Mount Thorley Operations 2014

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Environmental Impact Statement

Prepared for Mt Thorley Operations Pty Limited | June 2014

VOLUME 1 — Main Report













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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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BAppSc (Hons)

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Applicant

Mt Thorley Operations Pty Limited
PO Box 315
Singleton NSW 2330

Proposed development

Mount Thorley Operations 2014
Refer to Chapter 2 of the EIS for a detailed description of the proposed development

Land to be developed

Refer to Appendix A of EIS

Certification

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

Luke Stewart
Project Director
15 June 2014

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Final

Report J14013RP2 | Prepared for Mt Thorley Operations Pty Limited | 15 June 2014

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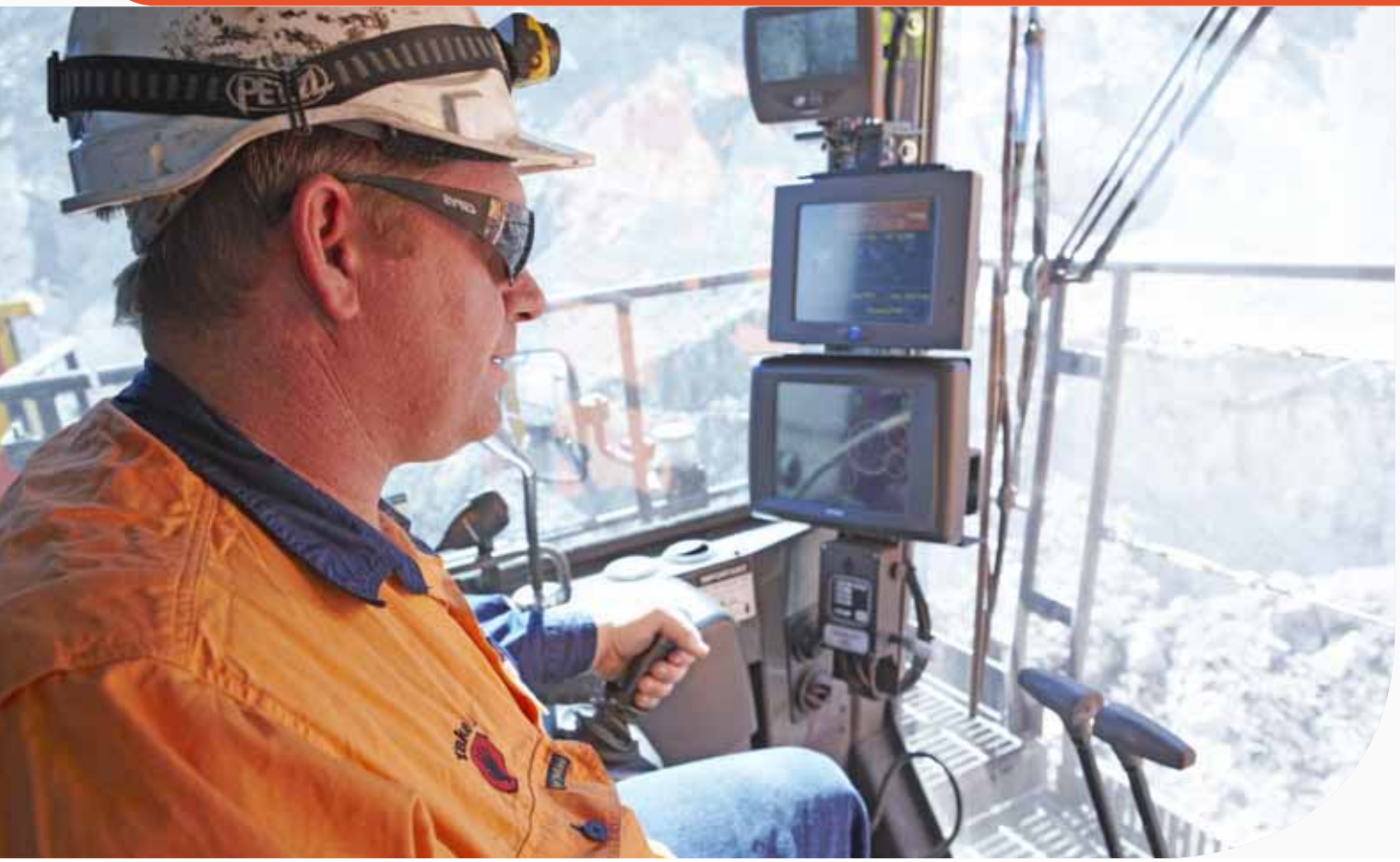
Executive summary



Executive Summary

ES1 Context to the proposal

Development consent for the Mount Thorley Operations 2014 (the proposal) is required to prevent the sterilisation of coal resource that is approved for extraction but cannot be mined during the current consent period. It would also enable the ongoing provision of services to the adjacent Warkworth Mine which is critical to the viability of both mines.

The Mount Thorley Operations (MTO) development consent No. DA 34/95 (the development consent) was issued by the then Minister for Urban Affairs and Planning on 22 June 1996 and expires on 22 June 2017. The proposal seeks to extend the time for approved mining that has occurred slower than anticipated beyond 2017, due to mining in Loders Pit (the focus of extraction at MTO) being delayed for approximately three years due to a significant rain event in June 2007.

On the completion of mining, the MTO would continue to provide valuable services to Warkworth Mine including emplacement of overburden material to enable an improved final landform at MTO (including filling of the Loders Pit void, thereby preventing a post-closure final void) and the processing of coal in the MTO coal preparation plant.

The economic significance of the resource was a consideration in the granting of the development consent in 1996. The proposal would prevent the sterilisation of approximately 28.6 million tonnes (Mt) of run-of-mine (ROM) coal. Notwithstanding the volume of coal to be extracted under the proposal, MTO continues to provide social and economic benefits by enabling more time to extract the economic resource, while providing services critical to the viability of Warkworth Mine. Hundreds of millions of dollars have been invested in MTO since it commenced operations in 1981 and, as an existing mine, it has established access to product transport and distribution infrastructure such as road, rail and port.

The continued operation of the Mount Thorley Warkworth (MTW), which is comprised of MTO and the adjacent Warkworth Mine, has significant social and economic benefits in the form of continuing employment for a workforce of approximately 1,300 persons on average, net economic benefits of some $1.5billion and royalties of some $617million. The economic benefits attributable to the MTO include continuing employment for a workforce of approximately 121 persons, $297million in direct expenditure and some $50million in royalties.

ES2 Background to the proposal

The MTO is an existing open cut coal mine approximately 10.5 kilometres (km) south-west of Singleton in the Hunter Valley.

The proposal seeks to extend the time for approved mining that has occurred slower than anticipated beyond 2017 under Part 4, Division 4.1 of NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposal would enable the extraction of the resource approved for mining, continued use of existing mining infrastructure, and the transfer of additional overburden from Warkworth Mine to complete the final landform for an additional 21 years from the date of any approval. The proposal does not involve any additional disturbance beyond that currently approved under the development consent.

The MTO and Warkworth Mine are owned by different entities. This separate ownership is reflected in each mine having its own standalone mining leases and development consent. Coal & Allied is the main shareholder in each mine and has been appointed by the respective owners to manage the mines as an integrated operation. A single management team for the adjoining mines provides various cost savings across each operation by way of integration. Further, equipment, personnel, water, rejects and coal preparation are shared and provide significant synergies for both operations. The MTW operation has a workforce of approximately 1,300 persons on average, which includes full-time contractors.

It is noted that a separate development application for the Warkworth Continuation 2014 under Part 4, Division 4.1 of the EP&A Act has been lodged at the same time as the DA for the proposal. The Warkworth Continuation 2014 would enable, amongst other aspects, the extension of mining at Warkworth Mine beyond the current spatial limits of approval and of the mine life, with the consent life for this proposal being aligning with the timeframe contemplated under the Warkworth Continuation to enable the continued integrations of the two operations.

ES3 Impact assessment

A summary of predicted impacts from the proposal after the implementation of the proposed avoidance, management and mitigation is provided below.

ES3.1 Noise

Acoustic engineers worked collaboratively with mine planners to ensure noise amelioration measures were incorporated into the mine design where reasonable and feasible. The effectiveness of these measures was continually tested in an iterative process with mine planners until adverse modelling predictions at assessment locations were minimised to the maximum extent that is feasible and reasonable.

A noise and vibration study was undertaken for the proposal in accordance with the Industrial Noise Policy (the INP, EPA 2000). The study was independently peer reviewed with the outcomes reflected in the final study. The findings of the study were:

- all reasonable and feasible measures have been applied to control noise from MTO;
- the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP) non-discretionary standard for cumulative amenity noise levels at privately-owned residential dwellings is met for Bulga village and, therefore, noise impacts are below the acceptable noise levels and amenity of the village should not be reduced;
- the determining factor for the project specific noise levels (PSNLs) for all residences is the intrusiveness criteria. Background levels have been determined in full compliance with the required processes in the INP for setting background levels;
- a significant exceedance (>5dB(A)) of the PSNL is predicted to occur at one assessment location at Mount Thorley Industrial Estate (149) which is currently afforded acquisition rights from MTO under the development consent. It is noted that operational noise levels from the proposal are not expected to be materially different from current noise levels for locations east of the mine given relatively no changes to current activities in the eastern parts of the mine site;
- noise levels would be within 1 or 2dB of the PSNLs for the majority of the residences at Bulga. Current government practice is not to accord mitigation rights to residences unless noise levels are greater than 3dB(A) above PSNLs;

- low frequency noise levels predicted from the proposal meet current Government policy requirements. Noise levels are predicted to meet relevant Broner criteria for low frequency noise and INP criteria for sleep disturbance at representative assessment locations; and

- cumulative noise levels would satisfy the INP (and Mining SEPP) night time criterion at all but two representative assessment locations in Warkworth village (77) and Mount Thorley (146). As these are representative locations, the criterion is also likely to be exceeded at two neighbouring locations in Warkworth village (102 and 264) and two neighbouring locations in Mount Thorley Industrial Estate (144 and 915). It should be noted that these assessment locations are currently afforded acquisition rights from MTO or Wambo Mine with the exception of 264, which is inferred to have acquisition rights from Wambo Mine but is not currently included in its approval.

Overall, no additional privately-owned receivers would be significantly impacted due to predicted noise impacts under the proposal.

A noise management system is currently implemented at MTW which consists of real-time and attended noise monitoring, administration, substitution and elimination controls, engineering measures, and a commitment to continuous improvement. These management practices would continue under the proposal. Compliance assessment monitoring for MTO, including independent reviews, have demonstrated a high level of compliance with noise criteria.

ES3.2 Air Quality

An air quality and greenhouse gas study was undertaken for the proposal in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC 2005b). The findings of the study were:

- all reasonable and feasible measures have been applied to control dust from MTO;

- air quality impacts would be primarily experienced at Warkworth village due to mining activities moving closer as the mine plan progresses westwards;

- the Mining SEPP's non-discretionary standard for cumulative air quality at privately-owned residential dwellings is met at all but two assessment locations (77 and 264). These assessment locations, and one non-residence (102 – Warkworth Hall), may experience concentrations above the relevant air quality goal for annual average PM_{10} (particulate matter with a diameter of 10µm or less). Assessment location 77 is currently afforded acquisition rights from Wambo Mine. Assessment location 264 is inferred to have acquisition rights from Wambo Mine but is not currently included in its approval;

- the Mining SEPP's non-discretionary standard for cumulative air quality at privately-owned residential dwellings is met for Bulga village and, therefore, air quality impacts are below the acceptable air quality concentrations and amenity of the village should not be reduced;

- dust from mining is generally coarse in fraction (> $PM_{2.5}$) whereas the fine fraction dust (< $PM_{2.5}$) of concern to human health typically originates from combustion sources;

- cumulative $PM_{2.5}$ (particulate matter with a diameter of 2.5µm or less) concentrations would be below the National Environment Protection Measure (NEPC 2003) advisory reporting standards at all of the assessment locations where the concentrations of other pollutants are below the relevant air quality goals;

- no air quality impacts are predicted to result from diesel emissions (NO_2 and CO) and blast fume emissions; and

- estimated annual average greenhouse emissions over the 21 year life of the proposal are conservatively estimated at 0.559Mt CO_2-e (Scope 1 and 2), which represents approximately 0.1 per cent and 0.35 per cent of Australia's and NSW emissions, respectively.

Air quality and greenhouse gas impacts are currently managed at MTW through an existing integrated management system which involves the implementation of a monitoring network, best practice mitigation measures, and operational control strategies and measures with the objective of continuous improvement. Recent air quality monitoring for 2012 and 2013 have shown that the MTW operations are complying with the relevant air quality criteria.

The objectives of MTW's climate change programme are integrated into existing business processes and funding is provided for a number of research projects related to the research of low emissions coal technologies. These practices would continue under the proposal.

ES3.3 Ecology

The proposal would not result in additional vegetation clearance and is expected to have negligible impact on the ecology of the Site and the local area. Potential direct and indirect impacts of the proposal would have very low to no residual impacts after implementation of current mitigation measures.

ES3.4 Social

A social impact assessment (SIA) was prepared for the proposal and the Warkworth Continuation 2014 due to the multifaceted nature of social impacts. The SIA was supported by a comprehensive stakeholder engagement programme.

As the proposal is to continue operations beyond 2017, and combined with the Warkworth Continuation 2014, enable MTW to maintain approximately 1,300 jobs over the longer term, the greater impacts on the socio-economic environment and community services are projected to occur if the proposal does not proceed.

These would include:

- workers and their families moving away from the area;

- workers and their families faced with unemployment and financial difficulties;

- reduced local spending;

- decreased local businesses;

- contribution to population decline;

- reduced viability of services such as local schools; and

- reduced community life and participation.

The stakeholder perceived impacts and opportunities of the proposal, paying particular attention to Bulga village, were determined through consultation and compared to the outcomes of the environmental aspects and economic technical studies that form part of the EIS or with external literature. Matters raised often related to predominately to the Warkworth Continuation 2014, not the proposal.

The selection of stakeholders focussed on consulting with those who were concerned regarding the proposal. The majority of the perceived impacts or matters raised by stakeholders are addressed by the corresponding technical studies of the impact. Coal & Allied would continue to address these matters of concern for stakeholders through ongoing consultation process to inform stakeholders of the impacts of the proposal and proposed mitigation, management and enhancement strategies. This EIS forms an important part of this consultation.

In addition, a suite of continuing and new social initiatives strategies have been developed by Coal & Allied to manage or mitigate perceived impacts and to enhance opportunities, based on feedback from stakeholders. These strategies include the continued investment in the community and engagement with key stakeholders including Singleton Council and near neighbours and enhancement of the two-way flow of information and feedback between the MTW operation and the community through appropriate programmes such as a 'Community Scorecard'.

A SIMP would be developed for the proposal to further develop these management and mitigation measures and detail a plan of implementation including responsibilities; timing; performance indicators and targets; and monitoring measures. The SIMP would be prepared in consultation with key stakeholders, following the EIS public exhibition and submissions process.

ES3.5 Economic

An economic study, in the form of a cost benefit analysis and regional economic impact assessment, was undertaken to assess the economic benefits of the proposal and address the requirements of the *Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals* (NSW Government 2012), the *Guideline for economic effects and evaluation in EIA* (Planning NSW 2002), and the *NSW Government Guidelines for Economic Appraisal* (NSW Treasury 2007).

The economic significance of the resource, as stated in clause 12AA of the Mining SEPP set the context in which the proposal was assessed. Specifically, the matters outlined in clause 12AA(2) are shown below:

Table E.1 Matters in clause 12AA(2) of the Mining SEPP regarding the economic significance of the resource

Entity	Employment generation (annual average full time employees)		Incremental expenditure ($M NPV – real TBC)	Incremental royalties ($M NPV – real TBC)
	Reference case (no approval)	The proposal		
MTO	152	121	297	50
Integrated MTW	987	1,307	6,020	617

The study described direct and flow-on economic benefits of the proposal for Singleton LGA, the Mid and Upper Hunter region, NSW and Australia. These economic effects were described as incremental impacts relative to a reference case, which assumed activities at MTW, inclusive of MTO, continued until the expiry of MTO's development consent in 2017. This is regarded as a conservative assumption as mining in Warkworth Mine's West Pit is forecast to reach consent limits in 2015 which would result in mining along a reduced strike length.

In net present value (NPV) terms, the proposal combined with the Warkworth Continuation 2014 would deliver net benefits to NSW of around $1.5billion. Where the economic flow-on effects of the proposal are concerned, the benefits attributable to MTO, in NPV terms, amount to:

- for NSW, the additional disposable income received by employees of $39million, additional annual employment of 15 full time employees, and a contribution to NSW gross state product (GSP) of $45million;
- for the Mid and Upper Hunter region, the additional disposable income received by employees of $23million, and additional annual employment of 16 full time employees; and
- for the Singleton LGA, the additional disposable income received by employees of $9million, and additional annual employment of four full time employees.

ES3.6 Groundwater

A groundwater study was undertaken to assess the potential impacts of the proposal and address the requirements of NSW Office of Water's *Aquifer Interference Policy* and Mining SEPP. The study applied a groundwater model rigorously calibrated with data from the extensive MTW monitoring network. The groundwater model was independently peer reviewed with the outcomes reflected in the final study. The findings of the study were:

- the groundwater model has predicted a water take from the Permian and alluvial sources less than the currently approved water take;
- no privately-owned water supply bores would be impacted above the minimal harm criteria presented in the *Aquifer Interference Policy*;
- the proposal is not predicted to significantly change the water table in alluvium that supports groundwater dependent ecosystems;
- the reduction in saline Permian groundwater discharge to the Wollombi Brook alluvium is predicted to reduce the salinity in the alluvium during the life of the proposal; and
- groundwater, surface runoff and rainfall inflows would slowly fill the backfilled depression in Loders Pit forming a watertable within the backfilled area with the water level eventually reaching a state of equilibrium.

Groundwater and surface water at MTW are currently managed through an overarching water management plan (WMP). The MTW WMP includes a groundwater monitoring programme that would continue under the proposal. No additional mitigation measures, to those already implemented, are required for the proposal.

ES3.7 Surface water

The water management systems (WMS) for MTO and Warkworth Mine are currently integrated across MTW. Water engineers have worked closely with mine planners and operational teams over many years to design a WMS that minimises the risk of adverse impacts occurring on surface water resources.

Water requirements would be predominantly sourced from water collected onsite with some water sourced offsite through water sharing agreements with nearby mines and from the Hunter River in accordance with MTW's current licence entitlements. Water would continue to be discharged from MTW's licensed discharge points. All saline discharges would be controlled to meet the requirements of the Hunter River Salinity Trading Scheme so that offsite water quality impacts are managed.

The results of the surface water study indicate that the impacts of the proposal on surface water resources are unlikely to be significantly different to the existing approved operations and would not have a significant impact on surface water quality of the adjacent water features. Surface water would continue to be managed under the MTW WMP and the existing MTW surface water monitoring programme. No additional mitigation measures, to those already implemented, are required for the proposal.

ES3.8 Aboriginal cultural heritage

Previous Aboriginal cultural heritage baseline studies have identified a number of heritage items or places within and around the Site. There are 48 extant places of material cultural heritage identified within the Site. These places primarily consist of stone artefacts. None will be disturbed or destroyed as a result of the proposal or are the subject of any specific requirements to address issues of cultural sensitivity. Further, it is considered that there are no Aboriginal cultural heritage places with scientific values that constitute a constraint on the proposal.

Aboriginal cultural heritage at MTO would continue to be managed under the auspices of the Coal & Allied Upper Hunter Valley Aboriginal Cultural Heritage Working Group, established in 2005, and the applicable management plan. In particular, the Loders Creek Aboriginal Cultural Heritage Conservation Area would be established for the long-term conservation and management of Aboriginal cultural heritage places and values.

ES3.9 Historic heritage

The historic heritage study identified 50 historic features within the Site and its surrounds including seven registered and 43 non-registered items or places. There are three non-registered historic heritage features within or on the boundary of the Site. These are on land that would not be disturbed under the proposal and, therefore, would not be impacted.

ES3.10 Traffic and transport

As there are no changes proposed to the average existing MTW workforce, truck traffic or annual train movements, the proposal is not expected to have any traffic or transport impacts.

ES3.11 Final landform and rehabilitation

The approved final landform at MTO, incorporated into the 1995 EIS, consists of a narrow valley leading to a final void. On either side of this valley is an elevated ridge that grades into the surrounding landform. Design of this final landform was constrained by the amount over overburden available within MTO. The ability to transfer overburden from Warkworth Mine to MTO avoids the need for a final void and allows for the design of a more natural looking final landform which would integrate better with the final landform of Warkworth Mine and the Bulga Coal Complex.

Rehabilitation of the areas mined under the proposal would continue to be undertaken progressively to create a stable, free draining landform able to maintain viable land uses where mining areas are integrated with the surrounding landscape.

The final landform would be developed with recognition of the pre-mining landform features and would incorporate the existing rehabilitated landforms to ultimately be consistent with the surrounding landscape features of both MTO and Warkworth Mine.

Approximately 2,100ha of EEC woodland is proposed to be rehabilitated at MTW with around 483ha occurring at MTO and around 1,617ha at Warkworth Mine. Woodland and trees over grassland components of the rehabilitation would form a north/south connection corridor of vegetation connecting the planned rehabilitation of MTO, Warkworth Mine, and Bulga Coal Complex with the Singleton Military Training Area, the Pokolbin State Forest and the Yengo National Park.

ES3.12 Visual amenity

Existing topography and vegetation would continue to provide screening to MTO as mining within Loders Pit continues and overburden is emplaced within the Site. Some residences west of the Site, such as elevated residences around Bulga village, may experience high visual amenity impacts. Progressive rehabilitation of disturbed areas and implementation of visual impact mitigation measures would be undertaken to minimise impacts on visual amenity. In addition, residents would be able to request site specific visual assessments be undertaken at potentially sensitive properties which may identify the need for site specific mitigation measures.

ES3.13 Land and soils capability

The proposal would result in no new disturbances of remnant soils as pre-mining vegetation removal and topsoil stripping in the Site has been completed. The potential impacts on land capability from the proposal would result from the continuation of mining in Loders Pit and Abbey Green North and rehabilitation of mined areas over 21 years, including receipt of overburden from Warkworth Mine should the Warkworth Continuation 2014 be approved.

There is no biophysical strategic agricultural land, to which the *Strategic Regional Land Use Policy* (NSW Government 2012) applies, within at least 2km of the Site.

ES4 Justification and conclusion

The MTO and the adjoining Warkworth Mine are long standing members of the community having commenced operations in 1981. A workforce of approximately 1,300 people including full-time contractors is employed at MTW. In summary, the proposal should be approved for the following reasons:

- it enables the extraction of resource already approved for mining;
- it allows for the ongoing provision of services to Warkworth Mine which is critical to the viability of both mines;
- it enables an improved final landform, including the infilling of the currently approved final void in Loders Pit, thereby preventing a post-closure final void;
- no additional disturbance would result from the proposal and impacts on near neighbours have been minimised to the greatest extent possible while maintaining an economically viable mine plan;
- it meets all government policies;
- MTO has a long history of minimal non-compliances with government approvals;

- it ensures maximum return on hundreds of millions of dollars invested in the mine since it commenced operations and, as an existing mine, it has established access to product transport and distribution infrastructure such as road, rail and port;

- it provides a state significant economic benefit to the local, regional, state and national economies; and

- it contributes to the long-term security for approximately 1,300 jobs.

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Chapter 1

Context

Chapter 1 — Context

1 Context

Development consent for the Mount Thorley Operations 2014 (the proposal) is required to prevent the sterilisation of coal resource that is approved for extraction but cannot be mined during the current consent period. It would also enable the ongoing provision of services to the adjacent Warkworth Mine which is critical to the viability of both mines.

The Mount Thorley Operations (MTO) development consent No. DA 34/95 (the development consent) was issued by the then Minister for Urban Affairs and Planning on 22 June 1996 and expires on 22 June 2017. The proposal seeks to extend the time for approved mining that has occurred slower than anticipated beyond 2017, due to mining in Loders Pit (the primary focus of extraction at MTO) being delayed for approximately three years due to a significant rain event in June 2007.

On the completion of mining, the MTO would continue to provide valuable services to Warkworth Mine including emplacement of overburden material to enable an improved final landform at MTO (including filling of the Loders Pit void, thereby preventing a post-closure final void) and the processing of coal in the MTO coal preparation plant (CPP).

The economic significance of the resource was a consideration in the granting of the development consent in 1996. The proposal would prevent the sterilisation of approximately 28.6 million tonnes (Mt) of run-of-mine (ROM) coal. Notwithstanding the volume of coal to be extracted under the proposal, MTO continues to provide social and economic benefits by enabling more time to extract the economic resource, while providing services critical to the viability of Warkworth Mine. Hundreds of millions of dollars have been invested in MTO since it commenced operations in 1981 and, as an existing mine, it has established access to product transport and distribution infrastructure such as road, rail and port.

The continued operation of the Mount Thorley Warkworth (MTW), which is comprised of MTO and the adjacent Warkworth Mine, has significant social and economic benefits in the form of continuing employment for a workforce of approximately 1,300 persons on average, net economic benefits of some $1.5billion and royalties of some $617million. The economic benefits attributable to the MTO include continuing employment for a workforce of some 121 persons, $149million in direct net economic benefits and some $50million in royalties.

The proposal is described in Chapter 2.

Chapter 2

The proposal

Chapter 2 — The proposal

2 The proposal

2.1 Background

MTO is an open cut coal mine approximately 10.5 kilometres (km) south-west of Singleton in the Hunter Valley. The mine has been operational for over 30 years, having commenced mining in 1981.

The mine is within the Singleton local government area (LGA). The area immediately surrounding the mine is dominated by coal mines and associated infrastructure and industry. The Warkworth Mine, Redbank Power Station and Hunter Valley Operations are to the north, Wambo Mine to the north-west, and Bulga Coal Complex to the south. The village of Bulga and the Wollemi and Yengo National Parks are to the west, and Mount Thorley Industrial Estate (MTIE) is to the east (see Figures 2.1 and 2.2).

Since 2004, MTO and Warkworth Mine have integrated at an operational level and are known as MTW with a single management team responsible for all the operations. Ownership of the two mines is separate, with MTO owned by Mt Thorley Co-Venture. This is reflected by way of each mine having its own standalone mining leases and development consent. A single management for the adjoining mines permits various cost savings across each operation by way of integration. Equipment, personnel, water, rejects and coal preparation are all shared between the mines. MTW operations employ approximately 1,300 persons including contractors.

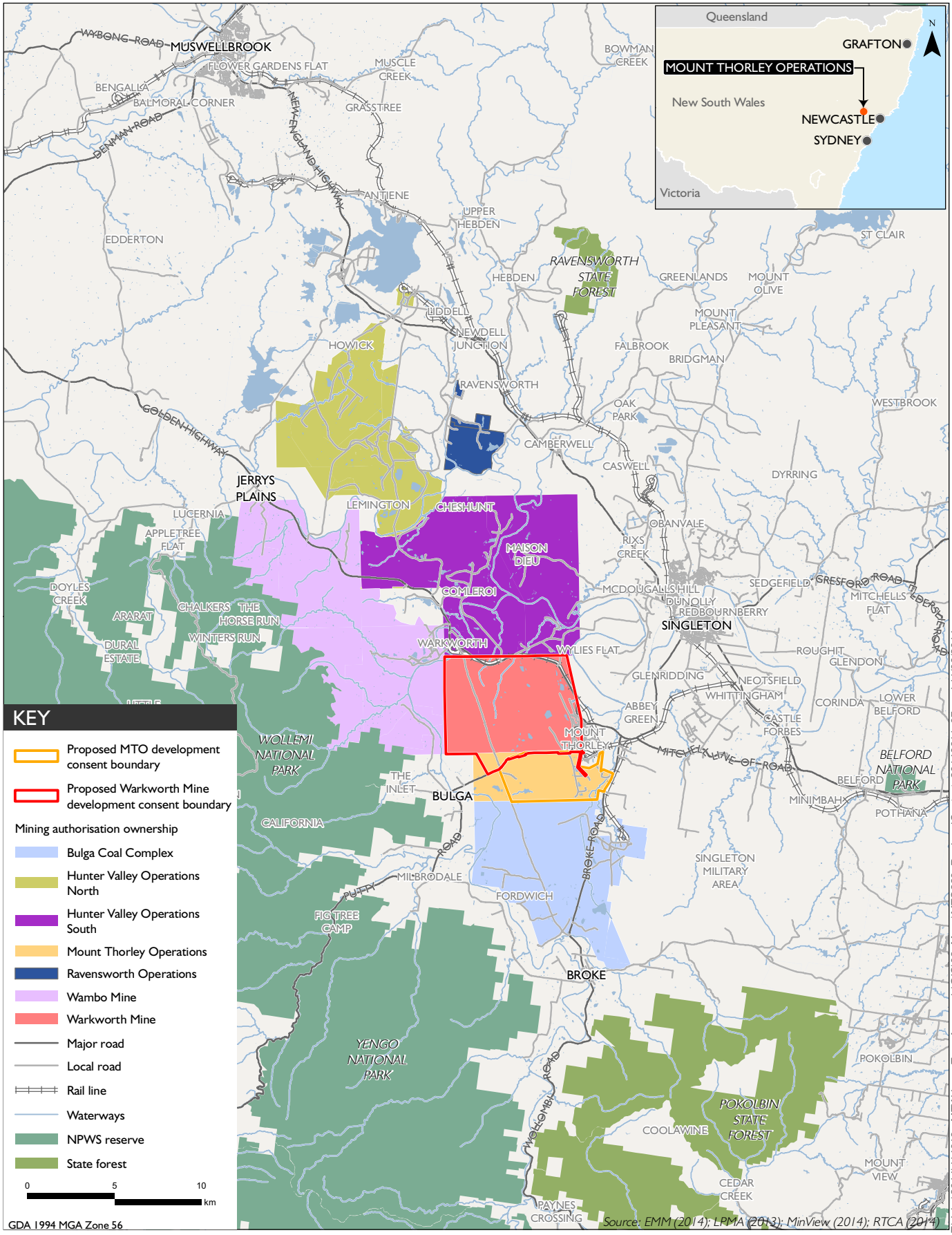
The mine currently operates under Development Consent No. DA 34/95 (the development consent) issued by the then Minister for Urban Affairs and Planning on 22 June 1996 under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and expires on 22 June 2017.

Mining activities at MTO approved under the development consent include the mining and rehabilitation of Loders Pit, Abbey Green North Pit (AGN) and Abbey Green South Pit (AGS). Mining of Loders Pit is continuing with rehabilitation well progressed to the east of the Site. Mining of AGS has been completed and the void is being used as a tailings storage facility (TSF) as approved, whilst mining of AGN is yet to commence. Run-of-mine (ROM) coal from MTO is transported to either the MTO or Warkworth CPP for processing. Product coal from the CPPs is transported via conveyor to the Mount Thorley Coal Loader (MTCL). Coal loaded onto trains at the MTCL is transported to the Port of Newcastle for export.

The proposal seeks to extend the time for approved mining that has occurred slower than anticipated beyond 2017, while enabling the continued use of mining infrastructure and the transfer of overburden from Warkworth Mine to complete the final landform for 21 years upon approval. A number of minor changes as detailed in Section 2.2 are also proposed.

The proposal would enable employment levels at MTW to be maintained in what is a challenging environment for the Australian coal industry, and as substantiated in Chapters 8 and 20, allow the important regional and local economic and social benefits from the mine's operation to continue. It would also provide for the continued accrual of economic benefits to the local area and Hunter Valley 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 need for the proposal is discussed in Chapter 3.

This chapter describes the proposal which is the subject of this environmental impact statement (EIS). This EIS has been prepared to accompany a development application (DA) for MTO submitted by Mount Thorley Operations Pty Limited, on behalf of the Mount Thorley Co-venture. The DA and EIS have been submitted to the Department of Planning and Environment (DP&E).



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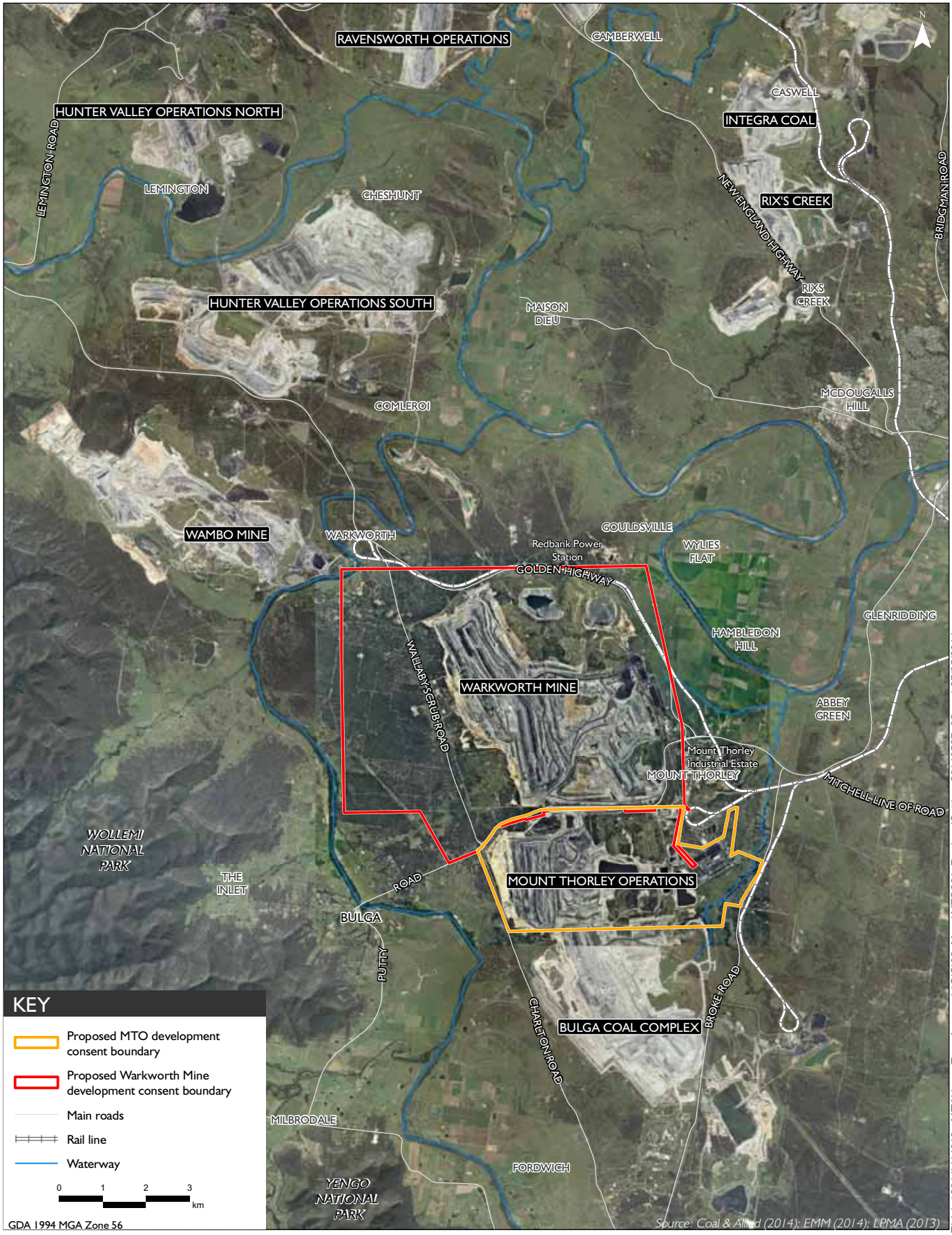
Regional context

Mount Thorley Operations 2014
Environmental Impact Statement

Figure 2.1



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Regional setting

Mount Thorley Operations 2014
Environmental Impact Statement
Figure 2.2

2.2 Proposal objectives

The objectives of the proposal are to:

- enable the extraction of coal resource approved for mining;
- enable an improved final landform, including the infilling of Loders Pit void;
- enable the continued operational integration of MTO and Warkworth Mine which is critical to the viability of both operations;
- maintain the current workforce at MTW of 1,300 jobs on average (of which approximately 121 would be attributed to MTO);
- maximise return on the substantial capital invested in the mine since it commenced in the 1981 using existing infrastructure such as road, rail and port;
- ensure all government policies are met; and
- continue to provide economic benefits to local, regional, state and national economies.

To enable objectives to be met, the proposal seeks a continuation of all aspects of MTO as it presently operates and extends or alters them as described in this chapter, including:

- maintain existing extraction rate of 10 million tonnes per year (Mtpa) of ROM coal;
- completion of mining in Loders Pit and AGN;
- maintain integrated MTW water management and tailings management systems;
- approved interactions with Bulga Coal Complex (see Section 2.4.2); and
- continuation of coal transfer between Warkworth Mine and MTO and transportation of coal via the MTCL to Port of Newcastle.

Minor alterations to approved operations are also proposed, comprising:

- transfer of overburden between MTO and Warkworth Mine to assist in rehabilitation and development of the final landform including the filling of Loders Pit void;
- upgrade to the integrated MTW water management system (WMS), including:
    - upgrade to the approved discharge point and rate of discharge into Loders Creek from 100ML/d to 300ML/d via the Hunter River Salinity Trading Scheme (HRSTS);
    - ability to transfer and accept mine water from neighbouring operations (ie Bulga Coal Complex, Wambo Mine, Warkworth Mine and Hunter Valley Operations);
    - increase in the storage capacity of the southern out-of-pit (SOOP) dam from 1.6 giga litres (GL) to 2.2GL;

- upgrade to the integrated MTW tailings management:
    - including use of the northern part of Loders Pit as a tailings storage facility (TSF) after completion of mining;
    - wall lift to Centre Ramp TSF; and
- upgrade to the MTO CPP to facilitate an increase in maximum annual throughput to 18Mtpa of ROM coal.

Mining in Loders Pit is expected to be completed in approximately 2020. Mining in AGN is yet to commence; however, it is anticipated to take approximately two years and be completed before 2022.

All activities, including coal extraction would be within disturbance areas approved under the existing development consent.

The proposal would enable the provision of a fully contemporised development consent for MTO. Mining activities are approved at MTO until 22 June 2017 under its development consent. The proposal seeks a 21 year development consent period from the date of any approval. If approval is granted in 2014, operations at MTO are forecast to continue to end of 2035, an 18 year extension over the current approval. The extension in timeframe is to facilitate the continued integration of operations with Warkworth Mine.

The majority of the area within the proposed development consent boundary (referred to herein as the Site) is owned by Miller Pohang Coal Company Pty Limited. A schedule of lands for the Site is in Appendix A.

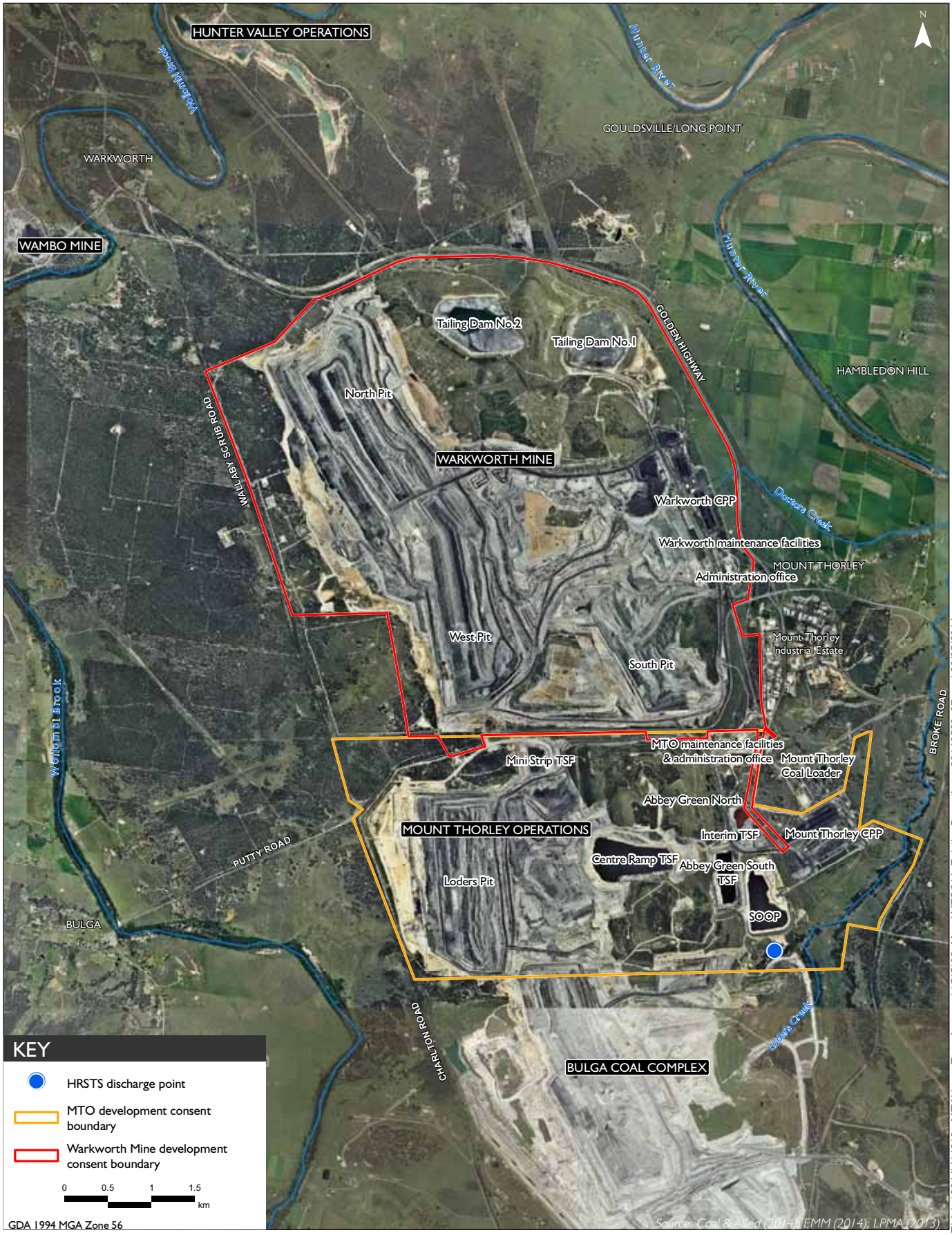
A summary of the key components of the proposal compared to current approved mining operations is provided in Table 2.1. Figure 2.3 shows the existing approved operations of MTO and Figure 2.4, the proposal.

Table 2.1 Comparison of key components of the proposal with existing operations

Key component	Existing operations	The proposal
Approval timeframes	• Operations at MTO are approved until 22 June 2017.	• Continue operations at MTO for a period of 21 years from the date of approval, which would nominally be until 2035 assuming approval is granted in 2014.
Mining areas	• The extent of approved mining at MTO can be seen in Figure 2.3.	• Complete approved mining within Loders Pit and AGN as shown in Figure 2.4.
Production	• Approval to extract up to 10Mtpa of ROM coal. • The ROM/product coal may be transported between Warkworth Mine and MTO. • All product coal may be loaded out via the MTCL.	• No change to the maximum rate of ROM coal extraction. • No changes to transport of ROM/product coal. • No change to load out of product coal.
Overburden emplacement	• Overburden material may be emplaced at the Site.	• Transfer of overburden between MTO and Warkworth Mine proposed to assist in rehabilitation and development of the final landform.

Table 2.1 Comparison of key components of the proposal with existing operations

Key component	Existing operations	The proposal
Coal processing	• The MTO CPP may process up to 10Mtpa of ROM coal. • The ROM coal from MTO may be transferred for processing at Warkworth Mine CPP and, similarly, ROM coal from Warkworth Mine may be processed at MTO.	• An increase to the maximum processing capacity of the MTO CPP to 18Mtpa of ROM coal. • No change to the movement of ROM coal and processing between MTO and Warkworth Mine.
Coarse reject	• Coarse reject produced at MTO and Warkworth Mine CPPs is co-disposed within overburden emplacement areas within MTW. That is, coarse reject produced at Warkworth Mine and MTO CPPs can be co-disposed of in overburden emplacements in either Warkworth Mine or MTO.	• No change to coarse reject management.
Tailings	• Tailings produced at Warkworth Mine and MTO CPPs is disposed within MTW. That is, tailings produced at Warkworth Mine and MTO CPPs can be disposed of either at Warkworth Mine or MTO.	• Tailings management will continue to be integrated and upgrades proposed include the use of the northern part of Loders Pit as a TSF after completion of mining. The capacity of the Centre Ramp Tailings Storage Facility (CRTSF) would be increased.
Water management	• SOOP capacity 1.6GL. SOOP discharge rate 100ML/day.	• Increase of SOOP to 2.2GL. Upgrade and increase SOOP discharge to 300ML/day.
Infrastructure	• Infrastructure includes: workshops; vehicle washing facilities; bulk oil and fuel storages; water management infrastructure; storage hoppers and crushers; coal stockpiles; CPP; erection pads; bathhouse; general stores; office building; mobile cribs and amenities; and other facilities and incidental activities. • In-pit facilities that are periodically moved include: water cart fill points, explosives magazine and reload facilities, mobile sub stations, powerlines, fuel storages and other equipment.	• Potential additions to, or modification of, existing infrastructure and mobile and in-pit facilities.
Operating hours	• Continuous operations, 24 hours per day, seven days per week.	• No change to operating hours.
Rehabilitation	• Progressive rehabilitation. • Final land use and final landform described in a number of approval documents.	• Continuing progressive rehabilitation. • Amended proposed final land use and final landform based on a 'whole-of-mine' approach to provide improved agricultural and biodiversity benefits.



COAL & ALLIED

MTO existing operations

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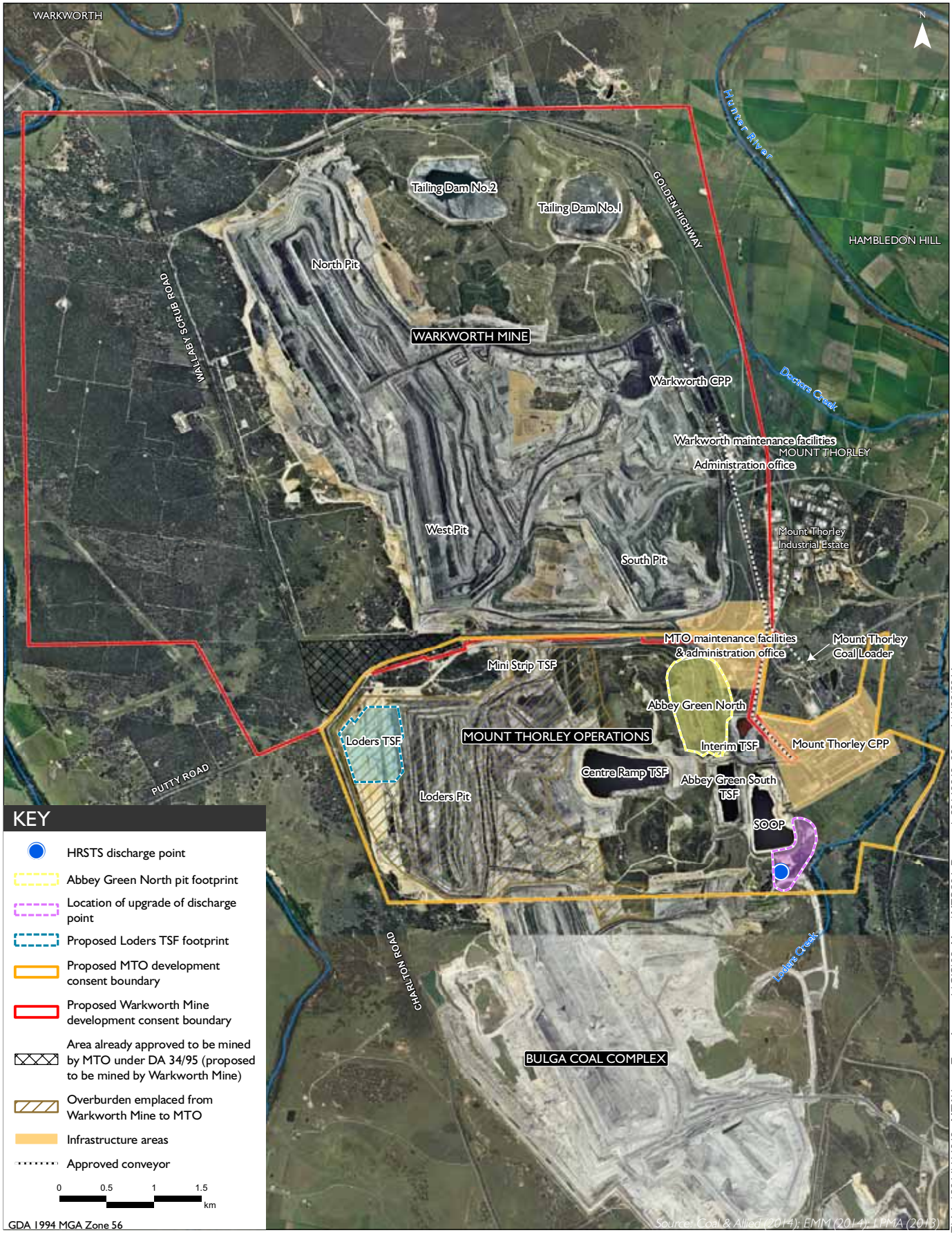
Environmental Impact Statement

Figure 2.3



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COAL & ALLIED

The proposal

Mount Thorley Operations 2014
Environmental Impact Statement

Figure 2.4

2.3 Purpose of the application and EIS

The purpose of this EIS is to accompany a DA by Mount Thorley Operations Pty Limited, on behalf of the Mount Thorley Co-Venture for continued operations at MTO, in accordance with Part 4, Division 4.1 of the EP&A Act.

This document provides a description of the existing environment, an assessment of the potential impacts resulting from the proposal and details measures that would be implemented, subject to approval, to avoid and/or compensate for potential impacts. The EIS provides information to allow DP&E, in consultation with NSW Government authorities, to assess the merits of the proposal and make a recommendation to the Minister for Planning, or delegate, as to whether or not to grant approval.

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

It is noted that a separate DA for the Warkworth Continuation 2014 under Part 4, Division 4.1 of the EP&A Act to enable, amongst other aspects, the extension of mining beyond the current spatial limits of approval and of the mine life, would be assessed concurrently with this application.

The DA for the Warkworth Continuation 2014 has been made subsequent to a 2010 application for an extension of Warkworth Mine to the west of the current pit wall (Warkworth Extension 2010). Project approval (PA 09_0202) was issued for the Warkworth Extension 2010 on 3 February 2012 by the Planning Assessment Commission (PAC), as delegate of the Minister.

Subsequently, the NSW project approval was appealed in the NSW Land and Environment Court (L&E Court). On 15 April 2013, the appeal was upheld by the L&E Court and the application was disapproved. Notwithstanding, Warkworth Mine has Commonwealth approval for the Warkworth Extension 2010.

The outcomes of the L&E Court judgment are referenced where relevant in this EIS.

2.4 Proposal description

2.4.1 Completion of mining

Mining of the existing approved open cut resources at MTO is anticipated to be complete by approximately 2022, as described below. Following this, rehabilitation would continue to be undertaken. The proposal would continue existing operational practices including use of draglines, shovels, excavators, loaders, dozers and truck fleets. This combination has proved appropriate for the geological conditions encountered at the mine and the required production rates. In recent years MTW has made substantial capital investment in fleet and equipment (see Warkworth Continuation 2014 EIS), and the drill, truck, dozer and excavator fleet would continue to be sound attenuated with completion expected by the end of the 2016 calendar year. These activities would continue within the existing MTO lease (CL 219) shown in Figure 2.5.

Loders Pit is mined typically utilising a dragline to make best use of the available strike length. Mining would continue to progress down dip towards the west. Approved mining in Loders Pit was expected to be completed in 2017, however was delayed due to a significant rain event in June 2007 which saw Loders Pit flooded. Loders Pit was utilised as a water storage post the June 2007 flood to allow the MTW operations the ability to return to normal mining in all of the others pits. Loders Pit was successfully dewatered in 2010 and mining recommenced in the same year. Due to this approximately three year cessation of mining in Loders Pit the continuation of mining is sought under this proposal. It is anticipated mining will be completed in Loders Pit by approximately 2020.

A portion of approved mining in Loders Pit north of the existing Putty Road (generally an area bounded by CCL 753 in the north, Putty Road in the south and Wallaby Scrub Road to the west) has mining approval as part of the 1996 development consent for MTO (ie DA 34/95). Accessing this coal is proposed to be undertaken by WML under the Warkworth Continuation 2014 and would avoid the need to relocate Putty Road, as approved under DA 34/95, if the coal was to be accessed by MTO. This area is shown in Figure 2.6. Should the Warkworth Continuation 2014 not be approved, it is proposed that MTO maintain the current existing approval under DA 34/95 to mine this area as proposed, inclusive of the realignment of Putty Road (subject to the feasibility of continued mining at MTO alone).

The AGN is an approved, but yet to be commenced boxcut pit on the eastern side of MTO that would be mined using truck and shovel operations and would ultimately be used as a TSF. Under the proposal it is anticipated that AGN would commence mining in approximately 2018 or 2019 and be completed within approximately two years before becoming a TSF as approved. This timing is driven by the need for TSF capacity and could be mined and ultimately used as a TSF at any time over the life of the proposal.

