER JAMIESON
Head Regional Operations Unit Coastal
Environment Protection and Regulation

Encl: Attachment A – Recommended Director Generals Environmental Assessment Requirements
Attachment "B" – Guidance Material.

ATTACHMENT A: DECC's ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Environmental Impacts of the Project

DECC requires the following information to determine the extent of environmental impacts of the proposal. Impacts should be assessed in accordance with the relevant legislative requirements and guidelines listed in Attachment B.

1. The Proposal

The objectives of the proposal should be clearly stated and refer to:

- the size and type of the operation;
- The nature of the processes and the products, by-products and wastes produced;
- The use or disposal of products;
- the anticipated level of performance in meeting required environmental standards and cleaner production principles;
- the staging and timing of the proposal; and
- the proposal's relationship to any other industry or facility.

2. The Premises

The EA will need to fully identify all of the processes and activities intended for the site over the life of the development. This will include details of:

- The location of the proposed facility and details of the surrounding environment;
- The proposed layout of the site;
- Appropriate landuse zoning;
- Ownership details of any residence and/or land likely to be affected by the proposed facility;
- Maps/diagrams showing the location of residences and properties likely to be affected and other industrial developments, conservation areas, wetlands, etc in the locality that may be affected by the facility;
- All equipment proposed for use at the site;
- Chemicals, including fuel, used on the site and proposed methods for their transportation, storage, use and emergency management;
- Waste generation and disposal;
- Methods to mitigate any expected environmental impacts of the development;
- Site rehabilitation following termination of the development.

If "coal beneficiation" is proposed to be undertaken at the premises the impacts of this activity, and any associated reject management and/or emplacement areas, need to be fully assessed in accordance in the sections described below.

3. Air

The EA must include a detailed Air Quality Impact Assessment (AQIA). The AQIA must identify and describe in detail the significant sources of air pollution and activities/processes with the potential to cause point and fugitive dust emissions and odour emissions beyond the boundary of the development site. The AQIA should cover both the construction and operational phases of the development. The AQIA should take into account cumulative impacts associated with existing

developments and any developments having been granted development consent but which have not commenced.

The EA should demonstrate that the facility will operate within the DECC's objectives which are to minimise adverse effects on the amenity of local residents and sensitive land uses and to limit the effects of emissions on local, regional and inter-regional air quality.

The AQIA must be prepared in accordance with the DECC's *"Approved Methods and Guidance for the Modelling & Assessment of Air Pollutants in NSW"*. This publication is available from the DECC's website at <http://www.environment.nsw.gov.au/air/>.

The AQIA must also include, but not be limited to, the following:

- Provide a description of existing air quality, using existing information and site representative ambient monitoring data. This description should include the following parameters:
 - dust deposition;
 - total suspended particulates;
 - PM₁₀ particulate matter;
- Identification and location of all fixed and mobile sources of dust/air emissions from the development including rehabilitation. The location of all emission sources should be clearly marked on a plan for key years of the mine development. Identify all pollutants of concern and estimate emissions by quantity (and size for particles), source(s) and discharge point(s).

Note: emissions can be classed as either:

- point (eg emissions from stack or vent), or
- fugitive (from wind erosion, leakages or spillages associated with loading or unloading, crushing/screening, conveyors, storage facilities, plant and yard operation, vehicle movements [dust from road, exhausts, loss from load], land clearing and construction works).
- Details of the project that are essential for predicting and assessing impacts on air quality including:
 - the quantity and physio-chemical characteristics of materials to be handled, stored or transported;
 - an outline of the procedures for material handling, storage and transport;
 - the management of activities and areas with potential for impacts on air quality.
- A description of the topography and surrounding land uses.
- Details of the exact locations of dwellings, schools and hospitals etc. Where appropriate provide a perspective view of the study area such as the terrain file used in dispersion and/or subsidence prediction models.
- Estimate the resulting ground level concentrations of all pollutants. Use an appropriate dispersion model to predict ambient TSP and PM₁₀ dust concentrations and dust deposition levels. Refer to Appendix B for appropriate guidelines.
- A detailed description of the methodology used to assess the air quality impacts of the development. The use of a particular dispersion model and model parameters used should be justified and discussed. The dispersion model input/output files should be included.

- Air quality impact predictions should include plans showing projected incremental levels of 24-hour average PM₁₀ concentrations, annual average dust deposition rates and annual average total suspended particulate concentrations throughout the life of the operation.
- An assessment of cumulative air quality impacts and a description of the methodology used.
- An assessment of the potential impacts on air quality other than by dust, for example nitrogen oxide emissions from diesel equipment and/or odour emissions arising from mine ventilation and/or spontaneous combustion.
- Describe the effects and significance of pollutant concentration on the environment, human health, amenity and regional ambient air quality standards or goals.
- Describe the contribution (if any) that the development will make to regional pollution, particularly in sensitive locations.
- An assessment of the impacts on air quality of dust and any other pollutants generated during construction works. In this context, particular attention should be given to:
 - The nature, extent and duration of dust generating activities, e.g. earthmoving/mining equipment, exposed surfaces, material stockpiles, unsealed trafficked areas, spillages etc.
 - Consideration of the location of dust sources, particularly their proximity to sensitive receptors prior to finalisation of any acquisition or similar processes.
- Describe the impacts on Greenhouse Gas Emissions including:
 - A quantitative assessment of and report on the project's predicted annual Scope 1, 2 and 3 greenhouse gas emissions in tonnes CO₂ equivalent (tCO₂e) using appropriate methodology (e.g. the latest version of the *National Greenhouse Accounts (NGA) Factors, Department of Climate Change*);
 - An assessment of and report on what emissions will be covered by the Carbon Pollution Reduction Scheme (CPRS);
 - For any emissions not covered by the CPRS the study should evaluate and report on feasible emissions abatement measures;
 - Annual emissions should be compared against:
 1. 'best practice' emissions for the activity; and
 2. total annual NSW emissions, so the impact of the proposal on NSW emission reduction targets can be evaluated;
 - A detailed description of the measures that would be implemented on site to ensure that the project is energy efficient.
- Outline specifications of pollution control equipment (including manufacturer's performance guarantees where available) and management protocols for both point and fugitive emissions. Where possible, this should include cleaner production processes.
- Include details of an air quality monitoring program to determine effectiveness of mitigation and to verify predictions, including provision for investigations in response to complaints.
- Control measures to be implemented to minimise dust generation from coal handling and stockpiles.

4. Noise and Blasting

The EA must include a comprehensive noise assessment of the existing environment, potential impacts and proposed noise amelioration measures in accordance with the guidelines and

methodologies detailed in Appendix B. The EA must determine the rating background noise level and ambient ($L_{Aeq(period)}$) noise levels in accordance with the NSW Industrial Noise Policy.

The evaluation should take into account the "operating" hours proposed and take into account adverse weather conditions including temperature inversions. The assessment must identify any noise sensitive locations likely to be affected by activities at the site, such as residential properties, schools, churches, and hospitals.

The project specific noise levels for the site must be determined. For each identified potentially affected receiver, this should include:

- determination of the intrusive criterion for each identified potentially affected receiver,
- selection and justification of the appropriate amenity category for each identified potentially affected receiver,
- determination of the amenity criterion for each receiver,
- determination of the appropriate sleep disturbance limit.

The noise and vibration levels likely to be received at the most sensitive locations from activities must be estimated. Particular emphasis should be placed on determining the noise impacts of the relocation of the ventilation fan. Potential impacts should be determined for any identified significant adverse meteorological conditions. Predicted noise levels under calm conditions may also aid in quantifying the extent of impact where this is not the most adverse condition.

Sound power levels measured or estimated for all plant and equipment should be clearly stated and justified. The expected noise level and noise character (eg: tonality, impulsiveness, vibration, etc) likely to be generated from noise sources during should be determined:

The EA should include an assessment of cumulative noise impacts, having regard to existing developments and developments which have received development consent in the area but which have not commenced.

It is predicted there will be an increase in traffic movements as a result of this project. The EA must identify the transport route(s) to be used, the hours of operation and quantify the noise impacts. The DECC publication '*Environmental Criteria for Road Traffic Noise*' (EPA, 1999) describes the methods generally used by the DECC to determine noise planning levels for road traffic noise in locations of varying sensitivity.

5. Water

The EA must provide sufficient information to demonstrate that the proposed development can be operated whilst complying with the *Protection of the Environment Operations (POEO) Act 1997*, in particular, the protection of water quality, including ground water, during construction, operation and following mine closure.

Potential impacts on water quality and quantity must be assessed, and mitigating measures proposed, for all on site water resources, all receiving waters downstream, and Lake Macquarie. The EA must assess:

- Details of all proposed water discharges including locations, water volumes, water quality and under what conditions;
- The expected water quality of all proposed discharges assessed in accordance with the Guidelines for Fresh and Marine Water Quality (ANZECC 2000);

- DECC requires very careful consideration of metal and salt discharges from the premises. The concentrations of metals and salinity in discharge waters should be directly compared with those in the receiving waters and Lake Macquarie using the Guidelines for Fresh and Marine Water Quality (ANZECC 2000). All impacts on receiving waters should then be assessed and mitigation measures proposed where ANZECC criteria can not be met;
- Quality of runoff from exposed soils, roads and coal handling areas;
- Quality of seepage water into the access pits;
- Design and location of all sediment and erosion control structures;
- Methods proposed to deal with pollutants other than sediments that may be in the water;
- Spillage controls and bunding;
- Sealing, kerbing and guttering of trafficable areas;
- Provision of truck washing facilities capable of washing wheels and under body of vehicles leaving the premises;
- Potential impacts on water quality and quantity for receiving waters downstream of the mine; and
- Potential long terms impacts on Lake Macquarie.

The methodology, data and assumptions used to design any pollution control works and assess the potential impact of the proposal on water quality, must be fully documented and justified.

The EA must include a detailed Water Management Plan and site water balance (which includes cumulative water balance modelling and assessment for all existing mines in the vicinity and the proposed mine) incorporating the following matters:

- Maximum on-site reuse of wastewater together with adequate water storages to avoid any discharge of pollutants from the premises. This must include correct installation and sizing of the wastewater collection and recycling systems;
- Details of all measures employed to minimise all water discharges from the premises at all times;
- Prevention of wet weather overflows of contaminated stormwater by collection and reuse or treatment of contaminated first flush stormwater;
- Segregation of contaminated water from non-contaminated water to minimise the volume of polluted water to be dealt with;
- Management of groundwater and surface waters; and
- Detailed design and management of all proposed water storages.

6. Creeks

The EA needs to describe the values of the creeks and other water bodies in the area and the predicted impacts of undermining.

7. Subsidence Impacts

The EA needs to assess and describe the predicted impacts of underground mining in detail. Particular emphasis should be given to sensitive areas such as waterways, wetlands, threatened species, endangered communities and areas proposed to be transferred to DECC estate under the Coal and Allied Lower Hunter Land Offset Agreement. The proposed development should ensure there is no adverse impact on water resources, habitat values or ecological processes within the area. The subsidence assessment should include, but be limited to, the following;

- Detailed assessment and prediction of subsidence impacts in the area;
- Detailed assessment of predicted subsidence impacts on all water resources, flora and fauna habitat values, threatened species, landscape values, ecological processes, and heritage values;
- Separate mapping of all areas that will be transferred to DECC estate; and
- Details of all proposals to mitigate the potential impacts of subsidence.

8. Dangerous Goods And Chemical Transport, Storage And Handling

The EA must outline all details regarding the transport, handling, storage and use of dangerous goods, chemicals and products, including fuel, both on site and with ancillary activities and describe the measures proposed to minimise the potential for leakage or the migration of pollutants into the soil/waters or from the site.

9. Waste and Chemicals

The EA should provide full details and classification of wastes generated from the process and their disposal options.

The EA must identify any fuel or chemical storage areas to be established on the site/s and describe the measures proposed to minimise the potential for leakage or the migration of pollutants into the soil/waters or from the site.

10. Contaminated Land

The EA must determine whether contaminated soils are likely to be disturbed during any proposed works. If contaminated soils are likely to be disturbed, the EA should detail the measures to be adopted to protect human health and the environment, and if necessary remediate or dispose of the contaminated material. The EA needs to specifically assess the former arsenic plant. The following DECC guidelines may be helpful in assessing any actions required in respect of the proposed works:

- *Contaminated Sites - Guidelines for Consultants Reporting on Contaminated Sites* (EPA 1997);
- *Contaminated Sites - Guidelines for the NSW Site Auditor Scheme* (EPA 1998); and
- *Contaminated Sites - Sampling Design Guidelines* (EPA 1995).