2.4.2 Indicative mine plans

Indicative mine plan snapshots showing the proposal's operations in 2017 (nominally Year 3), 2023 (Year 9) and 2028 (Year 14) can be seen in Figures 2.7, 2.8 and 2.9, respectively. Figure 2.10 shows the Year 21 (nominally 2035) mine plan. The final landuse is shown in Figure 2.15. As shown all extraction would remain within the current limits of approval.

The indicative Year 3, 9 and 14 mine plans were chosen as representative mining snapshots which allow for technical assessments for activities occurring at MTO concurrently with Warkworth Mine. The mine plans show the different activities being undertaken within the footprint during that indicative year, including mining, emplacement and rehabilitation. Overburden would be emplaced at either Warkworth Mine or MTO to create an undulating final landform as shown in each snapshot. Overburden transferred to MTO from Warkworth Mine would also assist in filling the Loders Pit void.

There are three types of rehabilitation areas shown on mine plans: rehabilitation to final landform; active rehabilitation which includes rehabilitation activities for all years between each indicative mine plan snapshot year; and temporary rehabilitation which is rehabilitation on areas which are not yet constructed to final landform but have been temporary rehabilitated for other reasons, such as dust and visual management purposes.

In indicative Year 3 mine plan (nominally 2017), mining occurs in Loders Pit only. Mining in Loders Pit is at its western most point and would continue within the same approved footprint (already cleared) mining the deeper seams. Rehabilitation to final landform has been completed in sections of the Site near the CRTSF and also areas in the south-east. Indicative Year 3 mine plan is also generally representative of current operations.

Indicative Year 9 mine plan (nominally 2023) is approximately the half way point of the proposal timeframe and represents when coal and overburden are being transported from Warkworth Mine to MTO for processing and emplacement, respectively. Mining has been completed in Loders Pit with the pit being used as an overburden emplacement area and receiving overburden from Warkworth Mine to fill the void and develop the final landform as proposed. Importantly, the base of the Loders TSF proposed in the northern portion of the existing Loders Pit would be emplaced to the appropriate level.

For modelling purposes, and to ensure a worst case scenario is captured, the noise and air quality studies have conservatively assumed that mining in AGN is still taking place in Year 9 (nominally 2023); however, in practice it may be completed and being used as a TSF much earlier. Rehabilitation to final landform has been completed across more than half of the Site with active rehabilitation on areas of Loders Pit ongoing. Loders TSF, which is in the early stages of construction in this indicative mine plan, would start receiving tailings once AGN is full in approximately 2026.

Indicative Year 14 mine plan (nominally 2028) represents a scenario with coal and activities associated with active rehabilitation works in Loders Pit being the focus of operations. No mining is anticipated to occur. Rehabilitation activities are anticipated to be completed to final landform across a large proportion of the Site. The AGN TSF is anticipated to be full by approximately 2026 and consolidating and drying prior to being capped at a later time. Loders TSF is receiving tailings from Warkworth Mine during this indicative Year 9 mine plan. The MTO CPP would still be receiving ROM coal from Warkworth Mine in this indicative Year 9 mine plan and for the life of this proposal.

For the remaining seven years of development consent period, activities would be focussed on the transfer of overburden from Warkworth Mine to facilitate active rehabilitation and rehabilitation to final landform, tailings management, water management and use of MTO infrastructure, including the MTO CPP to maintain efficient operations of the integrated aspects of MTW.

Overburden from both MTO and Warkworth Mine would be emplaced at MTO throughout the life of the development consent (ie 21 years) as shown in each snapshot to create an undulating landform. The development consent for the surface operations at the Bulga Coal Complex (DA 41-03-1999, as modified) allows for the development of a common landform with MTO. The final landform has been developed in consultation with Bulga Coal Complex to enable a better long-term outcome for the post mining landform. Development of the final landform may require emplacement of overburden from the surface operations at Bulga Coal Complex to MTO and overburden from MTO to the Bulga Coal Complex (where it is efficient, from an operational and environmental impact perspective, to do so). This exchange of overburden between MTO and Bulga Coal Complex is the subject of the DA for the Bulga Optimisation Project (SSD-4960) currently being assessed by DP&E (also contemplated under the subject proposal).

During operations, alternative mine plans may be used to the indicative plans above, provided that the environmental impacts remain within the envelope of effects assessed in this EIS. The mining operations can, therefore, retain some flexibility within the constraints of the identified and assessed environmental envelope.

2.4.3 Coal resources

Mineable coal within MTO is part of the Whittingam Coal Measures. These strata consist of approximately 20 coal seams which are interbedded with shales, siltstones, sandstones and conglomerates (see Figure 2.11). Different seams are suitable for production of either thermal or semi-soft coking coal.

Reserves and resources at the end of 2013 estimated in accordance with the JORC Code 2004 are presented in Table 2.2. More recently, the total resource was determined to be 28.6Mt. The proposal would enable the continued extraction of the approved resource (approximately 28.6Mt of ROM coal) to be mined over the life of the operations.

Table 2.2 Reserves and resources at the end of 2013

Reserves at end of 2013			Resources at end of 2013			
Proved Mt	**Probable Mt**	**Total Mt**	**Measured Mt**	**Indicated Mt**	**Inferred Mt**	**Total Mt**
24.5	7.3	31.7	0	0.9	31.1	32

Note: Totals may differ due to rounding.

2.4.4 Mining method

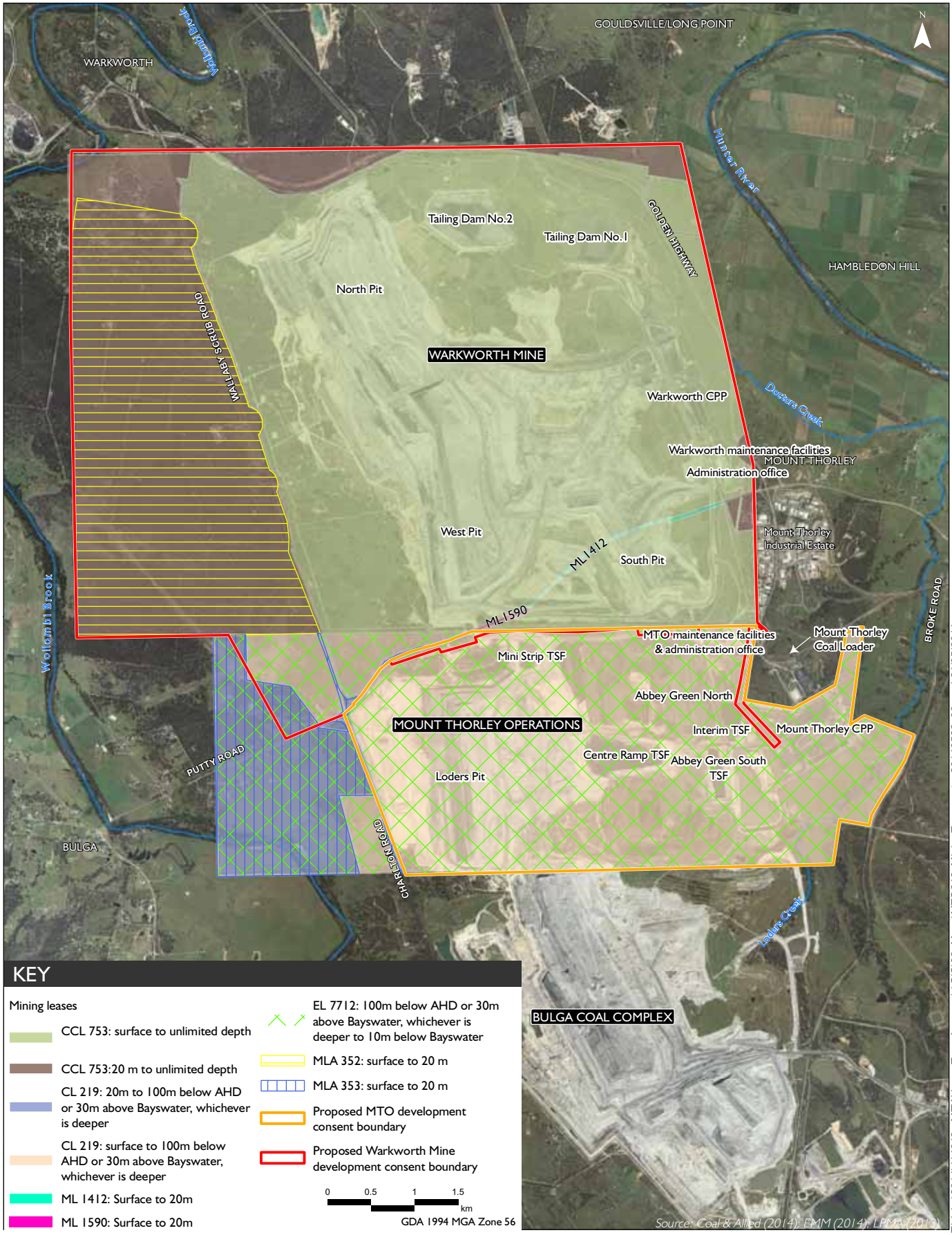
i Vegetation clearing and topsoil management

Vegetation removal and topsoil stripping precede mining operations and are implemented in accordance with Coal & Allied's Environmental Management System (EMS), namely the Flora and Fauna procedure and the Topsoil Stripping and Stockpiling Management procedure. Procedure objectives include the appropriate management of any significant flora and fauna species and communities, and to maintain the quality of the topsoil for subsequent use in rehabilitation. The procedures include requirements for flora and fauna impact assessments in pre-development and mining approvals, protocols for pre-clearing and clearing activities, and management measures for weed and pest control.

Vegetation clearing and topsoils management associated with the development of Loders Pit has been completed. Vegetation clearing and topsoil management relates exclusively to AGN.

A pre-clearance survey is undertaken before vegetation is removed and topsoil stripped. The purpose of the pre-clearance survey is to identify habitat trees and understory habitats such as fallen logs. Before clearing, trees suitable for timber are selectively marked and removed. Tree stands providing a viable seed source are harvested where practical. Vegetation may be chipped for rehabilitation mulch.

A Mining Operations Plan (MOP) requires mining operators to actively consider the environmental and rehabilitation aspects and to provide management systems for integration with mine planning and production (Environmental Sustainability Unit – Mineral Resources 2013). Further information on the function of a MOP is provided in Section 12.4.5. An integrated MOP applies across MTW.



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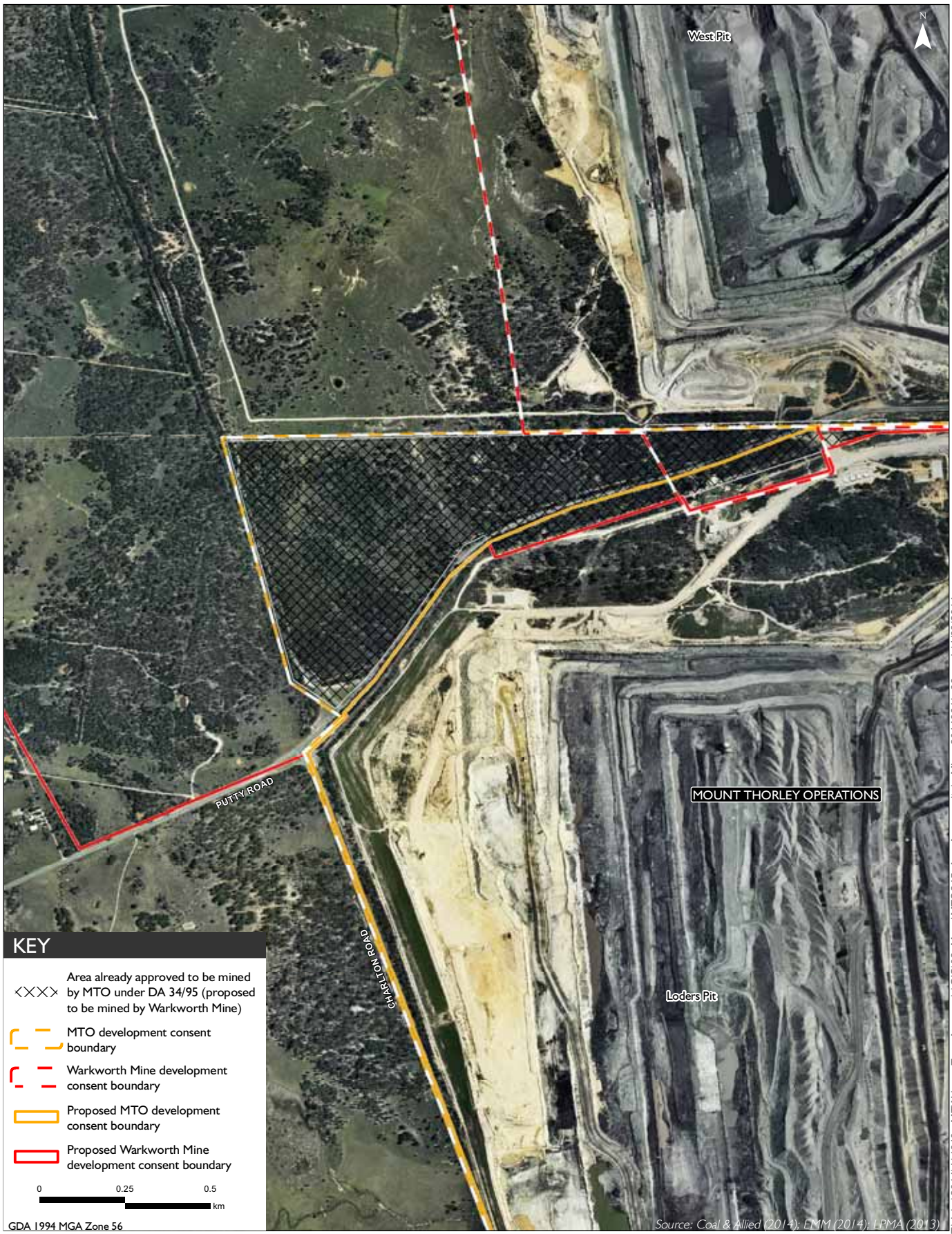
Mining leases

Mount Thorley Operations 2014
Environmental Impact Statement
Figure 2.5



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Area already approved to be mined by MTO under DA 34/95

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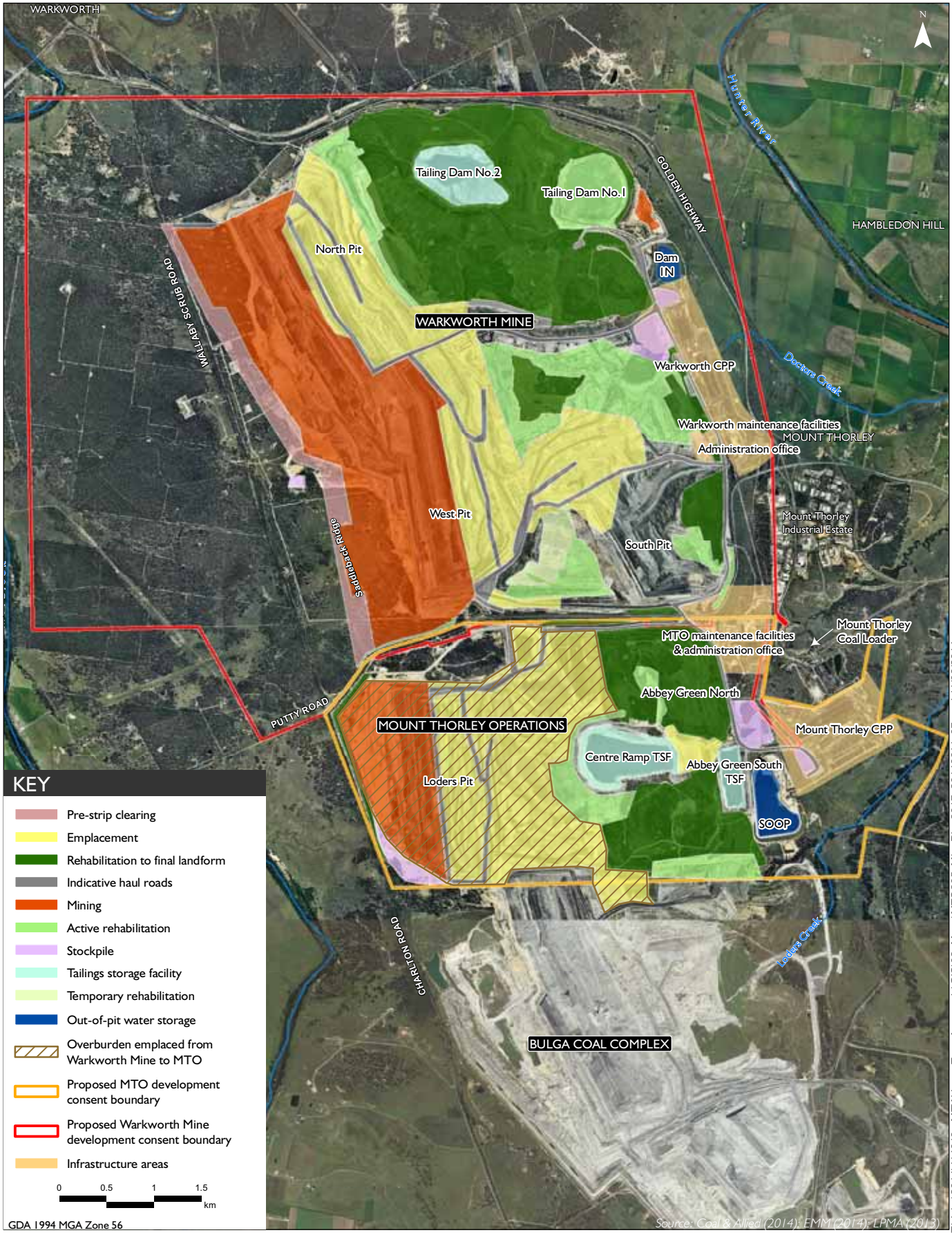
Environmental Impact Statement
Figure 2.6



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Indicative Year 3 mine plan

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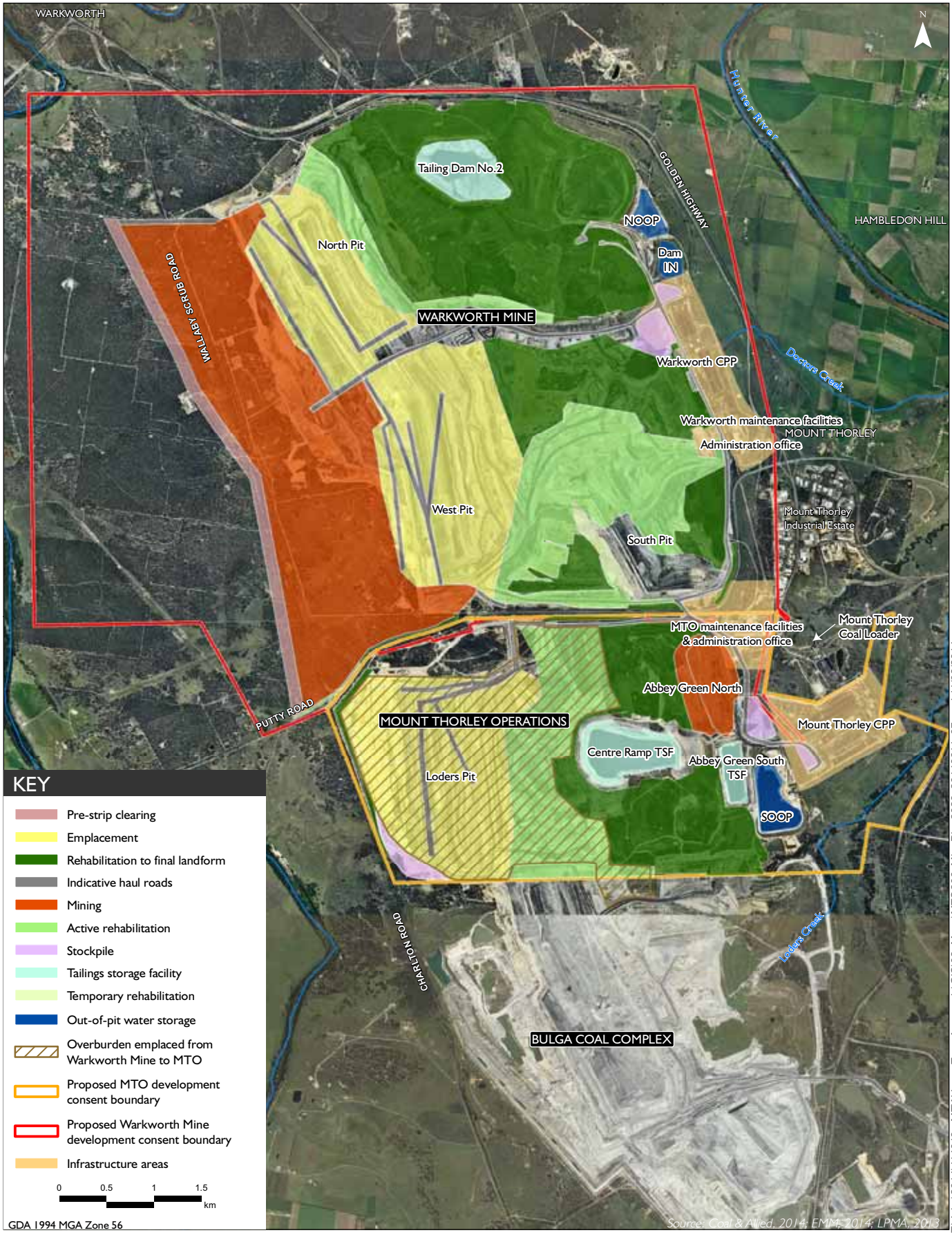
Environmental Impact Statement

Figure 2.7



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Indicative Year 9 mine plan

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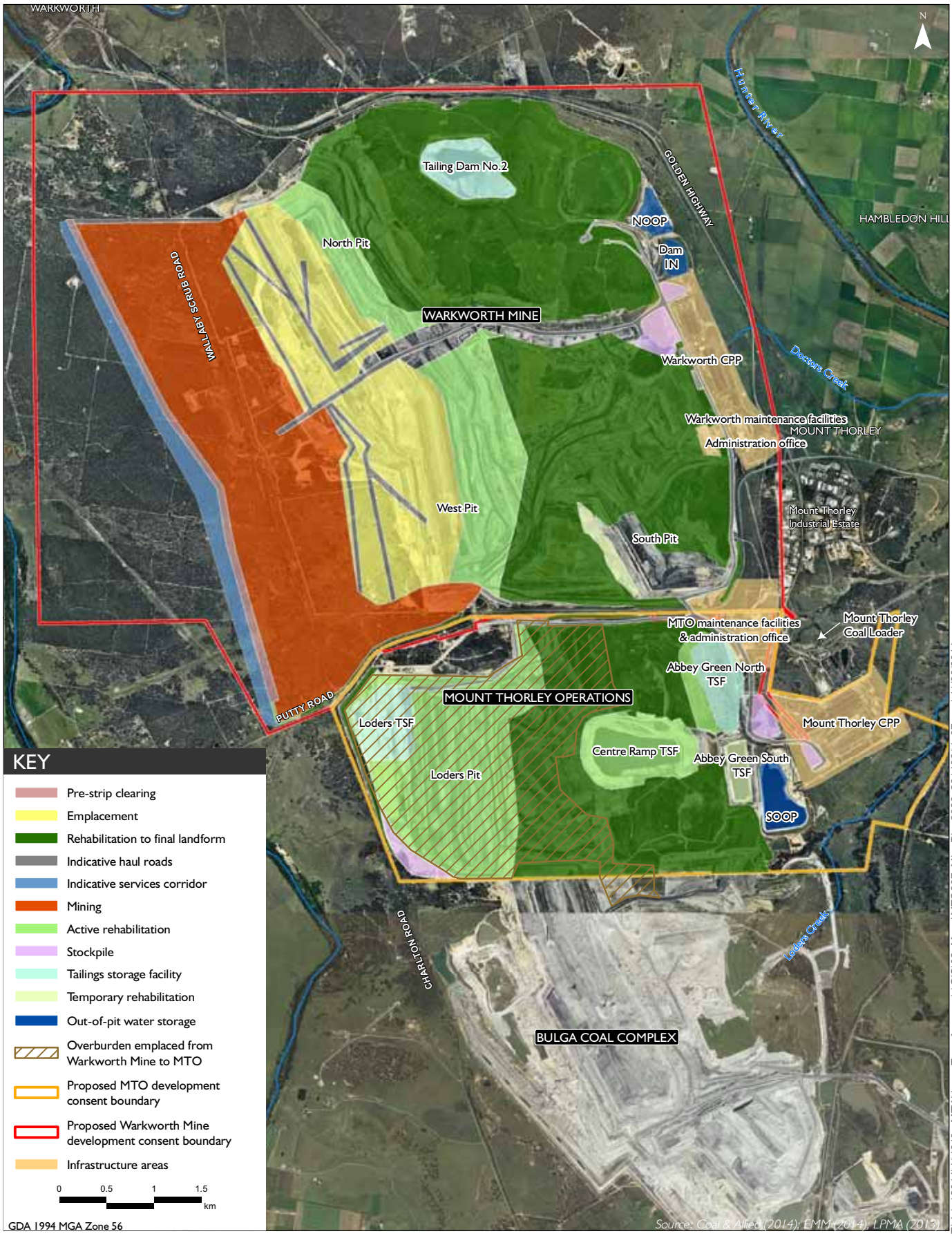
Environmental Impact Statement

Figure 2.8



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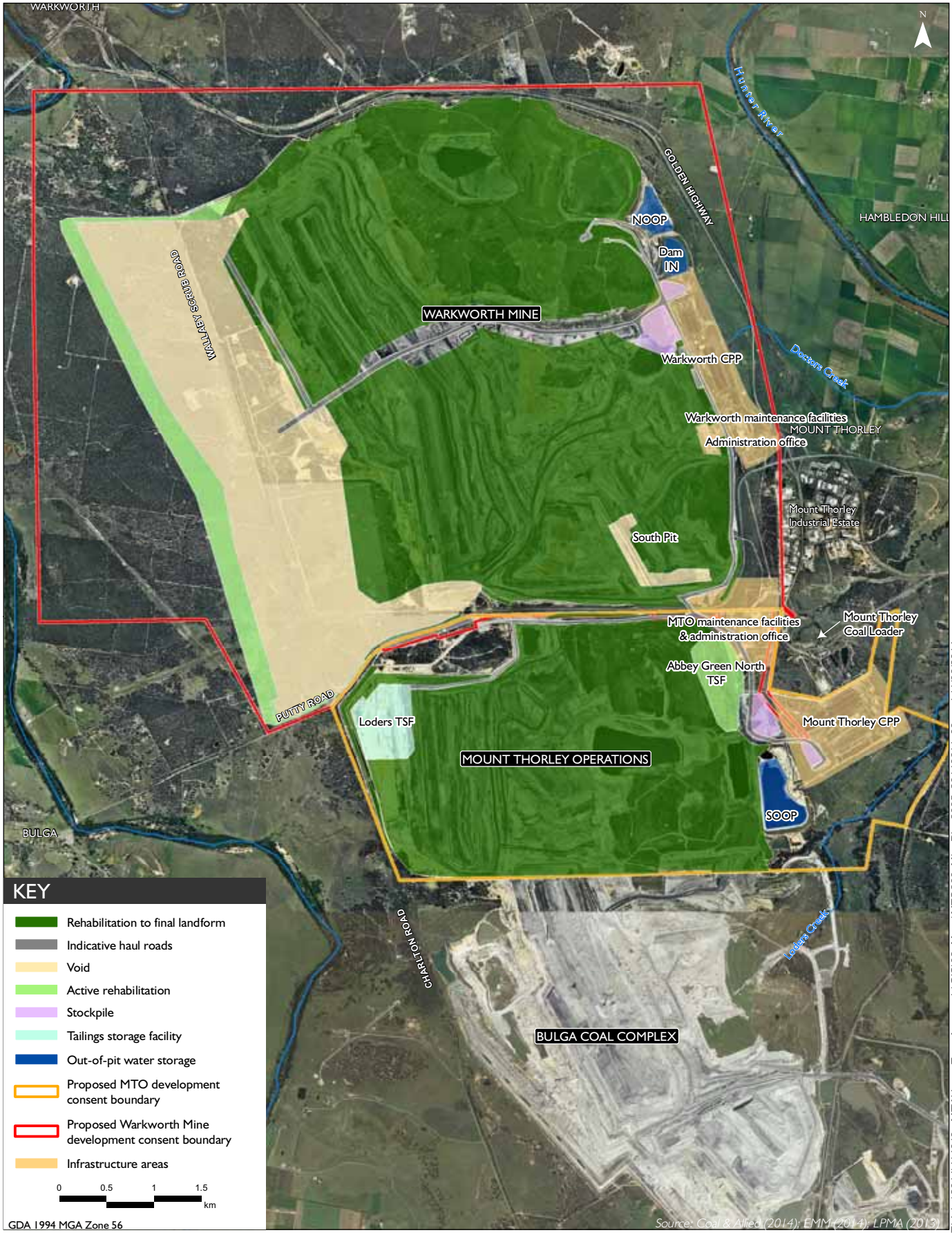
Indicative Year 14 mine plan

Mount Thorley Operations 2014
Environmental Impact Statement

Figure 2.9



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Indicative Year 21 mine plan

Mount Thorley Operations 2014
Environmental Impact Statement

Figure 2.10

Source: Coal & Allied (2010)

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COAL & ALLIED

Regional stratigraphy

Mount Thorley Operations 2014
Environmental Impact Statement
Figure 2.11

ii Open cut mining process

Coal extraction at MTO uses typical open cut methods incorporating dragline and truck/shovel operations. Overburden is removed using electric rope shovels and excavators, before coal is extracted using front end loaders and excavators. Depending upon thickness, interburden is removed using shovels, excavators or draglines. Draglines are typically tasked with removal of the deeper and thicker interburden zones to expose the deepest coal seam extracted and emplacements which comprise both overburden and interburden material.

The typical open cut mining process is shown in Figure 2.12.

iii Overburden management

Overburden is the strata between the top-most coal seam and the land surface. Almost all overburden is drilled and blasted. Interburden is a layer of rock between coal seams. Interburden is either ripped or drilled and blasted. Both overburden and interburden are removed by dragline, shovel, excavator or front end loader, depending on the thickness, for haulage to designated emplacements or to areas where mining is complete within the pit. For the purposes of this EIS, references to overburden generally include both overburden and interburden.

Overburden is transported and disposed of within mined out sections of the open cut pits to create a final landform. The elevation of the final landform is generally higher than the pre-mined elevation due to swelling of the excavated soil that is disposed, which is typically in the order of 20 to 30 per cent of the in-situ volume. The placement of overburden occurs in accordance with the mine plans for each of the pits at MTO. Overburden material may also be received from Warkworth Mine, via the bridge/underpass crossings of Putty Road, to assist in creation of the final landform.

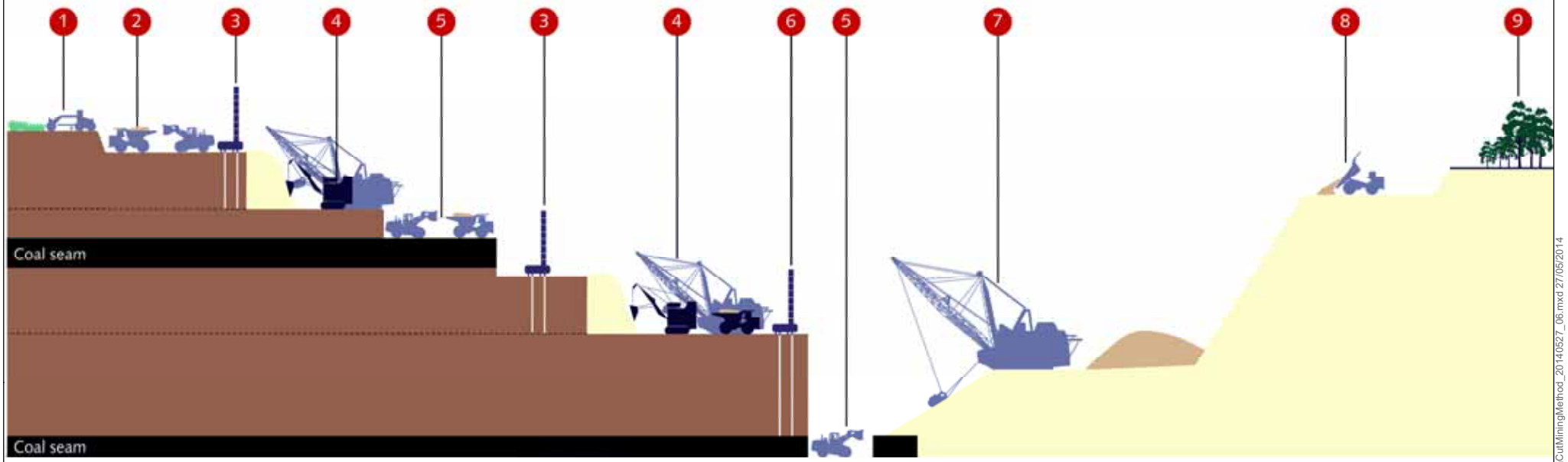
Overburden containing potentially acid forming materials, when exposed to oxygen, could lead to acidification of surface water runoff. Net acid producing potential, pH and total sulphur are used to determine the acid generating potential. Testing at MTW indicates that although sulphide materials as pyrite (FeS_2) are known to occur, their content is relatively low (average sulphur content 0.46 per cent). With natural buffering capacity, these materials have low acid rock drainage potential and are within specified acceptable ranges for use as a plant growth medium as part of the rehabilitation of the final landform (see Appendix N). Overburden management at MTW under the proposal would include the ongoing geochemical characterisation of mined materials and void wall rock to accurately predict risk factors and develop management measures where required. In addition, the proposal would continue the ongoing monitoring of runoff and seepage waters during operations to validate these predictions.

2.4.5 Mining schedule and fleet

Mining at a maximum rate of 10Mtpa of ROM coal is expected to be undertaken at MTO until approximately 2022 with the remainder of the consent life to be used for overburden emplacement, rehabilitation to final landform, tailings and water management activities and the use of MTO infrastructure, including the CPP, for the efficient operations of integrated aspects of MTW.

An estimate of the indicative fleet required for each snapshot of the proposal is provided in the noise and vibration study, Appendix F.

In 2011, MTW invested substantial capital for fleet upgrades and replacements to prepare for the anticipated approval of the (now disapproved) Warkworth Extension 2010 (PA 09_0202). As noted in Section 2.4.5, all drill, truck, dozer and excavator fleet will be sound attenuated by the end of the 2016 calendar year to minimise noise emissions.



1. Vegetation clearing and topsoil removal.
2. Overburden removal using front-end loader, shovel or excavator and trucks.
3. Overburden drilling and blasting.
4. Overburden removal using shovel or excavator and trucks or dragline.
5. Coal will be either drilled and blasted or ripped with dozers, depending on the thickness. Coal removal using front-end loader or excavator and trucks.
6. Overburden drilling and blasting, including highwall pre-split and throw blasting.
7. Dragline, shovel, excavator or front-end loader and truck operations.
8. Overburden placed into completed mine areas by trucks.
9. Shaping, topsoiling and revegetation.

Note: only two coal seams shown for indicative purposes

Source: Coal & Allied (2010)

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Open cut mining method

Mount Thorley Operations 2014
Environmental Impact Statement
Figure 2.12

2.4.6 Infrastructure

The proposal is based on the continued use and upgrades of existing infrastructure. Infrastructure at MTO is predominantly at the eastern side of the Site.

i Existing infrastructure

Most existing infrastructure is within the 'infrastructure envelopes' as shown in Figure 2.3. These facilities include:

- workshops to provide servicing and repair services to the mining fleet;
- vehicle washing facilities for both heavy and light vehicles;
- bulk oil and fuel storages for handling new and waste oil;
- water management infrastructure;
- storage hoppers and crushers;
- coal stockpiles;
- CPP;
- erection pads;
- bathhouse;
- general stores;
- office building; and
- other facilities.

Mobile crib and amenity facilities (including sewage treatment facilities) are in open cut areas for employees working in these areas. The facilities are trailer-mounted and near active working areas and are relocated as required as mining progresses.

Other in-pit facilities include water cart fill points, explosives magazine and reload facilities, mobile sub stations, powerlines, fuel storages and other equipment. These in-pit facilities are also positioned near active working areas and would continue to be moved as required as mining progresses under the proposal. The proposal may require the addition or modification of existing infrastructure and mobile and in-pit facilities as described above, as required within the current mining and infrastructure areas for the efficient operation of MTO.

ii Water management infrastructure

Minor upgrades to water management infrastructure items at MTO are proposed, including:

- upgrade and increase the rate of the approved HRSTS discharge point at Loders Creek (see Figure 16.2) from 100ML/day to 300ML/day;

- ability to transfer and accept mine water from reliable sourcing operations including but not limited to neighbouring mining operations such as Hunter Valley Operations, Wambo Mine and Bulga Coal Complex; and

- increase in the SOOP storage capacity from 1.6GL to 2.2GL within the same footprint.

Changes to the integrated MTW WMS are described in Section 2.4.11.

iii Tailings facilities

Existing and approved tailings facilities at MTO operated as part of the integrated MTW tailings management system, include the CRTSF, AGN and AGS, and would remain under the proposal. The capacity of the CRTSF would be increased with a wall lifted. Upon decommissioning of CRTSF, tailings disposal would be directed to the approved AGN TSF. On the completion of mining in Loders Pit, an in-pit tailings dam is proposed and has been designed to regulatory standards. This proposed TSF is called the Loders TSF and is shown on Figures 2.9 and 2.10. Further detail on tailings disposal is given in Section 2.4.9.ii.

2.4.7 Coal washing and processing

Under the proposal, the MTO and Warkworth CPPs would continue to wash and process coal in preparation for its transport to the Port of Newcastle via the MTCL.

These CPPs contain processing equipment that separates the ROM feed coal into various saleable products and rejects. The coal is processed and washed in accordance with market requirements. Washing relies on the physical properties of the coal which has a lower specific gravity than non-coal material and the difference in densities allows the materials to be separated by floatation or centrifugal action. The CPPs separate the raw coal into low ash and high ash products, coarse rejects and fine rejects.

The coarse coal circuit relies on relatively simple gravity separation, with coal particles floating in a magnetite and water mixture known as a dense medium. The heavier non-coal material sinks while the coal remains in solution. The separation is enhanced for coarse coal particles by pumping dense medium and ROM coal together through dense medium cyclones.

Fine ROM coal is cleaned in a process circuit that does not use a dense medium. It is mixed with water and pumped through classifying cyclones to remove the very fine particles, which generally contain a very high proportion of non-coal materials including clays. It is then fed into spiral separators, which separate materials by gravity, taking advantage of the differing centrifugal effects produced by coal and non-coal particles as they wind their way down the spiral pathways.

After thickening in coal cyclones, the coal product streams are de-watered in centrifuges prior to stockpiling. The above process is shown in Figure 2.13.

The proposal includes potential upgrades to the MTO CPP within the infrastructure area envelope which would assist with the proposed increase in processing capacity at MTO CPP from 10Mtpa to 18Mtpa of ROM coal, comprising:

- one new module;

- upgrade of two existing modules;

- new bathhouse and administrative facilities; and

- minor alterations and additions to stockpiles.

Both the MTO and Warkworth Mine CPPs would continue to operate continuously 24 hours per day, seven days per week.

2.4.8 Coal transport

i ROM coal

The currently approved maximum mining rate of 10Mtpa of ROM coal would be maintained under the proposal. Extracted coal would continue to be transported from the active working areas to the handling facilities at either the MTO or Warkworth Mine CPP by truck. It could also continue to be transferred between MTO and Warkworth Mine via internal haul roads utilising one of two existing bridge crossings over Putty Road (it may also be transferred using the third approved crossing that is not presently constructed). The coal would be delivered directly to the ROM dump hoppers or the ROM stockpile (see Figure 2.13).

Coal would continue to be generally delivered directly to ROM receival dump hoppers. A hardstand area adjacent to the dump hoppers is used as a contingency stockpile area for ROM coal, to minimise the effect of production variations or inclement weather on the continuity of supply to the CPPs. Coal is transferred from the contingency ROM coal stockpile by truck/front end loader to the dump hoppers as required.

The raw coal in the dump hoppers would then be crushed before being either fed directly into the CPPs or selective stockpiling on the raw product stockpiles. Upon reclaiming, the raw coal can be blended before being conveyed to surge bins.

ii Product coal

Under the proposal, product coal from MTO CPP would continue to be transported to the locations listed below as shown in Figure 2.14:

- product coal stockpiles by conveyor;
- MTCL via overland conveyor; and
- MTCL by truck using internal haul roads.

All product coal from MTO CPP would continue to be transported by overland conveyor to the MTCL for transport to the Port of Newcastle, with some product coal transported by truck along internal haul roads. At the MTCL, coal is then dispatched to the MTO train loading bin situated on the nearby rail loop. Trains of varying capacity from 2,000 tonnes (t) to 8,000t are then loaded with coal for transport to ship loading facilities at the Port of Newcastle.

Both the Warkworth and MTO CPPs would continue to operate continuously 24 hours per day, seven days per week.

2.4.9 Waste management

i Overview

Waste is classified and segregated into separate streams onsite and Coal & Allied environmental management protocols and procedures are implemented to ensure they are managed appropriately. The implementation of these would continue under the proposal.

The waste management systems at MTO and Warkworth Mine are integrated. Waste streams at MTW include overburden, rejects and tailings, liquid waste, hazardous waste, general waste (both putrescibles and non-putrescibles), vegetation waste and minor amounts of special waste (such as tyres).

The MTW waste management strategy includes the following:

- all sampling and classification results are retained for the life of the operations in accordance with the EPA's *Waste Classification Guidelines* (DECCW 2009). It should be noted that most waste classifications for the operations are clear and do not require a sampling regime, however where unidentifiable waste is encountered (ie liquid waste), testing would be undertaken prior to acceptance and disposal;
- where relevant and in accordance with EPA's requirements, notification and tracking of waste is undertaken;
- all waste management protocols and procedures are regularly updated to include relevant contemporary legislative requirements (for example, Resource Recovery Exemptions); and
- contingency planning is undertaken for events that affect operations at the mines that may result in environmental harm, such as hazardous substances spills or failure of TSFs. These are detailed in the MTW Environmental Pollution Incident Response Management Plan.

The following sections describe the waste management strategy for MTW that would continue under the proposal. Appendix O provides relevant waste management protocols and procedures implemented at MTW as well as the reported waste recycled (86 per cent) and disposal (14 per cent) quantities for 2013, which are considered to be representative of waste streams expected during the life of the proposal. It is noted that work instructions such as the above are live documents and updated from time to time.

ii Overburden emplacement

Overburden material would continue to be emplaced at MTO and, in addition, transferral of overburden from Warkworth Mine would assist in the development of the final landform. Overburden would be transferred to MTO via existing road crossings over Putty Road and either the yet to be constructed bridge or underpass.

Overburden emplacement methods are described in Section 2.4.4.

iii Rejects and tailings disposal

The integrated management (ie generation and disposal) of rejects and tailings for MTW would continue under the proposal. Reject material is produced as a by-product of the coal washing process. Extracted coal contains part of the rock strata above and below the coal seam. This rock is removed from the product coal through the washing process in the CPPs. As a result, two types of rejects are generated: coarse and fine reject.

Coarse reject is made up of larger rock which is drained, rinsed and directed to a rejects bin. The reject is then transported by haul truck and disposed at in-pit emplacement areas. The emplacement areas are capped with overburden material.

Fine reject (or tailings) has a high water content and is pumped to TSFs across MTW for settling and dewatering. Water from the TSFs would be retrieved and reused in the MTW WMS, such as water supply for the CPPs and dust suppression for haul roads and other exposed areas. When these TSFs reach capacity, they would be allowed to dry out and consolidate. When the TSFs are no longer required they would be capped with overburden and rehabilitated to an appropriate land capability.

Under the proposal, it is envisaged that Loders TSF, AGN, AGS and CRTSF would be used for tailings storage. These have been considered in the indicative mine plan snapshots assessed within this EIS.

iv Hazardous waste and dangerous goods

Hazardous waste and dangerous goods are regulated under the NSW *Work Health and Safety Act 2011* and NSW *Explosives Act 2003*. The MTO would continue to comply with regulatory requirements in relation to dangerous goods management. The storage of explosives or explosive precursors is managed in accordance with MTW's *Major Hazard Management Plan - Explosives and security sensitive dangerous substances (SSDS) security plan*, prepared in accordance with the requirements of NSW Workcover. These internal MTW documents are regularly updated and would incorporate the proposal should approval be granted.

v Other waste

The management of other waste, inclusive of construction waste, putrescibles and non-putrescibles waste, liquid and special waste (such as tyres) is undertaken through the implementation of Coal & Allied's environmental work instruction *CNA-10-EWI-SITE-E7-008 – Non-mineral Waste Management*, which is provided in Appendix O. Again, it is noted that work instructions are live documents and are updated from time to time.

Non-mineral waste management at the mines meets all regulatory requirements and relevant Rio Tinto standards. The management of non-mineral waste is guided by planning, process design and purchasing that result in the maximum reuse and recycling of materials. Each category of non-mineral waste is subject to appropriate segregation, collection, handling, transport and disposal to minimise environmental impacts. These non-mineral wastes are stockpiled in accordance with the environmental work instruction (see Appendix O), such as waste liquids stored in tanks or sumps.

It should be noted that only minor construction activity (ie activities not associated with continued mining at MTW) would result from the proposal (see Section 2.4.6), with the exception of the underpass/bridge over Putty Road. Construction of this crossing is not expected to generate large volumes of construction waste relative to waste currently managed onsite. Waste generated from this activity would be managed in accordance with the relevant MTW waste management protocols and procedures.

vi Offsite waste transportation

All transportation of regulated wastes is managed strictly in accordance with EPA's requirements to ensure that it does not pose a risk to human health or the environment. Waste transport certificates are issued and uploaded electronically to EPA by MTW's waste contractor. These records are kept in secure storage for the life of the operations in compliance with EPA's *Waste Classification Guidelines* (DECCW 2009). Details regarding the transportation of waste offsite are provided in Appendix O.

2.4.10 Public safety

i Site access

Public safety at MTW would continue to be managed primarily through the implementation of Rio Tinto's Health, Safety, Environment and Quality (HSEQ) standards, procedures and daily security inspections. Fencing, signposting, restricted access areas and locked external gates form part of the safety measures to ensure the safety of the public. In addition, there is no public access from the mine entrance to pit areas as part of the constraint on public access.

ii Bushfire management

Bushfire hazard management onsite is currently monitored and managed onsite through implementation of the MTW Bushfire Management Plan and regular communications and consultation with the NSW RFS. The RFS communicate regularly with mining operations in the Hunter Valley regarding bushfire hazard management, including fuel load (ie management of vegetation).

In 2012, the RFS advised mining operations in the Hunter Valley to undertake a programme of fuel load reduction to manage bushfire risk in the region. This programme was implemented by MTW on Coal & Allied-owned land, excluding areas within the mining footprint and areas designated as biodiversity offsets). These Coal & Allied-owned lands include areas west of the current operations. It should be noted that bushfire hazard management within biodiversity offset areas are managed through the implementation of the Flora and Fauna Management Plan.

Annual inspections of Coal & Allied-owned lands, including those leased to residential and commercial tenants are undertaken to identify and assess bushfire risk for public safety and, if required, implement appropriate risk reduction measures such as vegetation pruning or establishment of fire breaks.

As described in Section 2.4.4, measures such as vegetation removal and topsoil stripping precede mining operations and in-pit use of equipment such as explosives magazine and reload facilities and fuel storages would continue to be implemented under the proposal. These activities also reduce bushfire risk resulting from mining operations.

The MTW Bushfire Management Plan is reviewed regularly and would continue to be implemented under the proposal and updated to incorporate the proposal, should approval be granted.

iii Offsite

Public safety offsite would continue to be managed primarily through the implementation of Rio Tinto's HSEQ standards, procedures and daily security inspections. The proposal has specifically assessed the following elements of public safety offsite:

- vibration (see Section 9.4.9);
- dust (see Section 10.3);
- blast fume (see Section 10.3); and
- traffic (see Section 19.3.3).

These technical studies concluded that the proposal, with the continued implementation of existing mitigation measures, would not affect public safety offsite.

2.4.11 Rehabilitation

Rehabilitation would continue to be undertaken progressively across the mined area under the proposal. The requirements for rehabilitation would be determined in consultation with relevant government agencies and stakeholders and be undertaken in accordance with the MTW MOP as required by the NSW *Mining Act 1992* (Mining Act).

Rehabilitation objectives and the domain types are provided in Section 12.4.

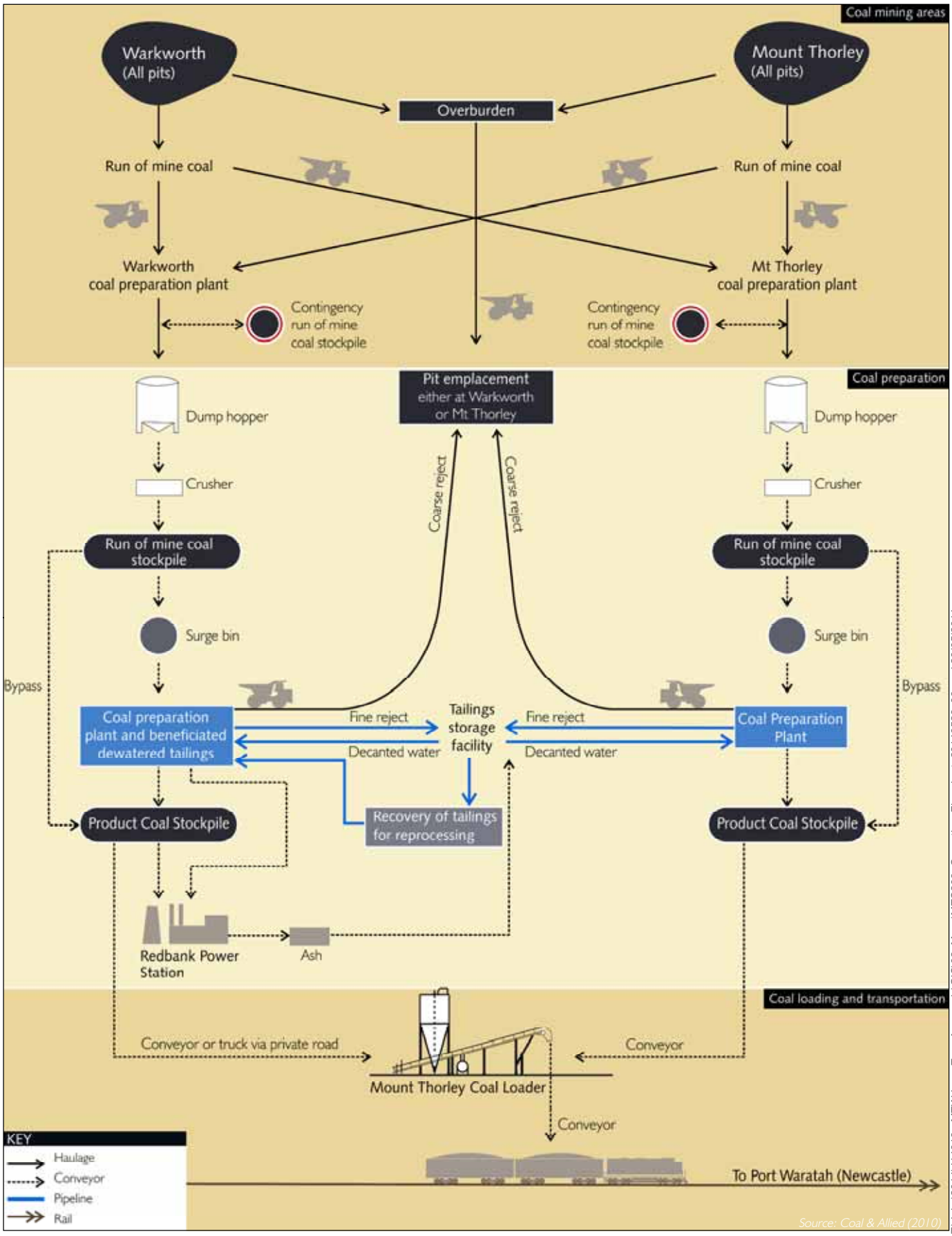
i Final landform

The approved final landform at MTO, incorporated into the 1995 EIS, consists of a narrow valley leading to a final void. On either side of this valley is an elevated ridge that grades into the surrounding landform. Design of this final landform was constrained by the amount over overburden available within MTO.

The proposal results in the revision of previously planned and approved final landform described in past environmental impact assessments, including the 1995 EIS, and MOPs. Importantly, the proposed transfer of overburden from Warkworth Mine to MTO would enable an improved final landform at MTO by filling of the Loders Pit void, thereby preventing a post-closure final void and allowing for the design of a more natural looking final landform which would integrate better with the final landform of Warkworth Mine and the Bulga Coal Complex.

The long-term approval being sought promotes an improved landform with improved vertical relief of overburden emplacements to integrate with the surrounding landscape to create a landform as near as possible to the natural ground.

The indicative post-mining landform is described further in Section 12.2.