11. Monitoring Programs

The EA should include a detailed assessment of any noise, air quality, water quality or waste monitoring required during the construction phase and on-going operation of the facility to ensure that the development achieves a satisfactory level of environmental performance. The evaluation

should include a detailed description of the monitoring locations, sample analysis methods and the level of reporting proposed.

12. Aboriginal Cultural Heritage Values

In regard to any new areas to be developed and areas subjected to subsidence impacts:

- The Environmental Assessment (EA) should address and document the information requirements set out in the draft *"Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation"* (Department of Environment and Conservation 2005) and the *'Part 3A EP&A Act Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation'* (Department of Planning and DEC 2007). These documents are available from the Department of Environment and Climate Change and the Department of Planning upon request.
- The EA should include surveys by suitably qualified archaeological consultants, conducted in consultation with traditional Aboriginal custodians.
- The EA should identify the nature and extent of impacts on Aboriginal Cultural Heritage values across the project area and the strategies employed to avoid / minimise these impacts. If impacts are proposed as part of the final development, clear justification for such impacts should be provided.
- The EA should assess the archaeological and Aboriginal significance of the site's Aboriginal Cultural Heritage values.
- It must also describe the actions that will be taken to avoid or mitigate impacts of the project on Aboriginal Cultural Heritage values. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.
- The EA needs to clearly demonstrate that effective community consultation with Aboriginal communities has been undertaken in assessing impacts, developing options and making final recommendations. The Department of Environment and Climate Change (DECC) supports broad-based Aboriginal community consultation and as a guide the *'Interim Community Consultation Requirements for Applicants'* (DECC 2005) provides a useful model to follow.
- If impacts on Aboriginal cultural values are proposed, an assessment of the regional significance of the values to be impacted, the extent to which these values are protected elsewhere in the landscape and consideration of the proposed impacts in the context of 'inter generational equity' should be undertaken.

Note: If the EA is relying on past surveys it is critical to confirm that the surveys are consistent with the requirements of the above Part 3A guidelines. Furthermore, if any new sites or objects are located, they should be recorded on NPWS site cards and registered on the Aboriginal Heritage Information Management System (AHIMS). AHIMS contact details: Phone: (02) 9585 6470, address: Lvl 6, 43 Bridge Street, Hurstville, NSW, 2220, e-mail: ahims@environment.nsw.gov.au.

13. Threatened Species, Populations and Ecological Communities (including their Habitat):

In regard to the areas to be undermined and in the immediate vicinity of the colliery (the study area), the EA must:

- document all the known and likely threatened species, their habitats, populations and ecological communities of the site / study area (including any adjacent areas that may be indirectly impacted upon by the proposal). The accompanying report must provide details of the survey methodologies used (both flora and fauna) and / or techniques utilised;
- provide a detailed assessment of the direct and indirect impacts of the proposal on such species, habitats, populations and ecological communities;
- provide a general baseline flora and fauna survey for the subject site, describing the vegetation communities, habitat types and species assemblages present;
- detail the actions that will be taken to avoid or mitigate impacts on threatened species, their habitats, populations and ecological communities; and in instances where impacts can not be avoided provide appropriate details on offset / compensatory habitat packages or strategies; and
- detail any impacts on existing and proposed DECC conservation estate and provide mitigation or avoidance measures for any adverse impacts.

To address likely impacts on threatened species, populations and ecological communities (including their habitat), the proponent will need to engage a qualified and experienced environmental consultant to conduct an appropriate flora and fauna survey of the subject site / study area, and provide an assessment report.

Surveys

Survey procedures and assessment of results should be consistent with those procedures and assessment approaches contained within the DECC publications shown at Attachment B.

A general baseline fauna and flora survey must be conducted on the subject site and/or study area to provide details of the vegetation communities, habitat types and species assemblages present. Additional targeted surveys will be required for all likely threatened species, populations and/or communities that are not easily detected using general survey methodologies.

Surveys must be undertaken at the time of year when the subject species are most likely to be detected (e.g. targeted threatened flora should be carried out when a species is flowering and/or fruiting, as these features are typically required to positively identify species).

If a proposed survey methodology is likely to vary significantly from widely accepted methods, the proponent should discuss the proposed methodology with the DECC prior to undertaking the EA, to determine whether DECC considers that it is appropriate.

Previous Surveys

Recent (less than 5 years old) surveys and assessments may be used. However, previous surveys should not be used if they have:

- been undertaken in seasons, weather conditions or following extensive disturbance events when the target subject species are unlikely to be detected or present (e.g. outside known flowering / fruiting periods, adverse drought conditions, flooding , bushfire, slashing and overgrazing etc.); or
- utilised methodologies, survey sampling intensities, timeframes or baits that are not the most appropriate ones for detecting the target subject species;

unless these differences can be clearly demonstrated to have had an insignificant impact upon the outcomes of the surveys.

Biobanking Assessment Methodology

If the proponent is proposing to conduct a biodiversity assessment using BioBanking Assessment Methodology, as outlined in the *'BioBanking Assessment Methodology and Credit Calculator Operational Manual'* (DECC 2009b), then it is advantageous that during the survey component of the EA that the relevant data is collected in the appropriate format for the Biometric tool (i.e. BioBanking Credit Calculator) (*Note: this may reduce duplication or further surveying at a later date). Under this scenario all vegetation types in the study area should be identified and matched to a DECC BioMetric vegetation type. Please note there is no formal requirement to use BioBanking under Part 3A of the *EP&A Act 1979*, but the process can, if the proponent wishes, provide guidance in determining the level and adequacy of an offset required to compensate the loss of vegetation / habitat.

For details on the use of Biometric, see <http://www.environment.nsw.gov.au/biobanking/>

Subject Species

In determining potential threatened species (the subject species) for the site, consideration shall be given to the habitat types present within the study area, recent and historic records of threatened species or populations in the locality and the known distribution of threatened species.

Databases such as DECC *Atlas of NSW Wildlife*, *BioBanking Credit Calculator*, *Australian Museum and Royal Botanic Gardens* should be consulted to assist in compiling the list. Other databases must also be consulted to create a comprehensive list of subject species.

Habitat Corridors

The EA should assess any adverse impacts caused by subsidence on habitat corridors.

Compensatory strategies

DECC's 'offset provision' principles state that impacts must be avoided first by using prevention and mitigation measures (DECC 2007). Where significant modification of the proposal to minimise impacts is not possible then compensatory strategies should be considered. These should include on or offsite proposals that contribute to long term conservation of affected threatened species, populations or ecological communities. If compensatory habitat is not considered appropriate, justification must be provided. Where a proposal involves the clearing of threatened species habitat then appropriate offsets which compensate for the clearing of the habitat should be provided.

Justification for any area(s) proposed as compensatory habitat / offsets must include an assessment of the threatened species / biodiversity values impacted on by the proposed works (i.e. those of the subject site) and a comparison of whether the proposed offset area(s) provides equivalent or greater values – "improve or maintain important biodiversity values".

To determine the adequate biodiversity offset either one of the following methodologies are to be used as a guide:

- DECC 'offsetting principles', as outlined in Appendix 2 – Principles for the use of biodiversity offsets in NSW *Draft Guidelines for Biodiversity Certification of Environmental Planning Instruments* (DECC 2007),
- *'BioBanking Assessment Methodology and Credit Calculator Operational Manual'* (DECC 2009b). Please note that the use of Biobanking is voluntary.

Offsets will require the proponent to consider adequate conservation in perpetuity, appropriate management regimes, and financial security with respect to ongoing management.

DECC would typically consider suitable measures to ensure conservation in perpetuity, such as (but not limited to) a Conservation Agreement under the *National Parks and Wildlife (NP&W) Act 1974*, a bio-banking agreement under the *Threatened Species Conservation Act 1995*, reservation of land under Part 4 of the *NP&W Act 1974*, and/or Section 88B-E covenant of the *Conveyancing Act 1919* (Note: that a covenant under the *Conveyancing Act 1919* will require such an instrument to be lodged for registration under a new deposited plan or a plan of survey [refer to: <http://rgdirections.lands.nsw.gov.au/plans/easementsandcovenants>]).

To appropriately manage any proposed compensatory offsets, DECC will require that an appropriate Management Plan (such as vegetation or habitat) be developed. These plans should be prepared prior to any potential approval of the development. Management plans should clearly document how any retained vegetated areas or habitat features will be managed with respect to long-term conservation and viability, including clear details on how they will be funded. They should cover, but not be limited to, the following issues:

- weed management (both control and suppression) and monitoring,
- management of retained native vegetation and habitat (including buffer zones),
- feral animal control,
- fire management (including asset protection zones [APZs]),
- public access (including increased traffic, and associated impacts, such as increased refuse and pets),
- minimisation of edge effects and fragmentation,
- stormwater control and changes to hydrology (including stormwater / runoff control and sediment / erosion control measures),
- management of specific habitat enhancement measures (e.g. hollow / habitat trees, animal fencing to facilitate movement [e.g. Koala 'floppy-top fencing'], artificial hollows and nest boxes etc.),
- fauna displacement and if appropriate translocation (including any licence requirements),
- proposed surveys, such as pre-extraction baseline, pre-clearance and rehabilitation surveys,
- details of long-term monitoring (including proposed timing),
- details of any rehabilitation program, including details of timing (including proposed staging details), rehabilitation measures (including details of proposed revegetation and species mix), and post-rehabilitation monitoring,
- measures to ensure conservation in perpetuity (e.g. transfer to DECC estate, conservation agreements or covenants), and
- funding details of long-term financial commitment to any proposed conservation measures, including any mechanisms to be implemented to achieve this.

DECC Conservation Estate

The EA needs to assess and describe the predicted impacts of underground mining in detail. Particular emphasis should be given to areas proposed to be transferred to DECC estate under the Coal and Allied Lower Hunter Land Offset Agreement. The proposed development should ensure there is no adverse impact on water resources, habitat values, ecological processes or heritage values within the area.

Report

The general report structure should be consistent with the information presented in Table 3.4 of DEC (2004). In addition the following is required:

- a geo-referenced map / aerial photograph (or equivalent) of the subject site and study area indicating their location and regional context;

- a detailed description of all vegetation communities / types (both undisturbed and disturbed) on the site and study area (and if applicable DECC BioMetric vegetation types), including a geo-referenced map / aerial photograph (or equivalent) showing their location. The descriptions should include: a general description, characteristic features (e.g. lacks a mid-storey, restricted to a particular geomorphic / edaphic feature etc.), their distribution and size, their vegetation structure (including cover), their condition, key diagnostic species, relationship to other communities, species richness and any significant species present (e.g. threatened species, ROTAP [Briggs & Leigh 1996], regionally significant taxa);
- identification of the classification system used in the vegetation descriptions (e.g. Specht *et.al.* 1974, Walker & Hopkins 1998 [Note: the classification must have regard to both structural and floristic elements]),
- details of how the vegetation classification for the site was developed, including details and associated products (e.g. dendrograms / two-way tables) of any analyses used;
- a full floristic list in tabular format of all taxa (both native and exotic) recorded on the subject site, indicating which vegetation communities they occur in, their cover / abundance, and conservation (including taxa of conservation significance);
- a full list of fauna (both native and exotic) in tabular format recorded on the subject site, indicating which vegetation communities / habitat types they occurred in;
- a geo-referenced map / aerial photograph (or equivalent) showing all threatened species, populations and ecological communities recorded on the site during surveying (*Note: records obtained from the "Atlas of NSW Wildlife" database can be used in determining likely habitat, but they are not to be schematically mapped in the EA, as this is considered a breach of licence conditions for such records);
- all habitat features / types should be detailed and mapped (where appropriate), such as frequency and location of stags, hollow bearing trees (including size), mature / old growth trees, culverts, rock shelters, rock outcrops, presence of feed tree / shrub / groundcover species (e.g. winter-flowering eucalypts, *Acacia* and *Banksia* trees, *Casuarina* / *Allocasuarina* and areas of native grasses), crevices, caves, drainage lines, soaks etc; and
- details of how the proposal will impact and affect known and potential threatened species, populations and ecological communities (including their habitat), including any assessment of significance.

References

Briggs, J.D. and Leigh, J.H. (1996) *Rare or Threatened Australian Plants*. 5th Revised Edition. Australian Nature Conservation Agency / CSIRO Publishing, Collingwood.

DEC (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities*. Working Draft. November 2004. Department of Environment and Conservation (NSW)

DECC (2007) *Biodiversity Certification of Environmental Planning Instruments: Working Draft*. April 2007. Department of Environment and Climate Change (NSW).

DECC (2009a) *Threatened Species Survey and Assessment Guidelines: Field Survey Methods for Fauna – Amphibians*. April 2009. Department of Environment and Climate Change (NSW), Goulburn Street, Sydney.