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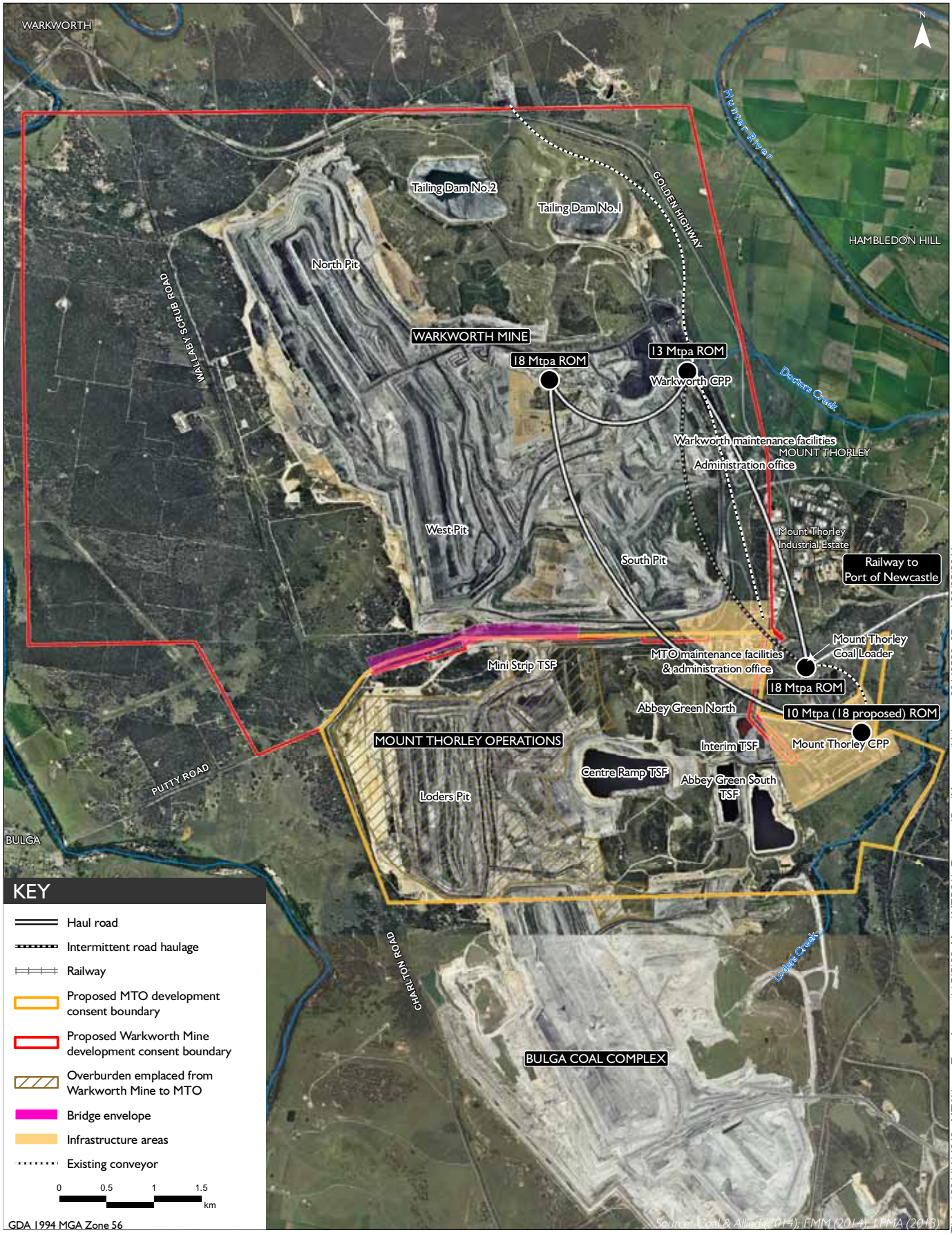
COAL & ALLIED

Managed by Rio Tinto Coal Australia

Flowchart of operations

Mount Thorley Operations 2014
Environmental Impact Statement
Figure 2.13



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Proposed coal movement volumes

Mount Thorley Operations 2014

Environmental Impact Statement

Figure 2.14

ii Final landuse

It is acknowledged that final landuses need to integrate with the rehabilitation undertaken by the surrounding mining operations, existing agricultural land and areas containing remnant vegetation, ultimately providing for sustainable end land uses agreed by a range of stakeholders. Previous landform designs including integration with Bulga Coal Complex, surrounding land use, external and internal planning requirements, existing management measures, existing rehabilitated landforms and ecological and sustainability values were considered in the development of the conceptual final landuse shown in Figure 2.15.

The final landuse under the proposal aims to provide ongoing agricultural benefits, with cattle grazing permitted in areas of rehabilitated grassland, whilst creating complementary areas of biodiversity. This would enable productive agriculture, an increase in habitat and biodiversity values and the establishment of vegetation cover that creates corridors to link surrounding native vegetation and enhance local and regional ecological linkages to provide for a sustainable final land use.

The indicative location of the biodiversity corridor is shown in Figure 2.16. It is compatible with long-term rehabilitation plans for adjacent land uses in the vicinity of MTO. The final landuse forms a north/south connecting corridor of vegetation between the existing vegetation to the north of MTW through the rehabilitation areas of Wambo Mine, Warkworth Mine and Bulga Coal Complex and remnant vegetation within the Singleton Military Area further south.

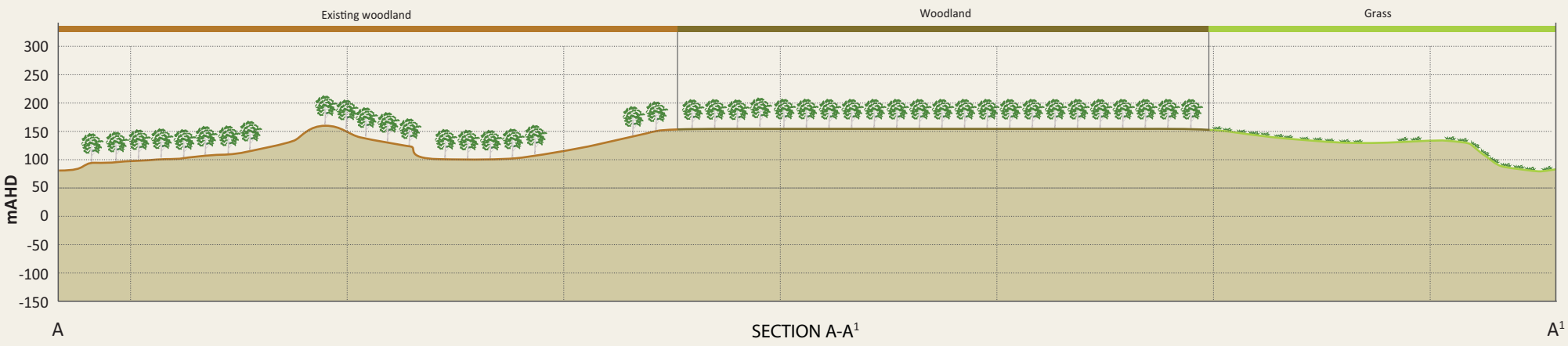
Final landuse is discussed further in Chapter 12.

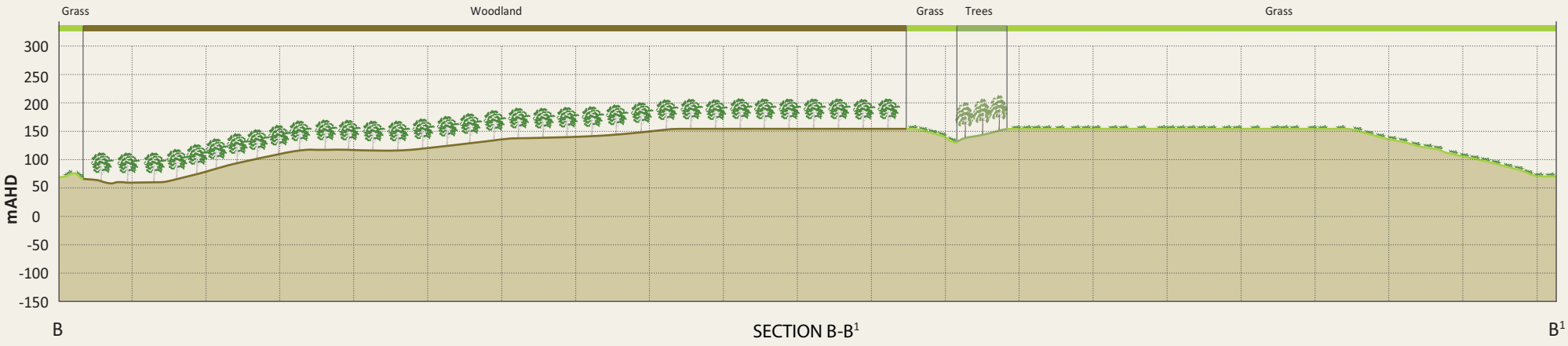
2.4.12 Water management

Water at MTO would be managed in accordance with MTW's Water Management Plan, prepared in consultation with the NSW Office of Water (NOW) and NSW Environment Protection Authority (EPA) for the integrated MTW operations. The plan requires:

- diversion of clean water runoff around areas of mining disturbance;
- collection and treatment of sediment-laden runoff from disturbed areas prior to discharge;
- collection of groundwater inflows and runoff from active mining areas within the MTW WMS;
- collection and treatment storage of potentially contaminated mine water prior to discharge to the MTW WMS;
- minimisation of water supply requirements from external sources by utilising onsite water for dust suppression and coal processing; and
- discharging excess mine water from the Site based on existing entitlements under the HRSTS.

An overview of the proposed changes to water management infrastructure was given above in Section 2.4.6ii. Changes to the MTW WMS as a result of the proposal are assessed in Chapter 16.





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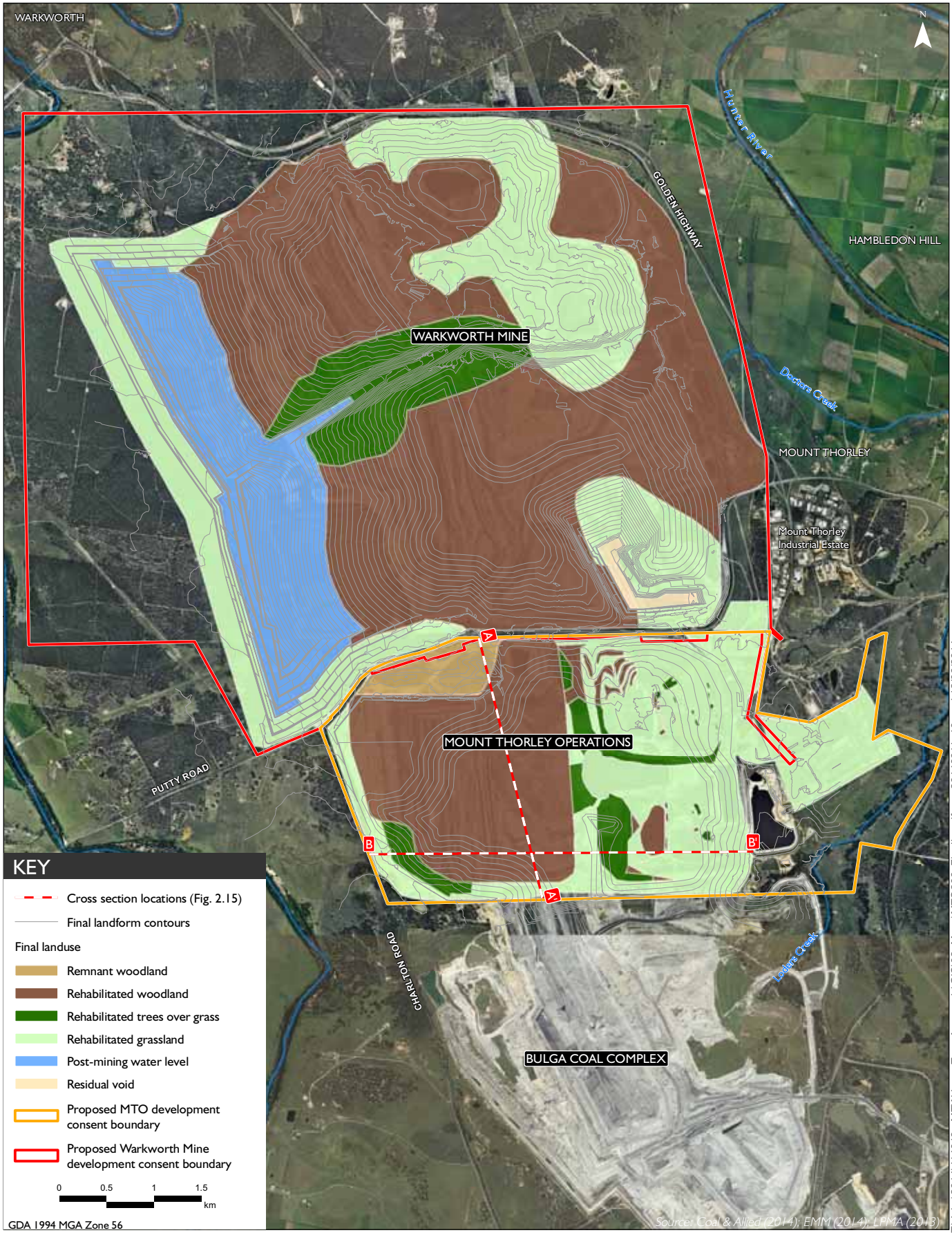
Final landform cross-sections

Mount Thorley Operations 2014
Environmental Impact Statement

Figure 2.15



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Final landuse and contours

Mount Thorley Operations 2014
Environmental Impact Statement
Figure 2.16

2.4.13 Workforce and operational hours

i Operational workers

The average workforce currently employed at MTW is approximately 1,300 persons. Although MTO and Warkworth Mine are integrated operations and workforce numbers are difficult to assign to the respective development consents, an estimate of 37 per cent (481 persons on average) could be attributed to activities approved under the MTO development consent and 63 per cent (819 persons on average) to the Warkworth Mine development consent.

The total long-term workforce for the continuation of MTW is estimated to be the same, ie a workforce of 1,300 persons on average. Again, although difficult to assign workforce numbers to respective development consents, the development applications for the proposal and the Warkworth Continuation 2014 would result in similar workforce proportions as presently occur until completion of mining at MTO. At this time, an estimate of 9 per cent (approximately 121 persons on average) would be attributable to MTO operations and 91 per cent (1,187 persons on average) to the Warkworth Mine development consent.

The actual workforce numbers would vary from year to year depending on the mine planning and market requirements.

ii Construction workers

Upgrade of the MTO CPP and the minor changes required to the currently approved design of the SOOP would require a generally small short-term construction workforce. These changes are not expected to result in a material increase in current workforce numbers.

iii Operational and construction hours

The MTO would continue to operate 24 hours a day, seven days a week and any construction activities would also be conducted during these times.

Chapter 3

Proposal need

Chapter 3 — Proposal need

3 Proposal need

3.1 Overview

The MTO is a large-scale business built on hundreds of millions of dollars of investment, which requires long-term regulatory certainty to remain financially viable. Currently 1,300 full time equivalent persons are employed on average, across MTW.

The proposal is needed to:

- enable the continued operational integration of MTO and Warkworth Mine which is critical to operations and environmental management at the respective mines;
- provide MTW with its best opportunity of maintaining its current workforce of approximately 1,300 people; and
- prevent the potential sterilisation of coal resource that is approved for extraction but cannot be mined during the current consent period and enable an improved final landform.

These matters are discussed in the sections below.

3.2 Mining slowdown

The economic study (Chapter 8 and Appendix E) suggests through a number of indicators that while mining activity has been historically very high, significant declines in Australian thermal coal prices over the past two years, amongst other factors, have had a negative impact on capital expenditure in NSW as shown in Figure 3.1. Investment in new tangible assets has fallen by more than half between December 2012 and December 2013. These trends are consistent with the expectation by the Hunter Valley Research Foundation (HVRF 2013a,b) that few additional mining investment proposals will progress in the medium term, except extension of existing mines to remain viable and that require little capital.

Source: ABS 2014

Figure 3.1 New capital expenditure in the NSW mining industry (current prices)

The effects of the mining slowdown are also being observed in the labour market. In a reversal of the recent past, there is now an excess of qualified mining engineers in NSW (Australian Journal of Mining 2014), as well as a shortage of positions for mining apprentices and trainees in the Hunter Valley (Australian Mining 2013). This is reflected in the unemployment rate in the Hunter Valley which has increased notably since 2011: 5.2 per cent in 2011 to 5.6 per cent in September 2013 (HVRFa, 2013).

3.3 Regional impacts

The HVRF's measure of employment intentions suggest that further weakness in the Hunter Valley labour market can be anticipated. Employment intentions have declined since December 2011 with HVRF's most recent measures lower than those during the Global Financial Crisis of 2008. Similar trends are also evident in the HVRF's (2013b) *Household Survey*, which suggests that consumer confidence and purchasing intentions in the Hunter Valley remains negative. Overall, HVRF (2013b) concludes that the economic outlook for the Hunter Valley reflects the end of the previous expansion phase combined with a drive to achieve efficiencies, the effects of which are now being felt by local suppliers, contractors and operational employees.

Recent job losses have also occurred in the wider industry, with approximately 1,500 direct mining jobs lost in the Hunter over the last 18 months (NSW Mining 2014). These job losses and their respective flow-on effects are representative of the indicators described above.

3.4 Operational integration of MTO and Warkworth Mine

The operational integration of MTO and Warkworth Mine is critical to operations and environmental management at the respective mines.

Examples of operational integration include:

- emplacement of overburden from Warkworth Mine at MTO assisting in the final landform development at MTO obviating issues with limitations in overburden emplacement capacity at Warkworth Mine and filling the Loders Pit final void leading to an improved environmental outcome;
- the MTW WMS that controls the flow and storage of water of different qualities across the operations and balanced to minimise the risk of uncontrolled releases from mine site storages;
- tailings management including the receipt of tailings from Warkworth Mine at MTO TSFs; and
- shared use of equipment and workforce between Warkworth Mine and MTO.

The proposal would enable the continued use of the MTO CPP to meet the production demands across MTW. The ability to increase throughput at MTO CPP provides operational flexibility to support MTW as the existing CPP infrastructure at both mines ages.

3.5 Completion of mining

As noted in Section 2.4.1, approved mining in Loders Pit was expected to be completed in 2017, however was delayed due to a significant rain event in June 2007 which saw Loders Pit flooded. The proposal would enable the continued mining of Loders Pit which would conclude in approximately 2020. The proposal also enables mining in AGN which would take approximately two years and be completed before 2022. This would enable extraction of approximately 28.6Mt of ROM coal.

3.6 Other benefits

The approved final landform at MTO, incorporated into the 1995 EIS, consists of a narrow valley leading to a final void. On either side of this valley is an elevated ridge that grades into the surrounding landform. Design of this final landform was constrained by the amount over overburden available within MTO. The ability to transfer overburden from Warkworth Mine to MTO avoids the need for a final void and allows for the design of a more natural looking final landform which would integrate better with the final landform of Warkworth Mine and the Bulga Coal Complex.

Subject to the approval of Warkworth Continuation 2014, the subject proposal would prevent the relocation of Putty Road which is currently approved under DA34/95 (subject to the feasibility of continued mining at MTO alone).

The proposal would also enable the provision of a fully contemporised development consent for MTO.

3.7 Summary

In summary, the proposal would enable the continued operational integration of MTO and Warkworth Mine which is critical to operations and environmental management at the respective mines. Therefore, the proposal is integral to the continued direct employment of an average of approximately 1,300 people across MTW (of which approximately 121 persons on average would be attributable to this proposal) and indirect employment or flow-on-effects of around 206 and 214 full-time equivalent workers per annum in NSW and in the Mid and Upper Hunter region, respectively. The proposal would also enable the continued provision of the mines' local, State and National benefits to continue.

The proposal also prevents the potential sterilisation of coal resource that is approved for extraction but cannot be mined during the current consent period and would result in an improved final landform amongst other benefits.

Chapter 4

The applicant and assessment requirements

Chapter 4 — The applicant and assessment requirements

4 The applicant and assessment requirements

4.1 The applicant

The applicant for the proposal is Mt Thorley Operations Pty Limited. Mount Thorley Operations Pty Limited has been appointed pursuant to the Mt Thorley Co-Venture Deed, as the manager of the Mt Thorley Co-Venture.

Ownership in the Mt Thorley Co-Venture is as follows:

- Mt Thorley Operations Pty Ltd (80 per cent); and
- POSCO Australia Pty Ltd (20 per cent).

The MTO is managed by Coal & Allied, which in turn receives management services from Rio Tinto Coal Australia Pty Ltd. The ownership and management structure for MTO is shown below.

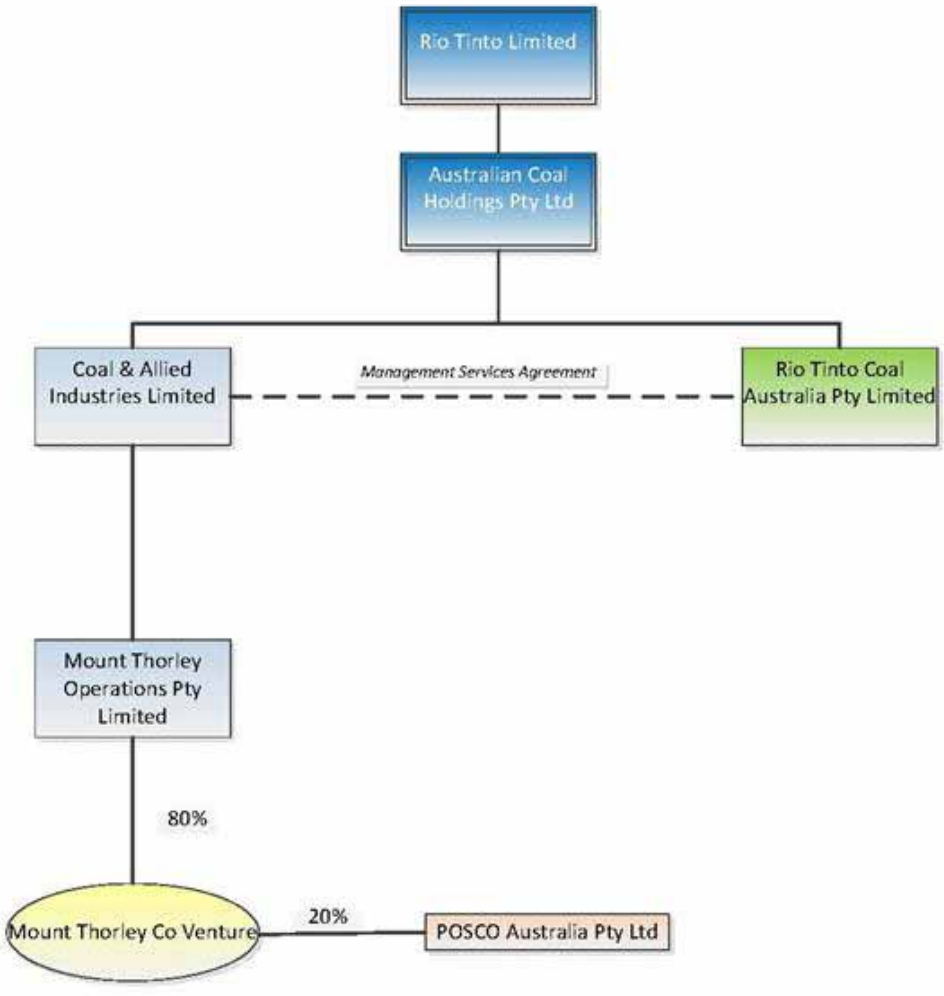


Figure 4.1 MTO ownership and management structure

4.2 Secretary's requirements

A request for environmental assessment requirements was submitted to the Director-General of the DP&E on 1 April 2014. The Secretary's requirements were issued on 22 May 2014 and are attached as Appendix D to this EIS.

Together with the matters raised stakeholder engagement, and as required under section 78A of the EP&A Act, this EIS has been prepared in accordance with the Secretary's requirements. A list of each of the requirements and the relevant sections of the EIS where these have been addressed are provided in Table 4.1.

Table 4.1 Summary of Secretary's requirements

Requirement	EIS reference
General requirements	
The Environmental Impact Statement (EIS) for the development must comply with the requirements in Clauses 6 and 7 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000.	Table 6.1
In particular, the EIS must include:	
• a full description of the development, including:	Chapter 2
- the resource to be extracted, demonstrating efficient resource recovery within environmental constraints;	Section 2.4.3
- the mine layout and scheduling;	Section 2.4.2
- minerals processing;	Section 2.4.7
- a waste (overburden, tailings, etc.) management strategy, dealing with the EPA's requirements (see Attachment 2);	Section 2.4.9
- a water management strategy, dealing with the EPA's and NSW Trade and Investment's requirements (see Attachment 2);	Sections 2.4.12 and 16.3.2, Appendix I and J
- a rehabilitation strategy, dealing with NSW Trade and Investment's requirements (see Attachment 2); and	Section 12.4
- the likely interactions between the development and any other existing, approved or proposed mining development in the vicinity of the site;	Sections 2.4 and 6.2
• a list of any approvals that must be obtained before the development may commence;	Section 6.6
• an assessment of the likely impacts of the development on the environment, focussing on the specific issues identified below, including:	Chapters 8 to 20
- a description of the existing environment likely to be affected by the development, using sufficient baseline data;	
- an assessment of the likely impacts of all stages of the development, including any cumulative impacts, taking into consideration any relevant laws, environmental planning instruments, guidelines, policies, plans and industry codes of practice;	
- a description of the measures that would be implemented to mitigate and/or offset the likely impacts of the development, and an assessment of:	
o whether these measures are consistent with industry best practice, and represent the full range of reasonable and feasible mitigation measures that could be implemented;	
o the likely effectiveness of these measures; and	
o whether contingency plans would be necessary to manage any residual risks;	
- a description of the measures that would be implemented to monitor and report on the environmental performance of the development if it is approved;	
• a consolidated summary of all the proposed environmental management and monitoring measures, identifying all the commitments in the EIS;	Table 21.1

Table 4.1 Summary of Secretary's requirements

Requirement	EIS reference
• consideration of the development against all relevant environmental planning instruments (including Part 3 of the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007); and	Chapter 6
• the reasons why the development should be approved having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development.	Section 23.1
In addition to the matters set out in Schedule 1 of the Environmental Planning and Assessment Regulation 2000, the development application must be accompanied by a signed report from a suitably qualified expert that includes an accurate estimate of the: • capital investment value (as defined in Clause 3 of the Environmental Planning and Assessment Regulation 2000) of the development, including details of all the assumptions and components from which the capital investment value calculation is derived; and • jobs that would be created during each stage of the development.	The signed report by a suitably qualified expert is provided separately to DP&E and not included in the EIS documentation
Specific issues The EIS must address the following specific issues:	
• **Noise & Blasting** – including: - an assessment of the likely operational noise impacts of the development (including construction noise) under the NSW Industrial Noise Policy, paying particular attention to establishing accurate background noise levels in the surrounding area and the obligations in chapters 8 and 9 of the policy; - if a claim is made for specific construction noise criteria for certain activities, then this claim must be justified and accompanied by an assessment of the likely construction noise impacts of these activities under the Interim Construction Noise Guideline; - an assessment of the likely road noise impacts of the development under the NSW Road Noise Policy; and - an assessment of the likely blasting impacts of the development on people, animals, buildings and infrastructure, and significant natural features, having regard to the relevant ANZEC guidelines;	Appendix F, Chapter 9
• **Air** – including: - an assessment of the likely air quality impacts of the development in accordance with the Approved Methods for the Modelling and Assessment of Air Pollutants in NSW and the EPA's additional requirements (see Attachment 2); and - an assessment of the likely greenhouse gas impacts of the development, dealing with the EPA's requirements (see Attachment 2);	Appendix G, Chapter 10
• **Water** – including: - an assessment of the likely impacts of the development on the quantity and quality of the region's surface and groundwater resources, having regard to the EPA's and NSW Trade and Investment's requirements (see Attachment 2); - an assessment of the likely impacts of the development on aquifers, watercourses, riparian land, water-related infrastructure, and other water users; and - an assessment of the likely flooding impacts of the development;	Appendices H and I, Chapters 15 and 16
• **Land** – including: - an assessment of the likely impacts of the development on the soils, land capability, and landforms (topography) of the site; and - an assessment of the compatibility of the development with other land uses in the vicinity of the development in accordance with the requirements in Clause 12 of State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007;	Chapter 6 and 13

Table 4.1 Summary of Secretary's requirements

Requirement	EIS reference
• **Traffic** – including an assessment of the likely traffic impacts of the development on the capacity, condition, safety and efficiency of the local and State road network;	Appendix L, Chapter 19
• **Visual** – including an assessment of the likely visual impacts of the development on private landowners in the vicinity of the development and key vantage points in the public domain, the creation of new landforms (overburden dumps, bunds, etc.), and minimising the lighting impacts of the development;	Appendix H, Chapter 14
• **Biodiversity** – ongoing management of approved impacts on biodiversity;	Chapter 11
• **Heritage** – ongoing management of approved impacts on Aboriginal and historic heritage (cultural and archaeological);	Appendix K, Chapters 17 and 18
• **Public Safety** – including an assessment of the likely risks to public safety off-site, paying particular attention to bushfire risks and the handling and use of any dangerous goods;	Section 2.4.10
• **Social & Economic** – including: - an assessment of the likely social impacts of the development (including perceived impacts), paying particular attention to any impacts on Bulga village; and - an assessment of the likely economic impacts of the development, paying particular attention to: o the significance of the resource; o economic benefits of the project for the State and region; and o the demand for the provision of local infrastructure and services.	Appendices E and L, Chapters 8 and 20
Consultation	
During the preparation of the EIS, you must consult with relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners. The EIS must describe the consultation that was carried out, identify the issues raised during this consultation, and explain how these issues have been addressed in the EIS.	Chapter 7

4.3 Environmental risk assessment

4.3.1 Method

In accordance with the Secretary's requirements and Rio Tinto Coal Australia's standard practices, an environmental risk assessment was completed for the proposal.

Numerous workshops were held between relevant internal stakeholders to develop a proposal that meets MTO's objectives and ensure environmental risks were considered during its design.

Following the preparation of the preliminary mine design an information gaps analysis was completed by the study team to aid in the definition of technical study scopes and enable an informed preliminary risk assessment workshop.

A preliminary environmental risk workshop was held and attended by Rio Tinto Coal Australia, EMM and project approval, social and communications specialists, mine planners and technical specialists for all of the environmental attributes. The key objective of the workshop was to determine the proposal's potential incremental (compared to the existing operations) environmental impacts, the likelihood of them occurring and the consequences of occurrence.

Risks were determined using standard safeguards, design or management measures applied at all Coal & Allied operations. Three levels of risk rating were established: low, medium and high. Each of the risk sources were then allocated an issue prioritisation category based on their considered likelihood and consequence of occurrence. Together with the Secretary's requirements and the outcomes of stakeholder engagement (refer to Section 4.2 and Chapter 7, respectively) these were used to determine environmental impact assessment priorities for this EIS.

4.3.2 Environmental issue prioritisation

Based on the outcomes of the workshop, the following broad qualitative risk prioritisation categories were assigned to each environmental attribute:

- High – noise and vibration, air quality and greenhouse gases;
- Moderate – groundwater, surface water, final landform and rehabilitation, and visual amenity; and
- Low – biodiversity, Aboriginal cultural heritage, historic heritage, traffic and transport, and land and soils capability.

Assessments for each of the attributes listed above have been undertaken as part of this EIS, commensurate with risk. The risk assessment process only considered potentially adverse environmental incremental impacts; however, the proposal would have a number of substantial benefits, including economic and social benefits which are further detailed in the respective chapters.

Chapter 5

Existing operations

Chapter 5 — Existing operations

5 Existing operations

A brief overview of the MTO's approval history is given in Section 2.1. As noted, the current development consent was granted by the Minister for Urban Affairs and Planning on 22 June 1996. The development consent allowed for the continuation of mining operations and a 400ha extension of the mining area to the west (ie Loders Pit).

Five modifications have been subsequently made to the development consent, with the most recent granted 2 May 2012. These are detailed in Table 5.1 below.

Table 5.1 Overview of modifications to development consent DA34/95

Modification number	Year	Overview
Modification 1	2001	To allow for haulage of ROM coal between MTO and Warkworth Mine.
Modification 2	2002	To allow for: • establishment of two new boxcut pits (AGN and AGS) to ultimately be used for storage of rejects; • placement of overburden to the east of and adjacent to the new boxcut pits; • an increase in the throughput at MTO CPP from 8Mtpa of ROM coal to 10Mtpa of ROM coal; • disposal of reject from Warkworth Mine at MTO and the transfer of mine and decanted water between Warkworth Mine and MTO; and • an increase in the capacity of Dam 9S from 288 to 500ML.
Modification 3	2004	To allow for: • erection of a new reject bin and corresponding rejects conveyor adjacent to the MTO CPP, for direct loading of rejects to the MTW truck fleet; • installation of ROM truck dump dust hoods over the existing ROM bins located at the western end of the MTO CPP; and • mining of the existing haul road between AGN and AGS, resulting in one pit rather than two separate pits.
Modification 4	2009	To allow for an extension of Dam 9S increasing its storage capacity from 500ML to 2,000ML, to replace Dams 6S, 7S and 8S with a single mine water dam.
Modification 5	2012	To allow for: • extension of AGN to the west by approximately 75ha; • realignment of a coal haul road to accommodate the pit extension and continued trucking of coal to the MTO CPP; • relocation of minor infrastructure and services to suitable locations outside of the pit extension area but within the confines of the approved mine site; and • temporary storage of mine water in AGN and the adjacent AGS void.

Note: All activities proposed under DA 34/95 via the original application and the subsequent modification and supporting documents listed above are continued under this proposal.

5.1 Approved operations

Chapter 2, the proposal, provides detail on the existing operations at MTO that would be continued under the proposal including mining methods; infrastructure; coal washing and processing; coal transport; rejects and tailings disposal; final landuse, final landform and rehabilitation. Therefore, this information is not repeated here.

It is assumed that a condition would be included in any approval for the proposal requiring the surrender of DA 34/95 at an appropriate time.

5.2 Existing interactions with associated facilities and other operations

5.2.1 Mount Thorley Operations and Warkworth Mine

As noted previously MTO and Warkworth Mine are integrated at an operational level with a single management team responsible for the management of all operations on either side of Putty Road and a single workforce and equipment fleet which may be allocated across any part of MTW as required. Interactions between the two mines are described in Chapter 2.

5.2.2 Mount Thorley Operations and Hunter Valley Operations

The Hunter Valley Operations is a coal mine north of Warkworth Mine, approximately 24km north-west of Singleton. The MTO and Hunter Valley Operations are separate operations with different ownership, although both are managed by Coal & Allied. Interactions between the operations are limited.

The South Lemington Pit 1 void at Hunter Valley Operations is currently used for temporary storage of mine water from both Hunter Valley Operations and Warkworth Mine (together with MTO as water management is integrated across MTW). A water main links the Hunter Valley Operations with Warkworth Mine (and hence MTO) allowing for water to be pumped in either direction as currently occurs on a routine basis.

5.2.3 Mount Thorley Operations and Bulga Coal Complex

Bulga Coal Complex is a coal mine south-east of MTO, approximately 12km south-west of Singleton. Mining activities at the Bulga Coal Complex are split between the open cut operations (Bulga Surface Operations) and the underground operations (Bulga Underground Operations), with shared coal preparation and rail loading infrastructure.

As described in Section 2.4.2, the development consent for the surface operations at the Bulga Coal Complex (DA 41-03-1999, as modified) allows for the development of a common landform with MTO. Development of the final landform may require emplacement of overburden from the surface operations at Bulga Coal Complex to MTO and overburden from MTO to the Bulga Coal Complex. This exchange of overburden between MTO and Bulga Coal Complex is the subject of the DA for the Bulga Optimisation Project, and is also considered under the proposal.

Water transfer has historically occurred between the Bulga Coal Complex void and MTO, as documented in the Mount Thorley Operations 2002 SEE, is set to continue as part of the proposal.

5.2.4 Mount Thorley Operations and Wambo Mine

Wambo Mine is an open cut and underground coal mining operation north-west of MTO, approximately 15km west of Singleton. Subject to agreement, MTO proposes to import mine water from neighbouring operations, including Wambo Mine. The transfer of water from Wambo is addressed in DA 305-7-2003 and Sections 2.10 and 4.6.1 of the associated EIS. Transfer from Wambo Mine would be via Hunter Valley Operations by an existing pipeline to Warkworth Mine, where transfer may occur as part of the operational integration of Warkworth Mine and MTO.

5.3 Environmental management

Environmental aspects of the integrated operations are managed under Coal & Allied's accredited ISO 14001 EMS which forms part of the Rio Tinto Coal Australia's HSEQ Management System.

The HSEQ Management System enables the operations to apply specific tools that support the implementation, execution and effectiveness of the Rio Tinto health, safety and environmental performance standards.

The HSEQ management system is designed on the principles of continuous improvement and generally follows the layout of common international standards (including ISO14001) and the Plan, Do, Check and Review cycle:

- Plan - identify what is required;
- Do - implement the activities;
- Check - monitor performance through checking and corrective action; and
- Review - evaluate the suitability, adequacy and effectiveness of the system through the management review.

The EMS relies upon an environmental policy, risk register, objectives and targets, a series of regulatory required management plans, a monitoring programme and environmental standards and procedures. The EMS forms the basis for rigorous and consistent environmental management. The EMS is subject to independent compliance audits every three years. The effectiveness of the system has been demonstrated through audits, which have shown a consistent trend in environmental improvement throughout the business, including MTO.

As part of the EMS, the mining operations at MTO are managed and monitored as the integrated MTW operations. An overview of existing management and monitoring procedures for the various environmental attributes are provided as appropriate in respective chapters in this EIS. This includes Sections 9.5 and 10.5 which describe operational management of noise and dust emissions, respectively.

Independent environmental audits are to be undertaken every three years (with the next one due in early 2015) to assess the environmental performance of the development and determine whether it is complying with the requirements of the development consent and any other relevant approvals, environment protection licences (EPL) and mining leases, including any assessment, plan or programme required under these approvals. The audits are also to review the adequacy of any strategy, plan or programme required under the abovementioned approvals and recommend measures or actions to improve the environmental performance of the development and/or any strategy, plan or programme. The audits are to be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Director-General and include consultation with relevant agencies.

An Annual Report is produced each calendar year in accordance with the existing consent conditions. The operations environmental performance with respect to the relevant monitoring requirements is documented in the Annual Report and made available to the community on the Coal & Allied website.

Chapter 6

Legislative considerations

Chapter 6 — Legislative considerations

6 Legislative considerations

6.1 Overview

This chapter describes the relevant State and Commonwealth legislation and regulatory framework under which the proposal will be assessed and determined.

6.2 Environmental Planning and Assessment Act 1979

The EP&A Act and the EP&A Regulation form the statutory framework for planning approval and environmental assessment in NSW. Implementation of the EP&A Act is the responsibility of the Minister for Planning, statutory authorities and local councils. It contains three parts that impose requirements for planning approval:

- Part 4 which provides for control of 'development' that requires development consent from the relevant consent authority. A division of Part 4 (Division 4.1) provides for control of State significant development (SSD) where the Minister for Planning (or delegate) is the consent authority;
- Part 5 which provides for control of 'activities' that do not require approval or development consent under or Part 4; and
- Part 5A which provides for control of State significant infrastructure that do not require approval or development consent under Part 4.

The requirement for development consent is set out in environmental planning instruments (EPIs); state environmental planning policies (SEPPs), regional environmental plans (REPs) or local environmental plans (LEPs).

6.2.1 State significant development provisions

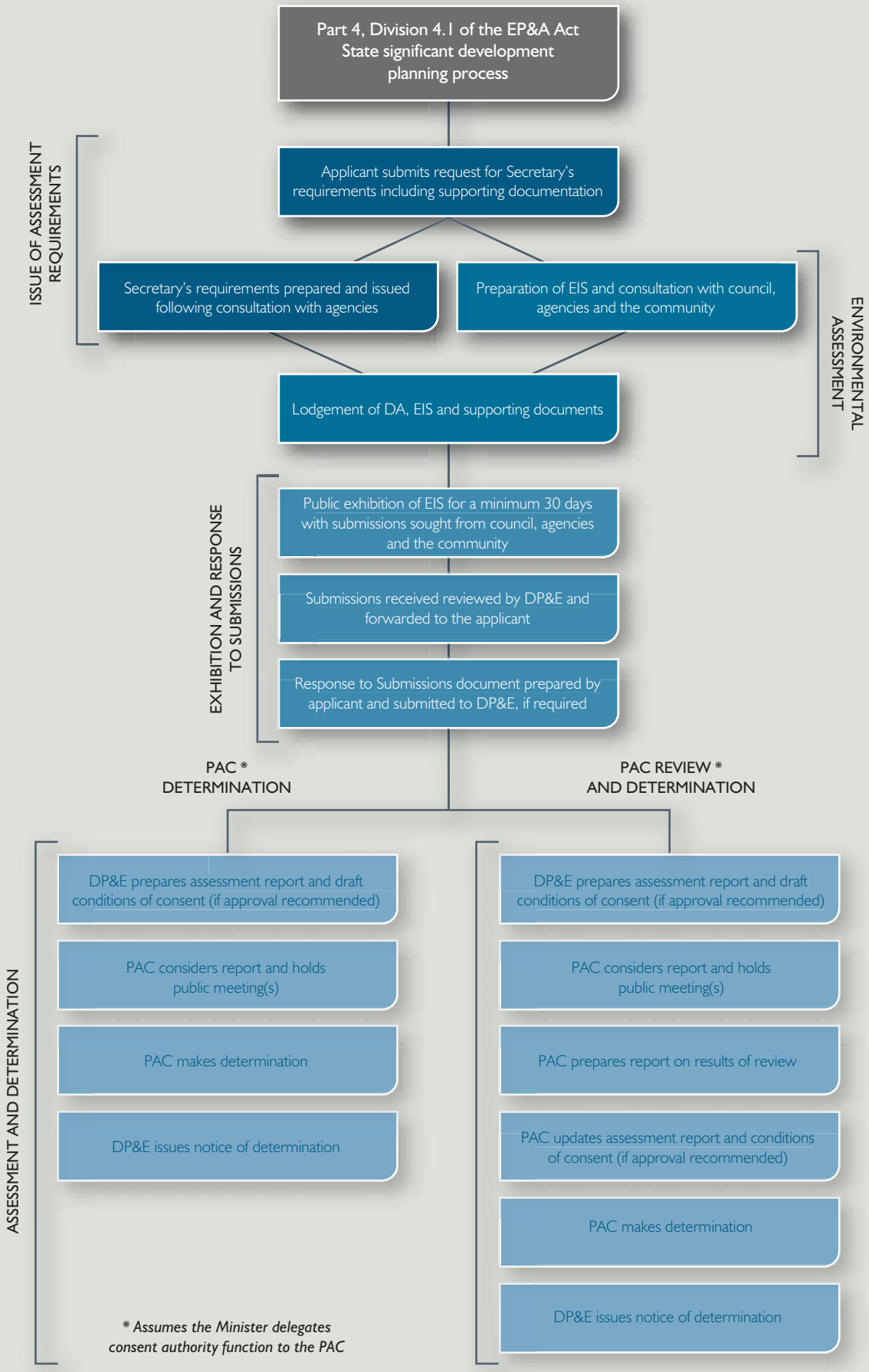
Division 4.1 of the EP&A Act specifically relates to the assessment of development deemed to be significant to the State (or SSD). The planning process under this part of the EP&A Act is presented in Figure 6.1.

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 the State Environmental Planning Policy (State and Regional Development) 2011 (the SRD SEPP) declares certain categories of development to be SSD. Relevantly, development for the purpose of coal mining is declared as SSD and, accordingly, Part 4.1 of the EP&A Act applies to the proposal.

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



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Planning approval process

Mount Thorley Operations 2014 Environmental Impact Statement

Figure 6.1

A DA for SSD must be accompanied by an EIS, prepared in accordance with the EP&A Regulation. Before lodging an EIS, an applicant must request Secretary's requirements which are essentially terms of reference that specify what must be addressed in an EIS. The Secretary's requirements for the proposal were issued on 22 May 2014 and are provided in Appendix D. The sections of the EIS where the Secretary's requirements have been addressed are identified in Table 4.1.

Section 89E of the EP&A Act is the primary provision in the Act giving the Minster (or delegate) the power to determine a DA for SSD. Section 89E(1) states:

> The Minister is to determine a development application in respect of State significant development by:
>
> (a) granting consent to the application with such modifications of the proposed development or on such conditions as the Minister may determine, or
>
> (b) refusing consent to the application.

The relevant factors in the assessment and determination of the proposal are addressed below.

6.2.2 Objects of the Act

The objects of the EP&A Act are specified in section 5. It states:

> The objects of this Act are:
>
> (a) to encourage:
>
> (i) 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,
>
> (ii) the promotion and co-ordination of the orderly and economic use and development of land,
>
> (iii) the protection, provision and co-ordination of communication and utility services,
>
> (iv) the provision of land for public purposes,
>
> (v) the provision and co-ordination of community services and facilities, and
>
> (vi) 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, and
>
> (vii) ecologically sustainable development, and
>
> (viii) the provision and maintenance of affordable housing, and
>
> (b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and
>
> (c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

An assessment of the proposal against the objects of the EP&A Act is provided 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 MTO contains coal resources approved for extraction under the current development consent; however, inaccessible within the development consent period. These resources are supported by existing extensive physical and human infrastructure. The proposal would facilitate proper development and the continued orderly use of these resources, thus promoting social and economic welfare. It would also not unduly compromise or prejudice the conservation of natural resources.

> *To encourage the promotion and co-ordination of the orderly and economic use and development of land.*

The proposal would allow for the continued development of a natural mineral resource on land within the footprint of existing mining leases. It would constitute an orderly and economic use of land and the resources that are contained within it.

> *To encourage the protection, provision and co-ordination of communication and utility services.*

This object is not applicable to the proposal.

> *To encourage the provision of land for public purposes.*

All the elements of the proposal would be constructed on privately-owned land within the footprint of existing mining leases. The proposed heritage conservation area provides land for public purposes.

> *To encourage the provision and co-ordination of community services and facilities.*

The proposal enables jobs to be maintained; it does not seek to increase MTW's workforce. Accordingly, there is unlikely to be any demand for additional community services. Ongoing operations would enable continued support of the community through initiatives such as the Coal & Allied Community Development Fund. Royalties generated by the continued operation of MTW (estimated to be around $617million in NPV terms) go to State revenue to provide for 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 proposal takes into account this objective. The proposal is entirely within previously disturbed land and highly unlikely to have significant ecological impacts. Proposed rehabilitation would improve the ecological value of disturbed land within the Site, providing for connectivity with remnant vegetation and rehabilitated mining areas to the north and south.

> *To encourage ecologically sustainable development.*

The Commonwealth Government's *National Strategy for Ecologically Sustainable Development* (Ecologically Sustainable Development Steering Committee 1992) defines ESD as 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'.

The proposal would enhance community resources by providing considerable employment and public revenues through royalties and taxes. In this way it would contribute to improvements in the local, State and National economies and contribute to an overall increase in quality of life. Also, the proposal would conserve community resources directly through the establishment of conservation areas and indirectly through effective impact mitigation.

Proposed rehabilitation of disturbed land, in combination with the protection of a nearby area for cultural heritage, would improve and maintain environmental quality now and for the future. The proposal would make a negligible contribution to global greenhouse gases (Scope 1 and 2). Less efficient energy production from low quality coal and/or less efficient mining would involve a higher contribution.

The principles of ESD are outlined in section 6 of the POEO Act and Schedule 2 of the EP&A Regulation. The proposal is consistent with ESD and its principles as discussed in Chapter 23.

> *To encourage he provision and maintenance of affordable housing.*

As the proposal utilises the same workforce, there would not be an increase in the demand on housing.

> *To promote the sharing of the responsibility for environmental planning between the different levels of government in the State.*

All relevant State and local government agencies have been consulted during the preparation of the EIS. Further consultation would occur during the response to submissions following exhibition and pre-determination phases.

> *To provide increased opportunity for public involvement and participation in environmental planning and assessment.*

Extensive community consultation was undertaken as part of the social impact study for the proposal. Feedback received through the consultation process has been considered in the preparation of the EIS. Public involvement and participation will also be provided through the public exhibition process of this EIS.

6.2.3 Section 79C matters for consideration

i General

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."

(2) Compliance with non-discretionary development standards—development other than complying development

If an environmental planning instrument or a regulation contains non-discretionary development standards and development, not being complying development, the subject of a development application complies with those standards, the consent authority:

(a) is not entitled to take those standards into further consideration in determining the development application, and

(b) must not refuse the application on the ground that the development does not comply with those standards, and

(c) must not impose a condition of consent that has the same, or substantially the same, effect as those standards but is more onerous than those standards,

and the discretion of the consent authority under this section and section 80 is limited accordingly.

(3) If an environmental planning instrument or a regulation contains non-discretionary development standards and development the subject of a development application does not comply with those standards:

(a) subsection (2) does not apply and the discretion of the consent authority under this section and section 80 is not limited as referred to in that subsection, and

(b) a provision of an environmental planning instrument that allows flexibility in the application of a development standard may be applied to the non-discretionary development standard.

The above matters are considered below and throughout this EIS. Notwithstanding the contents of section 79C(1)(iii), clause 11 of the SRD SEPP states that development control plans do not apply to SSD.

ii Environmental planning instrument framework

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

Aims

Clause 2 of the Mining SEPP sets out its aims. It states:

> The aims of this Policy are, in recognition of the importance to New South Wales of mining, petroleum production and extractive industries:
>
> (a) to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and
>
> (b) to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and
>
> (b1) to promote the development of significant mineral resources, and
>
> (c) to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources, and
>
> (d) to establish a gateway assessment process for certain mining and petroleum (oil and gas) development:
>
> (i) to recognise the importance of agricultural resources, and
>
> (ii) to ensure protection of strategic agricultural land and water resources, and
>
> (iii) to ensure a balanced use of land by potentially competing industries, and
>
> (iv) to provide for the sustainable growth of mining, petroleum and agricultural industries.

For the reasons set out in the chapter, the proposal is considered to be consistent with these aims.

Permissibility

The proposal is permissible with consent by virtue of clause 7(1)(b) of the Mining SEPP which states that development for the purposes of mining may be carried out:

> (i) on land where development for the purposes of agriculture or industry may be carried out (with or without development consent), or

(ii) on land that is, immediately before the commencement of this clause, the subject of a mining lease under the *Mining Act 1992* or a mining licence under the *Offshore Minerals Act 1999*,

The proposal would be carried out on land where development for the purposes of agriculture or industry may be carried out with consent. This is because the Site is zoned RU1 Primary Production under the Singleton Local Environmental Plan 2013 (LEP 2013). Development permitted with consent in this zone includes open cut mining, as well as agriculture and industry.

Matters for consideration

Part 3 of the Mining SEPP sets out a number of matters the consent authority must consider before determining an application for consent for development for the purposes of mining. These matters include the significance of the resource (clause 12AA), non-discretionary development standards for mining (clause 12AB), the compatibility of the mine with other land uses (clause 12), compatibility of proposal with mining (clause 13), natural resource management and environmental management (clause 14), resource recovery (clause 15), transport (clause 16) and rehabilitation (clause 17).

These matters are addressed below.

Significance of the resource

Clause 12AA of the Mining SEPP states:

(1) In determining an application for consent for development for the purposes of mining, the consent authority must consider the significance of the resource that is the subject of the application, having regard to:

(a) the economic benefits, both to the State and the region in which the development is proposed to be carried out, of developing the resource, and

(b) any advice by the Director-General of the Department of Trade and Investment, Regional Infrastructure and Services as to the relative significance of the resource in comparison with other mineral resources across the State.

(2) The following matters are (without limitation) taken to be relevant for the purposes of subclause (1)(a):

(a) employment generation,

(b) expenditure, including capital investment,

(c) the payment of royalties to the State.

(3) The Director-General of the Department of Trade and Investment, Regional Infrastructure and Services is, in providing advice under subclause (1)(b), to have regard to such matters as that Director-General considers relevant, including (without limitation):

(a) the size, quality and availability of the resource that is the subject of the application, and

(b) the proximity and access of the land to which the application relates to existing or proposed infrastructure, and

(c) the relationship of the resource to any existing mine, and

(d) whether other industries or projects are dependent on the development of the resource.

(4) In determining whether to grant consent to the proposed development, the significance of the resource is to be the consent authority's principal consideration under this Part.

(5) Accordingly, the weight to be given by the consent authority to any other matter for consideration under this Part is to be proportionate to the importance of that other matter in comparison with the significance of the resource.

(emphasis added)

Clause 12AA of the Mining SEPP operates to make the 'significance of the resource' the principal consideration of the matters the Minister is to consider under Part 3 of the Mining SEPP. The operation of clause 12AA is therefore limited to considerations under Part 3 of the Mining SEPP. Clause 12AA does not operate to make the 'significance of the resource' the principal consideration of the matters contained within section 79C.

Matters relating to the economic benefits, both to the State and the region in which the development is proposed to be carried out, of developing the resource are detailed in Chapter 8. This chapter provides a summary of an economic study that has been prepared which describes the direct and flow-on economic benefits of the proposal and the Warkworth Continuation 2014 proposal (aggregated). It considers the incremental or net impacts relative to the counterfactual that both proposals are not approved and MTW ceases operating at the end of 2021.