DECC (2009b) *BioBanking Assessment Methodology and Credit Calculator Operational Manual*. Department of Environment and Climate Change NSW, Sydney.

ERM (2009) *Silica Sand Extraction, Tanilba Northern Dune – Preliminary Environmental Assessment Report for a Part 3A Project Application*. Environmental resources Management Australia Pty Ltd.

NPWS (2000) *Vegetation Survey, Classification and Mapping: Lower Hunter and Central Coast Region*. Version 1.2, CRA Unit, Sydney Zone, NSW National Parks and Wildlife Service.

NPWS (2004) *Swamp Sclerophyll Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions – endangered ecological listing: NSW Scientific Committee – final determination*. NSW National Parks and Wildlife Service, Hurstville, NSW

Scotts, D. (2003) *Key Habitats and Corridors for Forest Fauna*. NPWS Occasional Paper 32, National Parks and Wildlife Service, Hurstville, NSW.

Specht, R.L., Roe, E.M., and Boughton, V.H. (1974) Conservation of major plant communities in Australia and Papua New Guinea. *Australian Journal of Botany*. Supplementary Series No. 7.

Walker, J. and Hopkins, M. S. (1998) Vegetation. In R. C. McDonald, R. F. Isbell, J. G. Speight, J. Walker, and M. S. Hopkins (eds.) *Australian Soil and Land Survey Field Handbook Second Edition*. Inkata Press, Melbourne.

DECC July 2009

ATTACHMENT B: GUIDANCE MATERIAL

GENERAL GUIDANCE MATERIAL

Assessing Environmental Impacts

Information requirements described in **Attachment A** should be assessed in accordance with the following legislative requirements and guidelines. In particular the requirements of Section 45 of the *Protection of the Environment Operations Act 1997* should be addressed.

Air Quality

- Protection of the Environment Operations (Clean Air) Regulation 2002.
- Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (2006).
- Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2005).
- Assessment and Management of Odour from Stationery Sources in NSW (November, 2006).

Impacts on Greenhouse Gas Emissions

- The Greenhouse Gas Protocol: Corporate Standard, World Council for Sustainable Business Development & World Resources Institute.
<http://www.ghgprotocol.org/standards/corporate-standard>
- National Greenhouse Accounts (NGA) Factors, Australian Department of Climate Change, 2008.
<http://climatechange.gov.au/workbook/index.html>
- Australia's Low Pollution Future: The Economics of Climate Change Mitigation, Australian Treasury, 2008.
<http://www.treasury.gov.au/lowpollutionfuture/>
- Carbon Pollution Reduction Scheme: Australia's Low Pollution Future, White Paper, Australian Department of Climate Change, 2008, Chapter 12: Assistance to emissions-intensive trade-exposed industries.
<http://www.climatechange.gov.au/whitepaper/report/index.html>

Noise and Vibration

- a. Construction noise should be assessed using DECC's "Existing Guidelines" available electronically at <http://www.environment.nsw.gov.au/noise/constructnoise.htm>
- b. Operational noise should be assessed in accordance with the *NSW Industrial Noise Policy* (EPA, 2000) and *Industrial Noise Policy Application Notes*.
<http://www.environment.nsw.gov.au/noise/industrial.htm>
- c. Operational vibration should be assessed in accordance with *DECC's Environmental Noise Management – Assessing Vibration: a technical guideline* (DEC, 2006).
<http://www.environment.nsw.gov.au/noise/vibrationguide.htm>
- d. Traffic noise should be assessed using the *Environmental Criteria for Road Traffic Noise* (EPA, 1999) <http://www.environment.nsw.gov.au/noise/traffic.htm>
- e. If blasting is required for any reasons, blast impacts should be demonstrated to be capable of complying with the guidelines contained in "Australian and New Zealand Environment Council – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration" (ANZEC 1990).
<http://www.environment.nsw.gov.au/noise/blasting.htm>

Water

Water Quality

- National Water Quality Management Strategy: Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000).
- NWQMS Australian Guidelines for Water Quality Monitoring and Reporting (ANZECC 2000).

Stormwater

- Managing Urban Stormwater: Soils and Construction (Landcom, 2004).
- Managing Urban Stormwater: Source Control (EPA 1998).
- Managing Urban Stormwater: Treatment Techniques (EPA 1998).

Groundwater

- State Groundwater Policy Framework Document (DLWC 1997).
- NSW State Groundwater Quality Protection Policy (DLWC 1998).
- (Draft) NSW State Groundwater Quantity Management Policy.
- NSW State Groundwater Dependent Ecosystems Policy (DLWC, 2002).
- National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia (ARMCANZ & ANZECC, 1995).

Waste and Chemicals

- Waste Classification Guidelines, Part 1: Classification of Waste (DECC, 2008)
- Environmental Compliance Report: Liquid Chemical Storage, Handling and Spill Management Part B Review of Best Practice and Regulation (DEC, 2005)
<http://www.environment.nsw.gov.au/resources/licensing/ecrchemicalsb05590.pdf>
- Storing and Handling Liquids: Environmental Protection Participants Manual (DECC, 2007)
<http://www.environment.nsw.gov.au/resources/sustainbus/2007210liquidsManual.pdf>
- Waste Exemption Guidelines <http://www.environment.nsw.gov.au/waste/RegulateWaste.htm>

Aboriginal Cultural Heritage Impacts

- Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation – (DEC, 2005) Available from the Department of Planning website.
- Part 3A EP&A Act Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation' (Department of Planning and DEC 2007). Available from DECC and Department of Planning on request.
- Interim Community Consultation Requirements for Applicants (DECC 2005)

Threatened Species Impacts

- Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities (DEC November 2004)
<http://www.environment.nsw.gov.au/resources/nature/TBSAGuidelinesDraft.pdf>.

(Note: Section 6.1 *Assessment of Significance* has now been amended by DECC 2007 and NSW DPI 2008)

- Threatened species survey and assessment guidelines: field survey methods for fauna – Amphibians (DECC April 2009)
<http://www.environment.nsw.gov.au/resources/threatenedspecies/09213amphibians.pdf>

(Note: DECC has recently produced new survey guidelines to cover Amphibians (frogs), which replaces the amphibian section in the DEC (2004) guidelines. However, the survey

requirements for all other species (flora and fauna) are still found in the DEC (2004) guidelines).

- Threatened Species Assessment Guidelines – The Assessment of Significance (DECC 2007 and NSW DPI 2008)
- Principles for the use of Biodiversity Offsets in NSW (DECC October 2008). <http://www.environment.nsw.gov.au/biocertification/offsets.htm>
- The BioBanking Assessment Methodology. Further information can be found on the DECC website at: <http://www.environment.nsw.gov.au/biobanking/assessmethodology.htm>.
- Consideration for assessment of the proposal through the NSW Government's Biodiversity Banking and Offset Scheme (BioBanking). BioBanking is a voluntary process which provides a systematic and consistent framework for counterbalancing (offsetting) the impacts of development to achieve an improve or maintain outcome for biodiversity values. Further information is available at: <http://www.environment.nsw.gov.au/biobanking/index.htm>

Department of Environment and Climate Change (DECC)
July 2009



NSW DEPARTMENT OF
PRIMARY INDUSTRIES

Our Reference: 08/7614
OUT 09/8908

Mr David Kitto
Director
Major Development Assessment
Department of Planning
GPO Box 39
SYDNEY NSW 2001

Dear Mr Kitto

Chain Valley Colliery Continuation of Operations Project

I refer to Lake Coal's proposed *Chain Valley Colliery Continuation of Operations Project* and the associated onsite planning focus meeting held on Thursday 18 June 2009.

The company's proposal is in line with the Government's environmental planning policy for all underground coal mining operations. All underground coal mines operating under planning approvals issued prior to the enactment of the *Environmental Planning and Assessment Act 1979 (EP&A Act 1979)* must obtain updated planning approvals under Part 3A of the Act by late 2010.

The proposal will consolidate and update existing approvals over the mining area. The project will also enable the company to maintain its current workforce of approximately 120 people and permit mining activities to continue at the colliery for at least another 21 years.

The following comments are provided by the Department of Primary Industries to assist in the framing of your Director-General's requirements for an Environmental Assessment (EA) for this proposal.

MINERAL RESOURCES ISSUES

Mining Act administration issues;

The company's operations and activities at the colliery are being conducted under various mining titles issued under the *Mining Act 1992 or earlier legislation*. It is noted that the continuation of mining operations at the colliery will not require additional mining titles to be issued.

Any EA prepared must identify the company's existing mining titles within the project area and clearly show those mining titles that also include the surface.

Environmental Management

- Chain Valley Colliery currently operates under a Mining Operations Plan (MOP) and Subsidence Management Plans (SMP) which were approved by the Department of Primary Industries. As conditions of the Colliery's various mining leases, the progress of the mine's activities are reported to the Department and relevant agencies in the site's Annual Environmental Management Report.
- Chain Valley Colliery has presented a MOP application for the period 2008 to 2015 which will be accepted conditionally for the period up to the end 2010, or the grant of a Part 3A Project Approval.
- Future proposed underground mining areas and the extent of second workings are to be presented in plan and section, based on identified surface area constraints and subsidence risk.
- Lake Coal must present in the EA the infrastructure upgrade and improvements required at the Chain Valley pit top layout and hardstand areas, coal handling and stockpiling, hydrocarbon management, waste management and water use and management.
- The EA must also include a concept design for the proposed de-commissioning, sealing and rehabilitation of the northern ventilation fan, and include concept design for the upgrade and operation of the proposed ventilation fan at the pit top.

Mine Subsidence

Based on the Department's knowledge and experience of the Chain Valley Colliery and other similar operations around Lake Macquarie, the EA must consider the following:

1. Complex site conditions which make subsidence prediction difficult and which requires rigorous geotechnical assessment:
 - The potential for complex interactions between workings in multiple seams
 - The potential for geological conditions adverse to coal pillar and panel stability
2. A range of surface features with varying sensitivities to subsidence movements and requirements for subsidence management that may affect the mine design, including:
 - Residential and commercial buildings and associated infrastructure in a Mine Subsidence District
 - Low-lying foreshore of Lake Macquarie
 - Marine environment of Lake Macquarie (including the endangered seagrass on the floor of Lake Macquarie)
 - Threatened wetland communities and fauna
3. A mine design philosophy that is underpinned by flexible planning to respond to the abovementioned complex site conditions and range of surface features which vary across the site.
4. The Department will require standard development consent conditions for SMP process approval.
- 5.

FISHERIES ISSUES

- The Department requires the EA to include an assessment of the potential impacts and changes to benthic communities in the Lake due to subsidence of the lake bed. This could be done by experimental analysis of existing communities on the lake bed at varying depth locations.
- The Department is concerned about the lack of knowledge on the occurrence of subsidence around the lake edge due to the existence of the drives under the foreshore. Considering the sensitivity of the foreshore habitats and the low slope of some of the areas in question, there is an expectation that monitoring systems would be in place to determine the degree of any subsidence occurring.
- The seagrass monitoring plan should be reviewed to ensure that the current monitoring sites are not compromised by further mining.

The Department of Primary Industries supports Lake Coal's proposed Chain Valley Colliery continuation of mining project.

Yours sincerely


William Hughes
for Executive Director
Mineral Resources

9.7.09

6 July 2009

Mr Howard Reed
Acting Manager - Mining
Department of Planning
GPO Box 39
SYDNEY NSW 2001

Dear Mr Reed,

Subject: Key Issues and Assessment Requirements Regarding Chain Valley Colliery

I refer to an email from Mr Carl Dumbleton (sent 19 June 2009), requesting Council to provide details of key issues and assessment requirements, which may be included in the Director-General's Requirements (DGRs) for the environmental assessment of the above-mentioned Part 3A Major Project.

An initial assessment has been made of the submitted Preliminary Environmental Assessment (PEA), prepared by Peabody – Lake Coal.

Council requests the following issues be included within the Director General's Requirements (DGRs) for the Environmental Assessment (EA) for this project:

1. Alternatives and Justification

The proponent should provide a detailed analysis of all alternatives including the 'do nothing' option. Council requests particular attention be given to alternate coal transport arrangements that avoid the need for road haulage of coal.

Alternate coal haulage options should include rail transport options, such as establishment of loading infrastructure within the Vales Point Power Station rail loop, or Eraring Power Station rail loop. Opportunities such as the current extension to the West Lake Macquarie Coal Haulage Road, should also be considered, particularly with regards to opportunities for rail loading at either the Newstan Colliery or Teralba Coal Preparation Plant facilities.

2. Planning Instruments

- (a) Assessment of the application must consider all relevant State, Regional and Local Environmental Planning Instruments including Lake Macquarie Local Environmental Plan (LMLEP) 2004 and Development Control Plan (DCP) No.1 – Principles of Development.
- (b) Planning Strategies such as the Lower Hunter Regional Strategy, Lake Macquarie City Council's Lifestyle 2020 Strategy must be considered.