The economic study has two components, a cost benefit analysis (CBA) and a regional economic impact analysis (REIA). CBA considers the direct costs and benefits accruing in NSW from the proposals, for instance, from additional value added in the form of wages and salaries paid to employees and contractors. Flow-on effects of the proposals, such as the effects on regional income, employment or value added, are assessed in the REIA.

As clause 12AA(2) states, the matters relevant in considering economic benefits, both to the State and the region in which the development is proposed to be carried out, of developing the resource are employment generation, expenditure, including capital investment, and the payment of royalties to the state. These matters are addressed below.

- **Employment generation:** As stated in Chapter 2, the current integrated Warkworth Mine and MTO workforce is approximately 1,300 people. The annual average employment directly attributable to MTO is approximately 121 persons. The proposal and the Warkworth Continuation 2014 proposal (aggregated) would provide the mine with its best opportunity of maintaining its current workforce and extending it for a further 14 years beyond the existing approval period (ie from 2021, assuming the project is determined by end of 2014 to 2035).

  The economic study demonstrates that the proposal and the Warkworth Continuation 2014 proposal (aggregated) are expected to have positive flow-on effects on the NSW, regional and local economies based on the significant projected expenditures on wages and salaries, as well as other mining inputs by MTW. The initial flow-on effects are estimated to generate additional annual employment of around 206, 214, and 61 full-time equivalent workers in NSW, the Mid and Upper Hunter region and Singleton LGA, respectively.

- **Expenditure, including capital investment:** Note: that the BCA estimates operating expenditures for MTO at around $393million in NPV terms. The aggregated operating expenditure for the proposals is estimated at $3.8billion in NPV terms. This excludes capital expenditure. The economic impact has been evaluated with reference to its contribution to NSW gross state product (GSP). In calculating GSP, the income flows accruing to the factors of production are required, including the share of income from production that can be attributed to capital inputs for incorporated businesses, which is also known as the gross operating surplus (GOS). GOS is calculated as output valued at producer prices, net of intermediate consumption (operating expenditure), net of employee compensation, and net of taxes on production (ABS 2013). Calculating the GOS requires that certain Australian System of National Accounts (ASNA) conventions are followed. Expenditures on assets that are not 'used up' in the course of the production process and which yield benefits beyond the period in which they are purchased (ie capital expenditure) are not included in the calculation to derive GOS.

- **The payment of royalties to the State:** The economic study demonstrates that in net present value (NPV) terms, the proposal would deliver net benefits to NSW of around $149million, including around $50million in additional coal royalties paid to the NSW Government. The aggregated net benefits of the proposals to NSW would be around $1.5billion, including around $617million in additional coal royalties paid to the NSW Government and about $259million in payroll taxes, council rates and other payments that accrue to different levels of Government.

Matters relating to the significance of the resource are detailed in Chapters 2 and 3. They are summarised below.

- **Size, quality and availability of the resource:** Estimated reserves and resources to the end of 2013 are presented in Section 2.4.3. More recently the resource was determined to be 28.6Mt. The proposal would enable the continued extraction of the approved resource (approximately 28.6Mt of ROM coal) to be mined over the life of the operations.

  Mineable coal consists of approximately 20 coal seams which are suitable for production of either thermal or semi-soft coking coal. This coal is mineable by existing open cut mining practices, including the use of a dragline, shovels, excavators, loaders, dozers and truck fleets. These practices have proved appropriate for the geological conditions encountered at the mine and the required production rates.

- **Proximity and access to existing or proposed infrastructure:** The land to which the application relates is owned by Miller Pohang Coal Pty Limited and contained within existing mining lease (CL219). The land is contiguous with existing mining areas and has direct access to existing infrastructure. This infrastructure has been listed in Section 2.4.6 and includes everything required for the processing and transportation of coal.

- **Relationship of the resource to any existing mine:** The resource proposed to be mined is associated with MTO and Warkworth Mine and enables the continued integrated operation of MTW.

- **Other industries or projects are dependent on the development of the resource:** There are a number of other industries that would be adversely impacted if the proposal does not proceed. These include upstream industries that supply goods and services to MTO and downstream industries that utilise the coal produced at the mine.

  In 2013 MTW spent $573million with 803 suppliers in Australia. Of this, $147million was spent on 377 suppliers in NSW, and $188million was spent on 228 local suppliers (ie from Upper Hunter, Muswellbrook, Singleton, Maitland and Cessnock LGAs. This correlates to an average spend of $820,000 per local supplier.

  Downstream industries that utilise the coal include domestic (Redbank Power Station) and overseas energy producers and steel makers.

Non-discretionary development standards

Clause 12AB of the Mining SEPP sets out a number of non-discretionary development standards for the purposes of section 79C(2) and (3) of the EP&A Act in relation to the carrying out of development for the purposes of mining. These standards relate to cumulative noise level, cumulative air quality level, airblast overpressure, ground vibration and aquifer interference. These standards are addressed in Chapters 9, 10 and 15 respectively for noise and vibration, air quality and groundwater.

Compatibility of the mine with other land uses

Clause 12 of the Mining SEPP states that:

> Before determining an application for consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must:
>
> (a) consider:
>
> (i) the existing uses and approved uses of land in the vicinity of the development, and
>
> (ii) whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and
>
> (iii) any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses, and
>
> (b) evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a)(i) and (ii), and
>
> (c) evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a)(iii).

These matters are addressed below.

> Consider the existing uses and approved uses of land in the vicinity of the development.

The area immediately surrounding MTO is dominated by coal mines and associated infrastructure and other industry. This includes the Warkworth Mine, Hunter Valley Operations, Wambo Mine and Redbank Power Station to the north and north-west, Bulga Coal Complex to the south, and MTCL and MTIE to the east. There is also extensive rail and electricity infrastructure in place. Bulga Coal has applied to the Minister for Planning for development consent to continue operations at the Bulga Coal Complex (Bulga Optimisation Project).

There are number of rural and rural/residential properties located to the north-east and south-west of the mine. The villages of Bulga and Warkworth are located to the west and north-west, respectively. Further to the west are the Wollemi and Yengo national parks.

The proposal, predominantly, seeks a continuation of all approved aspects of MTO for a longer period of time. Only minor alterations to approved operations are proposed. In light of the surrounding land uses it is considered that the proposal is appropriate to the existing and approved uses of land in the vicinity.

> Consider whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development.

It is a matter for the consent authority to determine the preferred uses of land in the vicinity of the proposal, having regard to land use trends. This EIS has considered impacts on the existing land uses, particularly on the rural/residential land uses identified above. As discussed in Chapter 23, subject to the application of the commitments, the proposal is unlikely to have a significant impact on these existing land uses.

> Consider any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses.

The proposal is a continuation of an existing mining operation which has been in operation since 1981. It is considered to be broadly compatible with surrounding land uses, particularly the mining and industrial land uses.

> Evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a)(i) and (ii).

The evaluation and comparison of the respective public benefits of the development and existing, approved and preferred land uses is a matter for the consent authority. However, there are clear public benefits associated with the continuation of mining within the footprint of existing mining leases. One tool the consent authority can use in making this evaluation and comparison is the economic study which describes the direct and flow-on economic benefits of the proposal and the Warkworth Continuation 2014 proposal (aggregated) for the Singleton LGA, Mid and Upper Hunter region and for NSW. As previously stated, it considers the incremental or net impacts relative to the counterfactual that both proposals are not approved and MTW ceases operating at the end of 2021.

In NPV terms, the proposal would deliver net benefits to NSW of around $149million. These net benefits take the form of:

- the additional disposable income received by MTW employees and long-term contractors who live in NSW, around $39million;
- the additional coal royalties paid to the NSW government of around $50million; and

- additional payroll taxes, council rates and other payments that accrue to different levels of government, and which amount to around $36million.

Almost three quarters of MTW employees and long-term contractors live in the Mid and Upper Hunter region. Around $23million in NPV terms in additional disposable income would flow to that region as a result of the proposal.

In addition to the direct effects described above, the proposal is expected to have positive flow-on effects on the NSW, regional and local economies. These flow-on effects are a reflection of the significant projected expenditures on wages and salaries, as well as other mining inputs by MTW. The initial flow-on effects are estimated at:

- around $39million, $23million and $9million in additional income (in NPV terms) for NSW, the Mid and Upper Hunter region and Singleton LGA, respectively;
- additional annual employment of around 15, 16, and 4 full-time equivalent workers in NSW, the Mid and Upper Hunter region and Singleton LGA, respectively; and
- an increase in the GSP of NSW of around $45million in NPV terms.

> Evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a)(iii).

A range of management measures and commitments have been made by MTO to mitigate potential impacts of the proposal on surrounding land uses. These commitments are summarised in Chapter 21. Subject to the application of the commitments, the proposal is unlikely to have a significant impact on these land uses.

Compatibility of proposal with mining

Clause 13 of the Mining SEPP relates to matters a consent authority must take into consideration when determining applications for development that is:

- in the vicinity of an existing mine, petroleum production facility or extractive industry;
- identified on a map as being the location of State or regionally significant resources of minerals, petroleum or extractive materials; or
- identified by an environmental planning instrument as being the location of significant resources of minerals, petroleum or extractive materials.

Clause 13(2) states:

> Before determining an application to which this clause applies, the consent authority must:
>
> (a) consider:
>
> (i) the existing uses and approved uses of land in the vicinity of the development, and
>
> (ii) whether or not the development is likely to have a significant impact on current or future extraction or recovery of minerals, petroleum or extractive materials (including by limiting access to, or impeding assessment of, those resources), and

(iii) any ways in which the development may be incompatible with any of those existing or approved uses or that current or future extraction or recovery, and

(b) evaluate and compare the respective public benefits of the development and the uses, extraction and recovery referred to in paragraph (a) (i) and (ii), and

(c) evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a) (iii).

Therefore, this clause requires the consent authority to consider the proposal's potential impact on other mining, petroleum production and extractive industries within the local area.

The proposal would be undertaken within the footprint of existing mining leases. It predominantly involves the continuation of approved activities including mining of Loders Pit and AGN. It would not impact on surrounding mines, or their ability to extract target resources. Further, it is noted that the Warkworth Continuation 2014 is critical to the viability of MTO as it would provide the necessary overburden volumes to complete the final landform. Similarly, the proposal is critical to the viability of Warkworth Mine as it would enable the ongoing provision of integrated services.

Natural resource and environmental management

Clause 14 of the Mining SEPP relates to natural resource and environmental management. It states:

(1) Before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure the following:

(a) that impacts on significant water resources, including surface and groundwater resources, are avoided, or are minimised to the greatest extent practicable,

(b) that impacts on threatened species and biodiversity, are avoided, or are minimised to the greatest extent practicable,

(c) that greenhouse gas emissions are minimised to the greatest extent practicable.

(2) Without limiting subclause (1), in determining a development application for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider an assessment of the greenhouse gas emissions (including downstream emissions) of the development, and must do so having regard to any applicable State or national policies, programs or guidelines concerning greenhouse gas emissions.

(3) Without limiting subclause (1), in determining a development application for development for the purposes of mining, the consent authority must consider any certification by the Chief Executive of the Office of Environment and Heritage or the Director-General of the Department of Primary Industries that measures to mitigate or offset the biodiversity impact of the proposed development will be adequate.

The drafting of any prospective conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner in relation to water resources, threatened species and biodiversity and greenhouse gases is a matter for the consent authority.

The results of the surface water and groundwater studies indicate that impacts are likely to be minor and manageable through licensing arrangements.

The majority of MTO has already been cleared for mining and rehabilitation is progressing generally in the east of the Site. The proposal would not introduce additional ecological impacts to those already assessed and approved under the development consent. The proposal is expected to improve the biodiversity values of the regional area, as rehabilitation is further developed and implemented across the Site.

The greenhouse gas assessment has estimated that annual average greenhouse emissions over the 21 year life of the proposal (Scope 1 and 2) are negligible, conservatively representing approximately 0.1 per cent and 0.35 per cent of Australia's and NSW emissions, respectively.

Details on potential impacts on groundwater and surface water resources are provided in Chapters 15 and 16, respectively. Details on potential ecological impacts are provided in Chapter 11. Details on greenhouse gas emissions are provided in Chapter 10.

Resource recovery

Clause 15 of the Mining SEPP states:

> (1) Before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider the efficiency or otherwise of the development in terms of resource recovery.
>
> (2) Before granting consent for the development, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at optimising the efficiency of resource recovery and the reuse or recycling of material.
>
> (3) The consent authority may refuse to grant consent to development if it is not satisfied that the development will be carried out in such a way as to optimise the efficiency of recovery of minerals, petroleum or extractive materials and to minimise the creation of waste in association with the extraction, recovery or processing of minerals, petroleum or extractive materials.

The MTO has been operating for over 30 years. The geology, mining methods and mining equipment required to maximise both the quantum and efficiency of the extraction of the available resources is well understood. Mining would continue to extract resources approved under the existing development consent.

Transport

Clause 16(1) of the Mining SEPP states:

> Before granting consent for development for the purposes of mining or extractive industry that involves the transport of materials, the consent authority must consider whether or not the consent should be issued subject to conditions that do any one or more of the following:
>
> (a) require that some or all of the transport of materials in connection with the development is not to be by public road,
>
> (b) limit or preclude truck movements, in connection with the development, that occur on roads in residential areas or on roads near to schools,
>
> (c) require the preparation and implementation, in relation to the development, of a code of conduct relating to the transport of materials on public roads.

Existing infrastructure at MTW allows the operations to be undertaken in accordance with the requirements of this clause. All coal produced at MTO is transported by rail to the Port of Newcastle.

Further details on transport matters are provided in Chapter 19.

Rehabilitation

Clause 17 of the Mining SEPP states:

> (1) Before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at ensuring the rehabilitation of land that will be affected by the development.
>
> (2) In particular, the consent authority must consider whether conditions of the consent should:
>
> (a) require the preparation of a plan that identifies the proposed end use and landform of the land once rehabilitated, or
>
> (b) require waste generated by the development or the rehabilitation to be dealt with appropriately, or
>
> (c) require any soil contaminated as a result of the development to be remediated in accordance with relevant guidelines (including guidelines under section 145C of the Act and the *Contaminated Land Management Act 1997*), or
>
> (d) require steps to be taken to ensure that the state of the land, while being rehabilitated and at the completion of the rehabilitation, does not jeopardize public safety.

The primary objective of final rehabilitation at MTO is to create a stable, free draining landform able to maintain viable land uses where the post-mining rehabilitated areas are integrated with the surrounding landscape.

Rehabilitation would continue to be undertaken progressively across the mined area under the proposal. The requirements for rehabilitation would be determined in consultation with relevant government agencies and stakeholders and in accordance with regulatory requirements. The objectives of the rehabilitation domains of mined areas at MTO are to:

- progressively establish approximately 483ha of woodland communities;
- progressively establish approximately 2,100ha of EEC woodland (an ironbark community) across the combined MTO and Warkworth Mine;
- establish improved pasture and some productive grazing;
- provide additional habitat for threatened species; and
- create an additional north/south wildlife corridor providing connectivity to other habitat.

Rehabilitation and final landform are discussed further in Chapter 12.

Mining on strategic agricultural land

Part 4AA of the Mining SEPP applies to 'mining or petroleum development' on strategic agricultural land.

Clause 17A provides a definition of mining and petroleum development for the purposes of Part 4AA. It states:

> (1) In this Part, mining or petroleum development means:
>
> (a) development specified in clause 5 (Mining) of Schedule 1 to State Environmental Planning Policy (State and Regional Development) 2011, but only if:
>
> (i) a mining lease under the Mining Act 1992 is required to be issued to enable the development to be carried out because:
>
> (A) the development is proposed to be carried out outside the mining area of an existing mining lease, or
>
> (B) there is no current mining lease in relation to the proposed development, or

The proposal is development specified in clause 5 of the SRD SEPP (see below); however, a new mining lease, or extension to the existing mining lease, is not required. Therefore, Part 4AA of the Mining SEPP does not apply to the proposal.

b. 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 SRD 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 (Mining) 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 $30million.

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.

c. State Environmental Planning Policy No 33 – Hazardous and Offensive Development

State Environmental Planning Policy No 33 – Hazardous and Offensive Development (SEPP 33) requires the consent authority to consider whether a proposal is a potentially hazardous or offensive industry. While coal handling is identified as a potentially hazardous industry, the existing operations at MTO are not classed as hazardous or offensive development under SEPP 33. The proposal does not propose any changes to current operations that would be potentially hazardous or offensive. Therefore, SEPP 33 does not apply to the proposal.

d. State Environmental Planning Policy No 44 – Koala Habitat Protection

State Environmental Planning Policy No 44 – Koala Habitat Protection (SEPP 44) applies to the extent that a consent authority is restricted from granting approval for a development proposal on land identified as core koala habitat without the preparation of a plan of management. The ecology chapter (Chapter 11) found that no areas of core koala habitat exist and, therefore, SEPP 44 does not place any constraints on the proposal.

e. State Environmental Planning Policy No 55 – Remediation of Land

State Environmental Planning Policy No 55 – Remediation of Land (SEPP 55) requires that a consent authority not grant consent to the carrying out of development on land unless it has considered any potential contamination issues. The Site was previously assessed for the *Extension of Mining at Mount Thorley Operations – Environmental Impact Statement* (ERM Mitchell McCotter 1995) which did not identify any potential contamination issues. Therefore, SEPP 55 does not place any constraints on the proposal.

f. Singleton Local Environmental Plan 2013

The Site is zoned RU1 Primary Production under the LEP 2013. Development permitted with consent in this zone includes open cut mining, as well as agriculture and industry. The objectives of the RU1 zone are:

- to encourage sustainable primary industry production by maintaining and enhancing the natural resource base;
- to encourage diversity in primary industry enterprises and systems appropriate for the area;
- to minimise the fragmentation and alienation of resource lands; and
- to minimise conflict between land uses within this zone and land uses within adjoining zones.

The proposal is considered to be compatible with the above objectives given that it involves the continuation and extension of an existing mining operation.

iii Planning agreements

One of the matters of consideration under section 79C is the relevant provisions of any planning agreements. Section 93F of the EP&A Act relates to planning agreements, which:

> ... is a voluntary agreement or other arrangement under this Division between a planning authority (or 2 or more planning authorities) and a person (the developer):
>
> (a) who has sought a change to an environmental planning instrument, or

(b) who has made, or proposes to make, a development application, or

(c) who has entered into an agreement with, or is otherwise associated with, a person to whom paragraph (a) or (b) applies,

under which the developer is required to dedicate land free of cost, pay a monetary contribution, or provide any other material public benefit, or any combination of them, to be used for or applied towards a public purpose.

Section 93F enables the applicant to enter into a Voluntary Planning Agreement (VPA) with planning authorities in lieu of a section 94 contribution. The applicant would enter into a VPA with Singleton Council which would detail the monetary contribution and/or provision of other material public benefits, which can be used for or applied towards a public purpose.

iv The Regulations

As previously stated, a DA for SSD must be accompanied by an EIS, prepared in accordance with the EP&A Regulation. Schedule 2 of the EP&A Regulation stipulates:

- requirements of the Director-General and approval bodies in relation to EISs;
- general provisions relating to EISs; and
- special provisions relating to State significant infrastructure.

The general provisions specify the form (clause 6) and the content (clause 7) of an EIS. Clause 6 states:

An environmental impact statement must contain the following information:

(a) the name, address and professional qualifications of the person by whom the statement is prepared,

(b) the name and address of the responsible person,

(c) the address of the land:

(i) in respect of which the development application is to be made, or

(ii) on which the activity or infrastructure to which the statement relates is to be carried out,

(d) a description of the development, activity or infrastructure to which the statement relates,

(e) an assessment by the person by whom the statement is prepared of the environmental impact of the development, activity or infrastructure to which the statement relates, dealing with the matters referred to in this Schedule,

(f) a declaration by the person by whom the statement is prepared to the effect that:

(i) the statement has been prepared in accordance with this Schedule, and

(ii) the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates, and

(iii) that the information contained in the statement is neither false nor misleading.

Clause 7 states that an EIS must also include each of the following:

(a) a summary of the environmental impact statement,

(b) a statement of the objectives of the development, activity or infrastructure,

(c) an analysis of any feasible alternatives to the carrying out of the development, activity or infrastructure, having regard to its objectives, including the consequences of not carrying out the development, activity or infrastructure,

(d) an analysis of the development, activity or infrastructure, including:

  (i) a full description of the development, activity or infrastructure, and

  (ii) a general description of the environment likely to be affected by the development, activity or infrastructure, together with a detailed description of those aspects of the environment that are likely to be significantly affected, and

  (iii) the likely impact on the environment of the development, activity or infrastructure, and

  (iv) a full description of the measures proposed to mitigate any adverse effects of the development, activity or infrastructure on the environment, and

  (v) a list of any approvals that must be obtained under any other Act or law before the development, activity or infrastructure may lawfully be carried out,

(e) a compilation (in a single section of the environmental impact statement) of the measures referred to in item (d) (iv),

(f) the reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development set out in subclause (4).

Note. A cost benefit analysis may be submitted or referred to in the reasons justifying the carrying out of the development, activity or infrastructure.

The above requirements and where they are addressed in the EIS are set out in Table 6.1 below.

Table 6.1 Schedule 2 requirements for an EIS

Requirement	Where contained in the EIS
Name, address and professional qualifications of the person(s) who prepared the EIS	Front cover
Name and address of the responsible person (the applicant)	Section 4.1
Address of land	Section 2.1
Description of development	Chapter 2
Assessment of the environmental impact	Chapters 8 – 20
Declaration that the EIS has been prepared in accordance with this Schedule, contains all available information that is relevant to the environmental assessment of the development and that the information contained in the statement is neither false nor misleading	Front cover
Summary of the EIS	Executive summary
A statement of the objectives of the development	Chapter 1 and Section 2.2

Table 6.1 Schedule 2 requirements for an EIS

Requirement	Where contained in the EIS
An analysis of feasible alternatives, having regard to its objectives, including the consequences of not carrying out the development	Chapter 22
A full description of the development	Chapter 2
A general description of the environment likely to be affected by the development	Chapters 8 – 20
The likely impact on the environment of the development	Chapters 8 – 20
A full description of the measures proposed to mitigate any adverse effects of the development	Chapters 8 – 20
A list of any approvals that must be obtained under any other Act or law before the development, activity or infrastructure may lawfully be carried out	Section 6.6
A compilation of the measures referred to in item (d) (iv)	Table 21.1
The reasons justifying the carrying out of the development, activity or infrastructure in the manner proposed, having regard to biophysical, economic and social considerations, including the principles of ecologically sustainable development	Chapter 23

v Likely impacts of the development

This EIS comprehensively describes the likely impacts of proposal, including likely environmental impacts on both the natural and built environments, and social and economic impacts in the locality. It also describes commitments proposed by Mount Thorley Operations Pty Limited to mitigate and manage these impacts. These descriptions are based on technical studies prepared by specialists, which are appended to this EIS. The technical studies were prepared using the most recent and accurate scientific data relevant to the proposal, in consideration of current policies and legislation. In addition, they adopted conservative assumptions to enable the upper limit of likely impacts to be determined.

Likely impacts on both the natural and built environments are described in Chapters 9 to 19 based on technical studies appended in Appendices F to L. Likely economic and social impacts are described in Chapters 8 and 20, respectively, based on technical studies appended in Appendices E and M.

vi Suitability of the site for the development

As previously stated, the area immediately surrounding the mine is dominated by coal mines and other industry, including Warkworth Mine, Hunter Valley Operations, Wambo Mine and Redbank Power Station to the north and north-west, and Bulga Coal Complex to the south, and MTIE to the east. The area also includes associated infrastructure such as rail lines and HV electricity powerlines.

The proposal would facilitate the recovery of coal reserves approved for extraction under the existing development consent and within the footprint of the existing mining leases granted under the Mining Act. It would also be undertaken on privately-owned land zoned for open cut mining. It is considered to be broadly compatible with surrounding land uses, particularly the mining and industrial land uses. A range of commitments have been made by Mount Thorley Operations Pty Limited to mitigate potential impacts of the proposal on surrounding land uses. Subject to the application of the commitments, the proposal is unlikely to have a significant impact on these land uses.

The Site is, therefore, considered suitable for the continuation of the existing mining operations under the proposal.

vii Submissions

This EIS will be placed on public exhibition for a minimum of 30 days by DP&E and submissions will be sought from SSC, government agencies and the community. Any submissions received by DP&E will be reviewed and forwarded to Mount Thorley Operations Pty Limited to consider and respond to (via a Response to Submissions document).

Following receipt of the Response to Submissions report, DP&E will prepare its assessment report considering this EIS, all submissions received during the exhibition process and the Response to Submissions report.

viii Public interest

To assist the consent authority in determining whether the proposal is in the public interest, this EIS provides a justification for the project, taking into consideration its potential environmental impacts, and the suitability of the Site. It also considers the proposal against the principles of ESD. The consent authority will also be required to consider all submissions received during the public exhibition of the EIS.

6.2.4 Non-discretionary development standards

i General

Clause 12AB of the Mining SEPP identifies non-discretionary development standards for mining relating to cumulative noise, cumulative air quality, airblast overpressure, ground vibration and aquifer interference.

Clause 12AB(1) states that if a proposed development for the purposes of mining satisfies a development standard set out in this clause, the consent authority cannot require more onerous standards for those matters but does not prevent the consent authority granting consent even though any such standard is not complied with.

Clause 12AB(2) states that the non-discretionary development standards are standards for the purposes of section 79C (2) and (3) of the EP&A Act. These sections of the Act have been provided earlier.

The proposal satisfies the majority of the non-discretionary development standards for mining as detailed below and described further in the relevant chapters and technical studies.

ii Cumulative noise level

Clause 12AB(3) provides non-discretionary development standards relating to cumulative noise. It states:

> The development does not result in a cumulative amenity noise level greater than the acceptable noise levels, as determined in accordance with Table 2.1 of the Industrial Noise Policy, for residences that are private dwellings.

A noise and vibration study has been undertaken which assessed the potential for noise and vibration impacts on residences surrounding the mine over the lifespan of the proposal. Operational noise at residences was predicted under varying meteorological conditions prevalent at site including calm, winds and temperature gradient conditions. Predictions show that the proposal would not result in a cumulative amenity noise level greater than the acceptable noise levels at all privately-owned assessment locations not already in a zone of acquisition from the MTO or other mines due to their predicted incremental impacts.

A detailed assessment of noise impacts of the proposal is provided in Chapter 9.

iii Cumulative air quality level

Clause 12AB(4) provides non-discretionary development standards relating to cumulative air quality. It states:

> The development does not result in a cumulative annual average level greater than 30 µg/m^3 of PM_{10} for private dwellings.

An air quality and greenhouse gas study has been undertaken which assessed the potential air quality impacts on residences surrounding the mine over the lifespan of the proposal. The study found that the proposal would not result in cumulative annual average levels greater than 30µg/m^3 of PM_{10} at privately-owned dwellings not already in a zone of acquisition for MTO or other mines.

A detailed assessment of the air quality impacts of the proposal is provided in Chapter 10.

iv Airblast overpressure

Clause 12AB(5) provides non-discretionary development standards relating to air blast overpressure. It states:

> Airblast overpressure caused by the development does not exceed:
>
> (a) 120dB (Lin Peak) at any time, and
>
> (b) 115dB (Lin Peak) for more than 5% of the total number of blasts over any period of 12 months,
>
> measured at any private dwelling or sensitive receiver.

A noise and vibration study has previously been undertaken which assessed the potential for noise and vibration impacts on residences surrounding the mine over the lifespan of the proposal. Predictions show that the proposal would not result in airblast overpressure levels greater than the above criteria at all privately-owned assessment locations not already in a zone of acquisition from MTO or other mines.

v Ground vibration

Clause 12AB(6) provides non-discretionary development standards relating to ground vibration. It states:

> Ground vibration caused by the development does not exceed:
>
> (a) 10mm/sec (peak particle velocity) at any time, and
>
> (b) 5mm/sec (peak particle velocity) for more than 5 per cent of the total number of blasts over any period of 12 months,
>
> measured at any private dwelling or sensitive receiver.

A noise and vibration study has been undertaken which assessed the potential for noise and vibration impacts on residences surrounding the mine over the lifespan of the proposal. Predictions show that the proposal would not result in ground vibration levels greater than the above criteria at all privately-owned assessment locations not already in a zone of acquisition from MTO or other mines.

A detailed assessment of vibration impacts of the proposal is provided in Section 9.4.9.

vi Aquifer interference

Clause 12AB(7) provides non-discretionary development standards relating to aquifer interference. It states:

> Any interference with an aquifer caused by the development does not exceed the respective water table, water pressure and water quality requirements specified for item 1 in columns 2, 3 and 4 of Table 1 of the Aquifer Interference Policy for each relevant water source listed in column 1 of that Table.
>
> Note. The taking of water from all water sources must be authorised by way of licences or exemptions under the relevant water legislation.

The standard refers to the *NSW Aquifer Interference Policy's* (AIP) minimal impact considerations for aquifer interference activities on the water table, water pressure and water quality of alluvial water sources. The potential groundwater impacts of the proposal have been assessed against these minimal impact considerations in the groundwater study (Appendix I). The study found that the proposal would take water indirectly from the Wollombi Brook alluvium and the Hunter River alluvium and directly from the Permian coal measures. This take would occur during the proposed mining period and post closure. The applicant would be required to hold relevant licenses from each water source to cover these predicted water takes.

No privately-owned water supply bores would be impacted above the minimal harm criteria described in the AIP.

Salinity levels in nearby water courses are not predicted to increase beyond the 1 per cent criteria stipulated in the AIP.

Therefore, the non-discretionary development standards relating to aquifer interference would be met.

A detailed assessment of the proposal's impact on groundwater is provided in Chapter 15.

6.2.5 Other relevant sections of the EP&A Act to the assessment and determination of the proposal

i Threatened species, populations and ecological communities

Section 5A of the EP&A Act relates threatened species, populations and ecological communities. It requires a number of factors to be taken into consideration in deciding whether a proposed action is likely to have a significant effect on threatened species, populations or ecological communities, or their habitats. These factors are listed in section 5A(2), as follows:

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

(d) in relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The vegetation and habitats of the Site have been cleared progressively in accordance with the development consent and Coal & Allied's vegetation clearing protocols. The proposal would not result in additional vegetation clearance and is expected to have negligible impact on the ecology of the Site and the local area.

A small area of remnant Narrow-leaved Ironbark Spotted Gum Open Forest (ERM Mitchell McCotter 1995) in the north-west of MTO, known as Charlton Ridge, would not be cleared and would contribute to the provision of fauna and flora habitat and connectivity throughout mine operation and at the conclusion of mining. Threatened species recorded within this area of remnant forest are the Large-eared Pied Bat (*Chalinolobus dwyeri*) (listed as vulnerable under the TSC Act and the EPBC Act) and the Eastern Freetail Bat (*Mormopterus norfolkensis*) (listed as vulnerable under the TSC Act) (Coal & Allied 2014).

ii Authorisations not required or which cannot be refused for State significant development

Under section 89J of the EP&A Act the following authorisations are not required for SSD that is authorised by a development consent:

(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*.

Should development consent be granted for the proposal, there is only one authorisation which would have otherwise been necessary but is not required due to the operation of section 89J. This is an Aboriginal heritage impact permit under section 90 of the NP&W Act for potential impacts on extant sites (or remnant portions thereof) containing Aboriginal cultural heritage (refer to Chapter 17).

While applications for zero share water access licences are required under section 61(1)(b) of the NSW *Water Management Act 2000* (WM Act), and additional water licence entitlements are required for predicted take from regulated water sources, no approvals are required under sections 89, 90 or 91 of the WM Act.

Further, under section 89K of the EP&A Act, the following authorisations cannot be refused if it is necessary for carrying out SSD that is authorised by a development consent, and are to be substantially consistent with that development consent:

(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*.

Should development consent be granted for the proposal, two authorisations must be granted consistently with an SSD approval due to the operation of section 89K, including a variation to EPL 1976 held under the POEO Act to increase the discharge rate of the approved HRSTS discharge point at Loders Creek from 100ML/day to 300ML/day.

iii Remaining provisions

Other sections of the EP&A Act which may be relevant to the proposal include:

- Section 23D which states the functions of the PAC including a request by the Minister or Director-General to 'review any (or any aspect or part of any) development, activity, infrastructure or project to which this Act applies' and 'hold a public hearing into any matter the subject of any such advice or review';
- Section 80 which states that the consent authority can determine a development application by either granting consent (unconditional or subject to conditions) or refusing consent;

- Section 80A which relates to the impositions of conditions of a development consent. This section provides that conditions may be imposed on a development consent if:

  - it relates to any matter referred to in section 79C(1) of relevance to the development the subject of the consent, or

  - it requires the modification or surrender of a consent granted under this Act or a right conferred by Division 10 in relation to the land to which the development application relates, or

  - it requires the modification or cessation of development (including the removal of buildings and works used in connection with that development) carried out on land (whether or not being land to which the development application relates), or

  - it limits the period during which development may be carried out in accordance with the consent so granted, or

  - it requires the removal of buildings and works (or any part of them) at the expiration of the period referred to in paragraph (d), or

  - it requires the carrying out of works (whether or not being works on land to which the application relates) relating to any matter referred to in section 79C(1) applicable to the development the subject of the consent, or

  - it modifies details of the development the subject of the development application, or

  - it is authorised to be imposed under section 80(3) or (5), subsections (5) – (9) of this section or section 94, 94A, 94EF or 94F.

- Section 94 which enables the consent authority to impose a condition requiring the applicant to provide a development contribution if the consent authority is satisfied that development for which development consent is sought will or is likely to require the provision of or increase the demand for public amenities and public services within the area. As noted previously, section 93F enables the applicant to enter into a VPA with planning authorities in lieu of a section 94 contribution;

- Section 97 which states that an applicant who is dissatisfied with a determination can lodge an appeal in the L&E Court within six months after determination. If the appeal is against a deemed refusal under section 82(1), the appeal must commence within six months after the expiration of the relevant period; and

- Section 98 which allows an objector to appeal against a consent authority's decision to grant consent within 28 days of the notice of determination. Section 23F states that a decision made by the PAC cannot be challenged if it was made after a public hearing.

6.3 Other State legislation

6.3.1 Mining Act 1992

The Mining Act regulates the granting of mining leases and mining activities generally and, amongst other legislative instruments, places controls on methods of exploration and mining, the disposal of mining waste, and rehabilitation and environmental management activities.

The proposal applies to land within the footprint of an existing lease under the Mining Act; namely, CL 219 held by MTO. No amendment to this lease would be required under the proposal. The existing MOP for this mining lease would be reviewed and updated as required in accordance with the proposal.

6.3.2 Protection of the Environment Operations Act 1997

The POEO Act is the principal environmental protection legislation NSW and is administered by the EPA. Schedule 1 of the POEO Act lists the 'scheduled activities' regulated by an EPL which includes criteria and monitoring requirements for licensed activities. The MTO currently holds EPL 1976 under the POEO Act. A variation to this license would be required under the proposal to increase the discharge rate of the approved HRSTS discharge point at Loders Creek (see Figure 16.2) from 100ML/day to 300ML/day.

As identified above in Section 6.2.5.ii, licences (or variations to licences) under the POEO Act cannot be refused and are to be substantially consistent with a development consent for SSD.

6.3.3 Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002

The HRSTS was introduced by the NSW Government to reduce salinity levels in the Hunter River, and operates under the *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002*. The HRSTS is a cap and trade market mechanism established by the NSW Government in 2002, and is administered by the EPA. The Scheme is designed to provide flexibility to mining companies and other industries in discharging saline water into the Hunter River during high flow conditions, while ensuring that the total salt load does not exceed the cap imposed by the EPA. In the case of the upper segments of the Hunter River, the salinity is capped at 600µS/cm.

The integrated MTW is currently a Licence Holder and Scheme Participant of the HRSTS. Coal & Allied currently holds 146 credits (68 credits for Warkworth Mine and 78 credits for MTO) which entitles MTW to discharge to the Hunter River 14.6 per cent of the total allowable discharge of salt for a given period. The proposal would not require additional HRSTS credits to be purchased.

6.3.4 Roads Act 1993

The Roads Act regulates activities that may impact on public roads in NSW. Approval is required under section 138 of the Roads Act to carry out works in, on or over a public road. The proposal does not seek to carry out works in, on or over a public road.

6.3.5 Dams Safety Act 1978

The NSW *Dams Safety Act 1978* (DS Act) applies to prescribed dams in NSW and establishes the Dams Safety Committee (DSC) responsible for ensuring the safety of such dams. There are three prescribed dams at MTO listed in Schedule 1 of the DS Act, as follows:

- Mt Thorley Abbey Green South Tailings;
- Mt Thorley Central Ramp Tailings Dam; and
- Mt Thorley South Out of Pit Water.

The proposal includes an increase to the capacity of the Mt Thorley South Out of Pit Water (also known as the SOOP dam) and notification of the DSC would be required. Notification would also be made regarding the proposal in relation to the two other prescribed dams.

Consultation with the DSC has been undertaken during preparation of this EIS (see Chapter 7).

6.3.6 Coal Mine Health and Safety Act 2002

Section 100 of the NSW *Coal Mine Health and Safety Act 2002* (CMH&S Act) states that a 'person must not establish any emplacement area except with the approval of the Minister and in the manner and subject to any conditions that the Minister may determine.' An emplacement area is defined as:

> (a) any pile, heap, hole, excavation or place in which or on which reject (whether in a solid state or in a solution or suspension) is piled, heaped, dumped, accumulated, deposited or placed, and
>
> (b) any wall or other structure that retains or confines reject, whether or not that wall or structure is itself composed of reject,
>
> but does not include an accumulation or deposit of reject situated underground.

Approval is required under section 100 for the increase in the storage capacity of the SOOP dam from 1.6GL to 2.2GL.

6.3.7 Water Act 1912 and Water Management Act 2000

The NSW *Water Act 1912* (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.

The 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 (WSP). The Site is within the Lower Wollombi Brook water source to which the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 (the Hunter Unregulated and Alluvial Water Sources WSP) applies. Water use and water management work approvals under sections 89 and 90, respectively, of the WM Act apply to the Hunter Unregulated and Alluvial Water Sources WSP; however, these approvals are not required is respect of SSD. Activity approvals, including aquifer interference approvals, under section 91 of the WM Act do not currently apply to the Hunter Unregulated and Alluvial Water Sources WSP.

Water licensing is addressed in Chapters 15 and 16, respectively.

6.3.8 National Parks and Wildlife Act 1974

The NSW *National Parks and Wildlife Act* 1974 (NP&W Act), administered by OEH, aims to conserve nature and objects, places or features of cultural value. An Aboriginal heritage impact permit is required under section 90 of the NP&W Act to knowingly destroy, deface of damage or knowingly cause or permit the destruction or defacement of or damage to, a relic or Aboriginal place.

The proposal would potentially impact some extant sites (or remnant portions thereof) containing Aboriginal cultural heritage (see Chapter 17). However, as identified above in Section 6.2.5.ii, an Aboriginal heritage impact permit under section 90 of the NP&W Act is not required for SSD.

6.3.9 Threatened Species Conservation Act 1995

The *NSW 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 proposal would not directly impact on threatened species and EECs listed under the TSC Act as discussed in Chapter 11.

6.4 State plans and policies

6.4.1 Strategic Regional Land Use Policy

The NSW Government has released the *Strategic Regional Land Use Policy* which aims to protect strategic agricultural land and valuable water resources in areas of regional NSW where mining and coal seam gas resources are prevalent. Seven regions in NSW to which the policy would apply have been identified; a strategic regional land use plan for the majority of these regions are yet to be developed with only plans developed for two regions to date. The Upper Hunter Strategic Regional Land Use Plan was released in September 2012 and applies to the Site.

The Upper Hunter Strategic Regional Land Use Plan includes a gateway process for SSD applications for mining on strategic agricultural land that require a new or extended lease. The gateway process does not apply to the proposal as no new mining lease, or extension to the existing mining lease, is required. As described in Chapter 13, the proposal would not impact on strategic agricultural land.

6.4.2 Aquifer Interference Policy

The NOW released its AIP in 2012 which clarifies the requirements for obtaining water licences for aquifer interference activities under NSW water legislation including the Water Act and WM Act. The AIP considers and defines minimal harm criteria for productive and less productive aquifers. The purpose of the AIP is assist proponents/applicants of aquifer interference activities in preparing the necessary information and studies to be used by the Minister in the assessment of project proposals that have some level of aquifer interference. Furthermore, the AIP forms the basis of the assessment and subsequent advice provided by the Minister (or NOW) at the various stages of an assessment under the EP&A Act. The AIP is associated with the SRLUP, discussed above, and can be used to inform the gateway process. Consideration of the proposal against the requirements of the AIP is provided in Chapter 15.

6.4.3 Hunter-Central Rivers Catchment Action Plan

The Hunter-Central Rivers Catchment Management Authority released its updated Catchment Action Plan in 2013. The Plan aims to deliver healthy and productive catchments and identifies actions to be implemented over a 10 year period. The Hunter-Central Rivers region covers 3.7 million ha and includes the Site. Accompanying the Plan are a number of 'regional assessment maps' which map key focus areas relating to land and soils, freshwater, biodiversity, estuaries and marine areas.

The Site is mapped as a 'Soil Degradation Risk Area', as is a large portion of the region. Soil degradation is taken to mean a reduction in the physical and chemical qualities of the soil which may lead to those soils becoming less useful to agriculture or biodiversity or which may lead to the loss of these soils through erosion. In addition, the degradation and erosive processes may have downstream impacts on water quality and the viability of ecosystems in receiving waters. The proposal's ecological, agricultural, groundwater, and surface water impacts have been assessed in Chapters 11, 13, 15, and 16, respectively.

6.5 Commonwealth legislation

6.5.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act aims to protect matters deemed to be of national environmental significance (MNES) 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;
- nuclear actions (including uranium mining); and
- actions of development for coal seam gas or large coal mining on water resources.

If an action (or proposal) will, or is likely to, have a significant impact on any MNES, 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 will, or is likely to, be a Controlled Action, an action may be referred to the Commonwealth Department of the Environment.

The proposal has been assessed as not having the potential for a significant impact on any MNES given the area has previously been cleared (see Chapter 11) and the rules regulating water discharges through the HRSTS (see Section 6.3.3).

6.5.2 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. Proposed activities or development that may affect native title are called 'future acts'. Claimants whose native title claims have been registered have the right to negotiate about some future acts, including mining and the granting of a mining lease, over the land the subject of their native title claim. All native title claim applications are subjected to a registration test and claims will only be registered if claimants satisfy a number of conditions. Where a native title claim is not registered a development can proceed through the mediation and determination processes, though claimants will not be able to participate in future act negotiations.

There are no native title claims or indigenous land use agreements relating to the Site. There is currently an unregistered claimant application (NC2013/006, NSD 1680/2013) which encompasses the entire Hunter Valley including the Site. As the proposal is within an existing mining lease, the future acts process under the *Native Title Act 1993* would not be triggered if this claim is accepted.

6.6 Summary of approval requirements

In summary, the proposal requires the following approvals:

- development consent under Part 4 Division 4.1 of the EP&A Act and subsequent approval of any management plans required under any development consent;
- update to the MOP for the mining lease held under the Mining Act in accordance with the proposal;
- variation to EPL 1976 to increase discharge rate to 300ML/day;
- additional water access licence entitlements under the WM Act for predicted take from the Hunter Unregulated and Alluvial Water Sources;
- notification of the DSC regarding works to and near prescribed dams in accordance with the DS Act; and
- approval under the CMH&S Act to increase the storage capacity of the SOOP dam from 1.6GL to 2.2GL.

Chapter 7

Stakeholder engagement

Chapter 7 — Stakeholder engagement

7 Stakeholder engagement

7.1 Introduction

This chapter provides an overview of the ongoing stakeholder engagement conducted by Coal & Allied and summarises the stakeholder engagement programme developed for both the proposal and the Warkworth Continuation 2014 and the outcomes of its implementation.

7.2 Overview

There has been a long history of consultation between Coal & Allied and key stakeholders as part of its existing mining operations and previous Warkworth Mine proposals in 2003 and 2010. During this time, Coal & Allied has built robust relationships with the communities in which it operates and has assisted in the contribution to their long-term sustainability.

A comprehensive stakeholder engagement strategy is in place for MTW, which is implemented by Rio Tinto Coal Australia Community Relations team. The key goals of the stakeholder engagement strategy are to ensure the timely provision of relevant and clear information and to create a process that provides opportunities for stakeholders to express their views and allows timely feedback on any matters raised.

Engagement tools implemented by Coal & Allied on an ongoing basis include:

- shopfronts in Singleton and Muswellbrook and a freecall information line (1800 727 745) to provide the community with the opportunity to provide feedback, both positive and negative, relating to Coal & Allied's operations in the Hunter Valley;
- Coal & Allied's website (www.riotintocoalaustralia.com.au) which contains information on mine operations and management, environmental monitoring results, project applications, community engagement and contact details;
- quarterly newsletters distributed to all residents within the Singleton LGA which provide information on Coal & Allied's mining operations in the LGA, including upcoming projects; and
- MTW's Community Consultative Committee (MTWCCC), which meets regularly to discuss mining operations and environmental performance, and comprises representatives of the community, Singleton Council and Coal & Allied.

An extensive consultation programme for the proposals has been carried out. The programme and its outcomes are discussed further in this chapter.

7.3 Consultation requirements

The consultation programme implemented for the proposal was undertaken with consideration of the DP&E (2007) *Guidelines for Major Project Community Consultation*. The Secretary's requirements for the proposal also include consultation with relevant local, State or Commonwealth government authorities, service providers, community groups and affected landowners.

7.4 Stakeholder engagement process

7.4.1 Stakeholder identification

The list of all stakeholders previously engaged through implementation of the MTW stakeholder engagement strategy was updated to include new stakeholders who were likely to be relevant to the proposal. Key stakeholders engaged as part of the consultation process were:

- near neighbours;
- community/interest groups;
- business groups and local businesses;
- mining industry employees/suppliers;
- Aboriginal/cultural heritage stakeholders;
- environmental groups;
- MTW employees/suppliers
- local government;
- State government;
- non-government organisations (NGOs) and not-for-profit (NfP) organisations;
- media;
- health, education, community, emergency services; and
- other.

Subsequent to the identification of the stakeholders, they were assessed to further understand the extent to which the various parties were likely to be affected by and/or have an interest in the proposal. The results were used to inform the development and timing of appropriately tailored engagement strategies.

7.4.2 Stakeholder engagement

The stakeholder groups identified and the engagement activities used are presented in Table 7.1. A range of formal and informal stakeholder engagement tools were applied, including phone calls, emails, meetings and briefing sessions, community information sessions and fact sheets.

Table 7.1 Stakeholders and engagement activities

Stakeholders	Engagement activities
Near neighbours and communities	• One-on-one meetings • Drop-in information sessions • Project fact sheet • Phone and email correspondence • Community information session at Bulga Community Hall
Government agencies	• Face-to-face meetings • Briefing sessions • Letter, email and phone correspondence
State and Federal political members	• Face-to-face meetings
Local government (including mayor, councillors and council officers)	• Face-to-face meetings • Briefing sessions • Email and phone correspondence • Project fact sheet
MTW employees	• Employee survey • Face-to-face meetings • Project fact sheet • Drop-in information sessions
Singleton LGA residents, local business and community groups and organisations	• Supplier survey • Face-to-face meetings • Drop-in sessions • Project fact sheet • Briefing sessions • Community information session at Coal & Allied's Singleton shopfront • Phone correspondence • Community information session
Service providers (utilities, emergency services, employment and training)	• Face-to-face meetings • Drop-in information sessions • Email and phone correspondence • Project fact sheet • Community information session
Local environmental groups	• Face-to-face meetings • Project fact sheet • Phone correspondence • Community information session

Table 7.1 Stakeholders and engagement activities

Stakeholders	Engagement activities
Aboriginal cultural heritage groups	• Face-to-face meetings • Briefing sessions • Letter, email and phone correspondence • Community information session • Site visit
Other NGOs and NfP organisations	• Face-to-face meetings • Drop-in sessions • Briefing sessions • Project fact sheet

7.5 Community consultation

7.5.1 General

As outlined in Section 7.4, an engagement programme with the local community was developed by Coal & Allied to promote open and transparent communication and consultation processes throughout the preparation of this EIS.

The engagement programme enabled any stakeholder interested in or with feedback on the proposal or the EIS process to notify Coal & Allied about their matters of interest via a freecall phone number or dedicated email inquiry line, which were advertised on all communication materials. Any matters raised were recorded in a central database and followed up by the Rio Tinto Coal Australia & Allied Communities Relations team, and where relevant, the social impact assessment specialists, to discuss or respond to the matter.

7.5.2 One-on-one consultations

One-on-one consultations were carried out primarily with near neighbours and community members to assess social impacts and opportunities and to help formulate mitigation strategies (refer to Chapter 20). The one-on-one consultations were carried out during preparation of the EIS.

Matters raised during these sessions can be found in Table 7.3.

7.5.3 Newsletters

An information factsheet on the proposal was developed and distributed to all households in the Singleton LGA from 22 March 2014. The factsheet provided notification and overview of the proposal and assessment process and outlined the forthcoming consultation programme. Complementary to this project information fact sheet, regular media releases and articles along with the quarterly Coal & Allied Hunter Valley Community newsletter were also be used to notify local communities of the proposal, assessment details and consultation activities.

7.5.4 Local social surveys

Two drop-in sessions were held on 27 March 2014 (between 12pm and 3pm at the Bulga Community Hall and between 5pm to 8pm at the Singleton Library) and on 28 March (between 8.45am and 12pm at the Singleton Library) to enable member of the community to access information on the proposal and to complete surveys to inform the social assessment.

7.5.5 Community information sessions

Two community information sessions were held during April 2014. The sessions offered stakeholders a chance to provide feedback and input into the social impact assessment (SIA) process.

An attendance register was set up at the entrance of the venues to record attendees and feedback forms were distributed to provide a formal mechanism for receiving comments and also to determine the most appropriate method to further engage with the attendees.

a. Bulga community information session

The first community information session was held at the Bulga Community Hall on 15 April 2014. A total of 43 people attended, mainly from the Bulga village. Feedback was captured on the day with details of the attendee's matter(s) of concern.

b. Singleton shopfront community information session

The second community information session was held at the Coal & Allied Shopfront at Singleton on 16 April 2014. There were no attendees to this session.

Matters raised during both community information sessions are discussed in further detail in Section 7.9.

7.5.6 Coal & Allied community shopfront

Coal & Allied maintains a community shopfront in the main street of Singleton (127 John Street). Information provided in the community information sessions was made available at the shopfront and would remain accessible for the duration of the proposal, together with new and updated information as it becomes available, such as copies of this EIS.

The shopfront is open during normal business hours and is continuously staffed. Access to the shopfront outside normal business hours is facilitated by contacting the Coal & Allied freecall information line on 1800 727 745.

7.5.7 Mount Thorley Warkworth Community Consultative Committee

The MTW CCC meets regularly to provide a forum for open discussion between the community, Singleton Council and Coal & Allied representatives. The MTW CCC discusses issues relating to the mining operation and environmental performance, thus keeping the community informed on these matters.

Members of the MTW CCC were personally contacted by Coal & Allied on 19 March 2014 prior to Coal & Allied's media release announcing their intention to lodge a development application for the proposal. The MTW CCC members were advised of the forthcoming consultation programme including the community information sessions and were encouraged to attend the sessions for further information. The proposals were also discussed at a meeting of the CCC on 12 May 2014. Minutes of this meeting are available on Rio Tinto Coal Australia's website.

7.6 Aboriginal community groups

Aboriginal stakeholders were consulted in accordance with OEH's (2010a) *Aboriginal cultural heritage consultation requirements for proponents* and (2005a) *Draft Guidelines for Aboriginal cultural heritage impact assessment and community consultation* and under the auspices of the existing CHWG as part of the Aboriginal cultural heritage study for the proposal. This is discussed in Chapter 17 and Appendix K.

7.7 Employees

Employees of Coal & Allied, including all employees of MTW, were informed of the proposal through a range of briefings, newsletters and toolbox talks.

In addition to the above, the social impact assessment specialists (EMM) carried out a MTW Supplier and Employee Contribution and Participation Surveys (SECAPS) during preparation of the EIS. The primary objective of the surveys was to gain insights into the ways in which MTW employees' and suppliers' contribute to, and participate in, the Hunter community.

The SECAPS were undertaken as part of the SIA process for the proposals and designed to provide further detail on the social impacts and opportunities of the proposals.

In total, 629 employees and suppliers completed the survey. The key findings of the survey are discussed in Section 20.2 and Appendix M.

7.8 Government consultation

7.8.1 General

In accordance with the Secretary's requirements (see Chapter 4), relevant local, State and Commonwealth government agencies and representatives were consulted to identify important matters to be considered in the EIS and seek guidance on assessment approaches and the application of relevant government policies to the proposal. Consultation undertaken with each level of government is described in the below subsections.

7.8.2 Singleton Council

In addition to ongoing regular consultation that occurs between Singleton Council and Coal & Allied, representatives from Coal & Allied have met with Singleton Council on a number of occasions to specifically discuss the proposal during the preparation of the EIS. The matters discussed with Singleton Council include consideration of other mining designs, consideration of a buffer or bund on the western end of the proposal, and exploring opportunities to increase local residency of MTW's workforce in particular.