(c) More specific assessment requirements should include how the development proposal achieves compliance with:

- The zone objectives of the LMLEP 2004
- The proposed development must be consistent with the strategic direction established by Council's Lifestyle 2020 Strategy. In this respect, the proposal should meet provisions at each level in the Strategy's hierarchy including the City vision, core values, aims, strategic directions, strategic plan and maps, and the statements of intent. In particular, the proposed development should maintain the environmental integrity and social identity of the area.
- Lower Hunter Regional Conservation Plan.
- Lake Macquarie Biodiversity Planning Principles.
- Lake Macquarie Greenhouse Action Plan (and associated updates to Greenhouse reduction targets).
- Lake Macquarie City Council's Protection of Watercourses and Drainage Channels Policy.
- Objectives and requirements of the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007.
- Objectives and requirements of the State Environmental Planning Policy (Infrastructure) 2007.
- Objectives and requirements of the State Environmental Planning Policy No.19 (Bushland in Urban Areas).
- Objectives and requirements of the State Environmental Planning Policy No.33 (Hazardous and Offensive Development).
- Objectives and requirements of the State Environmental Planning Policy No.44 (Koala Habitat).

3. Economic Impact

The proponent must prepare an Economic Impact Statement addressing the following key issues:

- (a) Employment generation direct and indirect.
- (b) Ability of project to act as catalyst for further development.
- (c) Financial flow expected back into local community including industrial and commercial.

- (d) Cost to local community from any dust or noise including but not limited to residents and schools.
- (e) Impacts on increased rail crossing use and delayed traffic.

4. Social Impact

- (a) **Social Impact Assessment:** The proponent must prepare a Social Impact Assessment, which includes a full cost-benefit analysis of the proposed development. In preparing the social impact assessment, the proponent is required to provide:
 - (i) An assessment of the populations affected by the proposal. This will include a demographic profile of the community and the major social issues pertaining to them that will be impacted on by the proposal.
 - (ii) An assessment of the predicted direct and indirect social impacts of the proposed development. This is to include identification of all of the benefits and non-benefits felt by the communities who will be affected by the proposal such as employment opportunities, along with decreased amenity, impacts on health, traffic delays, and noise.
 - (iii) An evaluation of the significance of the social impacts including whether the proposal will deliver net social and economic benefits.
 - (iv) The identification of possible measures for mitigating the negative impacts and for enhancing the positive impacts.
- (b) **Consultation:** The applicant must:
 - (i) Document all community consultation undertaken to date and identify what future consultation is proposed to be undertaken throughout the life of the project.
 - (ii) Document how the issues arising from the community consultation have been addressed in the planning or the implementation of the project.
 - (iii) Outline contingencies for addressing any issues arising from future community consultation and an effective communications strategy.
 - (iv) Outline how community objections are to be responded to.
 - (v) Consult with the following stakeholder groups (but not limited to):
 - Lake Macquarie City Council
 - The Lake Macquarie Estuary and Coastal Management Committee
 - The United Residents Groups for the Environment Inc (URGE)
 - The Community Environment Network (CEN)

5. Flora and Fauna

- (a) **SEPP (Mining, Petroleum, Production and Extraction Industries) 2007:** Schedule 1 of the SEPP (Mining, Petroleum, Production and Extraction Industries) 2007, recognised the need to protect biodiversity particularly in Lake Macquarie City from the environmental impacts associated with mining. Vegetation in this area is of high conservation priority in that it provides significant habitat for threatened squirrel glider, threatened large forest owls, the koala, micro bats, swift parrot, regent honeyeater, as well as a number of threatened flora species and endangered ecological communities (EEC).
- (b) **Conservation Offsetting:** The proposed development occurs within an area that has been identified by the Lower Hunter Regional Conservation Plan (LHRCP) (DECC 2009) as being of high conservation priority (see Map 3 of the LHRCP DECC 2009). Given the significance of habitat, for any proposed clearing or subsidence impacts, the proponent is required to use assessment methodology for offsetting consistent with the Biometric Tool and Threatened Species Tools as required of other developers under the Native Vegetation Act for Property Vegetation Plans (PVP) and the Threatened Species Conservation Act for Biobanking. The offsetting principles of the LHRCP must also be addressed.

The assessment should detail how the proposal will impact on the biodiversity values of any existing offset arrangements relevant to the proposal.

- (c) **Survey Assessment Methodology:** Survey Assessment Methodology is required for both the proposed conservation offset areas and the proposed development footprint. Without adequate surveying within the proposed conservation offset areas, it will not be possible to know if protected habitat is of a similar quality to that impacted. Survey Assessment Methodology must be in accordance with the DECC Threatened Species Assessment Guideline and the Lake Macquarie Flora and Fauna Assessment Guideline.
- (d) **Assessment of Significance:** Given the number of threatened species that occur within this area that may be subject to subsidence, the proponent must include provision for an assessment of significance in accordance with Section 5A of the Environmental Planning and Assessment Act 1979.
- (e) **Habitat Fragmentation and Corridors:** The subject area is recognised as providing significant tracts of continuous vegetation and movement corridors at both a regional and local scale. The EA should provide a detailed connectivity impact assessment.:
- (f) **Groundwater and Subsidence Impacts to Native Vegetation, Natural Drainage Lines, and associated Fauna Habitat:** The proposed development could affect a number of natural drainage lines and vegetation due to subsidence impacts.

- (i) Groundwater impacts to vegetation with reference to assessment methodology of the NSW State Groundwater Dependent Ecosystems Policy.
 - (ii) Subsidence impacts to vegetation and natural drainage lines.
- (g) **Natural Drainage Lines:** In addition to (f) above, the following must be addressed:
- (i) Opportunities to avoid subsidence impacts on natural drainage lines and associated habitat. Opportunities to comply with the Guideline for controlled activities Riparian Corridors (DWE) should also be included.
- (h) **Endangered Ecological Communities:** In addition to assessing subsidence and groundwater impacts requested above, the following must be assessed:
- (i) The impact assessment address recovery information guidance for EECs provided by the DECC.
 - (ii) The impact assessment to include detailed assessment of edge impacts of the project to adjoining EECs and justification as to how buffer widths have been determined to mitigate impacts (i.e.; proximity and type of impact to the EEC, adjoining vegetation type to the EEC, adjoining topography, existing ground water and surface water requirements).
 - (iii) The impact assessemtn include a detailed assessment of in-direct impacts on EECs, such as alteration of hydrology or groundwater regimes.
 - (iv) Opportunities to modify the extraction technique or development footprint such that no encroachment of EECs or their associated buffers occurs.
- (i) **Targeted Flora and Fauna Surveys:**
Detailed assessment of the impact on any species that is likely to be affected through losses or changes in habitat either directly or indirectly. Such species could include, but not limited to, Ground Orchids, *Tetratheca juncea*, Squirrel Gliders, Large Forest Owls and Koalas.