Table 7.2 outlines summarises matters discussed with Singleton Council to date and where each of these matters are considered in the report. A number of ongoing briefing sessions are planned with Singleton Council to continue discussion of various aspects of the proposals.

Table 7.2 Singleton Council consultation – matters discussed

Matters raised	Addressed in the EIS
Amenity impacts (noise and dust)	Section 9.3 and 10.3
Health impacts (dust and water)	Section 10.3, 15.3 and 16.4
Potential for continued mining beyond the proposal limits to current mining lease extent	Section 22.2
Consideration of other mining designs (eg underground, buffers)	Section 22.2
Continued employment and flow-on benefits into Singleton	Section 8.4
Consideration of local employment strategy to increase local residency of workforce	Section 20.4
Consideration of buffer/bund construction	Section22.2
Rehabilitation, final landform (including final void) and post-mining land use	Chapter 12
Methodology and approach of economic assessment	Section 8.2

7.8.3 State government

Following the L&E Court decision for Warkworth Extension 2010, Coal & Allied undertook a review of its options with respect for MTW and planning for the future with an objective to maintain production levels at or as close to existing levels. The DP&E has been consulted regularly prior to and during the preparation of the EIS as part of the longer term mine planning process, with initial informal briefings commencing in 2013. Initial briefings discussed proposal concepts and identification of key matters. The request for environmental assessment requirements was formally lodged with DP&E on 1 April 2014, with DP&E providing Sectary's requirements on 22 May 2014. Other meetings with DP&E during 2014 have considered and discussed assessment requirements and approach for key matters including ecology, noise, air quality and economics amongst other study areas and also the assessment process.

Other agencies have been consulted with as appropriate on key matters including the EPA for noise and air quality. Consultation with the EPA has focused on the noise assessment in accordance with the INP, and in particular the determination of background noise levels, and the air quality assessment in accordance with the guidelines.

7.8.4 Commonwealth government

Further approvals are not required under the EPBC Act as the proposal does not result in impacts to MNES (refer to Section 6.5) and, accordingly, consultation with the Commonwealth Government was not undertaken for the proposal.

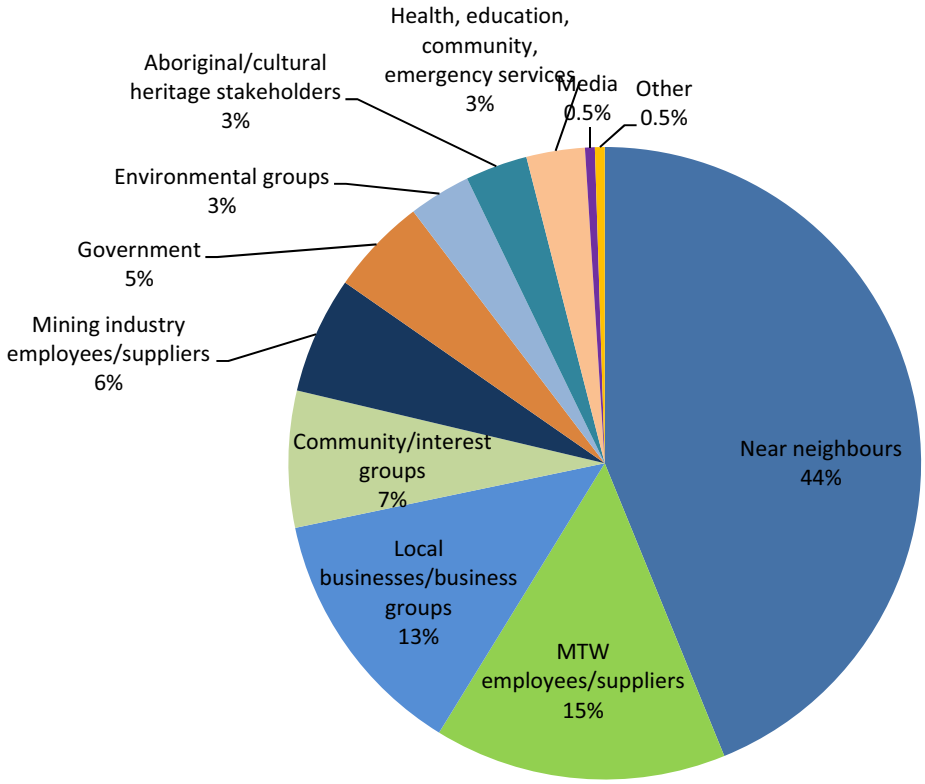
7.8.5 Other stakeholders

In addition to the above, other meetings were held with the following stakeholders:

- various Federal members of Parliament, including the member for Hunter;
- various State members of Parliament, including the member for Upper Hunter;
- neighbouring mines, including Bulga Coal Complex and Wambo Mine; and
- Rural Fire Services (RFS).

7.9 Matters raised during consultation

A total of 151 stakeholders participated in the consultation process. Figure 7.1 shows the range of stakeholder groups who participated in the consultation.



Notes: percentages are based on a total of 151 SIA participants. An individual may represent multiple stakeholder groups.

Figure 7.1 Stakeholder groups represented

A significant portion of stakeholders (51 per cent) that participated in the survey were from Bulga village. Other small villages around MTO were also included in the consultation, namely Long Point, Gouldsville, Broke, Milbrodale and Warkworth. Approximately 28 per cent of stakeholders were from the town of Singleton and were largely represented by local government, businesses or services. A total of 21 per cent of the sample were either employees/suppliers of MTW mine or employees/suppliers of other mines in the region.

A summary of the matters raised during consultation and where each matter has been considered in the EIS is provided in Table 7.3.

Table 7.3 Summary of matters raised during consultation

Theme	Matters raised	Addressed in the EIS
Current operations		
	Effectiveness of noise monitoring, management and mitigation	Sections 9.2.2, 9.3
	Noise exceedances	Section 9.3
	Unsuitability of industrial noise limits in a rural area	Section 9.2.1
	Noise modelling and associated acquisition /mitigation zones does not reflect real areas of noise impact	Section 9.4
	Transparency of companies activities within the mining industry	Chapter 20
Social		
	Opportunities for community through retention of workers (and their families)	Chapter 20
	Inability to sell properties, property values, and related impacts on investments/assets	Chapter 20
	Uncertainty surrounding the acquisition process	Chapter 20
	Fracturing of community due to property acquisitions and people moving away	Chapter 20
	Declining availability and use of community facilities due to declining population	Chapter 20
	Reducing sense of place/community cohesion with continued declining population	Chapter 20
	Impacts on rural community sustainability/intergenerational equity	Chapter 20
Noise and vibration		
	Increasing noise impacts and effects from low frequency noise	Section 9.4.4
	Cumulative noise of MTO and surrounding mines adversely affecting assessment locations	Section 9.4.7
	Increasing frequency and scale of blasting/vibrations impacts	Section 9.4.9
Air quality		
	Health impacts from poor air quality (dust) on respiratory illnesses	Section 10.3.2.vi
	Decreasing air quality from increasing dust emissions, unrehabilitated and exposed lands	Sections 10.2.3
Economic		
	Decreasing property values or complete devaluation of properties making them worthless to sell	Chapter 20
	Increasing loss in family savings or ability to fund retirement and future aged care needs due to decreasing property values	Chapter 20
	Inability to get local real estate agents to value and market their properties	Chapter 20
	Balancing mining needs with other industries in terms of diverse land use and skills base	Chapter 23
	Ensuring sufficient productive lands remain for future use and productivity	Sections 13.3 and 13.4
	Maintaining employment and training opportunities at MTW	Chapters 8, 20 and 23
	Continuing economic sustainability of the Singleton and Hunter region	Section 8.4.5
	Maintaining community sponsorship and investment at MTW	Chapter 20

Table 7.3 Summary of matters raised during consultation

Theme	Matters raised	Addressed in the EIS
Population, housing, infrastructure and services		
	Maintaining employment to halt declining Singleton LGA population	Chapters 8, 23
	Increasing population decline and impacts on existing community services	Chapter 20
	Population change and its affect on sense of community and cohesion	Chapter 20
	Increasing numbers of unoccupied dwellings, thus affecting community amenity	Chapter 20
Groundwater		
	Impacts on groundwater systems	Section 15.3
	Impacts on the general hydrogeological system of the Bulga, Milbrodale and Broke areas	Section 15.3
	Subsidence caused by aquifer changes	Chapter 20
Surface water		
	Potential for continued deterioration of the Wollombi Brook and affect on agricultural production and recreational activities	Section 16.4, 16.5
	Increasing affected watercourse through increased salinity, sediment (through erosion and subsidence) and dust deposition	Section 16.4, 16.5
Ecology		
	Effectiveness of rehabilitation practices	Section 11.4
Visual and lighting		
	Increasing visual and lighting impacts, especially on elevated properties from vegetation removal	Section 14.3
	Impacts on surrounding viewpoints – designated tourist roads and main roads	Section 14.3
	Potential impact on the nature of the visual character of the surrounding area	Section 14.3
Aboriginal cultural heritage		
	Disturbance and loss of Aboriginal cultural heritage	Section 17.3
	Impacts on cultural heritage values	Section 17.3
Community engagement/relationship		
	Opportunities to improve relations between community and Coal & Allied	Chapter 20
	Mistrust with NSW Government and DP&E (eg rescinding Deed of Agreement (2003))	Chapter 20
	Positive steps with consultation associated with SIA	Chapter 20

Chapter 8

Economics

Chapter 8 — Economics

8 Economics

8.1 Introduction

This chapter provides a summary of the economic study for the proposal prepared by BAEconomics, which is presented in full in Appendix E. The chapter describes the methodology and results of the two components of the economic study, a cost benefit analysis (CBA) and regional economic impact analysis (REIA).

The economic study considered the combined economic impacts of both the proposal and the Warkworth Continuation 2014 proposal (together the 'proposals'). This was done as the two mines, while having separate ownership, are both managed by Coal & Allied. However, the two mines are approved separately and, therefore; the relative contributions of the two mines were also examined.

As described in Chapters 2 and 6, the resource is of economic significance as per the matters outlined in clause 12AA(2) of the Mining SEPP. These matters, as shown in Table 8.1, set the context in which the proposal was assessed in the economic study.

Table 8.1 Matters in clause 12AA(2) of the Mining SEPP regarding the proposal

Entity	Employment generation (Annual average full-time equivalents)	Incremental expenditure ($M NPV)[1]	Incremental royalties ($M NPV)[1]
MTO	152 over 7 years	297	50
Integrated MTW	1,307 over 21 years	6,020	617

Notes: 1. Figures in the table are the differences between the reference case (ie the proposals not being approved) and the proposal (refer to Section 8.2.3). Note this is unlikely to eventuate as the base case is unlikely to be economically viable.

The economic study identified the proposals would deliver combined net benefits to NSW of around $1.5billion. These net benefits would take the form of:

- additional disposable income received by MTW employees and long-term contractors who live in NSW;
- additional coal royalties paid to the NSW Government; and
- additional payroll taxes, council rates and other payments that accrue to State and local government.

The economic study indicates that about 10 per cent of additional income and 7 per cent of additional employment contributed by the combined proposals can be attributed to MTO, with the remainder attributable to Warkworth Mine. The direct economic benefits of MTO, in terms of contribution to NSW gross state product (GSP), amount to $149million in NPV terms. The flow-on benefits attributable to MTO amount to:

- for NSW, around $39million in additional income (in NPV terms), additional annual employment of 15 full-time equivalent workers, and a contribution to NSW GSP of around $45million;
- for the Mid and Upper Hunter region, around $23million in additional income in NPV terms, and additional annual employment of 16 full-time equivalent workers; and

- for the Singleton LGA, around $9million in additional income in NPV terms, and additional annual employment of 4 full-time equivalent workers.

8.2 Methodology

8.2.1 Justification for a combined economic study

MTO and Warkworth Mine are separate mines with different ownership and separate development consents. However, the majority owner of both is Coal & Allied which is also the manager of both mines. Given the same management the mines are able to function as an integrated operation and share the use of a number of resources and infrastructure. These include a joint workforce and management team, water, coal handling and processing plants and reject management infrastructure, as well as other facilities. The proposals would also involve some production of coal within the consent boundary of MTO that can only be economically accessed from Warkworth Mine. From an economic perspective, therefore, the value added generated by the two mines is created jointly.

Preparing separate CBAs for the proposals would not reflect the current operations of the mines, since ROM coal and waste may be processed either at Warkworth Mine or at MTO, depending on circumstances and what is more efficient, and since product coal produced at Warkworth Mine and destined for export is loaded onto trains at MTO. Preparing separate CBAs would, therefore, require additional assumptions about how the two mines would operate and interact in future, the derivation of transfer prices in order to cost the services that MTO would provide to Warkworth Mine, and how shared costs should be allocated to each mining operation. These assumptions involve a degree of judgement.

For the above reasons, one CBA has been prepared for the integrated MTW. However, in order to provide an indication of the respective contributions of the two mines to the economic benefits of the proposals, the direct benefits to NSW and the state, regional and local flow-on effects that can be attributed to MTO and Warkworth Mine have also been separately identified in the economic study in Appendix E.

8.2.2 Components

The CBA considers the direct costs and benefits accruing in NSW from the proposals, for instance, a benefit would be from additional value added in the form of wages and salaries paid to employees and contractors a cost would be noise amenity impacts to local residents. The REIA identifies the likely incremental flow-on effects of the proposals on the NSW economy and the Mid and Upper Hunter region. These effects refer to the adjustments in the regional and state economies that follow from initial changes in the level of demand for goods, services and wages that result from the proposals, if they are approved.

The Mid and Upper Hunter region, comprises the Singleton, Upper Hunter, Muswellbrook, Cessnock and Maitland LGAs. Around 74 per cent of MTW employees live in the Mid and Upper Hunter region, and 10 per cent live in other LGAs in the Hunter Valley region. Overall, 99 per cent of MTW employees live in NSW.

8.2.3 Scenarios considered

Two scenarios were considered under the economic study to allow for comparison of economic impacts with and without the proposals. These scenarios are as follows:

1. reference scenario – where development applications for the proposals are not approved. Coal production and employment at MTW would begin to decline from 2016 onwards and would end by 2021 (mining at MTO would cease by 2017 as per its existing development consent); and

2. proposal scenario – where development applications for the proposals are approved. Production and employment would continue at the current level until around 2030 and then decline by the end of 2035 when production ceases and operations ramp down for expected closure.

It should be noted that mining at Warkworth Mine's West Pit is expected to reach the existing consent limit in 2015, at which point production may no longer be economically viable. The reference case is, therefore, considered to be 'optimistic' as it is unlikely that an economically viable mine would continue operation, and the estimated net benefits can correspondingly be interpreted as being conservative.

8.2.4 Context of economic study

The external effects considered in the economic study were based on the key potential environmental impacts and mitigation measures identified for the proposal. The key environmental impacts and mitigation measures for the MTO proposal are detailed in Appendix C of the economic study (see Appendix E). The external effects and the approaches adopted in valuing likely external effects of the proposal are detailed in Section 3.2 of the economic study (see Appendix E).

8.2.5 Limitations of models

i Limitations of input-output analysis

The principal advantage of the impact multiplier method is the simplicity with which levels of mining investment, employment and output can be translated into measures of changes in regional income and employment. However, the accounting conventions that form the basis of input-output models and hence how multipliers are derived impose a number of restrictive assumptions. Some of these assumptions pertain to input analysis generally while others relate to the use and interpretation of input-output analysis at a regional/state, as opposed to a national level. The key assumptions are set out below.

It is because of these assumptions that it is acknowledged that the economic models are a tool only to assist the consent authority in respect of determining the proposal, which is consistent with the L&E Court judgement (par. 19).

a. Fixed capital stocks

The National Accounts, on which input-output analysis is based, do not explicitly account for fixed capital stocks. This is an issue with input-output analysis generally as fixed capital has a significant impact on how an industry adjusts over time. It also follows that input-output analysis is static in the sense that it takes no account of the time required for the composition of inputs and outputs of production to shift to a changed level in output. Industries that require large amounts of fixed capital and labour adjust slowly, particularly when they are near full employment or when the supply of skilled labour is tight. These dynamics are hard to predict, but the implication over the short- to medium-term is that input-output effects will be overstated to varying degrees across industries.

The fixed nature of the capital stock is a critical issue in regional impact assessments. In moving from the national to a state or regional level, the location of fixed assets becomes increasing important in establishing the goods and services that are supplied locally and those which are imported. Moreover, there is no information as to whether fixed assets are owned locally or whether the owners are located outside the region or state. As a consequence it becomes increasingly difficult to determine the valued added by local industry.

b. Supply constraints

When the initial impact considered is an increase in production, the assumption of fixed production patterns requires that there is a sufficient endowment of resources that is either available in (or able to migrate to) a region to meet the increase in demand for inputs whose supply is fixed. These inputs include resources such as land and water, as well as labour with adequate skills. If there is a reduction in production, as is the case here in the reference case, some or all of the fixed resources may be deployed elsewhere within or outside the region of interest. The return to these fixed resources is likely to be lower. However, if these next best opportunities are not taken into account the costs of foregoing the proposals would be overstated.

c. Homogenous and fixed production patterns

The input coefficients that measure inter-industry flows between sectors are 'fixed' in input-output models; at any level of output, an industry's relative pattern of purchases from other sectors is unchanged. These assumptions are likely to be inconsistent with production patterns in the local economy, since the local economy may not have on offer the range of inputs required for a given industry. Therefore, the impact of the change in output on the local economy would differ from that implied by a national multiplier.

d. Fixed prices

Input-output analysis assumes that prices in the economy in question are held constant, so that the additional material and labour inputs are available at existing prices and wage rates. In reality, prices of inputs may change with substantive changes in their demand. To the extent that there is an impact on prices, imputed output effects would be overstated. However, this is only a problem in input-output analysis for projects of a sufficient scale to materially shift the demand for inputs into production and the total supply of industry output.

ii Implications for the REIA

Many of the above assumptions can lead to an overstatement of the impacts of a project; the resulting regional impact estimates should therefore be interpreted as an upper bound of the likely effects.

Furthermore, and while, from a theoretical perspective, the total multiplier is the appropriate choice for calculating flow-on effects (since this measure takes into account the full adjustment of the economy to a change in economic activity), total multipliers are calculated in a manner that compounds any measurement errors and breaches in the assumptions that underpin the analysis. For example, total multipliers are calculated as a progression of first, second and successive round effects, with each embodying any errors in earlier effects. From this perspective, a more conservative approach is to rely only on multipliers that capture first round effects.

As noted above, there are additionally specific issues that arise in deriving value added multipliers. Value added includes profits that are distributed on the basis of ownership of capital assets, which becomes increasingly uncertain as the analysis becomes more granular. The calculation of value added at a regional level is, therefore, not meaningful.

8.3 Cost benefit analysis

8.3.1 Examining welfare implications on NSW

The *Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals* (NSW Government 2012) recommends that applicants for mining and coal seam gas proposals submit a CBA with their applications. The purpose of the CBA is to examine the welfare implications of the application on NSW. The *Guideline for economic effects and evaluation in EIA* (Planning NSW 2002) furthermore recommends that, if a proposal is predicted to have significant economic impacts at a regional or state scale, these regional or state-wide effects should be formally assessed.

From an economic perspective, the extent to which a project contributes to the welfare of a country or state is measured with reference to value added. Value added is the additional value of goods and services newly created in an economy, and available for domestic consumption or for export. Value added is a central concept in the Australian System of National Accounts (ASNA), where it is referred to as 'gross value added' to emphasise that this measure is gross of the consumption of fixed capital (that is, depreciation).

Gross value added is the difference between output and intermediate inputs (the value created by production), and equals the contribution of labour and capital to the production process (ABS 2013). Subject to adjustments that need to be made to ensure that valuations are internally consistent by accounting for various taxes and subsidies, the sum of gross value added across all industries in a country or state equals gross domestic product (GDP) or GSP, respectively. The economic impact of the proposals has therefore been evaluated with reference to its contribution to NSW GSP.

As previously described, the REIA also considers two smaller regions, being the Mid and Upper Hunter region which comprises the Singleton, Upper Hunter, Muswellbrook, Cessnock and Maitland LGAs due to the vast majority of MTW employees living within these areas.

The formula used for deriving GSP is provided in Section 3.1.1 of the economic study (see Appendix E). Essentially it takes into account the change in GSP as a result of the proposals being approved and the incremental benefits accruing to NSW from:

- the additional salaries and wages paid to NSW employees and contractors of MTW;
- the share of MTW's GOS that can be attributed to NSW, including coal royalty payments; and
- the additional payroll taxes and land taxes/shire rates paid to the NSW Government and local government.

The GOS refers to the share of income from production that can be attributed to capital inputs for incorporated businesses.

8.3.2 Distributional effects

A classical CBA does not consider the distribution of impacts across different segments of society. Notwithstanding this, information about the distributional impacts of proposed projects (ie the gains and losses for affected individuals and groups) is of interest to policy makers (Commonwealth 2006). Identifying distributional impacts is sometimes difficult because of data limitations (for example increased corporate profits may be distributed to individual shareholders and to superannuation funds on behalf of other individuals so that the eventual beneficiaries are a diffuse group of individuals). As such, distributional effects are addressed as follows:

- in the context of the CBA, comments are made, where possible, on whether the identified impacts may occur at a local or state-wide level; and
- in the context of the REIA, the estimated flow-on effects are set out at a state-wide, regional and local level.

8.3.3 Cumulative impacts

If the proposals are approved, the economic impacts would occur within a broader context where coal mining is already an important aspect of the local economy. The question then arises whether some of the impacts of the proposals may have broader regional implications that are not adequately captured using a conventional, incremental CBA approach. For instance, this could be an issue in relation to environmental impacts if some critical threshold is exceeded that may lead to wider adverse consequences, or if there are environmental interactions.

It is considered unlikely that cumulative impacts of this type are of concern in the context of the proposal. Both MTO and Warkworth Mine have been in operation since 1981, and have been managed by the Coal & Allied and, therefore, operated as an integrated operation since 2004. The impacts of the mining operations on the environment are well understood and are generally local in nature (excluding GHG emissions).

Technical studies have been prepared to assess these impacts, particularly additional impacts that may arise from the continuation of MTO and are the subject of other sections of this EIS.

8.3.4 Valuation of external effects

A CBA requires a full accounting calculation where the costs and benefits of a project are compared in monetary terms. This requires that costs and benefits should, as far as possible, be valued. As a general matter, CBA relies on the 'opportunity cost' principle to value goods or services (NSW Treasury 2007; Commonwealth 2006). In practice, the opportunity cost concept is made operational with reference to the 'willingness-to-pay' (WTP) criterion. For 'conventional', market-based transactions, such as the sale of coal outputs or the purchase of labour and other inputs, the relevant valuation approach is therefore the market price.

The *NSW Treasury Guidelines* (2007) require that 'external effects' (also referred to as 'externalities') are accounted for as part of societal benefits and costs. External effects are spillovers (positive or negative) from the production of a good or service, for example in the form of noise (negative spillovers).

External effects give rise to non-market impacts that are difficult to value. A variety of techniques have been developed to quantify these effects, including surrogate market (revealed preference) valuation techniques and hypothetical market (stated preference) techniques. These techniques aim to elicit estimates of either the WTP or the 'willingness-to-accept' (WTA) for a particular outcome. They differ in a number of ways, including in terms of the amount and detail of data that are required (which may or may not be available) and how reliable the results are (the extent to which they are subject to biases). Stated preference methods, in particular, which rely on surveys to elicit valuations, suffer from a number of well-known biases that often limit their validity and reliability (Pearce et al. 2006, Commonwealth 2006).

In contrast, and while such approaches cannot be applied in all circumstances and may not precisely capture the effect in question, the strength of revealed preference methods is that they are based on actual decisions made by individuals/households or other decision-makers. The economic study relied on market-based and revealed preference techniques for valuing the external effects associated with the continuation of MTW. The unifying characteristic of both techniques is that they aim to value non-market impacts by observing actual behaviour and are, therefore, considered to be a more reliable indicator of people's preferences.

The approaches adopted in valuing likely external effects of the continuation of MTW are detailed in Section 3.2 of the economic study (see Appendix E) and summarised below.

i External effects that can be internalised by MTW

External effects that can be internalised by MTW are non-market costs that can be accounted for through either financial instruments, or the creation of direct offsets.

a. Financial instruments

Financial instruments generally involve the compensation of affected individuals or payments for measures designed to mitigate or remove the impact of the external effect.

External effects that have been valued in this manner are:

- noise and air quality impacts;
- visual amenity impacts; and
- Aboriginal and historic heritage impacts.

Compensation may represent an under or an overestimate of the value of the non-market impact on wellbeing. For instance, households predicted to be significantly affected, ie above government-prescribed criteria, by air and noise outcomes would be offered acquisition of their properties, in accordance with a process that generally results in prices that are above market values. In these cases it could be argued that the valuation of the corresponding external effects on that basis overestimates the impacts, although the affected landowners may have a (subjective) perspective of these impacts that may be lower or higher.

There are instances of more or less arbitrary cut-off points, for instance, because noise or dust criteria are exceeded at one location, but not at a different but nearby location. These types of boundary issues are essentially a function of environmental criteria that may deem one level of disturbance to be acceptable, but no longer tolerate a slightly higher level of disturbance. Irrespective of the criteria that may be set down in statutes or regulations, peoples' personal preferences may also vary, so that what may be an acceptable disturbance to some may be considered distressing by others. While these variations in perceived impacts should be acknowledged, there is no way in which they could be measured or assessed in a reliable manner, and the economic study in Appendix E has not attempted to do so. Again, it needs to be understood that the economic assessments are a tool to assist the consent authority which is consistent with the L&E Court judgement (par.19) and the consent authority will need to consider these issues in their ultimate decision in respect of the proposal.

b. Market-based valuation (offsets)

Direct offsets refer to actions that are taken to deliver an outcome that is equivalent or preferable to the case in which the proposal does not proceed.

The cost of acquiring direct offsets is pertinent to the valuation of ecological impact, ie progressive clearing of vegetation within the disturbance boundaries. The proposal would not result in additional vegetation clearance and is expected to have negligible impact on the ecology within the MTO area and the local area.

ii External effects that cannot be internalised by MTW

Some external effects cannot be addressed through direct compensation or offsets, but can be given an appropriate public value.

a. Valuation of traffic impacts

Road user costs have been used to value traffic impacts on road networks, traffic impacts at intersections, cumulative impacts, car parking and alternative site access.

Road user costs include the opportunity cost of drivers' travel time, which is estimated on the basis of labour costs and/or stated preference survey techniques; vehicle operating costs, which are typically computed for various representative vehicles; and accident costs, which refer to costs associated with pain and suffering, other economic costs, and various measures of property damage.

The proposal would not result in any net increase in rail traffic over and above currently approved rail activities servicing the integrated MTW operation.

b. Publically determined values

The consequences (or outcomes) of government decisions reflect implicit choices or value judgements to achieve an outcome. For example, the price of water licences, as determined by government allocations and revealed through trades, gives an indication of the value attached to the use of scarce water resources.

The incremental effects on groundwater and surface water were valued using the cost of licences that MTW would need to acquire in order to compensate for any external effects. No groundwater or surface water licensing costs were incorporated into the analysis because no additional Permian groundwater licenses would be required in the future and it is highly uncertain whether additional surface water access licenses would be required in the future (ie dependent on future rainfall).

c. Greenhouse gas emissions

If the development applications are approved for MTO and Warkworth Mine, the mining and associated processes would give rise to an increase in GHG.

The additional GHG emissions associated with MTO and Warkworth Mine have been valued using 'social cost of carbon' (SCC), as determined by the US Interagency Working Group on Social Cost of Carbon (2013). The SCC is an estimate of the monetised damages associated with an incremental increase in carbon emissions in a given year. It includes changes in net agricultural productivity, human health, property damages from increased flood risk, and the value of ecosystem services due to climate change. The NSW share of damages associated with additional GHG emissions has been estimated with reference to the NSW GSP as a percentage of world GDP.

iii Threshold values

Threshold values are costs and benefits that cannot be addressed through direct compensation or mitigation and that cannot be given an appropriate public value. Threshold values provide an indication of the value that the non-market benefits of protecting a resource or asset would need to reach, in order to be in the community's best interest to forego the benefits. No external effects that may be considered to fall under this heading have been identified for the proposals.

8.3.5 Results

This section summarises the results of the CBA for MTO. As set out above, the proposals have been evaluated with reference to their impact on NSW GSP.

i Gross operating surplus accruing to MTO

As stated above, one of the components of NSW GSP is the share of MTW's GOS that can be attributed to NSW. Deriving the incremental benefits to NSW if the proposals for the continuation of MTO and Warkworth Mine are approved therefore requires that the net GOS associated with the proposals is identified (see Table 8.2). The GOS is calculated as output valued at producer prices, net of intermediate inputs (operating expenditure), net of employee compensation, and net of taxes on production (ABS 2013). The GOS resembles (but is not the same as) a corporation's earnings before interest payments, taxes and depreciation, and hence includes a number of components that are not explicitly listed in Table 8.2. These components include royalty payments, corporate income taxes, depreciation, interest payments and certain other expenses.

Table 8.2 indicates the GOS attributed to MTO is around $332million in NPV terms.

Table 8.2 Gross operating surplus attributed to MTO

Costs	NPV[1] ($M real 2014)	Benefits	NPV[1] ($M real 2014)
Operating expenditure	$393	Value of mining output	$635
Compensation of employees and long-term contractors	$148	Revenue from tolling, coal processing	$248
Other taxes (net of subsidies) on production:	$8		
Total	**$549**	**Total**	**$883**
Gross operating surplus	**$334**		

Notes: 1. NPVs have been derived using a discount rate of 7 per cent.

ii Net impacts on NSW gross state product

The net economic benefit of the proposals for NSW is estimated at approximately $1.5billion in NPV terms (see Table 8.3). The key components of these benefits are the additional wages and salaries paid by MTW to NSW employees, royalties, as well as various taxes paid by MTW (which directly or indirectly benefit NSW) which are also material.

Given that 74 per cent of MTW employees currently live locally (within the Mid and Upper Hunter region), an estimated $464million in NPV terms of the additional disposable income generated by the continuation of MTW would benefit the local regional economy, as would the additional land taxes/shire rates paid by MTW (around $8million in NPV terms for MTO).

With the exception of those arising from traffic impacts, which have been valued separately, external effects have generally been valued on the basis of the financial payments made by Rio Tinto or on the basis of offsets.

Table 8.3 Incremental (economic) costs and benefits of the proposals for NSW

Costs, NPV	($M real 2014)	Benefits,	NPV ($M real 2014)
Production-related impacts			
		Compensation of employees/ contractors accruing to NSW:	
		Disposable income	$612
		NSW share of personal income tax receipts	$78
		NSW share of Medicare receipts	$2
		Share of MTW GOS accruing to NSW:	
		Royalties	$617
		Income to NSW shareholders of Rio Tinto	$12
		NSW share of company taxes paid by MTW	$116
		Taxes on production and imports:	
		Payroll taxes	$61
		Land taxes/shire rates	$5
Total production-related costs	**$0**	**Total production-related benefits**	**$1,501**
External effects			
Noise and vibration	$15	Zone of mitigation work, noise attenuation	$15
Visual amenity	$2	Visual amenity upgrades	$2
Noise and airgeneral	$3	Acquisition of properties	$3
Aboriginal heritage	$1	Cultural Heritage Facility	$1
Ecology	$10	Acquisition of offsets	$10
Traffic impacts	$13	Traffic impacts	$0
Groundwater	$0	N/a	$0
Surface water	$0	N/a	$0
European heritage	$0.5	Heritage trust, Great North Road	$0.5
GHG emissions	$0.5	GHG emissions	$0

Table 8.3 Incremental (economic) costs and benefits of the proposals for NSW

Costs, NPV	($M real 2014)	Benefits,	NPV ($M real 2014)
Total external effects costs	**$45**	**Total external effects benefits**	**$31**
Total societal costs	**$45**	**Total societal benefits**	**$1,533**
Net economic benefits	**$1,488**		

Notes: NPVs have been derived using a discount rate of 7 per cent.

Detailed calculations to derive production-related benefits that can be attributed to NSW are set out in Appendix A of the economic study (see Appendix E).

Description and rationale for the valuation of external effects are set out in Appendix B of the economic study (see Appendix E).

Totals may not sum precisely due to rounding.

A number of adjustments have been made to ensure that production-related benefits are appropriately attributed to NSW. These adjustments are described in Section 3.3.2 of the economic study (see Appendix E).

8.3.6 Sensitivity analysis

The CBA is based on a number of assumptions around which there is some level of uncertainty. This can be addressed by changing the values of critical variables in the analysis to determine the effect on the results and this is known as a sensitivity analysis.

The sensitivity of the results of the CBA was tested by applying variations to:

- the discount rate;
- coal prices and exchange rates; and
- re-employment assumptions.

Under all sensitivities tested the proposal remains strongly positive in terms of economic contribution to NSW.

i Discount rate

In accordance with the *Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals* (NSW Government 2012) discount rates of 4 and 10 per cent per annum were applied to the results of the CBA (a rate of 7 per cent was assumed in the CBA). Application of these rates indicates that material net benefits would accrue to NSW irrespective of which discount rate is used. For example, increasing the discount rate from 7 to 10 per cent (that is, discounting the future more heavily) reduces the overall estimate of the value of the proposal to NSW but even with a high discount rate of 10 per cent the net present value of the proposal remains strongly positive. Lowering the discount rate to 4 per cent increases the NPV of the proposal to NSW to just over $2billion.

ii Coal prices and exchange rates

Most of MTW's coal production is exported overseas, and is priced in US dollars. Different combinations of coal prices and US$/A$ exchange rates will therefore affect MTW's GOS, including corporate income tax payments and royalty payments to NSW.

In the CBA a thermal coal price of US$85 per tonne and an exchange rate of US$/A$0.85 was assumed. Accordingly, a number of variations to the coal price and exchange rate assumptions for the CBA were applied to test their sensitivities to the result. For example, if the thermal coal price changed to US$75 per tonne and the exchange rate changed to US$/A$95. The results can be seen in Tables 3.5 and 3.6 of the economic study (Appendix E).

The results of the sensitivity analysis shows that royalties paid to the NSW Government and the production benefits of the proposal are moderately sensitive to variations in exchange rate and coal price assumptions. For example, at a coal price of US$75/t a reduction in the exchange rate from A95c to A75c would lead to an increase in the net present value of royalty payments to the NSW Government of $133million and at an exchange rate of A75c an increase in the coal price from US$75/t to US$95/t would lead to an increase in the net present value of royalty payments of $170million.

iii Re-employment assumptions

A matter referenced in the L&E Court judgement (par. 456) discussed linkages between sectors of the regional economy, particularly with regard to the assumptions made for movement of employment to cater for the proposal. For the CBA, it was assumed that:

- 30 per cent of employees and contractors who would be made redundant by the closure of MTW would find employment elsewhere within NSW in the same year, and 40 per cent of these employees and contractors would find employment in NSW in the year after being made redundant (at the weighted-average wage and salary income reported for the Mid and Upper Hunter region by the ABS for the corresponding LGAs); and

- 70 per cent of any additional employees and contractors employed by MTW may move to MTW from other industries in NSW.

The implications of a number of variations in the re-employment assumptions for the CBA were varied to test their sensitivities to the result. For example, if:

- 50 per cent of employees and contractors who would be made redundant by the closure of MTW would find employment elsewhere within NSW in the same year, and none in the year after being made redundant; and

- 100 per cent of any additional employees and contractors employed by MTW may move to MTW from other industries in NSW.

The results of the sensitivity analysis show that significant employment and other benefits would accrue to NSW irrespective of the precise assumptions that are made about re-employment outcomes, and the extent to which any additional employment at MTW would draw workers from existing positions in NSW. This reflects both the substantial employment that would be generated if the proposals are accepted, and high wage and salary outcomes at MTW relative to average wages and salaries in the Mid and Upper Hunter region.

8.4 Regional economic impact analysis

8.4.1 Choice of analysis used

There are a number of methods that can be used for calculating flow-on effects from mine extensions. The methodology used relies on input-output analysis. The primary reason for selecting this methodology is simplicity and clarity with which the underlying assumptions can be set out and appropriate caveats made. When compared to more complex methods such a general equilibrium (GE) analysis the gross value of the proposals is small in relation to the Australian and NSW economies. Unlike an input-output analysis, a GE analysis takes into account the price impacts of a project on inputs and outputs. However, given the relatively small size of the proposals under consideration here, material price impacts would not be expected and the difference between the results of a GE and an input-output analysis should also be small.

Given the lack of information about industry structure and trade at a regional and state level, there is no reason to think that one method would be materially more accurate than another. Both GE and input-output analysis depend critically on accurately modelling flows of production and expenditure. As referenced in the L&E Court judgement (par. 19), they are a guide to, but not a determinant of the impacts of the proposals.

8.4.2 Adjusting regional/state industry composition and trade

Regional impact analysis depends, in large part, on adjusting the flows of production and expenditure, as represented by national input-output tables, to represent a state or regional economy. However, industries at a regional or state level have differing compositions of inputs and outputs than is the case for the national average; the same difficulty arises for specific projects within a region. Hence, a consistent set of ancillary information that is specific to national, state and regional economies is required to apportion national aggregates. The most commonly used information for this purpose (which is also recommended by the ABS) is industry employment.

As of 2011, the ABS has conducted a census of employment by industry and at the LGA level. This employment information can be used to calculate location quotients (LQs) to adjust national industry structure and trade flow data to derive the corresponding state and regional aggregates. Employment based LQs are ratios that indicate the percentage of people employed in a particular industry at a state/regional level, relative to the percentage of people employed in that industry in the economy as a whole. In the case of the Mid and Upper Hunter region, for instance, the employment based LQ indicates that the share of employment in the mining sector is significantly larger than it is for the Australian economy as a whole. Employment based LQs are then used to proportionally adjust the contribution of an industry to the use of intermediate inputs in a state or region. The consequent shortfall in intermediate inputs is made up by increasing 'imports' from outside the state or region across all industries.

The use of employment LQs has a critical limitation. Input-output tables do not explicitly account for fixed capital, human or physical, although the returns to these assets are implicitly reflected in wages and operating surpluses (profits). As the impact analysis becomes more granular, the geographic location of these fixed assets can become increasingly important. A region may simply not have the fixed assets needed to cost-effectively produce the input required by a local industry and as a consequence they would be 'imported' from other regions, states, or from overseas.

8.4.3 Interpretation of input-output multipliers

A change in demand sets the economy in motion as the productive sectors buy and sell goods and services from one another and households earn additional incomes, which gives rise to further flow-on effects (Coughlin et al. 1991). These relationships cause the total effects on the regional and state economy to exceed the initial change in demand.

Regional economic impacts can be measured in terms of income, value added and employment, which in turn gives rise to income, value added and employment multipliers. In the case of the proposals:

- the income multiplier refers to the percentage change in total income arising per dollar change in the wages and salaries paid by MTW;
- the employment multiplier corresponds to the change in total employment (in numbers of full-time equivalents) arising per additional person employed by MTW; and
- the value added multiplier refers to the percentage change in total value added arising per dollar change in the value added created by MTW.

Multipliers are classified into 'types'. Type I multipliers refer only to flow-on effects in the production sectors, while Type II multipliers incorporate subsequent impacts on households. In the case of the proposals:

- Type IA multipliers refer to the 'initial' and 'first round' effects arising from an increase in demand from MTW. The initial effect refers to the additional output from the proposals. The first round effect captures the immediate subsequent impacts on income, employment or value added from all industries whose output is required to produce the additional output from MTW.
- Type IB multipliers refer to the initial and 'production induced' effects, which encompass first round effects and additionally 'industrial support' effects. Industrial support effects capture subsequently induced effects that occur after the first round effects (since the initial output effect from MTW would induce additional output in other industries, which would in turn lead to further rounds of effects and so on).
- Type IIA multipliers incorporate the effects of the initial increase in output of MTW on households, and refer to the sum of production induced and consumption induced effects. Consumption induced effects capture the fact that, as a result of the additional output from MTW and subsequent production induced effects in other industries, wage and salary earners would earn extra income which they spend on goods and services produced by all industries in the state or region.

8.4.4 Limitations of input-output analysis

The limitations of input-output analysis are discussed in Section 8.2.5. The principal advantage of the impact multiplier method is the simplicity with which levels of mining investment, employment and output can be translated into measures of changes in regional income and employment. However, the accounting conventions that form the basis of input-output models and hence how multipliers are derived impose a number of restrictive assumptions. Some of these assumptions pertain to input analysis generally while others relate to the use and interpretation of input-output analysis at a regional/state, as opposed to a national level.

Many of the above assumptions can lead to an overstatement of the impacts of a project; the resulting regional impact estimates should therefore be interpreted as an upper bound of the likely effects (Bess and Ambargis 2011, Coughlin et al. 1991).

Furthermore, and while, from a theoretical perspective, the total (Type IIA) multiplier is the appropriate choice for calculating flow-on effects (since this measure takes into account the full adjustment of the economy to a change in economic activity), total multipliers are calculated in a manner that compounds any measurement errors and breaches in the assumptions that underpin the analysis. For example, total multipliers are calculated as a progression of first, second and successive round effects, with each embodying any errors in earlier effects. From this perspective, a more conservative approach is to rely only on multipliers that capture first round effects (Type IA multipliers).

As noted above, there are additionally specific issues that arise in deriving value added multipliers. Value added includes profits that are distributed on the basis of ownership of capital assets, which becomes increasingly uncertain as the analysis becomes more granular. The calculation of value added at a regional level is therefore not meaningful.

8.4.5 Results

i Income, employment and value added multipliers

Table 8.4 shows the estimated income, employment and value added multipliers for NSW, the Mid and Upper Hunter region and Singleton LGA for the proposals. Based on this analysis, the approval of the proposals would lead to the following effects on the economy of NSW (Type IA multipliers), ie to calculate the first-round flow-on effects of the MTO and Warkworth Mine proposals, it is necessary to deduct the initial effects from the multipliers, ie the additional expenditure from the proposal (compared to the reference case), by subtracting one:

- each additional dollar in wages and salaries paid by MTW induces an additional $0.63 in total income;
- each additional person employed by MTW induces employment of an additional 0.9 full-time equivalents; and
- each additional dollar of value added created by the proposals induces an additional $0.3 in value added.

Table 8.4 Income, employment and value added multipliers for NSW, the Mid and Upper Hunter region and for Singleton LGA

Multiplier	Type		
	IA	IB	IIA
	NSW		
Income	1.63	2.23	3.54
Employment	1.91	3.81	6.05
Value added	1.30	1.55	2.05
	Mid and Upper Hunter region		
Income	1.49	2.09	2.63
Employment	1.76	3.62	4.79
Value added	1.25	1.45	1.71

Table 8.4 Income, employment and value added multipliers for NSW, the Mid and Upper Hunter region and for Singleton LGA

Multiplier	Type		
	IA	IB	IIA
	Singleton		
Income	1.67	3.07	4.33
Employment	1.46	1.68	2.37
Value added	1.25	1.39	1.62

ii Net impacts of the proposals

The direct impacts of the proposals relative to the ramp down of MTW in the reference case are summarised in Table 8.5. Annualised values have been used to calculate the flow-on effects on an annual basis.

Table 8.5 Summary of net direct annual impacts of the proposals

Item	Proposal scenario (NPV, 2014 $M)	Reference scenario (NPV, 2014 $M)	Net change (NPV, 2014 $M)	Amortised net change (annual $M)
Value of output	$13,972	$6,445	$7,527	$664
Input costs	$7,253	$3,441	$3,812	$336
Gross wages and salaries	$2,694	$1,200	$1,494	$132
Gross operating surplus	$3,896	$1,746	$2,150	$190
Taxes on production	$129	$58	$71	$6
Value added + 'imports'	$6,719	$3,004	$3,715	$328

Notes: Expenditures incurred by MTW to mitigate external effects have been excluded from this analysis as they are assumed to equal the costs of the externalities they are intended to mitigate.

Input costs are total operating expenses, excluding wages and salaries. Gross operating surplus is the value of output less intermediate inputs (excluding capital costs). The sum of wages and salaries for employees and long-term contractors, gross operating surplus, taxes on production, and royalties equals value added prior to the deduction of 'imports'. Employment is the average level of full-time equivalent employment (employees and long-term contractors) from 2014 to 2035.

Table 8.6 shows the net income benefits and the average annual increase in employment if the proposals are approved, at the state, regional and local level. Apportionment of the change in income and employment associated with the proposals is based on assumptions (refer to Appendix E) and adjustments to account for:

- the size of the MTW workforce residing in NSW, the Mid and Upper Hunter region and in Singleton LGA;
- expectations that some share of workers who would be made redundant in the event the proposals are not approved would be re-employed within NSW, the Mid and Upper Hunter region and in Singleton LGA; and
- expectations that a share of any additional workers employed by MTW would redeployed from within NSW, the Mid and Upper Hunter region and in Singleton LGA.

Given the residence of the MTW workforce, the positive income effects of the proposal are concentrated regionally and locally. It has been assumed that a relatively larger share of MTW workers made redundant would be re-employed within NSW than with either the region or local area. As a consequence, the regional impacts on employment are larger than at the state level.

Table 8.6 Net income benefits, average annual net change in employment and derived 'imports' (MTW)

Area	Net income (NPV, 2014 $M))	Net employment (annual average)	Imports (per cent)
NSW	$612	227	4.9
Mid and Upper Hunter region	$464	282	-
Singleton LGA	$126	133	-

iii Flow-on effects for NSW

To calculate the initial flow-on effects of the proposals for NSW, it is necessary to deduct the direct effects from the multipliers by subtracting one from the first round effect in Table 8.4:

- the initial income multiplier effects are calculated by applying the multiplier to the total value of wages adjusted by the proportion of wages paid to employees living in NSW;
- the initial employment multiplier effects are calculated by applying the multiplier to the total net change in average employment adjusted by the proportion of wages paid to employees living in NSW; and
- initial value added effects for NSW are calculated by first calculating the value added accruing to NSW, and by subsequently deducting imports into mining and then applying the NSW multiplier.

Further, it is necessary to consider the issue of the transfer of labour between industries. The total flow-on income and employment effects have been adjusted to account for the expectation that a share of the full-time equivalents that would be made redundant in the reference case would be re-employed. Total value added (the sum of salaries and wages and GOS) has been adjusted for the corresponding change in incomes. The assumptions made for NSW are consistent with those made in CBA.

Table 8.7 shows the estimated flow-on effects from the proposals for NSW. The estimated net flow-on benefits of the proposals amount to:

- an overall increase in GSP of $450million ($39million per annum), equivalent to about 12 per cent of the net value added of the proposals ($3,715million);
- $385million in additional income ($33million per annum); and
- additional annual employment of around 206 full-time equivalent workers.

Table 8.7 Initial flow-on effects (Type IA) for NSW

	Income (2014 NPV $M)		Employment (full-time equivalents)		Value added (2014 NPV $M)	
	Total	**Annual**	**Total**	**Annual**	**Total**	**Annual**
Flow-on effects	$385	$33	-	206	$450	$39

The MTO's contribution to the flow-on effects to NSW were calculated as:

- an increase in GSP of $45million ($4million annually) (in NPV terms); and
- additional income of $39million (in NPV terms) and a net addition of 15 full-time equivalent workers.

iv Flow-on effects for Mid and Upper Hunter region

Table 8.8 shows the estimated flow-on effects from the proposals for the Mid and Upper Hunter region. The net benefits to the Mid and Upper Hunter region are estimated to be:

- around $227million in additional income ($20million per annum); and
- additional annual employment of around 214 full-time equivalent workers.

These effects have similarly been calculated by adjusting the various factors for the percentage of MTW employees living in the Mid and Upper Hunter region. Given the various uncertainties set out above, value added effects have not been calculated on a regional basis. For the Mid and Upper Hunter region, it has been assumed that:

- 50 per cent of any unemployed workers would leave the Mid and Upper Hunter region workforce;
- 20 per cent would be re-employed within one year (imputed as a loss of one year's wages for 20 per cent of the workforce); and
- an additional 30 per cent would be re-employed in the second year (imputed as a loss of two years' wages for 40 per cent of the workforce).

Table 8.8 Initial flow-on effects (Type IA) for the Mid and Upper Hunter region

	Income (2014 $m)		Employment (full-time equivalents)	
	Total	**Annual**	**Total**	**Annual**
Flow-on effects	$227	$20	-	214

The MTO's contribution to the flow-on effects to the Mid and Upper Hunter region were calculated as:

- approximately $23million in additional income (in NPV terms); and
- additional annual employment of around 16 full-time equivalent workers.

v Flow-on effects for the Singleton LGA

Table 8.9 shows the estimated flow-on effects from the proposals for the Singleton LGA. The net benefits for the Singleton LGA are estimated to be:

- around $84million in additional income generated ($7million per annum); and
- additional annual employment of around 61 full-time equivalent workers.

These effects have similarly been calculated by adjusting the various factors for the percentage of MTW employees living in the Singleton LGA (35 per cent).

Table 8.9 Initial flow-on effects (Type IA) for the Singleton LGA

	Income (2014 $m)		Employment (full-time equivalents)	
	Total	**Annual**	**Total**	**Annual**
Flow-on effects	$84	$7	-	61

MTO's contribution to the flow-on effects to Singleton LGA were calculated as:

- approximately $9million in additional income (in NPV terms); and
- additional annual employment of around 4 full-time equivalent workers.

8.5 Conclusions

The resource the subject of the proposal is of economic significance as per the matters outlined in clause 12AA(2) of the Mining SEPP. The economic study describes the direct and flow-on economic benefits of the proposals for Singleton LGA, the Mid and Upper Hunter region and for NSW.

The economic study has been prepared in accordance with relevant NSW Government guidelines, including the *Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals* (NSW Government 2012), *the Guideline for economic effects and evaluation in EIA* (Planning NSW 2002), and the *NSW Government Guidelines for Economic Appraisal* (NSW Treasury 2007).

In NPV terms, the proposals would deliver net benefits to NSW of around $1.5billion. These net benefits take the form of (see Table 8.3):

- the additional disposable income received by MTW employees and contractors who live in NSW, around $612million;
- the additional coal royalties paid to the NSW Government of around $617million; and
- additional payroll taxes, council rates and other payments that accrue to different levels of government, and which amount to around $259million.

Almost three quarters of MTW employees and contractors live in the Mid and Upper Hunter region. Around $464million in NPV terms in additional disposable income would flow to that region.

The assumptions underpinning the derivation of wages and salary benefits described above are conservative. It has been assumed that, in the event that the proposals are not approved and MTW closes by 2021, most of MTW's employees and long-term contractors would find alternative employment in the Mid and Upper Hunter region.

In addition to the direct effects described above, the proposals are expected to have positive flow-on effects on the NSW economy. These flow-on effects are a reflection of the significant projected expenditures on wages and salaries, as well as other mining inputs by MTW. In NPV terms, the initial flow-on effects are estimated at:

- around $385million in additional income for NSW;
- additional annual employment of around 206 full-time equivalent workers in NSW; and
- an increase in the GSP of NSW of around $450million ($39million annually).

Significant positive flow-on effects are also expected for the Mid and Upper Hunter region. In NPV terms, the initial flow-on effects are estimated at:

- around $227million in additional income would flow to the Mid and Upper Hunter region; and
- additional annual employment of around 214 full-time equivalent workers.

Thirty four per cent of MTW's employees and long-term contractors live in Singleton. In NPV terms, the estimated flow-on effects for the Singleton LGA are:

- around $84million in additional income; and
- additional annual employment of around 61 full-time equivalent workers.

While MTO and Warkworth Mine would continue to operate as an integrated mining complex if the proposals are approved, the relative contributions of the two mines to the benefits that would accrue to NSW has also been examined. The analysis indicates that the direct economic benefit that can be attributed to MTO is around 10 per cent of the direct economic benefit of the combined MTO and Warkworth Mine proposals, in terms of contribution to NSW GSP. For the flow-on effects of the combined MTO and Warkworth Mine proposals, 10 per cent of additional income and 7 per cent of additional employment can be attributed to the MTO proposal.

Chapter 9

Noise and vibration

Chapter 9 — Noise and vibration

9 Noise and vibration

9.1 Introduction

This chapter provides a summary of the noise and vibration study prepared by EMM, which is presented in full in Appendix F.

The chapter describes the existing acoustic environment and noise and vibration management, potential impacts at assessment locations, and management and monitoring measures under the proposal.

The study has been prepared in accordance with the EPA's *NSW Industrial Noise Policy* (EPA 2000) (INP).

9.2 Noise criteria

As discussed in Section 6.2.3.ii.a, the Mining SEPP was recently amended and now includes clause 12AB that sets out a number of non-discretionary development standards for mining. These are discussed in Chapter 6. Clause 12AB(3) provides non-discretionary development standards relating to cumulative noise. It states:

> The development does not result in a cumulative amenity noise level greater than the acceptable noise levels, as determined in accordance with Table 2.1 of the Industrial Noise Policy, for residences that are private dwellings.

The Mining SEPP references the acceptable noise level from the INP Table 2.1. This is reproduced below in Table 9.1.

Table 9.1 Amenity criteria (residences)

Indicative noise amenity area (Residence)	Time of day	Recommended L_{Aeq} noise level, dB(A)	
		Acceptable	Maximum
Rural	Day	50	55
	Evening	45	50
	Night	40	45
Suburban	Day	55	60
	Evening	45	50
	Night	40	45
Urban	Day	60	65
	Evening	50	55
	Night	45	50
Urban/Industrial interface	Day	65	70
	Evening	55	60
	Night	50	55

Source: INP

The definitions for the various amenity area categories are described in the INP. Based on these definitions, the centre of Bulga is a 'suburban' area while most other assessment locations considered in this study reside in 'rural' areas. For this assessment, categorising residences as rural or suburban is inconsequential since the limiting night time amenity criterion is identical for both categories. Outside of the INP, it is acknowledged that feedback from Bulga residences describe their area as rural rather than suburban.

A relatively small number of residences adjoin the MTIE and, hence, their amenity category is appropriately described as urban/industrial interface according to the INP's definition. Similarly, the two assessment locations in Warkworth village are exposed to relatively high industrial noise from Wambo Mine as substantiated in the cumulative assessment presented in Section 9.4.7. These two residential areas are, therefore, appropriately assessed as urban/industrial interface.

It is demonstrated that the non-discretionary Mining SEPP is satisfied for Bulga village residences and means the area's amenity is not compromised as it meets the INP's ANL.

9.2.1 Industrial Noise Policy

The noise and vibration study completed includes a full INP assessment. The overall aim of the NSW INP is to allow the need for industrial activity to be balanced with the desire for an appropriate amenity level in the community. One of its specific objectives is to establish noise criteria, or project specific noise levels (PSNL) to protect the community from excessive intrusive noise and preserve amenity for specific land uses.

The assessment procedure for industrial noise sources such as mining has two components:

- controlling intrusive noise impacts in the short-term for residences; and
- maintaining noise level amenity for particular land uses for residences and other land uses.

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the ANL described in Table 9.1. Meeting these noise levels "will protect against noise impacts such as speech interference, community annoyance and to some extent sleep disturbance" (INP). In cases where potentially noise-producing industrial developments are proposed for an area, the amenity criteria, which set a cap for the cumulative noise from industry will be more stringent than the intrusive criteria so that the total impact from industry does not cause amenity to deteriorate.

While both criteria must be satisfied to achieve this objective, the more stringent of the intrusive or amenity criteria become the limiting criteria or PSNL. The process by which the two criteria work is shown conceptually in Figure 9.1 and it is noted that the two criteria are measured over different time periods.

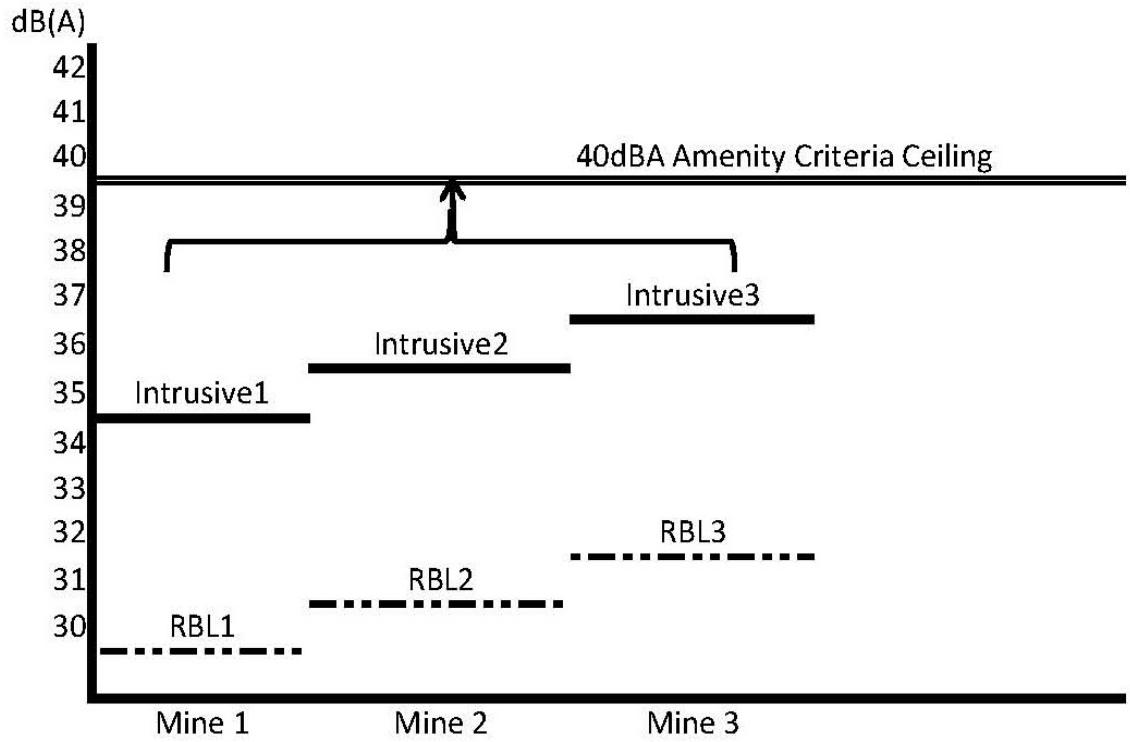


Figure 9.1 Amenity criteria to stop noise creep

For Bulga residences, the amenity, which relates to cumulative noise from all industry, cannot worsen because no new large scale industry would be able to physically exist in a position that could push amenity levels any higher for Bulga residences. Further, Bulga Coal Complex is progressing away from Bulga village and coal extraction at MTO would cease in approximately 2020 at Loders Pit, with only the transfer of overburden from Warkworth Mine continuing in this area of the mine. Hence, if the proposal is granted development consent it is expected that Bulga's amenity would be preserved to levels described in the Mining SEPP non-discretionary standards (ie the INP's ANL).

The INP requires the assessment of predicted noise levels against PSNLs, which for the proposal, has been determined based on the intrusiveness criteria (RBL plus 5dB(A)). The way in which this was determined is described below.

The objective of the INP's holistic approach to amenity noise is to satisfy the recommended ANLs. The strictest of these is the night time acceptable amenity criterion of 40dB(A). This criterion has been adopted in this assessment for most residences and from all industrial noise sources, inclusive of MTO's contribution, as per the INP. This is a practical approach in the current situation because the neighbouring industrial sites (Warkworth Mine and Bulga Coal Complex) are changing their noise contribution in the area as described in the respective EAs (EMM 2014; Umwelt 2013) and the INP supports the inclusion of MTO's current contribution as part of the total existing industrial noise levels of the area. The other instrument that supports this holistic approach is the non-discretionary Mining SEPP.

The INP provides nine steps for noise management at Section 1.4 'Applying the policy'. For reference, these steps are provided in Table 9.2 with references within this EIS as to where these have been addressed. Refer to Appendix F for more detail.

Table 9.2 INP checklist

Step		Reference
1.	Determining the project specific noise levels for intrusiveness and amenity that are relevant to the site or the area (Section 2)	Section 9.2 and Figures 9.3 and 9.4
2.	Measuring and determining existing background and ambient noise levels, using the method relevant to the expected level of impact (as outlined in Section 3)	Section 9.3
3.	Where the proposed development is expected to produce annoying noise characteristics, adjustments are to be applied to the noise levels produced by the development in question (as outlined in Section 4)	Section 9.4.4
4.	Predicting or measuring the noise levels produced by the development in question, having regard to meteorological effects (such as wind, temperature inversions) (see Section 5)	Section 9.4.2
5.	Comparing the predicted or measured noise level with the project-specific noise levels and assessing impacts (Section 6)	Section 9.4.2
6.	Considering feasible and reasonable noise mitigation strategies where the project specific noise levels are exceeded (Section 7)	Section 9.5
7.	Negotiation between the regulatory/consent authority and the applicant and between the community and the applicant to evaluate the economic, social and environmental costs and benefits from the proposed development against the noise impacts (Section 8)	Chapter 6 and Chapter 20
8.	The regulatory/consent authority sets statutory compliance levels that reflect the achievable and agreed noise limits for the development (Section 9)	To be completed by consent authority at the completion of the approval process
9.	Monitoring of environmental noise levels from the development to determine compliance with the consent/licence conditions (Section 11). To be completed post approval for the proposal	To be completed post approval for the proposal. Monitoring information for the current operations is provided in Section 9.5

9.2.2 Perceived changes in noise

Examples of common noise levels include:

- Inside bedroom (windows closed) – 20dB(A).
- Quiet suburban area – 40-50dB(A).
- Busy office – 60dB(A).
- Busy city street at the kerbside – 70–80dB(A).
- Rock concert – 110dB(A).

Table 9.3 provides an indication as to an average person's perception about changes in noise levels. For example, a change in sound level of 3dB is only just perceptible to the average person.

Table 9.3 Perceived change in noise

Change in sound level (dB)	Perceived change in noise
3	just perceptible
5	noticeable difference
10	twice (or half) as loud
15	large change
20	four times as loud (or quarter) as loud

9.3 Existing environment

9.3.1 Assessment locations

A total of 221 privately-owned residential locations have been identified within the proximity of MTO that have the potential for exposure to noise from the proposal (refer Figure 9.2). These residential locations are herein referred to as assessment locations. The assessment locations are considered under two sections below; namely, Bulga and other localities. Other localities comprise Hambledon Hill, Gouldsville, Long Point Road, Mount Thorley and Warkworth village.

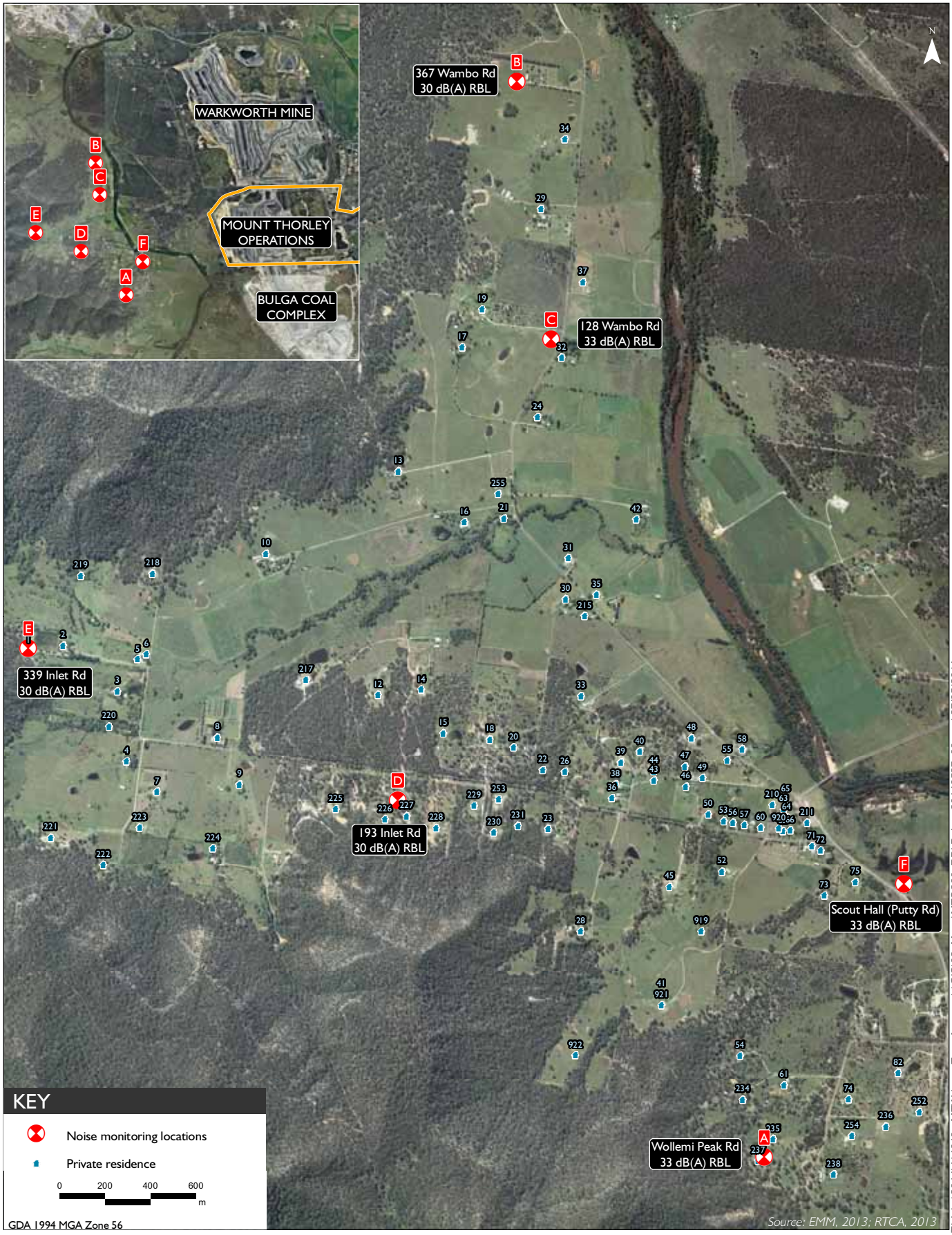
9.3.2 Background noise levels

i Bulga

To characterise the existing acoustic environment at these residential locations, an extensive process of data gathering and analysis using six real time noise monitors in Bulga was completed. The six monitoring locations, A to F (refer to Figure 9.2), are well dispersed across the Bulga area and therefore provide representative data for all residences in the area. Accordingly, the data from the six monitoring locations was adopted for all assessment locations of Bulga, depending on a specific property's proximity to influencing noise sources in the environment (for example, the mines to the east, Putty Road and the central part of Bulga village).

The purpose of the monitoring was to quantify the background noise level to enable an impact assessment of the proposal to be completed. For an impact assessment, the INP requires the assessment of noise levels that exclude influence on derived representative background noise from the site. Noise loggers with directional filtering functionality (the BarnOwl logger from SoundScience) were used to achieve this, which enabled noise influences from MTO to be filtered out of the total background noise. This enabled background noise levels excluding MTO to be considered.

The results of the long-term background noise monitoring presented in Table 9.4 are summarised as rating background levels (or RBLs, which are the median of the assessment background levels or ABLs) for the six monitoring locations. The data used was collected between November 2012 and August 2013, and are shown for day, evening and night assessment period. The quantity of data collected for the background noise survey is substantially greater than the INP's required minimum of seven days and therefore provides a much more comprehensive representation of repeatable RBL values. The INP's application notes have been conservatively adopted to determine the final RBL for the six locations, shown in Table 9.4.



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Long-term background noise monitoring locations in Bulga

Mount Thorley Operations 2014
Environmental Impact Statement

Figure 9.2

Table 9.4 Representative background noise levels for Bulga (RBL as per INP)

Location	Period (Duration)	RBL, dB(A)			Final RBL, dB(A)
		Day	Evening	Night	
A. Wollemi Peak Rd	20/06/13 - 14/08/13 (3 months)	33	33	34	33
[1]B. 367 Wambo Rd	01/12/11 - 29/11/12 (11 months)	30	33	34	30
C. 128 Wambo Rd	29/11/12 - 31/07/13 (8 months)	33	37	33	33
[1]D. 193 Inlet Rd	01/12/11 - 28/05/12 (6 months)	30	32	31	30
[1]E. 339 Inlet Rd	18/03/13 - 30/06/13 (3.5 months)	30	30	30	30
F. Scout Hall (Putty Rd)	01/12/11 - 04/09/12 (10 months)	33	37	36	33

Notes: *1. Locations B, D and E data show RBLs at or below the INP minimum of 30dB(A) for some assessment periods, and hence 30dB(A) was adopted as per the INP across all three assessment periods.*

The RBL is as defined in the INP, ie the median value of all ABLs. The ABL is also as per the INP, ie the lower 10th percentile of L_{90} values.

The data in Table 9.4 demonstrates higher background noise at locations A, C and F. These locations have greater exposure to the surrounding mines, Putty Road or the relatively more active centre of Bulga than the other three locations (refer to Figure 9.2). Validation of unfiltered RBL data was undertaken to demonstrate the effect of using directional filtering to remove noise from MTO from the analysis for establishing background noise levels.

The RBL data in Table 9.4 shows RBLs are marginally higher during the evening or night at some locations as compared to their corresponding daytime values. This is likely a result of enhancement of neighbouring mine noise from influences of weather conditions. This is shown at all but one of the six monitoring locations and, therefore, strongly supports a proposition that mine noise is enhanced by certain weather conditions, for example, in the presence of temperature inversion conditions.

Of the six locations, three of the locations (B, D and E) have the INP's minimum threshold background value of 30dB(A). These locations are relatively more removed from industrial sources (the mines), local road traffic and are further away from the central part of Bulga village, as compared to the other three locations. The three locations where an RBL of 33dB(A) is found, are consistent with the data adopted in previous assessments for Warkworth Mine.

The background noise levels assigned to each assessment location are illustrated in Figures 9.3 and 9.4. Where assessment locations are not in proximity to a noise logger and no data exists, the INP minimum of 30dB(A) is conservatively assumed. Also, given the differences in calculated RBL at locations D and F at Bulga, a transition from higher RBL to lower RBL was developed along this orientation east to west. On the basis that mine noise was one of the main influences on background noise in the area, the transition was developed from demonstrated changes in predicted noise levels for Warkworth Mine and Bulga Coal Complex (as published in their most recent assessments). This results in a relatively smoother transition in RBL values across this area and assigns corresponding criteria more evenly between adjoining properties. This approach minimises the situation often found where one property has a marked step increase in RBL and therefore criteria than their immediate neighbour - the problematic 'line-in-the-sand' delineation of criteria which often results in different zones of impact (for example, one property is assigned treatment while their neighbour is not).

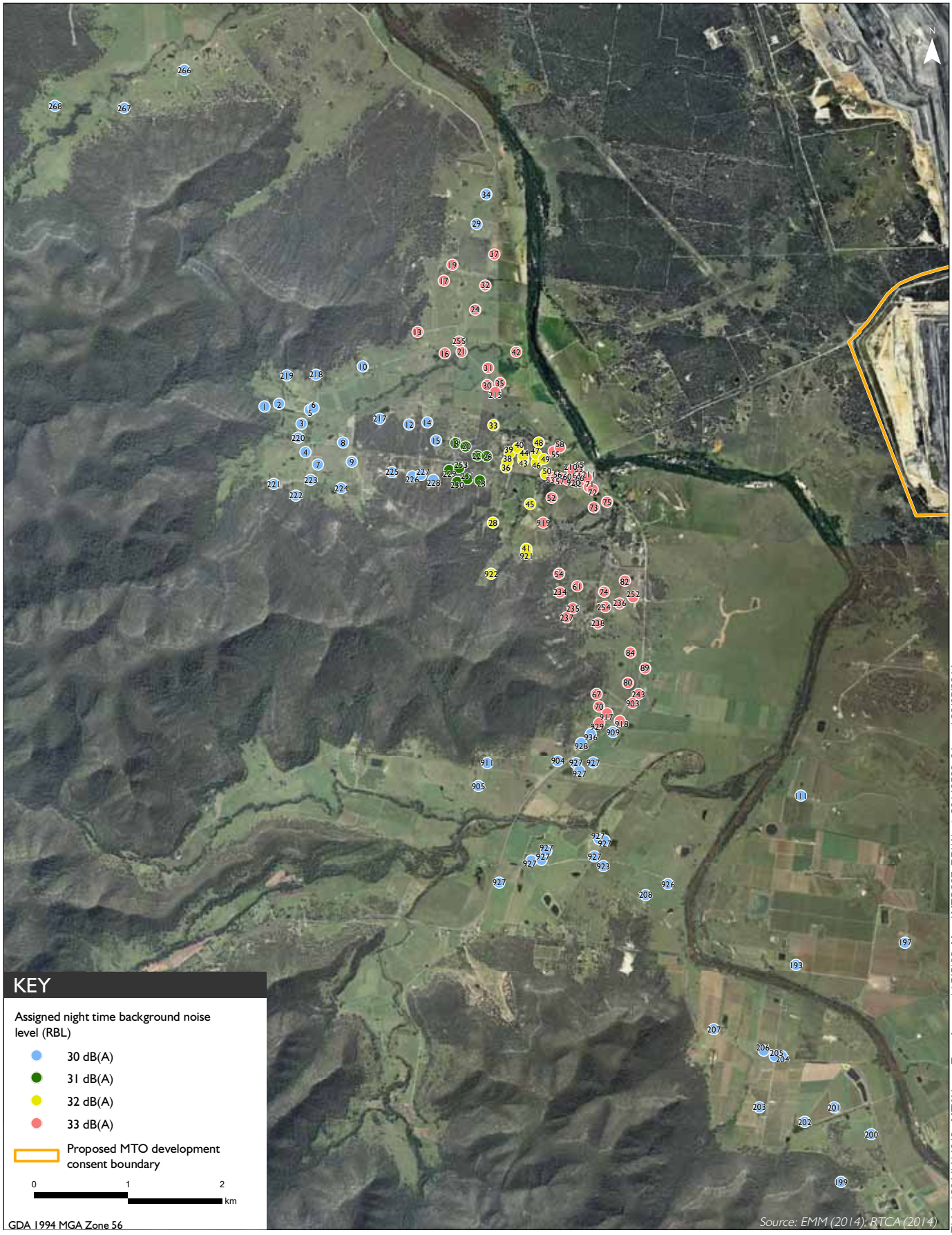
ii Other localities

The historic data in the 2002 Warkworth EIS (ERM 2002b) includes RBL data (as per the INP) for Hambledon Hill, Gouldsville, Long Point Road and Warkworth village. The corresponding RBL values for these locations are as follows:

- Hambledon Hill (east of Warkworth Mine) – 30dB(A) day, evening and night;
- Gouldsville Road (north-east of Warkworth Mine) – 33dB(A) day, evening and night;
- Long Point Road (further north-east of Warkworth Mine) – 3dB(A) day, evening and night; and
- Warkworth village (north-west of Warkworth Mine) – 33dB(A) day, evening and night.

For residences of Maison Dieu to the north of MTO, in the absence of suitable long-term monitoring data, background noise levels consistent with the INP's minimum threshold value of 30dB(A) have been conservatively adopted. It is probable that background noise levels are higher due to Hunter Valley Operations and other industry to the north of these residences.

The other group of residences that are considered are in relative proximity to the MTIE to the north-east of MTO. Background or RBL data at these locations is not documented in any literature in the public domain. It is expected that these properties would be influenced by industrial noise from the nearby industrial estate, including the MTCL and associated rail operations. Further, some properties in this vicinity have existing acquisition rights due to impacts from various mines. These are assessment locations 144, 146 and 915 (915 is on the same lot as 144 and hence the same acquisition limit is adopted). The existing consents for both MTO and Warkworth Mine do not provide an operational limit for these locations. They do, however, provide acquisition conditions. For example, the Warkworth Mine development consent includes an acquisition limit of 44dB(A) for assessment location 144 while the MTO development consent modifed in 2012 places location 144 in an acquisition on request list. Hence, RBL values were not assigned to these locations and assessment completed against acquisition limits. Those properties in this area that do not have existing rights would be assessed conservatively as having the INP minimum threshold RBL of 30dB(A) for day, evening and night.



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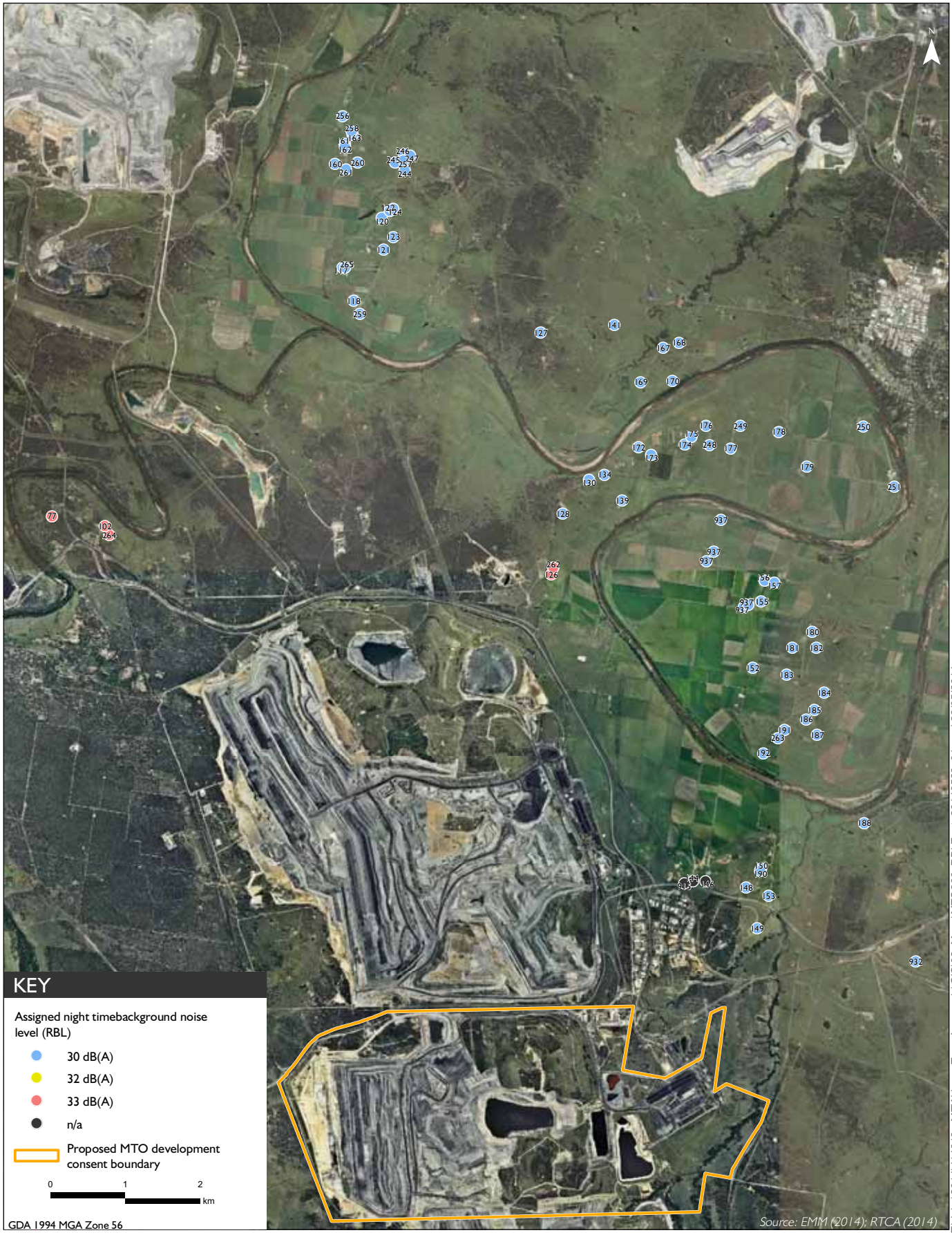
Assigned night time background noise levels
- Western and southern assessment locations

Mount Thorley Operations 2014
Environmental Impact Statement

Figure 9.3



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Assigned night time background noise levels - Eastern and northern assessment locations

Mount Thorley Operations 2014
Environmental Impact Statement
Figure 9.4

9.4 Impact assessment

9.4.1 Methodology

Where PSNLs are exceeded, all reasonable and feasible noise mitigation is required to be implemented. The INP Section 7 "Mitigating noise from industrial sources" states there are three main strategies for noise control. These are controlling noise at the source, the transmission path and at the receiver. Initial modelling for unmitigated operations showed that mitigation measures were warranted. Hence, all reasonable and feasible noise mitigation has been included in the modelling, including the following key mitigation strategies:

- Mitigation at the source – the applicant has attenuated 50 per cent of the haul truck fleet, with the commitment to attenuate all trucks by the end of the 2016 calendar year. Further, attenuation packages have been and would continue to be fitted to all mining fleet of dozers, excavators and drills by the end of 2016. The cost of the attenuation programme is in excess of $50million across MTW.

- Operational management – during adverse weather conditions identified 24 hours ahead of planned operations, a relatively small number of plant would be either relocated to in-pit areas or shut down so that total site noise satisfies criteria. These items are identified in the following sections. This method is common practice for current operations at MTO and is used elsewhere in the mining industry. This measure also results in a significant annual cost to the business associated with lost production.

The mine plans that form the basis of the assessment were optimised over many iterations of noise modelling for different operating scenarios. In arriving at the mine plans, alternative noise minimisation techniques were identified and applied. Some potential options, however, were rejected for a number of reasons. For example, reducing the height of night time overburden emplacement activities and acoustically treating the CPP were considered but found to provide minimal acoustic benefit (less than 1dB(A)). Noise mitigation along the transmission path such as a large bund was also considered and was found to be ineffective for the residences in Bulga given the relatively flat open terrain between the Site and residences.

Further plant relocation to in-pit areas or plant shutdowns to achieve PSNL at all assessment locations in Bulga (ie beyond those described previously) were also considered in the modelling and assessment process. However, these were found not to be reasonable for the Site. For example, the scenario required to achieve PNSL at all assessment locations in Bulga village resulted in one excavator, one dragline, 12 haul trucks, 12 dozers and two drills being relocated or shut down during adverse meteorological conditions. The resultant loss in production from this quantity of plant being disengaged, for the frequency and duration required due to the presence of adverse meteorological conditions, exceeds $100million (real NPV) over the life of the proposal.

MTW must maintain a production profile of at least 18Mtpa of ROM coal to generate sufficient revenue to remain economically viable.

To assess the potential for noise impacts on residences, a total of three indicative mine scenarios over the 21 year life of the proposal have been assessed. These three indicative mine plans reflect the worst-case operating scenarios. The indicative mine plans are referred to as Year 3, Year 9 and Year 14, each indicating the approximate time after the anticipated commencement date:

- Indicative Year 3 (nominally 2017) – mining has ceased in AGS and not yet commenced in AGN with mining activity in Loders Pit only. Rehabilitation activities have been completed in sections of the Site near the CRTSF and also areas in the south-east. Indicative Year 3 is also generally representative of current operations.

- Indicative Year 9 (nominally 2023) – approximately the half way point of the proposal timeframe and represents when coal and overburden are being transported from Warkworth Mine to MTO for processing and emplacement, respectively. It is expected that AGN would commence mining in 2018 or 2019 and be completed within approximately two years before becoming a TSF as approved. For modelling purposes, and to ensure a worst case scenario is captured, the noise study has conservatively assumed that mining in AGN is still taking place in 2023; however, in practice it is likely to be completed and being used as a TSF before 2023. Rehabilitation activities have been completed across more than half of the Site with the exception of Loders Pit which is receiving overburden from Warkworth Mine to develop the final landform and tailings in the proposed Loders TSF which is scheduled to start receiving tailings in approximately 2026.

- Indicative Year 14 (nominally 2028) – represents a similar scenario to Year 9 (2023) with coal and overburden transfer occurring. No mining is anticipated to occur. Rehabilitation activities have been completed across the majority of the Site with the exception of the Loders TSF which is receiving tailings from Warkworth Mine.

Noise modelling was based on three-dimensional digitised ground contours for the surrounding land, mine pits and overburden emplacement areas for indicative mine plans of the proposal. The indicative mine plans represent worst case snapshots and equipment was placed at various locations and heights, representing realistic operating conditions in each of these indicative stages of the mine. Sound power levels adopted in the modelling for equipment used for in-pit earth-moving and overburden emplacement levels are based on measurements at site, and for the attenuated fleet, supplier in-service commitments. MTO has conservatively opted to model the haul trucks with a sound power level of 115dB(A) for this EIS to reflect the level that can be continuously achieved by current sound attenuation technologies.

Operational noise levels were determined for two meteorological conditions: periods with no wind or temperature gradients (referred to as ‘calm’ conditions), and worst case meteorological conditions (referred to as ‘prevailing’ conditions). Noise levels at residences may increase or decrease under prevailing conditions compared with noise during calm conditions. Noise levels were predicted under each set of meteorological conditions and assessed against the relevant noise criteria.

Table 9.5 presents the PSNLs for the noise assessment of the proposal.

Table 9.5 Noise assessment criteria, dB(A)

Locality	Assessment location	Rating Background Level (RBL)[1]	Intrusiveness criteria, PSNL (RBL+5dB), $L_{eq,15min}$[2]	Derivation of RBL
Bulga	13, 16, 17, 19, 21, 24, 30-32, 35, 37, 42, 52-58, 60-67, 70-75, 80, 82, 84, 89, 210, 211, 215, 234-238, 243, 252, 254, 255, 903, 917-920, 929	33	38	Proximity similar to logger at A,C and F
	28, 33, 36, 38-41, 43-50, 921, 922	32	37	RBL set using degradation of noise levels from east to west from Warkworth Mine and Bulga Coal Complex
	18, 20, 22, 26, 23, 229, 230, 231, 253	31	36	RBL set using degradation of noise levels from east to west from Warkworth Mine and Bulga Coal Complex
	1-7, 8-10, 12, 14, 15, 29, 34, 217, 218-223, 224-228	30	35	Proximity similar to logger at B, D or E
	266-268, 904, 905, 909, 911, 927, 928, 936	30	35	RBL not available - assumed minimum
Gouldsville/ Long Point	126, 262	33	38	RBL From 2002 EIS location N2
	128, 130, 134, 139, 172-179, 248, 249	30	35	RBL assumed from 2002 EIS location N3
	127, 141, 167-170, 250, 251	30	35	RBL not available - assumed minimum
Hambledon Hill/Wylies Flat	152, 155-157, 180-187, 191, 192, 263, 937	30	35	RBL from 2002 EIS location N6
Maison Dieu	117, 118, 120-124, 160-163, 244-247, 256-261, 265	30	35	From Hunter Valley Operations South Coal Project EA 2008
Milbrodale	111, 193, 197, 199-208, 923, 926	30	35	RBL not available - assumed minimum
Mount Thorley	144, 146, 915	n/a[3]	n/a[3]	RBL not available.
	148-150, 153, 188, 190, 932	30	35	RBL not available - assumed minimum
Warkworth	77, 102, 264	33	38	RBL assumed from 2002 EIS location N4

Notes: *1. Rating background level, or RBL, derived in accordance with the INP as described in Section 8.*

2. Intrusiveness criteria are equal to the measured RBL + 5dB.

3. RBLs without influence from the site are not available and existing consent do not specify operational limits (only acquisition limits are provided in the existing consent). These locations have been previously identified as impacted by the site.

9.4.2 Operational noise

Operational noise levels during calm weather were predicted to comply with the PSNLs for all assessment locations during calm meteorological conditions for each of the day, evening and night periods.

Operational noise levels during prevailing conditions are predicted to be below or at the PSNLs at 160 of the 221 assessment locations. Noise levels are predicted to exceed the PSNL at a total of 61 assessment locations. In a single case, noise levels are also predicted to exceed the Site's applicable acquisition limit. A summary of the predicted exceedances is provided in Table 9.6 based on the worst case noise level predicted across the three indicative mining years (ie worst case for all years). The existing impacts are shown in parenthesis, where known. These results are also presented in Figures 9.5 and 9.6. Results in Figures 9.5 and 9.6 are presented in the form of coloured markers which represent predicted noise levels at assessment locations with respect to PSNLs. These data incorporate all calm and prevailing weather conditions for day, evening and night operations as appropriate.

Table 9.6 Summary of PSNL exceedances at assessment locations

Extent of noise exceedance above PSNL	Number of affected properties			
	Indicative Year 3	Indicative Year 9	Indicative Year 14	All years (Existing)
Bulga and surrounds				
Marginal (1-2dB(A))	53	0	0	53
Moderate (3-5dB(A))	0	0	0	0
Significant (greater than 5dB(A))	0	0	0	0
All other assessment locations (including Warkworth village and Maison Dieu locations to the north-west and north)				
Marginal (1-2dB(A))	3	5	5	4
Moderate (3-5dB(A))	4	2	1	3
Significant (greater than 5dB(A))	0	1	0	1 (1)
Total	**60**	**8**	**6**	**61**

Table 9.6 indicates that operational noise levels for all Bulga assessment locations would either satisfy, or be within 1-2dB(A) of PSNLs during prevailing meteorology. At all other assessment locations, operational noise levels would result in a marginal or moderate exceedance of the PSNLs at a number of locations during prevailing conditions. One assessment location (149) has been predicted with a significant noise level exceedance, which is modelled to occur during indicative Year 9 operations. This location has acquisition rights under the existing development consent.

It is also important to note that operational noise levels from the proposal are not expected to be materially different from current noise levels for locations east of the mine given the limited changes to current activities in the eastern parts of the mine site. Further, with proposed attenuation of plant at the Site, it is expected that noise levels would improve for all assessment locations.

The INP (Section 8.2.1) identifies issues to be considered if predicted noise levels exceed the PSNLs, even after the application of reasonable and feasible mitigation. An assessment of residual noise impacts from the proposal has been undertaken in Section 10.6 of Appendix F.

9.4.3 Sleep disturbance

The most important potential impact of intermittent noise is sleep disturbance of nearby residents. Sleep may be disturbed by intermittent noises such as shovel gates banging, dozer track plates and heavy vehicle reversing alarms. To counter these issues, the applicant has had snubbers fitted to shovel gates, 'quackers' fitted in lieu of reverse alarms and installation of attenuation packages more generally.

While the INP does not specify a criterion for assessing sleep disturbance, various studies including the EPA's *Road Noise Policy* (RNP) (DECCW 2011) indicate that levels below 50 to 55dB(A) inside homes are unlikely to wake sleeping occupants. EPA's current position on sleep disturbance, as documented in application notes on the EPA website, is that maximum (L_{max}) noise from industrial sources should not exceed background plus 15dB. Based on a night time RBL of between 30dB(A) to 33dB(A), this assessment has adopted an external sleep disturbance criterion of 45dB(A) to 48dB(A) L_{max} for residences.

Where the sleep disturbance criterion is satisfied, sleep disturbance is unlikely. But where it is not met, a more detailed analysis is required. The detailed analysis should quantify the extent of impacts, including levels of exceedance above the criterion and the duration and number of events that may occur.

The highest maximum noise levels expected at residences would likely result from haul trucks. The maximum sound power level of unmitigated haul trucks has previously been measured to be typically 125dB(A) L_{max}.

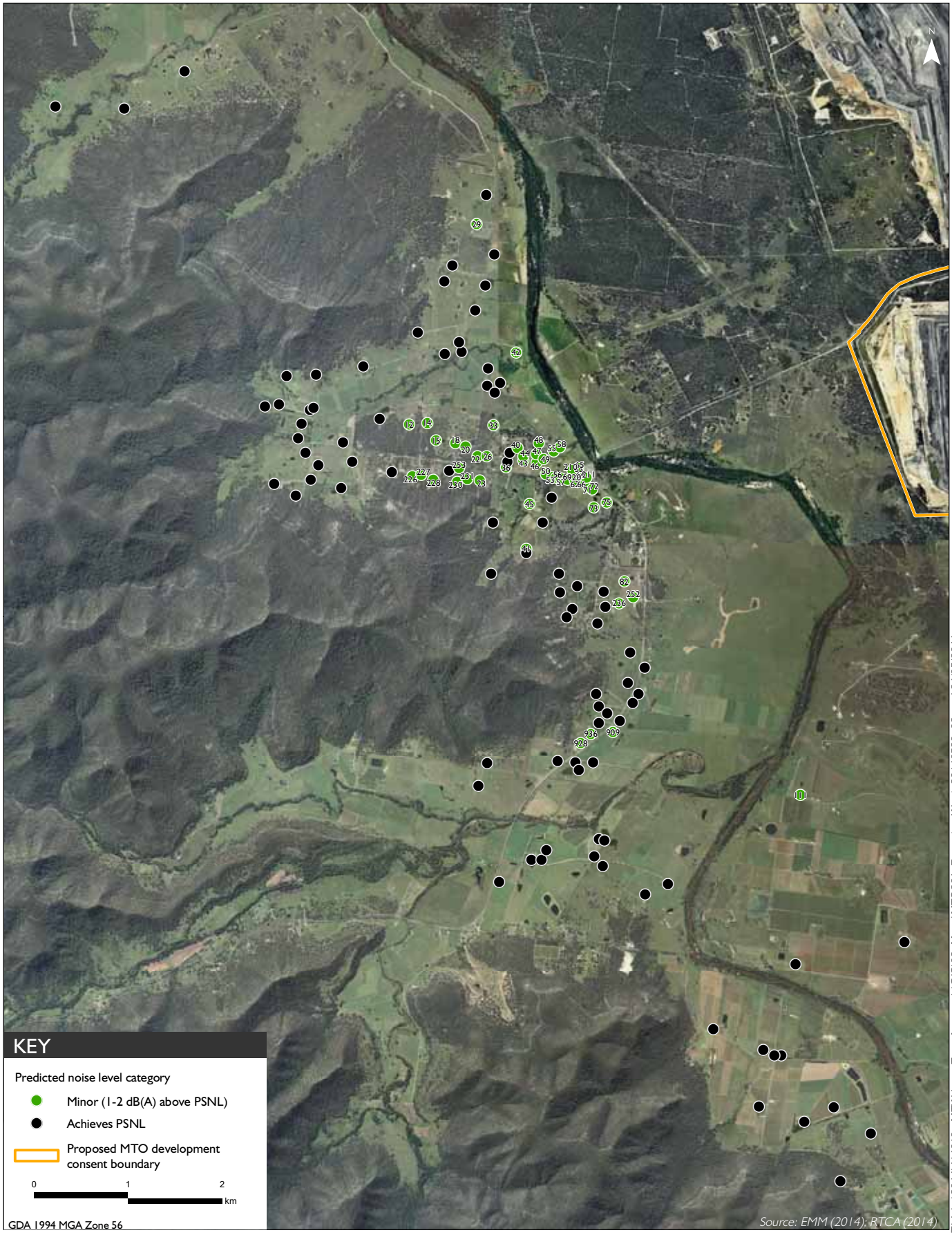
Maximum noise levels were predicted under adverse meteorology at 11 representative assessment locations.

Table 9.7 indicates that predicted noise levels under prevailing weather conditions are within the EPA's sleep disturbance criterion at all representative assessment locations shown.

Table 9.7 Predicted maximum L_{max} noise from site (under prevailing meteorology)

Property no.	External L_{max} noise level from on-site plant, dB(A)			L_{max} criterion, dB(A)
	Year 3	Year 9	Year 14	
1	33[1]	<30	<30	45
34	35[1]	32	<30	45
42	39[1]	36[1]	<30	48
58	39[1]	36	<30	48
72	39[1]	38	30	48
75	40[1]	38	30	48
118	<30	<30	<30	45
126	33	32[1]	<30	45
144	41	42	42	45
148	41	40	40	45
237	38[1]	34[1]	<30	45

Notes: 1. The L_{eq} operational noise level prediction from Appendix F has been adopted where it is higher than the predicted L_{max} noise level. This is because it is theoretically impossible to measure an L_{eq} greater than the L_{max}. However, the prediction method adopts the maximum noise level from a single source which can result in an L_{max} prediction less than the overall L_{eq} result, which includes all noise sources.



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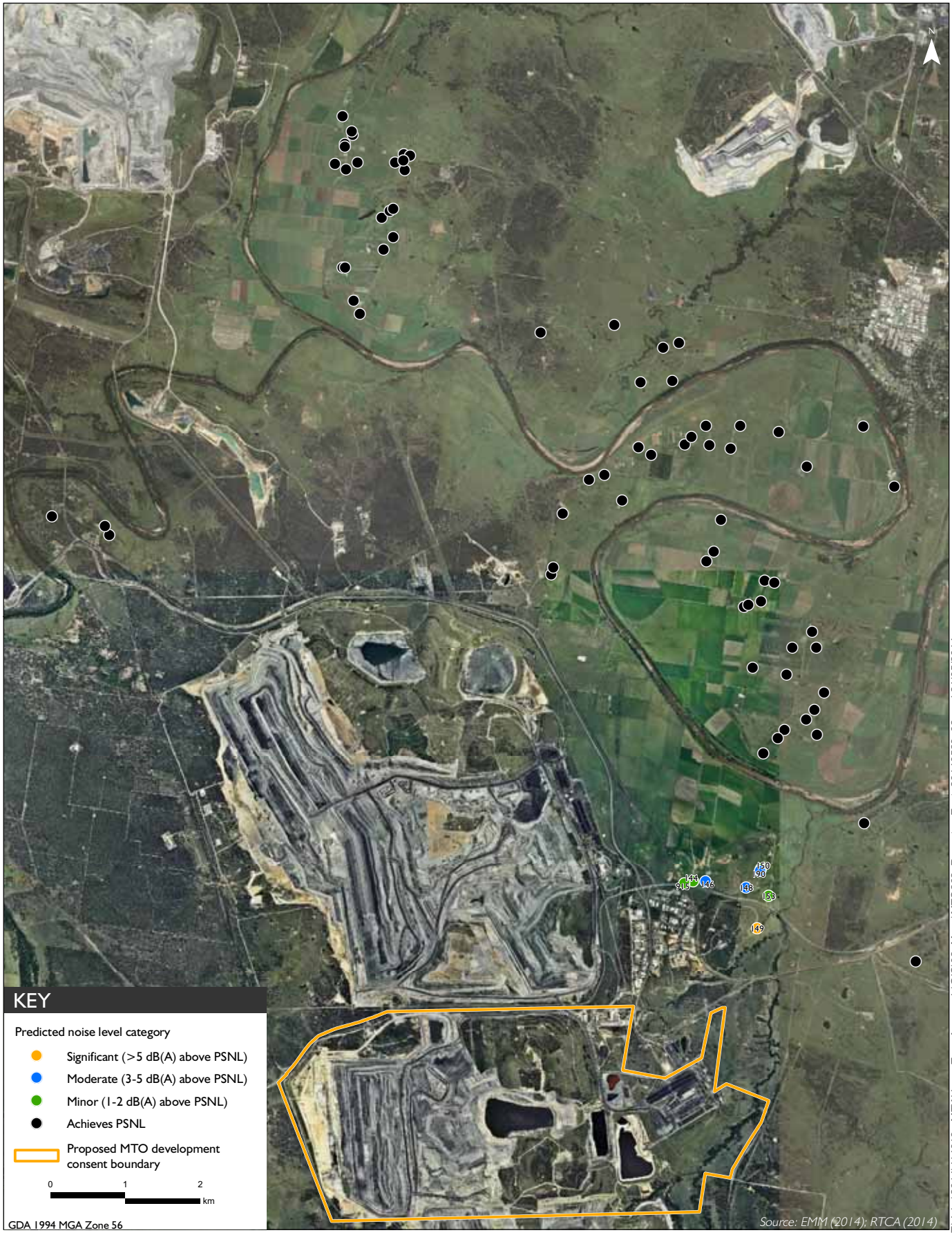
All years worst case day, evening and night operational noise levels, INP weather ($L_{eq,15min}$ dB(A)) – Western and southern assessment locations

Mount Thorley Operations

Noise and vibration assessment

Figure 9.5



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All years worst case day, evening and night operational noise levels, INP weather ($L_{eq,15min}$ dB(A)) – Eastern and northern assessment locations

Mount Thorley Operations 2014
Environmental Impact Statement
Figure 9.6

9.4.4 Low frequency noise

In a letter dated 22 August 2013 the EDO forwarded a complaint on behalf of the Bulga Milbrodale Progress Association Inc. (BMPA), about the DP&E's decision to refuse to apply Low Frequency Noise (LFN) data in accordance with the INP and condition of consent for MTO and Warkworth Mine, to the NSW Ombudsman.

The results of this complaint, were contained in a letter to DP&E dated 22 January 2014. A copy of this was obtained under the *Government Information (Public Access) Act 2009*. An extract from this letter follows:

> As you are aware, Bryce Purches of this office had made inquiries with the DPI and the NSW Office of Environment and Heritage (OEH). Mr Purches has recently left, and the file has been reallocated to me for assessment of the information received by those agencies.
>
> The Ombudsman is primarily concerned to ensure government agencies are fair and reasonable in their dealings. It is clear that opinions, even by experts, may differ. We are unwilling in such situations to question expert opinion, except in those rare cases where the opinion appears so unsupportable that it suggests something improper may have occurred. It is seldom appropriate for us to decide between differing technical views, nor do we have the resources to routinely obtain our own independent expert opinion.
>
> To this end, we sought information from DPI and OEH about the review of the INP, and the application of LFN data to the operations of Mount Thorley Warkworth open cut mine in accordance with the conditions of consent DA 300-9-2002-1.
>
> DPI has provided information and evidence to demonstrate that the (then) DECCW (OEH) had from 2010 made a commitment to revise the INP in relation to low frequency noise, and to review the INP as a whole. While progress on this has been slower than expected, our verbal interactions with OEH has confirmed that they anticipate a review will be completed later this year.
>
> Assessment of LFN appears to be quite contentious, especially in rural settings. I do not propose to develop a view as to which position is most likely accurate, as I have explained above, we do not have that expertise, or the resources to seek that expertise.
>
> It would appear to me, however, that the following points have been agreed by DPI and OEH:
>
> - There may be technical merit as to the difficulty in applying the low frequency modifying factor in rural areas, subject to further study. OEH has commissioned a comprehensive study of LFN as a part of the INP review, titled Low Frequency Noise & Infrasound, still underway;
> - That OEH would not include conditions about LFN in Environment Protection Licences; and
> - A review of the INP would be conducted, and LFN would be a priority issue.
>
> When we receive complaints about compliance and enforcement, failure to take action alone is generally not sufficient grounds to justify an investigation by this office. We look closely at the facts of each case, including the agency's reasons for its decisions.
>
> In this case, there appears to be appropriate consideration of professional advice from qualified staff and experts about LFN that casts doubt as to the practicality of strict enforcement of the condition of consent. Notwithstanding this, OEH has also acknowledged that any review of LFN in the INP will include consultation with NSW Health given the health issues said to be associated with LFN.

> Noise monitoring continues to be a high priority issue, and a Noise Management Plan and Noise Monitoring Programme for the whole mining complex are in place. Further, DPI has advised that there will be a requirement to provide separate noise management and monitoring documents for the Mount Thorley and Warkworth mines, in consultation with OEH and DPI due to a Land and Environment Court decision.
>
> For the reasons outlined above, it appears to me the information and evidence provided by the agencies is sufficient to satisfy me that the DPI has provided adequate reasons for its decision and has properly considered all relevant issues, and there is no other evidence of wrong conduct that requires intervention by this office.
>
> I appreciate why you forwarded this matter to this office, and I acknowledge the importance of noise monitoring and the impacts of noise on the local community. BMPA should continue to engage with the agencies and the mine operators as is appropriate and participate in community consultation and engagement as opportunities arise.

The above confirms that the applicant currently undertakes regular low frequency noise monitoring as part of the noise management regime for MTO.

9.4.5 Review of external noise monitoring data

The applicant currently undertakes regular low frequency noise monitoring as part of the noise management regime for the Site as outlined in Section 9.4.4. Monitoring data from the 2013 calendar year was reviewed in detail (total of 46 measurements) to provide a current representation of potential low frequency noise impacts from the Site. This method is preferred and considered more comprehensive than an alternate theoretical noise modelling approach, as it provides a 'real-world' representation of noise levels received in the surrounding communities.

The data was reviewed and assessed against the INP and Broner assessment methods as outlined in Section 9.7. The review was completed on data samples where a mining noise contribution was observed from MTO only.

The data indicates that there are no instances where the 'Broner' assessment criteria are exceeded. Exceedances of the INP's 15 dB dB(C) minus dB(A) threshold is shown at some locations.

The dB(C) minus dB(A) difference of 20 dB as used in DIN45680 is achieved for most measurements with the exception of two measurements at South Bulga. One of these measurements is influenced by wind noise which is likely to influence a higher dB(C) value. The remaining measurement accounts for less than 5 percent of the total measurements taken in the Bulga locality (23).

9.4.6 DEFRA curve assessment

External and internal noise monitoring was undertaken at a mine owned residence on Putty Road during the night-time on 17 April 2014 to quantify representative internal mine levels and to apply the Department of Environment Food and Rural Affairs (DEFRA) (UK) reference curve to highlight any potential for internal low frequency noise impacts. Refer to Appendix F of the EIS for more details.