6. Heritage

The requirements of the Local Aboriginal Community and the Department of Environment and Climate Change (DECC) must be considered.

An appropriately qualified heritage consultant is required to identify indigenous and non-indigenous heritage significance and provide a thorough assessment, heritage management and mitigation strategies prepared in accordance with the relevant policies, consultation requirements, assessment standards and methodologies including but not limited to the following:

- (a) Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DECC).
- (b) Interim Community Consultation Requirements for Applicants by DECC, December 2004.
- (c) Aboriginal Cultural Heritage Draft Community Consultation, Requirements for Proponents, Part 6 National Parks and Wildlife Act 1974, May 2009.
- (d) Lake Macquarie City Council's (LMCC) Draft Aboriginal Heritage Study (AHS) being undertaken by Umwelt on behalf of LMCC. The draft AHS contains relevant Sensitive Landscape Mapping.
- (e) The Burra Charter, Australia ICOMOS 1999.
- (f) Statements of Heritage Impact, Heritage Office and Department of Urban Affairs & Planning 1996, revised 2002.
- (g) Assessing Heritage Significance, Heritage Office 2001.
- (h) Heritage Interpretation Policy, Heritage Office, 2005.
- (i) Interpreting Heritage Places and Items, Heritage Office, 2005.

7. Visual Impact

A detailed Visual Impact Statement should be provided that assesses the impact of the proposed development and illustrates how any impacts will be ameliorated.

8. Traffic and Transport

A detailed Traffic Study will need to be prepared in accordance with the Road and Traffic Authority's *Guide to Traffic Generating Developments*.

Detailed analysis should be provided regarding traffic impacts, especially those related to road coal haulage.

Council requests particular attention be given to alternate coal transport arrangements that avoid the need for road haulage of coal.

Alternate coal haulage options should include rail transport options, such as establishment of loading infrastructure within the Vales Point Power Station rail loop, or Eraring Power Station rail loop. Opportunities such as the current extension to the West Lake Macquarie Coal Haulage Road, should also be considered, particularly with regards to opportunities for rail loading at either the Newstan Colliery or Teralba Coal Preparation Plant facilities

9. Noise and Vibration

- (a) Potential noise and vibration impacts, particularly to residential properties, must be considered from the mine including:
 - Construction of the proposed development.
 - The operation of the proposed development.
 - Traffic and transport both on and off site.
- (b) A comprehensive Acoustic Report will need to be prepared which covers all aspects of the mines operation including:
 - Traffic and transport noise.
 - Compliance with the DECC Industrial Noise Policy.
 - A construction site noise and vibration management plan.
 - Vibration to comply with guidelines published by NSW DECC and ANZECC (1990)
 - Hours of operation.

10. Surface and Groundwater

The proponent must assess the following:

- (a) The impact of the mining operation and final landform on riparian corridors and creeklines.
- (b) Stormwater management issues including the maintenance of pre-development peak stormwater discharges and volumes; and the management of water quality and the health of riparian corridors.
- (c) The necessary erosion and sediment control requirements and provide a short and long-term management plan.
- (d) Changes to stream hydrology resulting from subsidence including impacts on downstream ecology and riparian habitats.
- (e) Impacts of altered stream hydrology on alluvial flows.
- (f) Impacts on local and regional groundwater hydrology including substantial aquifers relied upon by adjoining properties and nearby land uses.
- (g) Impacts on groundwater dependant ecology.
- (h) Quantification of any off-site impacts due to altered mine water discharges.
- (i) Options for mine water reuse.

11. Mine Subsidence

Detailed impact analysis should be provided on subsidence impacts to private property. Analysis should also include flora and fauna impacts associated with subsidence of natural areas, (see section 5).

Detailed analysis should be provided on all subsidence impacts, particularly under Lake (or Lake-bed) impacts.

Consideration should be given to:

- (i) Seagrass impacts
- (ii) Altered hydrodynamic processes associated with subsidence of the Lake bed.
- (iii) Potential changes to the wave climate (due to Lake-bed subsidence increasing water depth and hence wave penetration)
- (iv) Impacts on benthic communities

All relevant assessments should also consider Sea Level Rise in accordance with relevant Local and State Govt predications.

Consideration should also be provided with regards to foreshore erosion impacts. Particular attention should be given to how Lake-bed subsidence changes the wave climate and erosion vulnerability of foreshores.

12. Methane

The proponent must assess the potential for coal-seam methane gas to escape from the existing and proposed mine. Analysis should be provided on the feasibility for methane capture and reuse.

13. Bushfire

The proponent must assess the need for bushfire asset protection zones and identify any associated land clearing required.

14. Air Quality and Greenhouse Gas Emissions

The proponent must undertake a thorough assessment of potential impacts on air quality and greenhouse gas emissions.

In particular, Council requests that the assessment consider the impacts of particulate matter (PM), and given the sites proximity to such a large population the assessment should give consideration of PM2.5, rather than a more general consideration within PM10.

In regards to greenhouses gases, the proposal must consider all relevant National, State and Local Carbon reduction targets (including Lake Macquarie City Council's Citywide Carbon Reduction Targets) and identify how the proposal will contribute to the attainment of these targets. Any

Carbon offset strategies that are proposed to assist in achievement of these targets should be identified and the associated calculations documented.

15. Rehabilitation and Future Land Use

The EA must provide a detailed analysis on the potential future land use of the area. This assessment should give consideration to all relevant strategic planning strategies identified in (2) above, and detail the proposed rehabilitation standards that will assist in the achievement of the relevant goals of these strategies.

Consideration should also be given to surrounding land uses (particularly Wyee) and how the proposed future land use for the proposal integrates with the future land use for these areas.

Should you require further information or wish to discuss the key issues and assessment requirements, please do not hesitate to contact the under signed on 02 4921 0393.

Yours faithfully

Symon Walpole
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