Mine noise contribution was clearly audible externally throughout the measurement period.

i External noise levels

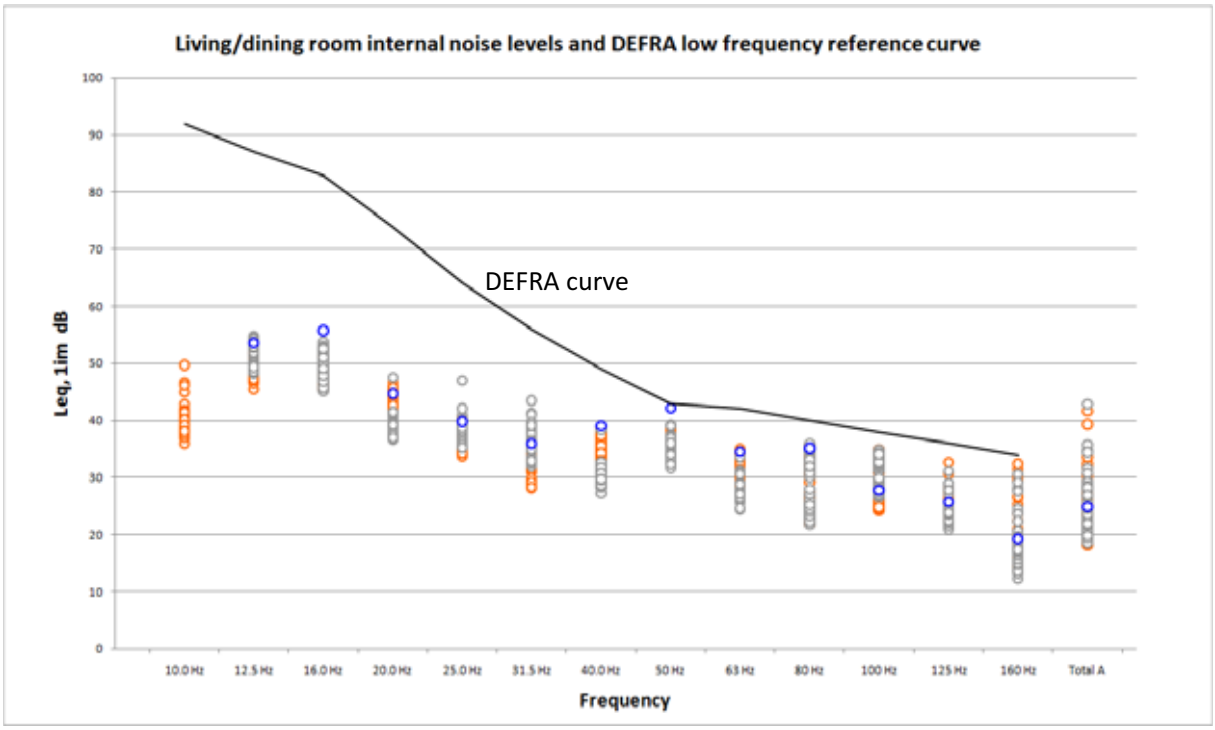
The level of mining noise externally was approximated from measured levels between the third octave frequency range of 10 Hz to 800Hz inclusive (ie low pass). The external low pass noise level was found to be in the range of 59dB(L) to 64dB(L), 54dB(C) to 58dB(C) and 40dB(A) to 44dB(A). It was also found that corresponding dB(C) minus dB(A) readings did not exceed 14 dB throughout the two hours of monitoring. Other noise sources included occasional traffic on Putty Road and natural noise sources such as insects and crickets.

ii Internal noise levels

Whilst mining noise was audible, measurable and consistent outside this dwelling, internally mining noise was not audible in any areas or rooms.

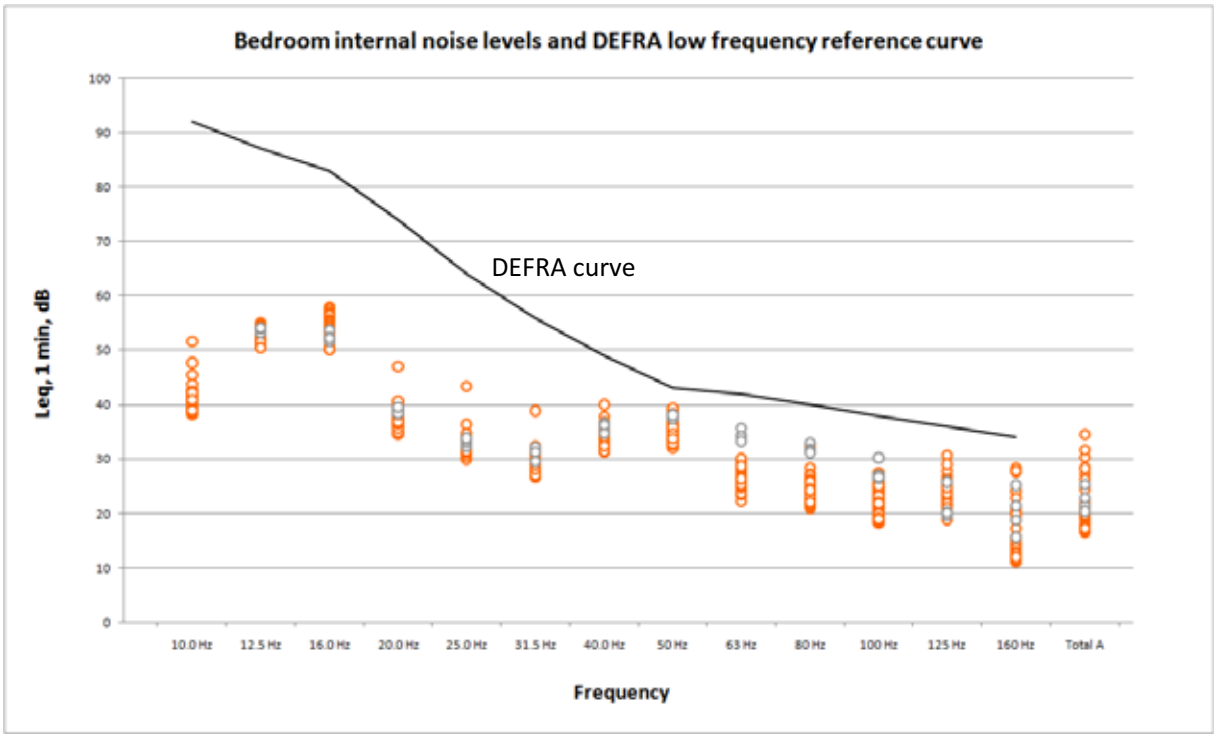
The results from the noise monitoring plotted against the DEFRA low frequency reference curve are provided in Figure 9.7 and Figure 9.8 for the living/dining and bedroom, respectively. The charts exclude samples where extraneous noise was observed. A total of 88 one minute samples in the living/ dining room and 51 in the bedroom were captured.

It is clear from the charts that noise levels recorded in the living/ dining and bedroom are below the DEFRA low frequency reference curve for all measurements.



Note: Orange marker represents position 1, grey marker represents position 2 and blue marker represents position 3.

Figure 9.7 Internal low frequency noise monitoring results (Living/dining room)



Note: Orange marker represents position 1 and grey marker represents position 2.

Figure 9.8 Internal low frequency noise monitoring results (Bedroom)

9.4.7 Amenity criteria – cumulative assessment

This section provides an assessment of cumulative noise from all industrial sites to assess an area's amenity against the Mining SEPP's non-discretionary standards which adopt the INP's ANLs. The amenity criteria provide the over arching goal that if achieved would mean for example, a residence is not compromised and remains habitable.

The ambient noise at assessment locations in the vicinity of the proposal are influenced by adjoining industrial premises, such as Wambo Mine, Hunter Valley Operations, Warkworth Mine, Bulga Coal Complex, and to some extent, Redbank Power Station.

The level of noise at residences from each of these surrounding industries was referenced from the following documents:

- an EIS for the expansion of Wambo Mine (Resource Strategies 2003);
- an EA for Hunter Valley Operations South Coal Project (ERM 2008);
- the EIS prepared for Warkworth Mine being exhibited concurrently with this proposal and corresponding noise assessment (EMM 2014); and
- the EIS for the Bulga Coal Complex optimisation project (Umwelt 2013).

Most of these assessments predict noise levels at residences under both calm and prevailing weather conditions. To assess cumulative impacts, the L_{eq} noise levels predicted by this assessment were combined with the L_{eq} noise levels from relevant mining stages of each of the aforementioned assessments. The assessment method for cumulative impacts had to take into account a range of factors including the location of each of the aforementioned mines and the combined effect of prevailing meteorological conditions.

Twenty representative assessment locations were used to assess cumulative noise impacts (refer to Figure 9.9). The results as provided in Table 9.8 show that the INP's (and Mining SEPP) acceptable night time criteria are satisfied at all but one representative assessment location (77 at Warkworth). Exceedances are predicted at assessment location 77 for indicative Years 3, 9 and 14 of the proposal, being dominated by Wambo Mine operations worst case predictions. This assessment location is already entitled to acquisition rights upon request from Wambo Mine.

Given the magnitude of exceedance at assessment location 77, and being representative of Warkworth village, by extrapolation the amenity criterion is exceeded at neighbouring residential assessment location 264, also due to Wambo Mine.

It is demonstrated that the non-discretionary Mining SEPP is satisfied for Bulga residences and, therefore, means the area's amenity is not compromised as it meets the INP's ANL.

This outcome is based on noise from the proposal being assessed during indicative worst case operating years and, therefore, the contribution to the cumulative noise environment is not expected to increase beyond indicative Year 14. Further, noise levels predicted from Bulga Coal Complex referenced in the Bulga Optimisation Project (Umwelt 2013) are expected to decrease as mine life progresses. For example, assessment location 266 in Bulga village (as per BOP numbering system) shows upper predicted noise levels over the day, evening and night periods of 36, 35, 34, 33 and 29 dB(A) for mining years 1, 3, 6, 13 and 16, respectively. Noise levels in Bulga village from MTO also decrease throughout the mine life, with all active mining and emplacement activity ceasing by Year 14. Therefore, in consideration of the preceding, it is anticipated that the predicted cumulative noise levels presented in Table 9.8 represent worst case cumulative noise levels for the life of the proposal with noise levels decreasing during the remainder of the proposed development consent period.

Further, the amenity, which relates to cumulative noise from all industry, cannot worsen for this area because no new large scale industry would be able to physically exist in a position that could push amenity levels any higher for Bulga residences.

Table 9.8 Cumulative noise at properties, dB(A) $L_{eq,period}$

Property no.	MTO mine operating years			INP Amenity criteria
	Year 3	Year 9	Year 14	
1	26 (53%) - 33 (54%)	25 (21%) - 32 (23%)	23 (1%) - 32 (4%)	40
13	34 (9%) - 38 (35%)	35 (4%) - 38 (12%)	35 (0%) - 36 (2%)	40
19	34 (9%) - 39 (27%)	34 (4%) - 38 (12%)	34 (0%) - 37 (3%)	40
32	32 (11%) - 38 (34%)	33 (3%) - 37 (20%)	33 (1%) - 36 (4%)	40
37	34 (7%) - 38 (22%)	34 (2%) - 38 (17%)	34 (0%) - 37 (3%)	40
41	29 (58%) - 37 (39%)	29 (30%) - 37 (24%)	27 (0%) - 36 (3%)	40
42	32 (20%) - 38 (47%)	32 (14%) - 37 (34%)	31 (0%) - 36 (5%)	40
44	32 (29%) - 38 (42%)	33 (14%) - 38 (22%)	32 (0%) - 36 (4%)	40
58	32 (24%) - 38 (38%)	33 (14%) - 38 (21%)	32 (0%) - 36 (5%)	40
77	**53 (0%) - 57 (0%)**	**53 (0%) - 57 (0%)**	**53 (0%) - 57 (0%)**	**50**
84	29 (67%) - 37 (39%)	28 (27%) - 37 (20%)	25 (1%) - 33 (6%)	40
118	29 (2%) - 35 (10%)	28 (2%) - 35 (5%)	28 (1%) - 34 (1%)	40
128	34 (3%) - 39 (9%)	34 (3%) - 37 (12%)	33 (2%) - 37 (3%)	40
146	33 (35%) - 41 (33%)	32 (47%) - 40 (42%)	31 (43%) - 40 (25%)	50
149	34 (19%) - 39 (72%)	35 (28%) - 39 (70%)	31 (37%) - 38 (85%)	40
150	34 (8%) - 37 (50%)	34 (10%) - 36 (45%)	30 (14%) - 35 (66%)	40
155	32 (5%) - 36 (19%)	32 (4%) - 35 (15%)	31 (3%) - 35 (7%)	40
157	32 (4%) - 36 (17%)	32 (4%) - 35 (19%)	31 (2%) - 35 (6%)	40
237	29 (71%) - 38 (50%)	29 (33%) - 37 (18%)	27 (1%) - 36 (3%)	40

Notes: 1. Numbers in bold indicates levels above EPA's night Amenity Criterion.

9.4.8 Road and rail traffic

The rail loading facility is located east of the Site adjoining MTO and MTIE. The proposal would not result in any net increase in road and rail traffic volumes of that currently approved and, therefore, such impacts for the proposal have not been assessed.

9.4.9 Blasting noise and vibration assessment

The proposal is for continuation of mining operations which would remain within the current approved boundaries. Blasting impacts would therefore remain as previously assessed in past noise and vibration impact assessments for the proposal.

9.5 Reasonable and feasible mitigation

9.5.1 Management and monitoring

MTW would continue to implement its noise management system, which is detailed in following sections, under the proposal. The noise and vibration study has demonstrated that the noise management system would adequately manage noise and vibration impacts due to the proposal.

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Cumulative noise assessment

Mount Thorley Operations 2014
Environmental Impact Statement
Figure 9.9

9.5.2 MTO noise management system

The MTW Noise Management Plan was developed in accordance with industry best practice with consideration given to the full available range of reasonable and feasible mitigation and their effectiveness in determining the measures to be implemented at the Site. The plan details a range of existing acoustic management and monitoring procedures which are managing the existing operations to comply with the conditions of the development consent. The management measures include those which are implemented on a continuous (standard) basis, as well as both proactive and reactive measures, categorised in accordance with the hierarchy of control for contingency planning to manage residual risks. The hierarchy of control is as follows:

- administrative controls;
- substitution controls;
- engineering; and
- elimination controls.

Together, this suite of management measures and processes comprise the MTW noise management system.

The effectiveness of the MTW Noise Management System has been tested on a number of occasions in recent years, including formal compliance audits, requests for independent review, ad-hoc supplementary monitoring programmes, and departmental requests for information. MTW continues to demonstrate a position of overwhelming compliance with noise criteria, and a high level of adherence to the measures outlined in the noise management plan.

i Administrative controls

Administrative controls implemented at MTW include:

- Trigger Action Response Process (TARP);
- heavy mining equipment (HME) Sound Power Level (SWL) screening;
- night shift environmental management report; and
- validation surveys of the real-time monitoring network.

Each of these measures is described below.

a. Trigger Action Response Process

The TARP is the key reactive noise control implemented at MTW, and involves the effective and timely response to elevated noise (trigger), irrespective of meteorological conditions.

Triggers are enacted in a number of ways, prompting commencement of reactive processes to validate, quantify and appropriately respond to noise conditions, including:

- receipt of a noise alarm from the real-time, directional noise monitoring network;

- identification of elevated noise through routine supplementary surveillance noise monitoring, undertaken by MTW personnel each night;
- notification of elevated noise through the routine (monthly) attended compliance monitoring regime undertaken by experienced and independent experts; and
- receipt of community complaint in relation to noise.

When a trigger is confirmed (noise levels which are approaching or exceeding the noise criteria in the vicinity of nearby private residences), an appropriate response is implemented to ensure the noise event is resolved within 75 minutes of identification. The response may include substitution or elimination measures, commensurate with the nature and severity of the noise event.

b. HME Sound Power Level (SWL) screening

Understanding of the sound profile of the mining fleet is critical to effective introduction of both proactive and reactive noise controls. To ensure this information is kept up-to-date and relevant, sound power level testing (sound screening) is undertaken on 33 per cent of the attenuated heavy mining equipment (HME) fleet annually. In this way, 100 per cent of attenuated equipment will be screened on a rolling three-year cycle. The results of sound screening will be used for the following:

- to inform MTW of equipment which is experiencing degradation in suppression equipment and requiring repair;
- to inform MTW of fleet types and units which can be preferentially deployed into or removed from noise risk areas; and
- to periodically update the predictive modelling interface (PMI) (see Section 9.5.3(i)) to increase model accuracy and usefulness.

When one piece of equipment measures greater than 3dB(L) against operational specifications, MTW maintenance staff inspect and assign the piece of equipment to the appropriate maintenance schedule.

c. Nightshift environmental management report

The MTW operational personnel prepare and circulate a report following each night shift which describes the noise management activities undertaken including routine controls, minor changes and equipment shutdowns, if any, during the shift. Where noise enhancing weather conditions are predicted for the shift ahead these are described in the report. Along with the description of the conditions, potential management strategies are also detailed.

d. Validation surveys of the real-time monitoring network

To ensure that the real-time monitoring network adequately assesses and represents all receivers, validation surveys are undertaken on an as-needs basis, involving supplementary noise monitoring in the vicinity of the private residence concerned, and comparison with measured levels from the nearest real time monitor. Where a survey indicates a change may be required this is reviewed and actioned as appropriate to ensure monitoring systems and reactive triggers remain representative.

ii Substitution controls

Substitution controls are implemented in response to one or more triggers (described in 'administrative controls' above), and are utilised both proactively and reactively. Substitution measures involve the repositioning or replacement of equipment or reassignment of tasks when conditions require. For example, assignment of sound attenuated trucks to higher (noise) risk hauls during noise enhancing conditions ahead of shift, or reactively following a trigger.

iii Engineering measures

In conjunction with their suppliers, MTW has progressed with the attenuation of its fleet of haul trucks and other mining equipment. All new trucks purchased for use on the mines would be commissioned as noise suppressed (or attenuated) units. MTW currently operates a mixture of sound attenuated and non-sound attenuated machines and the existing fleet of trucks are being progressively fitted with suitable noise attenuation packages. Baseline testing has been completed and acoustic engineering is being applied to understand what sound power levels are achievable across the fleet. The attenuation programme is being undertaken in a targeted manner, addressing the noisier pieces of equipment as a priority for the operations given the remaining development consent life.

Identification and rectification of defects to sound attenuation equipment is undertaken as required through the normal maintenance process where reasonable and feasible. MTW has also completed works to replace all in-pit reverse alarms with 'quacker' style reverse alarms on its mining fleet.

During 2012, engineering works were undertaken to address noise associated with shovel operations. Engineering controls were introduced including hydraulic snubber brakes, and fitting of self-greasing permalubes to the dipper door pins. Where additional reasonable and feasible opportunities for engineering controls are identified in the future, these would continue to be investigated and trialled as appropriate.

iv Elimination controls

Elimination controls are implemented in response to one or more triggers (described in 'administrative controls' above). Elimination controls, equipment or task shutdown, are implemented as a last resort where other controls have been inadequate.

9.5.3 Continuous improvement

MTW continues to work with the DP&E to improve the noise management plan, demonstrating commitment to continuous improvement and driving industry best practice noise management. It is expected that the continued implementation and refinement of measures outlined in the noise management plan (as updated from time to time) would enable MTW to effectively manage any noise impacts associated with this proposal, and to ensure a high level of compliance is maintained throughout the life of the mine.

MTO is committed to reasonable and feasible continuous improvement and is currently working towards implementing a PMI and alternative real-time noise monitoring technology as described below.

i Predictive modelling interface

The PMI allows for proactive planning of mining operations and weather conditions as a leading measure for managing noise emissions. The PMI utilises predictive meteorological forecast data coupled with detailed mine plans and equipment sound power level information to predict noise levels at residences. The PMI is currently being refined and is expected to be fully integrated into day-to-day operations.

ii Development and installation of alternate real-time noise monitoring technologies

MTW is also in the process of investigating alternate noise monitoring technologies to assist with operational control. During 2012 MTW committed capital funding to build and install a first of class directional noise monitor, known as 'environmental noise compass' (ENC) in the Bulga village area. The ENC was installed late December 2013 and is currently collecting data. The ENC aims to accurately pinpoint and identify noise emissions from multiple sources in real-time, to a greater level of accuracy than existing directional noise monitoring technology. This technology is expected to provide additional noise management value to MTW and is considered a first in noise management in NSW. A picture of a typical unit is provided in Figure 9.10.

Figure 9.10 Typical image of the Environmental Noise Compass (ENC)

9.6 Residual level of impact

Section 8.2.1 of the INP lists issues to be considered if predicted noise levels exceed the PSNLs after reasonable and feasible mitigation has been applied. Table 9.9 provides an assessment of residual noise impacts (presented in Table 9.9) from the proposal.

Table 9.9 Residual level of impact

INP factors for consideration	Justification of the proposal
1. Characteristics of the area and receivers likely to be affected —the extent of the areas (including existing, developing or proposed residential, health or education sites) and number of receivers (including groups that may be especially sensitive to noise, such as pre-schoolers, students, the aged, hospital and nursing home patients) likely to be affected by noise levels above the project-specific noise levels —the daily activities of the community (in particular, effects such as sleep disturbance, speech interference, level of annoyance or effects on physical or physiological health) —property values —zoning of land uses affected by noise and the appropriateness of the zoning or land use —the potential change in the ambient noise levels as a result of the proposal; cumulative noise impacts in the area; and whether parts of the area that are already moderately or badly affected by noise will be more or less affected —the extent to which biodiversity (especially native birds and other animals) will be affected —the likely variation between individuals in response to the noise —the amenity of areas used for outdoor recreational activities or conservation, heritage or wilderness areas —other industry in the area (including agriculture)	The majority of the local area surrounding the proposal is characterised by mining and associated infrastructure and agricultural land, mainly pasture, with moderate sized stands of native woodland retained along the steeper hillsides and ridgelines and in patches along creek lines. The applicant owns a substantial area of land surrounding the Site. MTO has been in operation since 1981 and the originally approved mine has been modified several times. Immediately to the north of MTO is Warkworth Mine, which also commenced operations in 1981. The integrated operation of MTW has been ongoing since 2004. The Bulga Coal Complex, which is adjacent to the south, has been operating since the 1980s. Wambo Mine and Hunter Valley Operation South, to the north of Warkworth Mine, commenced operations in 1969 and 1971, respectively. The noise and vibration study predicted noise levels at 221 assessment locations surrounding the mine. The predicted noise levels are during worst case INP prevailing meteorological conditions and for the majority of the time actual noise levels are likely to be less than those predicted. Of the 221, three are predicted with moderate noise level exceedances (3-5 dB(A) above PSNL) and one is predicted with significant noise level exceedances (greater than 5 dB(A) above PSNL). Assessment locations with predicted moderate and significant noise level exceedances account for less than 2% of the total assessment locations considered. A total of 139 assessment locations within Bulga were considered. Of these, 53 are predicted with minor noise level exceedance during Year 3 operations only. A sleep disturbance assessment showed predicted noise levels to satisfy strict EPA criteria. Due to proposed attenuation of mobile plant, noise from current and approved operations is expected to decrease. A cumulative noise assessment in accordance with the INP and Mining SEPP demonstrates criteria would be satisfied for all locations with the exception of those already impacted by other mining operations.. There is a very large range of human reaction to noise, including those who are very sensitive to noise. This noise-sensitive sector of the population would react to intruding noises that are barely audible within the overall noise environment, or would have an expectation of very low environmental noise levels. On the other hand, there are those within the community who find living in noisy environments, such as near major industry, on main roads or under aircraft flight paths, an acceptable situation. The bulk of the population lies within these two spectrums, being unaffected by low levels of noise and being prepared to accept levels of noise commensurate with their surroundings.

Table 9.9 Residual level of impact

INP factors for consideration	Justification of the proposal
2. Characteristics of the proposal and its noise or vibrations —the noise characteristics of the activity —the extent to which any remaining noise impact exceeds the project-specific noise levels —the circumstances and times when the project-specific noise levels are likely to be exceeded —the circumstances and times when the source noise levels are likely to be below the project-specific noise levels (for example, when wind blows source noise away from the receiver) —the accuracy with which impacts can be predicted, and the likelihood that the impacts will occur in the manner predicted —the degree to which the character of the noise is new to an area and differs from existing noise sources —the economic benefit and social worth of the proposal for the local area, the region or the nation.	The MTO is an existing and well established mine in the Hunter Valley. The proposal seeks a continuation of all aspects of the mine as it presently operates. MTO currently invests significantly in noise management and would continue to do so under the proposal. For example, attenuation of all major plant across the MTW would exceed $50million and will be completed by the end of 2016. The applicant has committed to managing noise levels to meet or be within 1-2 dB of PSNL at the majority of properties. Managing noise to this level is reasonable and feasible for the Site. Managing noise to PSNLs at all locations was tested and found not to be reasonable or feasible for the Site as it would result in the mine not being economically viable. The assessment has identified that noise levels predicted above PSNLs would only occur during worst case prevailing metrological conditions. It has been demonstrated that with continued management of the mine, such as by implementing equipment fleet with best practice noise suppression, that INP PSNLs can be met for the majority of assessment locations. Further, with the proposed attenuation of mobile plant at the Site, it is expected that noise levels would improve for all assessment locations to the east of the Site. The noise modelling adopts area specific validation and, therefore, provides added confidence in the accuracy of predictions. Extensive monitoring to measure compliance would be continued under the proposal. The economic study for the proposal has identified that the direct economic benefit that can be attributed to MTO is around $149million in NPV terms. The economic flow-on effects from MTO amount to: • for NSW, around $39million in additional income (in NPV terms), additional annual employment of 15 full-time equivalent workers, and a contribution to NSW GSP of around $45million; • for the Mid and Upper Hunter region, around $23million in additional income in NPV terms, and additional annual employment of 16 full-time equivalent workers; and • for the Singleton LGA, around $9million in additional income in NPV terms, and additional annual employment of 4 full-time equivalent workers.
3. The feasibility of additional mitigation or management measures: —Alternative sites or routes for the development —The technical and economic feasibility of alternative noise controls or management procedures	The MTO is an existing and well established mine in the Hunter Valley and relocation is not reasonable or feasible. The applicant has considered a range of noise management and mitigation measures for the proposal. Those that are considered reasonable and feasible have been included in this assessment. These include: a significant investment in providing best practice noise suppression on equipment fleet (see details in section 10.1.1 of Appendix F). These measures in combination with the established real-time noise monitoring and management system would assist in keeping noise levels to within or below 1-2 dB of PSNL for the majority of assessment locations - this is a reasonable and feasible outcome for the viability of the proposal.
4. Equity issues in relation to: —The costs borne by a few for the benefit of others —The long-term cumulative increase in noise levels —The opportunity to compensate effectively those affected	The applicant would be investing significantly in noise management and mitigation over the life of the proposal which would be of significant benefit to the surrounding communities. The cumulative noise assessment demonstrates that with reasonable and feasible mitigation and management in place that the INP recommended acceptable amenity noise limits can be achieved for the life of the mine. The applicant would appropriately address all assessment locations identified with noise level exceedance as negotiated with DP&E and the landowner.

9.7 NSW Land and Environment Court issues

One of the key matters raised in the L&E Court (see Section 2.3) was noise. The broad noise areas the judgement focussed on are as follows:

1. combining Warkworth Mine and MTO into one assessment;

2. representative background noise for Bulga;

3. sleep disturbance impacts;

4. low frequency noise;

5. cumulative noise; and

6. existing mining noise levels already unacceptable (suggesting therefore any new mining proposals should not be allowed).

Each of the above matters has been addressed in more detail in this chapter. A summary for each is provided below and further detail is provided in Appendix F:

1. The current approach does not combine Warkworth Mine and MTO. The two mines are assessed separately in this EIS. Further, the approvals do not overlap and it is clear when a noise source is regulated under the Warkworth Mine development consent and EPL and when it is regulated under the MTO development consent and EPL.

2. An extensive background noise analysis has been completed for Bulga residences and is documented herein (refer Section 9.3). Six long-term monitoring sites across Bulga were used capturing several months of data in some cases. The data reflects consistency with historic (2002) data showing background levels of 30dB(A) to 33dB(A). Further, noise modelling was used to provide much finer allocation of noise background levels for individual residences.

3. Sleep disturbance is addressed in Section 9.4.3.

4. Low frequency noise is addressed in Sections 9.4.4 to 9.4.6.

5. Cumulative noise is addressed in Section 9.4.7. It is demonstrated that the non-discretionary Mining SEPP is satisfied for Bulga residences and means the area's amenity is not compromised as it meets the INP's ANL. Further, the amenity, which relates to cumulative noise from all industry, cannot worsen for this area because no new large scale industry would be able to physically exist in a position that could push amenity levels any higher for Bulga residences.

6. The Site's current and on-going management is described in Section 9.5. It should also be noted that the attenuation to plant is currently at 50 per cent of trucks, and partly commenced on other items, and a commitment to have all major plant attenuated by the end of 2016 will mean an improvement to off-site noise levels on the current situation. As per Item 5, it is demonstrated that the ANL would be satisfied with the proposal.

9.8 Conclusions

The assessment of the potential for noise impacts on 221 assessment locations over the lifespan of the proposal includes predictions of emissions based on an equipment fleet with best practice sound suppression on all major plant, implementation of which has substantially progressed. Further, MTW has developed a first in the NSW industry for pre-emptive real time noise modelling and is using best practice real time noise monitoring and management techniques. This constitutes all reasonable and feasible mitigation that would continue to be applied under the proposal.

One of the study's aims was to demonstrate the effectiveness of managing off-site noise to within the INP's requirements and as described below this has largely been achieved.

Operational noise at assessment locations was predicted under varying meteorological conditions including calm and prevailing meteorology. Modelling has been validated in the past against monitoring results with strong agreement found.

The study developed a fairer approach to background noise level assignment for Bulga assessment locations through monitoring points and transition of RBLs between these.

The assessment concluded that operational noise would comply with the Mining SEPP non-discretionary standards at all locations not already significantly impacted by mining noise. It was also found that operational noise would comply with the INP's operational criteria for all assessment locations during 'calm' weather conditions for day, evening and night periods.

Predictions during prevailing meteorological conditions indicated that, of the 221 assessment locations, operational noise levels from the proposal would result in significant noise level exceedances (ie greater than 5dB(A)) at one assessment location (149) to the east of the mine. This location is in MTO's 'acquisition on request' list contained in its current development consent (as modified in 2012).Overall, operational noise at eastern assessment locations is expected to remain relatively unchanged from existing and approved activities. No significant exceedances are predicted for assessment locations in Bulga. Further, the proposal is likely to result in lower noise levels for eastern receivers than current and approved operations due to implementation of plant attenuation.

The cumulative noise assessment demonstrates adherence to the INP's amenity criteria and the non-discretionary Mining SEPP at all properties not previously identified as impacted.

It is demonstrated that the non-discretionary Mining SEPP is satisfied for Bulga assessment locations and means the area's amenity is not compromised as it meets the INP's ANL. Further, the amenity, which relates to cumulative noise from all industry, cannot worsen for this area because no new large scale industry would be able to physically exist in a position that could push amenity levels any higher for Bulga assessment locations. This means that while some assessment locations would be 1 or 2dB above PSNLs, for example, these houses are habitable and still subject to a rural amenity.

Chapter 10

Air quality and greenhouse gas

Chapter 10 — Air quality and greenhouse gas

10 Air quality and greenhouse gas

10.1 Introduction

This chapter provides a summary of the air quality and greenhouse gas study prepared by Todoroski Air Sciences Pty Ltd (TAS), which is presented in full in Appendix G.

The chapter describes the existing air quality environment, predicted emissions, potential impacts at assessment locations, and management and monitoring measures.

10.2 Existing environment

10.2.1 Topography and climate

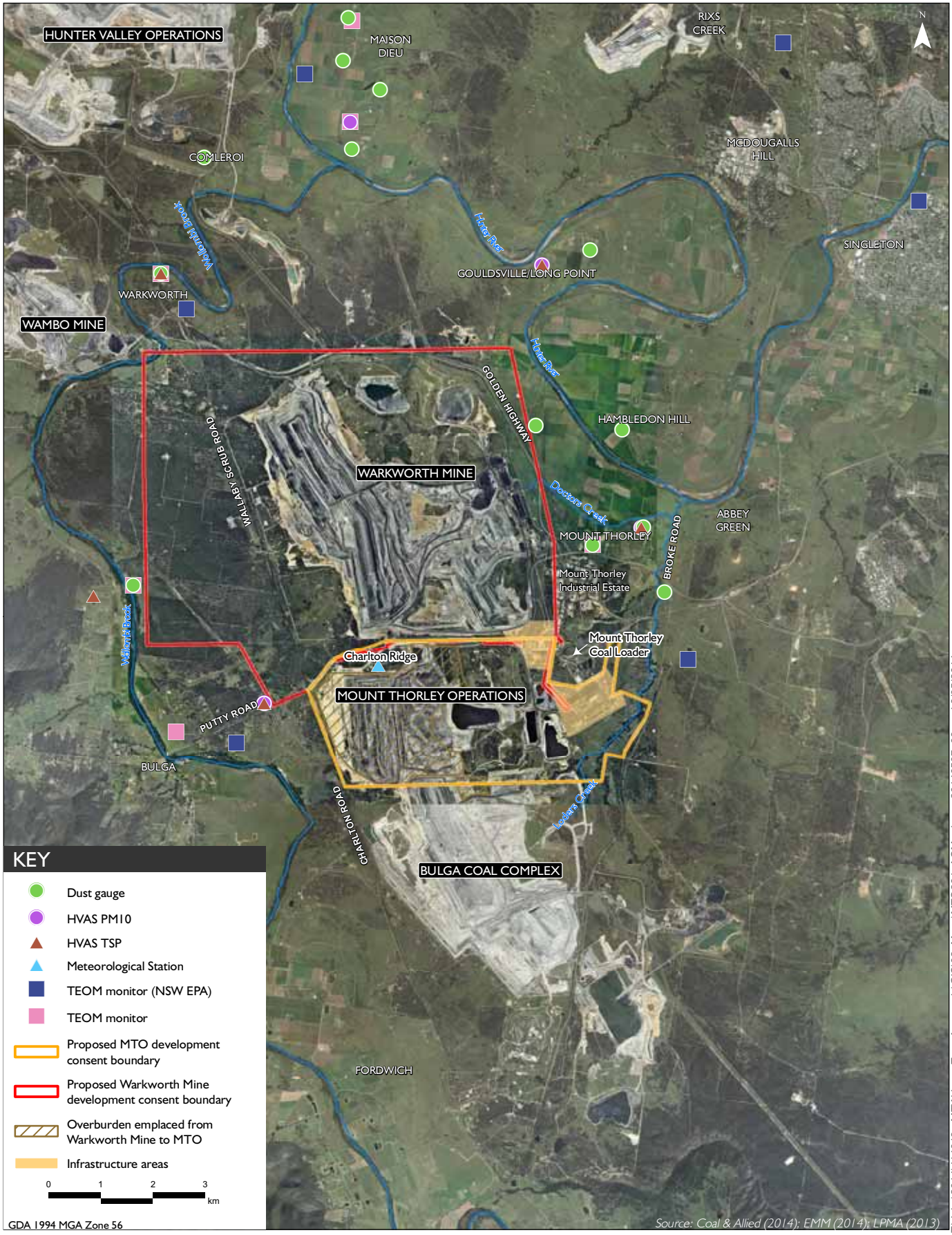
The surrounding landform and local climate will have a bearing on how air in the locality will move and disperse pollution. It is important to understand these factors when conducting an air quality and greenhouse gas study.

The topography surrounding the Site is characterised by the steep escarpment to the west and south which forms part of the Wollemi National Park and the Pokolbin State Forest, respectively. To the north and east, the terrain is generally open to form the Hunter Valley. In the general vicinity of the Site, the terrain is typical of grassland and woodland with moderately hilly terrain. The complex terrain features of the surrounding area have a significant effect on the local wind distribution patterns.

Long-term climate data was used to characterise the local climatic conditions based on the long-term meteorological parameters. The data was collected at the Bureau of Meteorology's (BoM) station at Jerrys Plains Post Office (Station Number 061086), approximately 20km north-west of MTO. A summary of the climatic data is provided below.

- January is the hottest month with a mean maximum temperature of 31.7°C and July is the coldest month with a mean minimum temperature of 3.8°C.
- Humidity levels exhibit variability over the day and seasonal fluctuations. Mean 9am humidity levels range from 59 per cent in October to 80 per cent in June. Mean 3pm humidity levels vary from 42 per cent in October to December, to 54 per cent in June.
- Rainfall peaks during the summer months and declines during winter. The data show January is the wettest month with an average rainfall of 77.7mm over 6.4 days and August is the driest month with an average rainfall of 36.1mm over 5.2 days.
- Wind speeds during the warmer months have a greater spread between the 9am and 3pm conditions compared to the colder months. The mean 9am wind speeds range from 8.6km/h in April to 11.7km/h in September. The mean 3pm wind speeds vary from 11km/h in May to 14.7km/h in September.

The Charlton Ridge meteorological station (see Figure 10.1) is operated by MTW to assist with environmental management of site operations.



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Air quality monitoring locations

Mount Thorley Operations 2014

Environmental Impact Statement

Figure 10.1

Annual and seasonal windroses for the area show that the most common winds on an annual basis are from the south-southeast and south with very few winds originating from the north-east and south-west sectors. Dominant seasonal winds are south-southeast in the summer, south-southeast and north-west in winter, and south-southeast with varied winds from east-southeast, south and north-west in spring. The autumn distribution is similar to the annual distribution pattern. The annual and seasonal windroses for 2012 are shown in Figure 10.2.

10.2.2 Ambient air quality

The main sources of particulate matter in the wider area include active mining, agricultural activities, emissions from local anthropogenic activities such as motor vehicle exhaust and domestic wood heaters, urban activity and various other commercial and industrial activities. Particulate matter consists of dust particles of varying size and composition, which are referred to as deposited dust, total suspended particulate matter (TSP), and TSP particles which have a diameter of 10 micrometres (µm) or less (PM_{10}) or 2.5µm or less ($PM_{2.5}$).

Other air pollutant emissions considered in the study include carbon monoxide (CO), nitrogen dioxide (NO_2) which can potentially arise from mining operations such as the diesel powered equipment used on site.

i Air quality goals

Air quality goals are benchmarks set to protect the general health and amenity of the community in relation to air quality. The air quality goals relevant to the study are outlined in the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (the EPA Approved Methods, DEC 2005b) and summarised in Table 10.1. The EPA currently does not have impact assessment criteria for $PM_{2.5}$ concentrations; however, the National Environment Protection Council (NEPC) has released a variation to the *National Environment Protection Measure* (NEPM, NEPC 2003) to include advisory reporting standards for $PM_{2.5}$, which are included in Table 10.1.

The Mining SEPP non-discretionary standard with respect to cumulative air quality at private dwellings of PM_{10} annual average criterion of 30µg/m^3 is equivalent to the EPA annual average PM_{10} criterion.

Table 10.1 Impact assessment air quality goals

Pollutant	Averaging Period	Impact	Criterion
TSP	Annual	Total	90µg/m^3
PM_{10}	Annual	Total	30µg/m^3
	24 hour	Total	50µg/m^3
Deposited dust	Annual	Incremental	2g/m^2/month
		Total	4g/m^2/month
$PM_{2.5}$*	24 hours	-	25µg/m^3
	Annual	-	8µg/m^3
CO	15 minute	-	100mg/m^2
NO_2	1 hour	-	246µg/m^3
	Annual	-	62µg/m^3

Source: *Approved Methods (DEC 2005b).*

**National Environment Protection Council advisory standard, National Environment Protection Measure (NEPC 2003).*

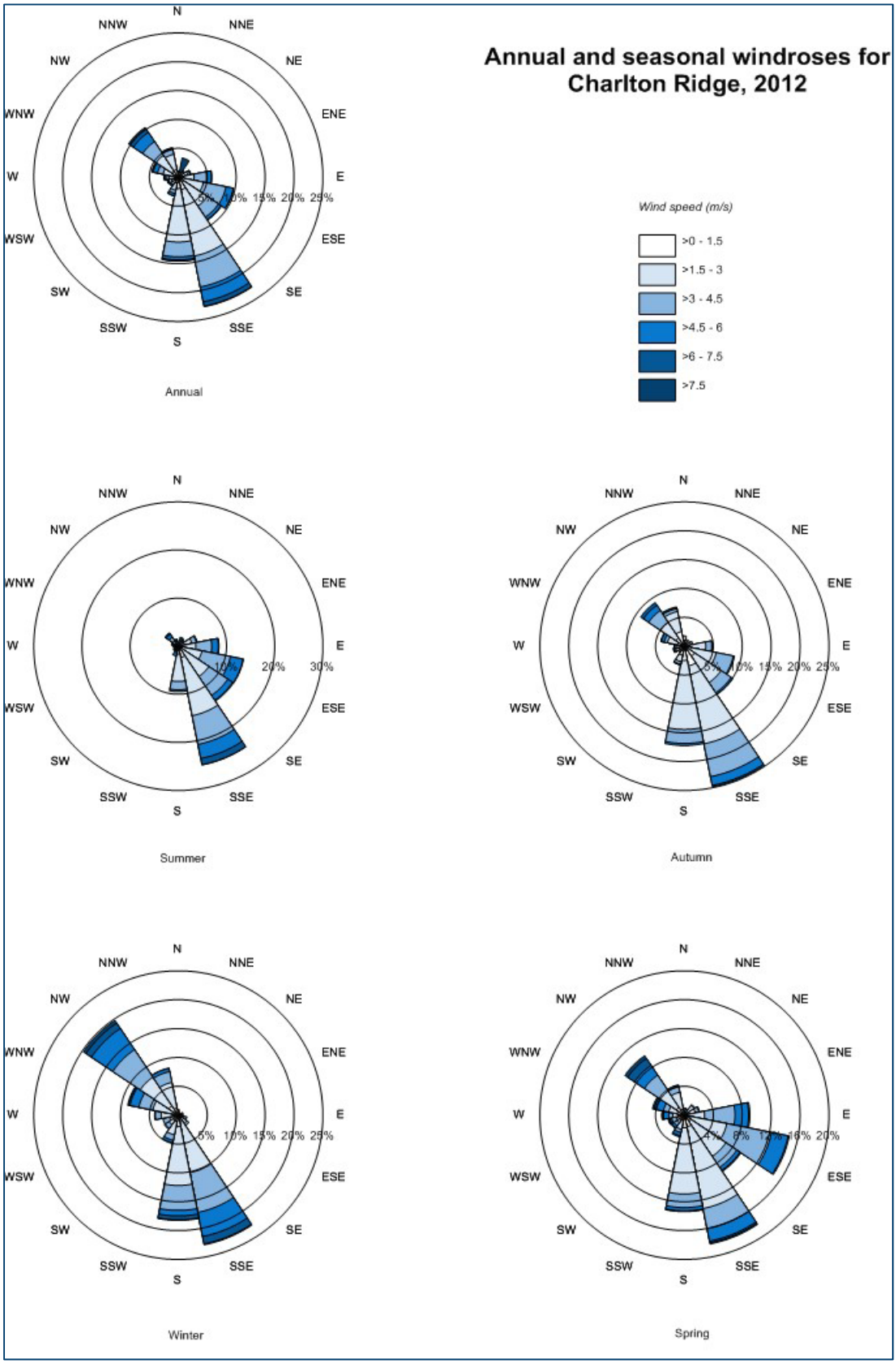


Figure 10.2 Annual and seasonal windroses for Charlton Ridge weather station (2012)

Acquisition and negotiated agreements with private residential landowners are generally required by DP&E if there are systemic exceedances of the EPA criteria. In the context of impact assessments for approval of new proposals and modifications to existing projects, this is interpreted to mean where EPA criteria is exceeded on more than five days in any year (a 98.6 percentile level of compliance).

ii Monitoring data

To quantify ambient air quality near the Site, data was collected from a number of monitoring locations (including locations other than those at MTW) in the vicinity of the Site (refer Figure 10.1) including 12 Tapered Element Oscillating Microbalances (TEOMs), 11 High Volume Air Samplers (HVAS) measuring either TSP or PM_{10}, 13 dust deposition gauges and three NO_2 monitors. Monitoring review periods varied generally commencing between January 2010 and January 2012 and concluding between December 2013 and March 2014. A summary of the ambient monitoring data is provided below.

- Annual average PM_{10} concentrations are below the relevant criterion of 30µg/m³.
- Maximum 24-hour average PM_{10} concentrations are on occasion above the relevant criterion 50µg/m³.
- PM_{10} concentrations are generally highest in the spring and summer months with the warmer weather raising the potential for drier ground elevating the occurrence of windblown dust, bushfires and pollen levels.
- Annual average TSP concentrations are below the relevant criterion of 90µg/m³.
- Annual average dust deposition concentrations are below the relevant criterion of 4g/m^2/month.
- Maximum daily 1-hour average NO_2 concentrations are below the relevant criterion of 246µg/m³.

The MTW air quality monitoring network is described in Section 10.5.2.

10.2.3 Compliance history

Reporting of air quality monitoring results in the 2012 and 2013 annual reviews for MTW show that current dust generation has met the relevant criteria given in Table 10.1. This is despite dust generation recorded in 2012 being generally higher than for previous years, attributed to lower rainfall. A summary of the 2012 and 2013 dust monitoring results presented in the respective annual reviews is provided below.

- Increases in monthly dust deposition concentrations at all monitoring locations were below 1.25g/m^2/month, indicating compliance with the criteria of 2g/m^2/month.
- Maximum total dust deposition concentrations at all monitoring locations for both years were below 3.5g/m^2/month, indicating compliance with the criteria of 4g/m^2/month.
- Exceedances of dust deposition criteria recorded at a number of sites were determined to be contaminated by non-mine sources such as bird droppings, insects and vegetation.

- Annual average TSP concentrations were below the criteria of 90µg/m^3 with recorded levels being generally 60µg/m^3, with the exception of recorded levels of approximately 85µg/m^3 at the most impacted monitoring location WML-HV1 (located at Mount Thorley) in 2012. It is noted that investigations of the most impacted monitoring location, WML-HV1, have shown it to be heavily influenced by agricultural pursuits on private property. It has since been moved to a more representative location on a neighbouring property in Mount Thorley.

- 24-hour PM_{10} concentrations above the EPA criteria of 50µg/m^3 were recorded on eight days in 2012 and ten days in 2013; however, investigation of wind direction and location identified that the elevated levels on these days were due to other sources of particulate matter, such as bushfires and regional dust events. Therefore, there were no non-compliances with, or sustained exceedances of, the PM_{10} 24-hour criterion in 2012 and 2013 attributable to MTW.

- Annual average PM_{10} concentrations were below the EPA criterion of 30µg/m^3. For most of the monitoring locations the annual average concentrations were approximately 20µg/m^3, with the exception of one monitoring location (MTIE), which recorded a concentration of approximately 28µg/m^3 in 2012 and approximately 26µg/m^3 in 2013.

10.3 Impact assessment

10.3.1 Methodology

i Air assessment approach

The study was undertaken with the knowledge that the existing MTO activities are already approved. Therefore, the existing and potential environmental impacts are already approved, and management and monitoring measures have been developed and implemented. To adequately assess the potential impacts resulting from the proposal, the assessment methodology incorporated all of the existing and approved MTO activities. The assessment results thus represent the potential impacts resulting from the whole of MTO, including the changes resulting from the proposal. Consequently, it must be recognised that some of the predicted effects are due to the activities from operations already approved irrespective of the proposal.

The modelling assessment also includes dust from all nearby existing and proposed mining projects including Warkworth Mine, Wambo Mine, Hunter Valley Operations, Rix's Creek and Bulga Coal Complex. The assessment uses the best available data to incorporate the presently proposed Bulga Optimisation Project and Rix's Creek West Pit extension.

The study was prepared generally in accordance with the EPA Approved Methods which sets out the applicable criteria, and detailed guidelines on how to conduct an air quality impact assessment. The study investigated the potential for adverse air quality impacts to occur at surrounding assessment locations as a result of the proposal through the use of air dispersion modelling. Assessment locations used in the study are shown in Figure 10.3.

The modelling approach was a combination of the CALPUFF Modelling System for dispersion modelling and the CSIRO meteorological model TAPM. The CALPUFF model is an advanced 'puff' model that deals with the effects of complex local terrain on dispersion meteorology. It allows for spatial variation of meteorology, such as wind patterns, over a three-dimensional modelling domain in an hourly varying time step. CALPUFF is accepted by the EPA as an appropriate modelling system for open cut coal mines in NSW. The potential impacts of the proposal were modelled using local topographical and meteorological data.

Estimated maximum dust emissions from the proposal, and all nearby mines were added to existing air quality levels to determine the total impacts that may arise. The calculated dust at the assessment locations were then compared with the air quality criteria, presented in Table 10.1, to determine whether compliance was achieved. Several rounds of modelling assessment were completed as part of work with the mine planners in order to minimise potential emissions and impacts. The refined indicative mine designs were put forward and assessed in the study.

The study considers three indicative mine plan years (Year 3, 9 and 14) chosen to represent a range of potential impacts over the life of the proposal by reference to the location of the operations and the potential to generate dust in each year.

The cumulative air quality environment in the vicinity of Bulga village and for the assessment locations generally to the west and south-west of the proposal is likely to improve beyond Year 14. This arises as the dust emissions predictions from the other mines in the area for these years show reductions in emissions and/ or move further away from the assessment locations.

The emissions reductions beyond Year 14 occur as mining activity/ footprints reduce and also as some of the mines consents expire. It should be noted, however, that all of the neighbouring mines were conservatively included in the modelling assessment for Year 14 (even those without a development consent or known plans to operate at this time, as described earlier in this section).

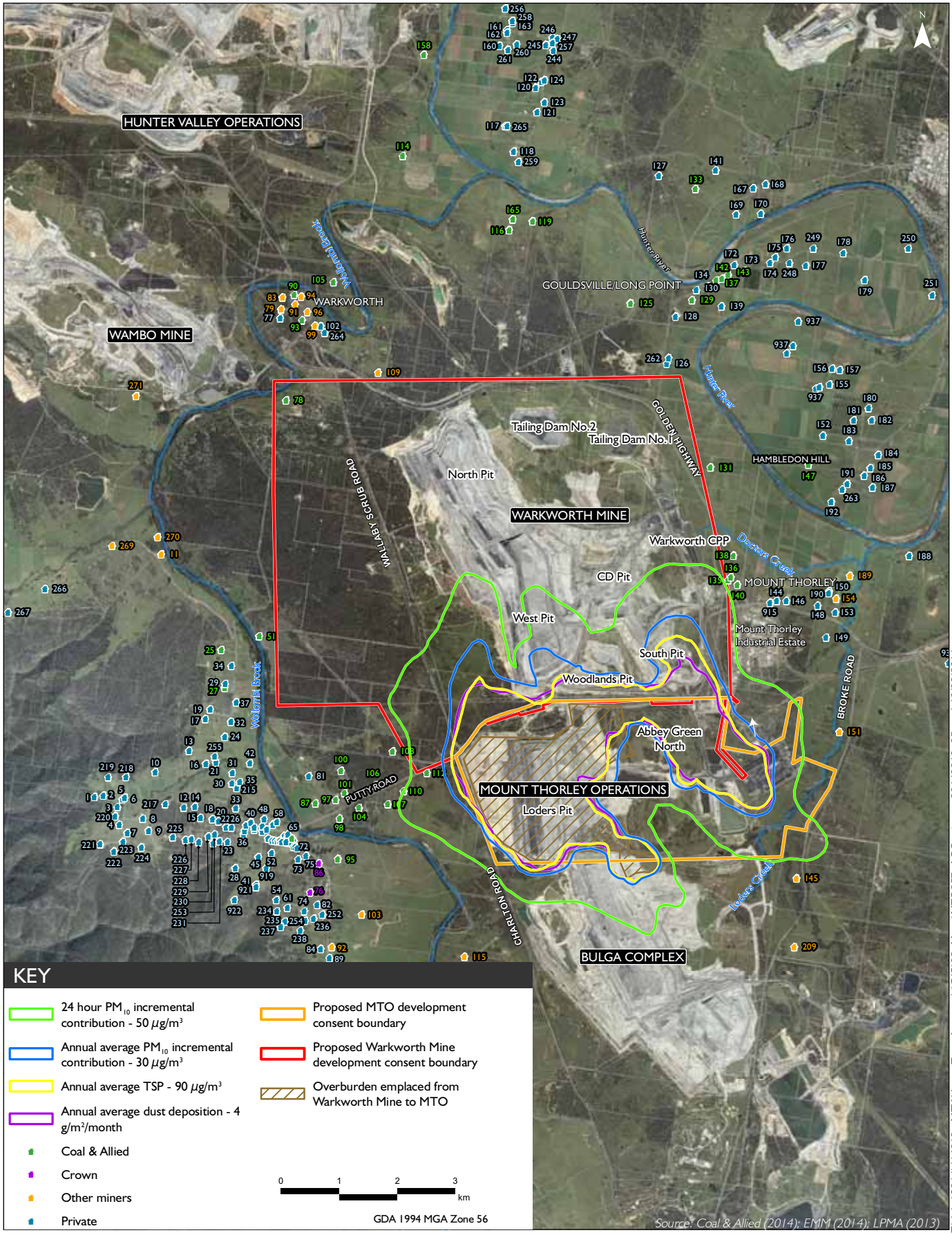
Dust emissions and impacts from the Bulga Coal Complex would progressively reduce at the majority of the assessment locations as the proposed operation moves to the east (away from assessment locations) and its emissions and footprint reduce over time (Umwelt 2013).

For each of the three indicative years, the rate of dust emission was calculated by analysing the various types of dust generating activities taking place in each year and applying suitable emission factors sourced mainly from studies supported by the US EPA and from Australian studies and site specific data where possible. The estimated dust emissions reflect the application of best practice dust mitigation currently being implemented at MTW in accordance with its Air Quality and Greenhouse Gas Management Plan (AQMP) and pollution reduction programme (PRP) (see Section 10.5.1).

ii Cumulative assessment

In addition to the estimated dust emissions from the proposal, emissions from all nearby approved, and proposed mining operations were also modelled, per their current consent (or current proposal), to assess potential cumulative dust effects. Emission estimates from these sources were derived from information provided in the air quality assessments available in the public domain at the time of modelling. These estimates are likely to be conservative as, in many cases, mines do not continually operate at the maximum extraction rates assessed in their respective EAs. Further, it was assumed that all mines would continue to operate until 2035, the life of the proposal.

Other dust generating activities in the surrounding area would also contribute to existing dust levels and an allowance for this contribution as well as contributions from other non-modelled dust sources was included in the assessment. The contribution to the prevailing background dust levels of other non-modelled dust sources was estimated by modelling the past (known) mining activities during 2012 and comparing model predictions with the actual measured data from the corresponding monitoring stations. The average difference between the measured and predicted PM_{10}, TSP and deposited dust levels from each of the monitoring points was considered to be the contribution from other non-modelled dust sources, and was added to the future predicted values to account for the background dust levels.



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All years, worst case air quality modelling results

Mount Thorley Operations 2014
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Figure 10.3

The assessment of cumulative impacts used PM_{10} data collected from TEOM monitoring conducted by MTW and Hunter Valley Operations during 2012 as this period has the highest baseline PM_{10} levels measured in Bulga village but does not contain the anomalous high peaks that occurred during the bushfire period in late 2013 or the relatively low levels that occurred in Bulga village in 2013. The use of this data is likely to result in a generally conservative assessment (ie overestimate) of the potential cumulative air quality impact predicted to occur.

10.3.2 Results

i Dispersion modelling predictions

The dispersion model predictions for each of the indicative mine plan years are presented in this section. The results show the estimated maximum 24-hour and annual average PM_{10} concentrations. Annual average TSP concentrations and annual average dust (insoluble solids) deposition rates for the proposal operating in isolation (the incremental impact) and with other sources (the total (cumulative) impact) are within the PM_{10} zone of effect and do not affect the outcomes of the study.

The privately-owned assessment locations where impacts are predicted to exceed relevant assessment criteria are summarised in Table 10.2 showing the year(s) of impact and the level of impact. The mine-owned (MTW or other mines) assessment locations where impacts are predicted to exceed relevant assessment criteria are summarised in Table 10.3. Contours of the all years, worst case modelling predictions (ie 100 percentile) with respect to all assessment locations are shown in Figure 10.3.

Table 10.2 Summary of modelled predictions where predicted impacts exceed assessment criteria at privately-owned assessment locations

Assessment location ID	PM_{10}			TSP	Dust deposition	
	Incremental 24-hour average		Total annual average	Total annual average	Incremental annual average	Total annual average
	Criterion 50µg/m³		Criterion 30µg/m³	Criterion 90µg/m³	Criterion 2g/m²/month	Criterion 4g/m²/month
	Year of impact (level of impact - µg/m³)	No. of days above 50µg/m³	Year of impact (level of impact - µg/m³)	Year of impact (level of impact - µg/m³)	Year of impact (level of impact - g/m²/month)	
77			Year 3 (32)			
			Year 9 (36)			
			Year 14 (35)			
102			Year 3 (31)			
			Year 9 (31)			
264			Year 3 (31)			
			Year 9 (32)			

Three privately-owned assessment locations (77, 102, and 264) all in Warkworth village may experience concentrations above the relevant criterion for annual average PM_{10}. Of these: assessment location 77 is within Wambo Mine's current acquisition zone; assessment location 102 is the Warkworth Hall, a non-residential location; and assessment location 264 is newly identified and would have been within Wambo Mine's acquisition zone had it been previously assessed.

Therefore, the cumulative air quality level of 30µg/m³, as set in clause 12AB(a) of the Mining SEPP, is met at all but two residential assessment locations (77 and 264), both of which are already significantly affected by a neighbouring mine (Wambo Mine).

Table 10.3 Summary of modelled predictions where predicted impacts exceed assessment criteria at mine-owned assessment locations

Assessment location ID	PM_{10}			TSP	Dust deposition	
	Incremental 24-hour average		Total annual average	Total annual average	Incremental annual average	Total annual average
	Criterion 50µg/m³		Criterion 30µg/m³	Criterion 90µg/m³	Criterion 2g/m²/month	Criterion 4g/m²/month
	Year of impact (level of impact - µg/m³)	No. of days above 50µg/m³	Year of impact (level of impact - µg/m³)	Year of impact (level of impact - µg/m³)	Year of impact (level of impact - g/m²/month)	
78			Year 3 (32) Year 9 (55) Year 14 (57)	Year 9 (110) Year 14 (117)		Year 9 (4.9) Year 14 (5.2)
79*			Year 3 (32) Year 9 (35) Year 14 (34)			
83*			Year 3 (32) Year 9 (34) Year 14 (33)			
90			Year 9 (32)			
91*			Year 9 (32)			
93			Year 9 (33)			
94*			Year 9 (31)			
96*			Year 9 (31)			
99*			Year 9 (32)			
109*			Year 3 (61) Year 9 (35)	Year 3 (125)		Year 3 (5.3)
112	Year 3 (67)	6	Year 3 (37) Year 9 (34) Year 14 (43)			
145*			Year 3 (36) Year 9 (41)			
209*			Year 3 (32) Year 9 (35)			
271*			Year 3 (44) Year 9 (46) Year 14 (46)	Year 9 (92) Year 14 (92)		
941*			Year 9 (31)			

Notes: *Non MTW mine-owned property.*

Fifteen mine-owned assessment locations may experience concentrations above the relevant criterion for annual average PM_{10}. A subset of these assessment locations may also experience concentrations above the relevant criteria for 24-hour average PM_{10} (112), annual average TSP (78, 109 and 271) and annual average dust deposition (78 and 109).

It is noted that mine-owned assessment locations 145, 209 and 271 are predominantly influenced by other dust sources in the area and are largely unaffected by activity from the proposal.

ii Maximum 24-hour average PM_{10} contemporaneous assessment

The Level 2, EPA contemporaneous assessment method (outlined in Section 11.2 of the EPA Approved Methods (DEC 2005b)) was also applied to examine the potential maximum (cumulative) 24-hour average PM_{10} impacts for the proposal. The EPA method uses the measured background data for each day of the year and on each day, adds the additional effect (the change in dust level) that may result from the proposal to determine the cumulative effect.

As the proposal interacts with Warkworth Mine, future Warkworth Mine activities were included as part of the total cumulative assessment of likely future impacts.

The analysis focused on locations that were chosen to represent the assessment locations surrounding MTO. These locations correspond with the five monitoring stations (MTW TEOM stations at Bulga, Wallaby Scrub Road, Warkworth, MTIE and Knodlers Lane – see Figure 10.1 for locations) where suitable ambient monitoring data is available.

Generally, these monitoring locations are representative of the most impacted receptors in the surrounding assessment locations as they are typically closer to the mining activity and hence are likely to experience greater impacts. The predicted cumulative 24-hour average PM_{10} levels assessed at the monitor locations can be therefore be considered a reasonable, conservative measure of the potential 24-hour average PM_{10} impacts that may arise across the representative assessment locations.

Maximum background levels of 24-hour average PM_{10} have, in the past, reached levels near the relevant criterion (depending on the monitoring location and time). As a result, the EPA approach of adding maximum background levels to maximum predicted proposal only levels (Level 1 assessment) would show levels above the criterion. In such situations, more detailed assessment is required. The EPA approach in this regard sets out a more thorough (Level 2) assessment whereby the measured background level on a given day is added contemporaneously with the corresponding predicted proposal only level using the same day's weather data. This method factors into the assessment the spatial and temporal variation in background levels affected by the weather and existing sources of dust in the area on a given day.

A summary of the results of the contemporaneous assessment at each monitoring location is provided in Table 10.4.

Table 10.4 EPA maximum 24-hour average PM_{10} contemporaneous assessment results (number of additional days above criteria as a result of the proposal)

Location	Year 3	Year 9	Year 14
Bulga	0	0	0
Wallaby Scrub Road	0	0	0
Warkworth	1	6	4
Knodlers Lane	0	2	1
MTIE	0	3	0

The results indicate that it is unlikely that cumulative impacts would arise at the assessment locations near the Bulga and Wallaby Scrub Road monitoring locations during the years assessed.

There is potential for cumulative impacts to arise near the Warkworth, Knodlers Lane and MTIE monitoring stations. The potential risk of cumulative impacts at the Knodlers Lane and MTIE monitors is relatively low with only two and three additional days, respectively, of predicted impact above the relevant criterion in Year 9 and only one day for Knodlers Lane in Year 14.

The potential risk of cumulative impacts near the Warkworth monitor is greater with one, six and four additional days predicted to exceed the relevant criterion in Years 3, 9 and 14, respectively. These predictions are expected, as prevailing winds would transport material along the mine pit and project dust northwards. As the mine progresses westwards, the impacts to the north of the mine move closer to Warkworth, as represented in the indicative mine plan years assessed. The majority of assessment locations at Warkworth are mine-owned or currently afforded acquisition rights.

iii Cumulative $PM_{2.5}$

Further consideration was given to $PM_{2.5}$ in the assessment given the lack of suitable monitoring data at the Site. The nearest available $PM_{2.5}$ data is collected at the Upper Hunter Air Quality Monitoring Network station at Singleton. This data shows a trend of increasing $PM_{2.5}$ levels in the winter and reduced levels in the summer which is likely due to the influence of urban sources of fine particulate matter such as wood heaters.

Examination of the available $PM_{2.5}$ measurement data for Singleton shows that the annual average $PM_{2.5}$ level during 2012 is approximately 8µg/m³, 70th percentile 24-hour average maximum levels are approximately 9.6µg/m³ and maximum 24-hour average levels are below 25µg/m^3.

It is considered that background levels of $PM_{2.5}$ at the Site would be significantly lower than the levels in Singleton, given that the concentration of wood heaters, people and cars is considerably less in the near vicinity of the Site.

Given background $PM_{2.5}$ data does not exist at the Site and in the absence of assessment methodology guidance in NSW, a method used by the Victorian EPA was utilised to determine likely cumulative $PM_{2.5}$ levels for assessment locations in proximity to the Site. As stated in the Victorian State Environment Protection Policy (Air Quality Management):

> Proponents required to include background data where no appropriate hourly background data exists must add the 70th percentile of one year's observed hourly concentrations as a constant value to the predicted maximum concentration from the model simulation. In cases where a 24-hourly averaging time is used in the model, the background data must be based on 24-hour averages.

In the case of the proposal, if the incremental (proposal only) results for annual and 24-hour $PM_{2.5}$ were added to the estimated annual average background $PM_{2.5}$ levels, or the 70th percentile 24-hour maximum levels, then no assessment location (predicted to comply with the criteria for other pollutants) would experience $PM_{2.5}$ level above the NEPM advisory reporting standards.

iv Diesel emissions

The modelling predictions for NO_2 emissions found that in Years 3, 9 and 14 all assessment locations are predicted to experience maximum 1-hour average and annual average NO_2 concentrations below the relevant criteria of 246µg/m³ and 62µg/m³, respectively.

The ambient air quality goals for CO are set at higher concentration levels than the NO_2 goals. Based on the NO_2 monitoring data which are low compared to the goals, and consideration of the typical mix of ambient pollutant levels and associated emissions of CO, the indication is that predictions of CO would be well below the air quality goals.

v Blast fume emissions

Blast fume emissions (NO_2) were estimated on the basis of emission levels presented in a CSIRO study of Hunter Valley blasts (Attala et al. 2008). Dispersion modelling of the potential blast fume emissions was conducted for each indicative mine plan year. The model was set up to generate a blast in the pit during each hour of the day when blasting is permitted. The modelling was done with and without application of the existing blast restrictions that set out the permissible conditions under which a blast may be triggered. This comparison was also conducted to determine the effects of these permissions in limiting potential impacts. Isopleth diagrams demonstrating the contours of the assessed maximum 1 hour average NO_2 concentrations during each potential blast hour of each year are provided in the air quality and greenhouse gas study (see Appendix G).

The modelling results show that during the middle daytime hours no impacts due to blasting fume emissions are predicted to occur. During these times, the blast restrictions have a relatively small effect because there would not be any appreciable impact to mitigate. However, in the early evening, when there is potential for impacts to arise offsite, the results show that application of the blasting permissions would avert such potential impacts for most assessment locations.

As the proposal moves west the potential for blast fume impacts to the west increases. This means that potential impacts at assessment locations to the west would need to be managed in the later years of mining.

It is noted that, in this regard, MTW is currently implementing a predictive management system to aid with management of blasting operations. Such a system uses actual conditions for each blast to predict the potential impact which may occur. The prediction is made on the basis of forecast weather data, allowing operators to schedule a blast to the time of least impact over the course of the upcoming day. In effect the system updates the blasting permissions for each individual blast on the basis of predicted impact. The system thus deals with the spatially and time varying weather and terrain influences and is generally more reliable than relying on a fixed set of wind speed and wind direction restrictions.

Overall, it is anticipated that, with implementation of the protocols outlined in the MTW Blast Management Plan (BMP) (see Section 10.5.3), potential blast impacts would be averted.

vi Health effects

The air quality and greenhouse gas study (see Appendix G) included a detailed review of the available studies that relate to health effects associated with exposure to particulates. Finer particles (smaller than 10µm, termed 'respirable') tend to be of more concern when considering health risks related to air quality as these particles can penetrate into the lungs whereas larger particles would, if inhaled, be trapped in the upper respiratory system and not reach the lungs. Health effects related to air quality vary depending on the length of exposure and whether those exposed are within a susceptible group (for example the elderly, infants, and persons with chronic cardiopulmonary disease, pneumonia, influenza or asthma).

Studies that identify the potential health risks of human exposure to particulate matter generally relate to large cities, where a larger portion of the particulates are in the fine fraction that would penetrate into the lung, and also where a greater portion of the particulate matter is from combustion sources, which carries with it other individually toxic substances that are damaging to human health. Rural populations are considered too small for conclusive epidemiological studies to be conducted in those areas, and insufficient alternative data is available for rural areas to identify specific issues that health experts can agree on. Therefore, as a matter of precaution, the findings for urban areas are extrapolated to cover rural areas in order to have a basis for managing exposure to particulate matter for rural populations.

It is important to note that the majority of particulate emissions from mining are dust which originates from the soil. Due to the extreme forces required at the micro level to break down a particle of dust into smaller particles in the fine fraction, mining techniques used at coal mines generally cannot breakdown rock, coal or soil material into these very fine fractions. As a result emissions from mines are predominantly in the coarse size fraction which would not penetrate as deeply into the lung, or carry additional toxic combustion substances.

On average it has been measured that approximately 5 per cent of the total dust (TSP) from mining is in the $PM_{2.5}$ size fraction, and approximately 12 per cent of PM_{10} from mining is in the $PM_{2.5}$ fraction (SPCC 1986). In contrast, in the urban areas in which the majority of the health studies have been conducted, approximately 50 per cent of the PM_{10} is comprised of particles in the $PM_{2.5}$ size range, and most of these are from combustion. However, this is not to say that particulate emissions from mining are harmless as mining emissions include a component of particles in the PM_{10} and $PM_{2.5}$ range and this would include fine combustion particles from diesel equipment.

In many rural areas domestic wood smoke is a key issue of health impact. Wood smoke warrants close attention in any evaluation of health impact as it can be a significant, highly localised source of toxic pollution in the winter period for rural communities and individuals. Wood heaters are also inside living rooms and their chimneys closer to residents than coal mines, which means the air that the population breathes would usually be affected by wood heater emissions to a much greater degree than more distant particulate sources. Recent studies by the CSIRO (CSIRO 2013) into the composition of particulate matter in the Hunter Valley found that a key source of fine particulate is wood smoke. An initiative to target particulates in the Hunter Valley has recently been launched by the EPA, and a key action relates to management of wood smoke in the urban areas (EPA 2013).

As noted in Section 10.3.2iii, no additional assessment locations (that are not already impacted due to PM_{10}), are predicted to experience $PM_{2.5}$ levels above the NEPM advisory reporting standards due to the proposal.

10.4 Greenhouse gas emissions

10.4.1 Methodology

Greenhouse gas (GHG) emissions were predicted in accordance with the National Greenhouse Accounts (NGA) Factors document published by the Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education (DIICSRTE 2013a). The NGA Factors document defines three scopes (Scopes 1, 2 and 3) for different emission categories based on whether the emissions generated are from 'direct' or 'indirect' sources. Scope 1 emissions encompass the direct sources from an activity and Scope 2 and 3 emissions occur due to indirect sources. To quantify the amount of carbon dioxide equivalent (CO_2-e) material generated from the proposal, emission factors were obtained from the NGA Factors document and other sources as required.

Scope 1 and 2 GHG emission sources identified from the operation of the proposal are the onsite combustion of diesel fuel, petrol fuel, petroleum based greases and oils, explosives, emissions of methane from the exposed coal seams, gaseous fuels and onsite consumption of electricity. Estimated quantities of materials that have the potential to be Scope 1 and 2 emissions were based on a conservative upper limit of the assumed maximum production throughout the life of the proposal.

Scope 3 emissions can often result in a significant component of the total emissions inventory; however, these emissions are generally not directly controlled by the proposal. These emissions are generally considered to be the Scope 1 emissions from other various organisations related to the proposal. The primary contribution of the Scope 3 emissions from the proposal occurs from the end use of the product coal and the transportation of the product coal. Specifically these emissions result from the purchase of diesel, petrol, petroleum based greases and oils, electricity for use onsite, the transport of product coal to its final destination, and the final use of the product coal.

Estimated Scope 3 emissions were derived from emission factors for the transport modes of rail and shipping and the associated average weighted distance travelled for the export coal, though they have the potential to vary in the future depending on the market situation at the time. The approximate rail distance was taken to be 166km (return distance) and the approximate shipping distance was taken to be 13,000km (return distance), based predominately on destinations in the Asian market. The emissions generated from the end use of product coal assumed that 5 per cent of the product coal is consumed at Redbank Power Station and the remaining quantity is to be used in power generation and steel manufacturing.

10.4.2 Impact assessment

The predicted Scope 1, 2 and 3 emissions associated with the proposal are summarised in Table 10.5. It is noted that these are highly conservative, based on the assumption that the maximum approved limit of production (10Mtpa ROM coal) would be maintained throughout the life of the proposal, whereas extraction is anticipated to be completed by 2022.

Table 10.5 Summary of CO_2-e emissions per scope (t)

Period	Scope 1	Scope 2	Scope 3
Annual	472,345	86,854	21,915,119
Total	**9,919,249**	**1,823,924**	**460,217,504**

Notes: Numbers have been rounded.

The estimated annual greenhouse emissions for Australia for the period October 2012 to September 2013 was 567.5Mt CO_2-e (DoE 2014). The estimated greenhouse emissions for NSW in the 2010/2011 period are 159Mt CO_2-e (DIICSRTE 2013b). The conservative estimated annual average greenhouse emissions over the 21 year life of the proposal are 0.559Mt CO_2-e (Scope 1 and 2), which represents approximately 0.1 per cent and 0.35 per cent of Australia's and NSW emissions, respectively.

10.5 Management and monitoring

10.5.1 MTW integrated management system

The management of air quality is integrated across MTO and Warkworth Mine is undertaken in accordance with the MTW Air Quality and Greenhouse Gas Management Plan (AQMP). The MTW AQMP was prepared in accordance with the requirements of Schedule 3, Condition 27 of the development consent and Schedule 4, Condition 18 of Warkworth Mine's development consent to manage project specific and cumulative air quality impacts associated with MTW mining operations. The MTW AQMP was developed in accordance with industry best practice with consideration given to the full available range of reasonable and feasible mitigation and their effectiveness in determining the measures to be implemented at the Site. It was submitted to DP&E for approval on 28 March 2014.

Dust management practices in place at MTW aim to ensure compliance with prescribed criteria and to respond to government and community concerns regarding the impacts of mining on regional air quality in the Hunter Valley.

The MTW AQMP applies reasonable and feasible air quality mitigation measures to achieve a standard of mine operation consistent with current best practice for the control of dust emissions from coal mines in NSW. The measures reflect those outlined in *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (Katestone Environmental 2010), and those imposed on mines by the EPA through application of PRPs that relate to haul road emissions, and dust mitigation in response to adverse weather conditions.

The PRPs apply to all Hunter Valley coal mines, including MTO. The best practice controls currently implemented were considered in this assessment and, where applicable, applied in the dust emission estimates.

10.5.2 Monitoring network

The air quality monitoring network at MTW involves monitoring of dust deposition, TSP, PM_{10} and meteorological conditions according to relevant Australian Standards. Monitoring is supported by cameras and physical inspection by appropriately trained mine personnel (see Section 10.5.1.vi). Air quality monitoring locations are shown in Figure 10.1. The monitoring network consists of:

- nine dust deposition gauges representative of residences on privately-owned land;
- five HVAS to measure TSP;
- five HVAS to measure PM_{10};
- five TEOM monitors that transmit live data (real-time PM_{10}) to site personnel via the SCADA (supervisory control and data acquisition) system;
- one meteorological monitoring station (Charlton Ridge); and
- three relocatable 'early warning unit' PM_{10} monitors, positioned nearer to mining operations, which are currently in their testing phase with the intent to use them as supplementary monitors to alert MTW staff of deteriorating air quality conditions.

Alarms, based on data from the real-time PM_{10} monitoring units, are used to inform the operation of potentially adverse weather conditions. Following receipt of an alarm the shift coordinator would undertake or delegate a site inspection and implement additional controls as required.

10.5.3 Blasting

Air quality impacts of blast operations at MTO are managed under the MTW BMP. The purpose of the MTW BMP is to ensure that blasting operations comply with all relevant requirements particularly noise, overpressure, vibration, blast fume and dust effects.

The MTW BMP applies a blasting permissions flowchart to guide operators on the suitability of various factors including the current weather conditions for blasting. The MTW BMP takes into consideration meteorological factors such as wind speed and direction which can affect the scale of potential blast impacts at assessment locations.

A predictive blast system is also used to schedule blast events to the least-risk time of the day where feasible. This approach minimises the risk of offsite impacts occurring, and is based on hourly forecast weather conditions that may affect the dispersion of blast emissions.

10.5.4 Greenhouse gases

Current GHG management practices to minimise the overall generation of CO_2-e emissions would continue under the proposal. The MTW climate change programme has objectives in four key areas delivered through ongoing integration into existing business processes:

- supporting research and promotion of technologies that reduce carbon dioxide emission from the use of coal;
- improved use of energy at operations, projects and supply chain;
- designing future projects with energy efficiency and climate change risks considered; and
- raising awareness amongst stakeholders that climate change is an issue that requires us all to change how we currently operate.

Research programme funding is also provided by MTW for the COAL21 Fund, the Australian Coal Association Research Programme, and the Cooperative Research Centre for Greenhouse Gas Technologies to support and develop the research of low emissions coal technologies.

10.5.5 Mount Thorley Operations dust management system

Operational control strategies and measures to effectively manage air quality impacts are detailed in the MTW AQMP. Such measures, both proactive and reactive, are categorised in accordance with the hierarchy of control for contingency planning to manage residual risks. The hierarchy of control is as follows:

- administration;
- engineering;
- substitution; and

- elimination.

Further information on these controls is provided below.

i Administrative controls

The management of dust at MTO is supported by the application of Trigger Action Response Plans (TARPs). A TARP defines the minimum set of actions required by site personnel in response to the deviation in mine conditions from normality. Triggers related to air quality are set below criteria and are enacted in the following ways:

- elevated PM_{10} is measured via the real-time monitoring network;
- supplementary 'early warning monitors' detect increasing PM_{10} trends close to active areas;
- meteorological monitoring identifies increased dust risk conditions (alerts triggered based on elevated wind speeds); and
- excessive dust producing activities are observed and communicated by operators.

When a trigger is enacted to warn operational personnel of potentially deteriorating air quality conditions, the initial response is an inspection of operational areas and surrounds, and supporting check of monitoring systems and conditions. This can be undertaken in a number of ways, including:

- use of cameras to view active areas and potential impacts on surrounding public roads;
- interrogation of available meteorological and real-time PM_{10} data (both MTW monitoring system and publically available Upper Hunter Air Quality Monitoring Network); and/or
- physical inspection by appropriately trained MTW personnel.

Where the inspection identifies unacceptable dust emissions from operating areas, a response is initiated to appropriately address the matter, which may include:

- request for additional dust suppression (water cart mobilisation); and
- temporary cessation of work for a specific part, or all of the MTO mine, as necessary.

Operational personnel prepare and circulate a shift change handover report to the incoming shift. The handover report describes air quality management activities including routine controls, minor changes or adaptations, equipment shutdowns, and any proactive controls, if any, to be implemented during the upcoming shift. If predicted for the subsequent shift, unfavourable dust conditions are described in the report together with potential management strategies.

Coal & Allied is implementing a predictive dust risk forecasting tool to assist operational personnel to make the optimal management decisions on a day to day basis. The tool utilises predictive meteorological forecast data coupled with detailed mine activity (mine plan) data to determine the most likely times during the upcoming day that dust lift off and air dispersion conditions may be unfavourable. This advance warning allows mine staff time to be better prepared in the event that such conditions occur. The tool is currently being developed, and would be integrated into day-to-day operations during 2014.

ii Engineering controls

Engineering controls for dust management are installed and implemented on major dust sources at MTW on a 'reasonable and feasible' basis. Examples include upgraded 'fast fill' water fill points for the fleet of eight water carts and dust aprons installed on drill rigs.

iii Substitution controls

Substitution controls for dust are implemented in response to one or more triggers (described above), and are utilised both proactively and reactively. Substitution measures generally involve the postponing of tasks such as blasting or dozing operations when conditions require, or the prioritisation of a water cart for dust suppression purposes to a discrete area of the mine in response to a dust issue.

iv Elimination controls

Elimination controls are implemented in response to one or more triggers (described above). Elimination controls, equipment or task shutdown, are implemented as a last resort where other controls have been inadequate, or in the event of an 'extreme' dust day, characterised by heavily restricted visibility and elevated air quality on a regional level.

v Continuous improvement

In accordance with the requirements of the Rio Tinto Coal Australia's Health, Safety, Environment and Quality Management System, MTW would continuously seek to further air quality management by way of improving existing controls and investigating new and emerging technologies, implementing new controls where required, and thoroughly investigating any exceedance and non-compliance events.

10.6 Conclusions

Dust amelioration measures were incorporated into the mine design through discussions between air quality experts and mine planning engineers. This process resulted in improved environmental outcomes as reflected in the study predictions.

The study undertaken for the proposal predicted dust emissions at a number of assessment locations in the vicinity of the Site using air dispersion modelling in accordance with the EPA Approved Methods.

The assessment considered, the optimised mine plan, and where possible, a range of improvements that have been made at MTO in recent years, including infrastructure to improve the watering of haul roads, such as new fill points and new water carts to replace smaller carts, aerial seeding programmes to better stabilise mine areas prior to full rehabilitation and community response officers on each night shift to assist with operational control.

Fifteen mine-owned assessment locations may experience concentrations above the criterion for annual average PM_{10}. A subset of these assessment locations may also experience concentrations above the relevant criteria for 24-hour average PM_{10}, annual average TSP, and annual average dust deposition.

Three privately-owned assessment locations (77, 102, and 264), may experience concentrations above the criterion for annual average PM_{10} and the Mining SEPP's cumulative air quality non-discretionary standard. Of these: assessment location 77 is within Wambo Mine's current acquisition zone; assessment location 102 is the Warkworth Hall, a non-residential location; and assessment location 264 is newly identified and would have been within Wambo Mine's acquisition zone had it been previously assessed.

No impacts are predicted from emissions resulting from the use of diesel powered equipment. Impacts from blast fume emissions are expected to be manageable with the operation of MTW's BMP.

Dust from mining is generally coarse in fraction (> $PM_{2.5}$) whereas the fine fraction of dust (< $PM_{2.5}$) of concern to human health typically originates from combustion sources. Wood smoke in rural areas is a problematic source of fine particulate with potential health impacts, and recently initiatives to specifically target these particulates have been launched in the Hunter Valley.

A comprehensive integrated air quality management system, including an extensive monitoring network, is currently in place for mining operations at MTW which incorporates best practices for the control of dust emissions from coal mines. Predicted air quality impacts resulting from the proposal would be managed and mitigated under the current management system.

Estimates of Scope 1, 2 and 3 GHG emissions were conservatively predicted using the NGA Factors document. The annual average GHG emissions over the 21 year life of the proposal were conservatively estimated to represent approximately 0.1 per cent and 0.35 per cent of Australia's and NSW emissions, respectively. Current GHG management measures would continue to be employed to minimise the overall generation of CO_2-e emissions at MTO.

Overall, the assessment shows that the project would be able to operate within applicable criteria at all privately-owned receptors, apart from three locations in Warkworth village including two private residences (77 and 264) and the Warkworth Hall (102).

Chapter 11

Ecology

Chapter 11 — Ecology

11 Ecology

11.1 Introduction

This chapter describes the existing ecological environment and potential impacts from the proposal. It provides a summary of the proposed rehabilitation at MTO with respect to ecological values and identifies management and monitoring measures that would be implemented to prevent or minimise adverse impacts.

11.2 Existing environment

The majority of MTO has been cleared for mining under the development consent and rehabilitation is progressing generally in the east of the Site. A small area of remnant Narrow-leaved Ironbark Spotted Gum Open Forest in the north-west of MTO, known as Charlton Ridge, is being retained under the development consent and contributes to the provision of fauna and flora habitat and connectivity during and post operation of the mine.

Threatened species recorded within this area of remnant forest are the Large-eared Pied Bat (*Chalinolobus dwyeri*) (listed as vulnerable under the TSC Act and the EPBC Act) and the Eastern Freetail Bat (*Mormopterus norfolkensis*) (listed as vulnerable under the TSC Act) (Coal & Allied 2014).

11.3 Impact assessment

The vegetation and habitats of the Site have been cleared progressively in accordance with the development consent and Coal & Allied's vegetation clearing protocols. The proposal would not result in additional vegetation clearance and is expected to have negligible impact on the ecology of the Site and the local area.

Potential direct and indirect impacts of the proposal are listed in Table 11.1, along with measures currently implemented to manage impacts. The potential for residual impacts after mitigation are also presented.

Table 11.1 Potential ecological impacts and mitigation

Project component	Potential direct impact	Potential indirect impact	Mitigation / management measures to be implemented	Residual impact potential
Mining	Inadvertent injury/fatalities to mobile fauna that could move into the Site on occasion eg kangaroos.	Dust from mining / truck movements affecting vegetation / fauna in surrounding areas.	Coal & Allied protocols – dust suppression and noise and air quality monitoring and fauna management.	Very low
Overburden placement	Runoff from overburden entering vegetation in remnant areas to the north, west and south of the Site.	Changes in vegetation community composition /habitats due to changes to microclimate or physical attributes, For example,from shading, changes to surface water quality or amount of water.	Monitoring of overburden and a buffer area provided to remnant vegetation where possible, and implementation of MTW WMS.	Very low

Table 11.1 Potential ecological impacts and mitigation

Project component	Potential direct impact	Potential indirect impact	Mitigation / management measures to be implemented	Residual impact potential
Bulga Coal Complex interactions (acceptance of overburden, acceptance of mine water)	No additional impacts expected.	No additional impacts expected.	N/A	None
Tailings management	No additional impacts expected.	No additional impacts expected.	Appropriate groundwater and surface water measures implemented, monitored and managed (see Chapters 15 and 16).	None
Upgrades to water management – discharge point and rate of discharged water into Loders Creek	Potential erosion/ sedimentation increase in receiving waters.	Changes to habitat quality for aquatic species.	Appropriate groundwater and surface water measures implemented, monitored and managed (see Chapters 15 and 16).	None
MTO CPP upgrade	No additional impacts expected.	No additional impacts expected.	Coal & Allied internal protocols for environmental management for any new construction areas.	None

11.4 Management and monitoring

11.4.1 Rehabilitation and final landform

To minimise impacts on the local environment, rehabilitation would be undertaken progressively across the mined area. Rehabilitation of the mined area is to be undertaken in accordance with the MOP as required by the Mining Act. Approximately 483ha of mined land would be rehabilitated to locally occurring ecological communities, including some areas of EEC (refer to Chapters 12 and 13). An additional 97.5ha would be rehabilitated to trees over grass, providing additional stepping stone habitat for mobile species.

Specific performance indicators would be developed and measured to track the progress of rehabilitation with performance monitoring reported annually. The final landform would be developed with recognition of pre-mining landform and incorporate existing rehabilitation areas consistent with adjacent vegetation communities.

11.4.2 Species for rehabilitation

Species recommended for use in rehabilitated areas are locally occurring and representative of local vegetation communities and EECs. A seed collection programme would be implemented to ensure species abundance and diversity is available for planting out of the rehabilitation areas (see Section 12.4.2.iii).

11.4.3 Habitat corridors

As described in Chapter 12 and shown previously in Figure 2.15, the woodland and trees over grassland components of the rehabilitation aim to contribute to a regional habitat corridor, providing for the movement of flora and fauna species over a large area at the conclusion of mining. The vegetated corridor would extend southwards from the Wollemi National Park to the Yengo National Park, taking in the riparian zones of Wollombi Brook, the proposed Warkworth Mine rehabilitation and offset areas, MTO and Bulga Coal Complex rehabilitation areas and the remnant vegetation of the Singleton Military Training Area and Pokolbin State Forest.

11.4.4 Fauna habitat enhancement

Fauna habitat enhancement would form part of the rehabilitation programme. This may include the placement of logs, woody debris and other features to support fauna in recolonising the rehabilitation areas. With time, the rehabilitated areas would provide additional suitable habitat for native flora and fauna including threatened species such as the Regent Honeyeater and Swift Parrot.

11.4.5 Management and Monitoring

The development of performance indicators and ongoing monitoring would allow for adaptive management to form part of the ongoing rehabilitation of the Site. The MTW MOP would be updated to accommodate specific objectives and performance criteria as described in Chapter 12.

11.5 Conclusions

The proposal would not introduce additional ecological impacts to those already assessed and approved under the development consent. The proposal is expected to improve the biodiversity values of the regional area, as rehabilitation is further developed and implemented across the Site.

Chapter 12

Final landform and rehabilitation

Chapter 12 — Final landform and rehabilitation

12 Final landform and rehabilitation

12.1 Introduction

This chapter describes the objectives of rehabilitation at the Site, which are aligned with those of biodiversity (see Chapter 11), and presents the desired rehabilitation domain types. It includes discussion on the final landform and rehabilitation and measures to promote the achievement of rehabilitation objectives for the life of the development consent.

12.2 Final landform

12.2.1 Objectives

The primary objective of final landform at MTO is to create a safe, stable, free draining, non-polluting feature that is able to maintain viable land uses where the post-mining rehabilitated areas have been integrated with the surrounding landscape.

12.2.2 Conceptual framework and design

The existing MTO has already altered the local landform and includes overburden emplacements, a void, TSFs, roads and infrastructure. Some of the existing overburden emplacement areas, through the centre of the Site, have been rehabilitated to pasture and trees.

The proposal provides the opportunity to improve the previously planned and approved final landforms described in past development applications and MOPs. The development of the proposal's conceptual final landform considered previous landform designs and surrounding land use, external and internal planning requirements, existing management measures and rehabilitated landforms and desired ecological and sustainability values. The final landform is reliant on the receipt of overburden from Warkworth Mine as proposed.

The post mining land capability across MTO is planned to provide biodiversity values in native habitat and support agricultural land predominately for cattle grazing in areas of rehabilitated grassland.

By using an integrated approach through the MOP process including regular review of mine plans, progressive rehabilitation and monitoring; potential environmental or community impacts may be reduced, hence improving outcomes for the final landform.

The final landform at MTO would be developed with the intent of blending with the surrounding landscape features of MTO, Warkworth Mine and Bulga Coal Complex. The landform would be undulating, with slopes of generally 10 degrees for overburden emplacements and up to 18 degrees for internally draining areas such as low walls and ramps consistent with the approved landform design in the current MTW MOP. This would be achieved by creating gradients for the overburden emplacements similar to the adjoining natural slopes and cognisant of existing rehabilitation.

Loders Pit void would be backfilled and the existing overburden emplacement areas would be combined to cover the CRTSF and extended to the west to integrate with the features in Loders Pit. The haul roads, water storage and TSFs would be covered or capped and rehabilitated. The grading on the overburden emplacement area batters would reduce surface water runoff and erosion and encourage vegetation establishment.

12.2.3 Alterations to Loders Pit landform

Overburden would be emplaced in Loders Pit removing the approved final void to a level similar to the height of the natural ground at the base of the levee in the south-west corner of the lease where the alluvial associated with Salt Pan Creek interact with the existing mining lease boundary. From this point, both north and east, the ground level rises and the respective highwall and the end wall would be retained.

Two depressions would remain near the south-western corner of MTO. While these would be constructed to the same relative ground level, due to the existing topography, the area behind the existing levee would be at natural ground level but the southern area below the endwall.

Due to the soil disturbance undertaken, rehabilitated filled voids act as groundwater sinks for an extended period as water collects within the larger soil pore spaces. As described in Chapter 15, localised surface runoff and rainfall inflows would slowly fill the rehabilitated mining void until the localised depressions form a marshy water body that, over time, would eventually reach equilibrium between inflows and outflows. The speed with which this equilibrium is reached would depend on the climatic variability.

Measures that are designed to restrict fauna, pedestrian and vehicle access from the remaining areas of the highwall and endwall would be implemented to ensure their safety. These measures would be developed following consultation with stakeholders during the mine closure planning.

Outside the areas of the remaining highwalls associated with Charlton Ridge and Loders Pit, the intent would be to make the post-mining environment difficult to determine from non-mined environments once the vegetation has established.

Surface water catchments assessed in Chapter 16 have identified sediment control structures that may be retained. Future structures for erosion and sediment control and water management would be incorporated into the landform as rehabilitation progresses. The grading on the emplacement batters would reduce surface water runoff and erosion and encourage vegetation establishment.

12.3 Final landuse

The applicant acknowledges that final land uses need to integrate with the rehabilitation undertaken by the surrounding mining operations, existing agricultural land and areas containing remnant vegetation, ultimately providing sustainable land uses agreed by a range of stakeholders.

The consultation and communications programmes to be undertaken in the development of the closure strategy would explore options and alternatives for land uses. The importance of the local agricultural industry is recognised and the applicant seeks to integrate biodiversity enhancement with sustainable agricultural practices, where practical. The final landuse under the proposal aims to provide agricultural benefits whilst creating complementary areas of biodiversity. This would contribute to local agricultural practices, increase habitat and biodiversity values and establish vegetation cover that creates corridors to link surrounding native vegetation and enhance local and regional ecological linkages to provide for a sustainable final land use (see Chapter 13).

12.4 Rehabilitation

12.4.1 Objectives

Rehabilitation would continue to be undertaken progressively across the mined area under the proposal in accordance with extensive performance/completion criteria (see Appendix N). The requirements for rehabilitation would be determined in consultation with relevant government agencies and stakeholders. Rehabilitation of the mined area is to be undertaken in accordance with the MOP as required by the Mining Act. The objectives of the rehabilitation domains of mined areas at MTO are to:

- progressively establish approximately 483ha of woodland communities;
- progressively establish residual areas of EEC woodland (an ironbark community), as part of Warkworth Mine's commitment for mine rehabilitation across MTW;
- establish some productive grazing;
- provide additional habitat for threatened species; and
- create an additional north/south wildlife corridor providing connectivity to other habitat.

The progressive rehabilitation is currently, and would continue to be, overseen by an onsite specialist who, along with mine planners, through detailed planning ensures that future rehabilitation resource requirements are available to enable the objectives of rehabilitation domains to be met.

12.4.2 Rehabilitation trials and research activities

Rehabilitation trials and applied research activities are currently undertaken at MTO in an effort to improve the effectiveness and efficiency of rehabilitation of mined lands.

i Compost application and incorporation

A compost application and incorporation trial is underway with the objective of improving the nutritional and physical properties of the growth mediums. Two agricultural implements are used to incorporate the compost through the top layer of growth medium: a rock windrower (which removes rocks from the soil surface), and an aerator (which incorporates the compost while minimising the breakdown of soil structure usually caused by traditional cultivation equipment).

ii Sowing of native seed

The use of a direct drill seeding machine instead of the conventional broadcast seeding equipment is being trialled at MTO. The following advantages were identified from 2013 trial results:

- better placement of seed to enhance germination with lower seeding rates;
- minimal soil disturbance during sowing and resulting in weed seeds being depleted from the top soil layer; and
- maintenance of mulch layer during seeding as seed is planted through surface stubble.

iii Native seed collection

Given the rehabilitation objectives of MTO include the re-establishment of an ironbark EEC community, diversity targets have been set for the various functional groups to ensure sufficient levels of species diversity are included in the native vegetation seed mixes to cover the progression of rehabilitation. Suitable areas of seed collection have been identified and seed collected from Site, other Coal & Allied land and nearby privately-owned properties. Approximately 2,000kg of native under-storey was collected in 2013 consisting of 25 native grass species. Tree and shrub seed for 17 native species was collected with smaller quantities of an additional nine species collected for establishing seed production areas. Seed is stored at a Coal & Allied-owned property near Muswellbrook and is transported to MTO when required.

12.4.3 Rehabilitation domains

Detailed baseline data from analogue sites would be used to develop and monitor a number of rehabilitation performance measures/criteria for specific rehabilitation domains.

Rehabilitation of MTO and Warkworth Mine is planned collectively to facilitate an integrated landform and provide for enhanced rehabilitation objectives. This is reflected in the MTW MOP.

The applicant has committed to progressively establishing approximately 2,100ha of woodland EEC within the rehabilitated MTW.

The areas of the other vegetation types that are proposed to be established within the post-mined rehabilitation areas are provided in Table 12.1.

Table 12.1 Rehabilitated domain types

Vegetation type	Warkworth Mine (ha)[1]	MTO (ha)[1]	Total (ha)[1]
Woodland	1,617	483	2,100
Trees over grass	222	97.5	319.5
Grassland	848	575	1,423

Notes: 1. Areas of domains have been estimated and are approximate.

The final landuse, landform and rehabilitation domain types for MTO at closure and completion of rehabilitation are shown in Figure 2.15. The figure outlines the areas proposed for woodland community re-establishment, treed grasslands and grasslands.

Mining infrastructure within the identified disturbance area would be removed if no longer required and affected lands rehabilitated. However, should other potential uses for the mining infrastructure be considered viable then these options would be examined further.

12.4.4 Rehabilitation performance/completion criteria

Performance/completion criteria for the proposed rehabilitation of mined lands would be the same as currently approved for the operation which is defined in the current MTW MOP. These criteria were developed in accordance with industry best practice such as the *ESG3: Mining Operations (MOP) Guidelines* (NSW Trade & Investment 2013) and the *Warkworth Extension 2010 Environmental Assessment* (EMM 2010a). Consideration was given to the full available range of reasonable and feasible mitigation and their effectiveness in determining the measures to be implemented at the Site.

Performance measures/criteria are measurable benchmarks which provide a greater level of detail about how the applicant would achieve the desired rehabilitation objectives for the proposal. Specific performance indicators would be established and measured to demonstrate and guide the implementation and track the progress of rehabilitation with monitoring of performance reported annually.

The performance measures quantify the rehabilitation and land management programme in terms of efficiency or effectiveness and establish the indicative timeframes for completion. The performance indicators are used to define and evaluate the programme, typically in terms of making progress towards the development of sustainable ecosystems whilst also providing a framework for the implementation of key activities. These indicators provide the basis for the procedural context of the site work practices. The performance indicators are attributes of the biophysical environment, for example pH and slope, that can be used to approximate the progression of a biophysical process and can be measured to demonstrate and track the progress of an aspect of rehabilitation towards desired completion criteria.

Similar to the existing MOP, performance measures and indicators for the proposal would be designed to form the basis of the performance criteria and provide the ability to track the development of sustainable ecosystems through a series of conceptual stages for each of the domain types. These stages are:

- Stage 1 – Decommissioning: removal of hard stand areas, buildings, contaminated materials, hazardous materials;
- Stage 2 – Landform establishment: incorporates gradient, slope, aspect, drainage, substrate material characterisation and morphology;
- Stage 3 – Growing media development: incorporates physical, chemical and biological components of the growing media and ameliorants that are being used to optimise the potential of the media in terms of the preferred vegetative cover;
- Stage 4 – Ecosystem and landuse establishment: incorporates revegetated lands and habitat augmentation, species selection, species presence and growth together with weed and pest animal control/management and establishment of flora;
- Stage 5 – Ecosystem and landuse sustainability: incorporates components of floristic structure, nutrient cycling recruitment and recovery, community structure and function which are the key elements of a sustainable landscape; and
- Stage 6 – rehabilitation complete: landuse and landscape is deemed as suitable to be relinquished from the mining leases.

Rehabilitation performance/completion criteria are established in the MTW MOP (see Section 13.4.6) and these are provided in Appendix N.

12.4.5 Rehabilitation outcomes

The progressive rehabilitation of some areas of ironbark EEC woodland (as part of the adjacent Warkworth Mine's commitment to rehabilitate 2,100ha across MTW with the majority at Warkworth Mine) on mined land would be guided by leading-practice knowledge of rehabilitation and revegetation professionals. Investigations into the communities present within the region have been undertaken and a sound understanding of the structure and functioning of these communities has been gained. The knowledge taken from these studies would be used to ensure that the best available techniques of re-establishing a diverse tree, shrub and ground stratum layer within these communities are employed. Best available knowledge would be used to maximise the establishment of a diversity of native species, particularly the understorey species that maintain the ecological function of native vegetation communities.

Replanting of mine rehabilitation areas would use local native plant species and seed collection programmes to ensure adequate seed is collected from relevant species to enable species diversity to be maintained. With time, the rehabilitated areas would provide additional suitable habitat for native flora and fauna including threatened species such as the Regent Honeyeater and Swift Parrot (refer to Chapter 11).

The woodland and trees over grassland components of the rehabilitation would form a north/south connecting corridor of vegetation. As previously described, the corridor extends from the Wollemi National Park, across the Wollombi Brook and its riparian vegetation, through the proposed Warkworth Mine rehabilitation and nearby offset areas to connect with the planned rehabilitation within Warkworth Mine and adjacent Bulga Coal Complex, the Singleton Military Training Area, Pokolbin State Forest and the Yengo National Park further to the south. This is shown in Figure 2.15.

12.4.6 Mining Operations Plan

A MOP is intended to fulfil the function of both a rehabilitation plan and a mine closure plan (see Section 12.5). It is a public document that outlines the processes and procedures that would enable the Site to progress towards the final rehabilitation and ultimately relinquishment. The MOP is required to be consistent with the development consent requirements, but, as the MOP may be more readily modified, the processes, procedures and the techniques utilised to enable the Site to minimise its environmental impact are further refined and are often more detailed than that presented in the environmental impact statement.

As a result, additional detail and improvements on performance indicators, completion/relinquishment criteria and rehabilitation methods or technologies utilised can often be found outlined in the approved MOP. The existing MTW MOP contains detailed rehabilitation performance/completion criteria which would be updated to incorporate the proposal. These criteria for the current domain types have been extracted from the MOP and are provided in Appendix N.

12.5 Mine closure

12.5.1 Rio Tinto Closure Standard

As the development of the final landform progresses to completion through the life of the development consent, and it is determined that MTO is to move toward closure (rather than prepare and lodge a further modification or new development application to extend the operations), detailed planning and preparation for closure of the mine would commence. Rio Tinto maintains a number of standards applicable to all Rio Tinto managed activities, such as MTO. This includes the current Rio Tinto Closure Standard (Rio Tinto 2013), which was developed with the intent:

> to ensure that Rio Tinto managed activities are left in a condition which minimises adverse impacts on the human and natural environment, and that a legacy remains which makes a positive contribution to sustainable development.

Upon determination of the closure of MTO, a closure strategy would be prepared in accordance with the contemporary closure standard. The closure strategy is a thorough process whereby desired closure and post closure options are evaluated and documented, with a preferred option chosen. The closure strategy would build on the rehabilitation domains committed to under the proposal and documented in this EIS.

It is generally consistent with the principles of the *Strategic Framework for Mine Closure* (ANZMEC & Minerals Council of Australia 2000).

As part of the closure strategy preparation and implementation, a comprehensive consultation process of both employees and relevant external stakeholders would be developed and maintained and supported by a thorough communication programme.

A closure management plan based on the current preferred option or options for closure as determined through the closure strategy process would then be prepared. The current plan would:

- develop and document a description of specific technical solutions related to infrastructure and facilities for the preferred closure option or options;
- develop and maintain full auditable details of closure cost;
- develop a detailed communication plan that is executed in a timely, consistent and transparent manner. This must target all internal and external stakeholders; and
- develop and maintain a socio-economic mitigation programme which addresses, as a minimum, the following (if relevant to the specific proposal):
    - socio-economic impacts, land owner considerations and community dependencies throughout the life of the operation;
    - all post closure institutional arrangements that clearly outline the governance, financing, staffing and monitoring of these institutions; and
    - the development of programmes to manage the issues associated with artisanal miners or other community activities, which have potential to adversely impact mine closure solutions.

In addition to the above processes, once it has been determined that Warkworth Mine would close (and not prepare and lodge a modification or further development application), a full decommissioning plan would be prepared five years prior to the estimated date of ceasing production at MTO. The decommissioning plan would contain specific details of how closure would be achieved and would be linked to the closure management plan.

12.5.2 Post-mining management

Similar to the decommissioning plan referenced in Section 12.5.1 required by Rio Tinto's internal procedures, a closure management plan (to be incorporated into the MTW MOP) would be prepared for MTO at prior to completion of mining.

The key management requirements would be to ensure the ongoing stability of the remaining highwall and endwall and safety for the community. Due to their location and design, rehabilitation of highwall and end walls may be difficult but measures that are designed to restrict fauna, pedestrian and vehicle access from these areas would be implemented to ensure their safety. These measures would be developed following consultation with stakeholders during the mine closure planning as referenced in Section 12.5.1.

12.6 Conclusions

The final landform at MTO would be developed with recognition of the pre-mining landform features and would incorporate the existing rehabilitated landforms to ultimately be consistent with the surrounding landscape features of both MTO and Warkworth Mine.

Approximately 2,100ha of woodland EEC is proposed to be rehabilitated with MTO (483ha) and Warkworth Mine (1,617ha). Woodland and trees over grassland components of the rehabilitation would form a north/south connection corridor of vegetation connecting the planned rehabilitation of MTO, the Warkworth Mine and Bulga Coal Complex with the Singleton Military Training Area, the Pokolbin State Forest and the Yengo National Park.

Rehabilitation of the mined areas under the proposal would continue to be undertaken progressively to create a stable, free draining landform able to maintain viable land uses where mining areas are integrated with the surrounding landscape. Upon determination of the closure of MTO, detailed investigations and consultation and communications programmes in accordance with Rio Tinto's global standards would be undertaken regarding viable, practical and sustainable land uses. The importance of the local agricultural industry is recognised and the applicant seeks to integrate biodiversity enhancement with sustainable agricultural practices, where practical.

Chapter 13

Land and soils capability

Chapter 13 — Land and soils capability

13 Land and soils capability

13.1 Introduction

This chapter provides a summary of soils studies previously undertaken for the Site. As described in Chapter 2, the proposal does not result in additional disturbance to land beyond as the majority of the activities are associated with the completion of the final landform and its rehabilitation. Subsequently, the previous studies remain current.

The chapter describes the existing soils environment, including soil type and landscape at MTO, and the potential impacts of the proposal. It includes an analysis of topsoil availability and top-dressing, pre and post-mining land capability and suitability as well as management and monitoring measures that would be implemented to prevent or minimise adverse impacts.

13.2 Existing environment

13.2.1 Soils

The soil unit types in the Site are reported by ERM Mitchell McCotter (1995). These have been converted to soil unit types used by GSSE in the 2010 assessment of the Warkworth Extension 2010 and are comparable to the description of soils in the EIS for the Warkworth Continuation 2014.

i Soil types

Five broad soil types were found in the Site. Each had a high sand content, ranging from 80 to 90 per cent. The soils were considered to be fundamentally similar, being sand soils of low fertility. A description of each soil type is provided in Table 13.1.

Table 13.1 Description of soil types

Soil type	Area of Site (%)	Description
Brown duplex loam	63	Brown duplex loam was associated with undulating hill slopes, particularly mid-low sloping land and creek flats. It is characterised by an abrupt texture change between the dark brown silty/loam surface soil and the brown sandy clay loam and yellowish-brown medium/heavy clay subsurface layers.
Red duplex loam	4	Red duplex loam was associated with undulating slopes. This soil type is characterised by an abrupt texture change between the dark brown loamy surface soil and the reddish-brown medium clay subsurface soil.
Saline soils	7	Saline soils were found in the valley of Salt Pan Creek. This soil unit is characterised by a hard setting surface crust and high salinity.
Uniform sand	1	Uniform sand was associated with the south-eastern part of the Site. This deep sand is associated with the Warkworth Sands Woodland vegetation community and has developed from Aeolian sand deposits.
Grey-brown gradational loam	14	Grey-brown gradational loam was associated with the top of the ridge trending east to west in the north of the Site. The soil unit is characterised by a gradual texture change between the brownish-black surface loam and the underlying greyish-brown sandy clay loam and sandy clay.

ii Topdressing suitability

Topsoil stripping in the Site is mostly complete and topsoil has been stockpiled for future top dressing of the rehabilitation areas. The topdressing suitability for each soil unit in the Site is discussed in Table 13.2.

Table 13.2 Description of soil types

Soil type	Description
Brown duplex loam	The surface 10cm of topsoil is suitable for stripping and reuse as a topdressing medium in rehabilitation works. GSSE (2010) found that some topsoil profiles exhibited high sodicity values. However, soil aggregate stability was reasonable due to significant organic carbon content. The subsoil was considered unsuitable for rehabilitation works as it is highly sodic and dispersive.
Red duplex loam	The surface 10cm of this soil is marginally suitable for stripping and reuse as a topdressing medium in rehabilitation works. This soil material is classified as marginal due to its inherent characteristics of weak structure combined with variable amounts of sodicity. However, its loamy texture combined with moderate aggregate stability identifies its application as a topdressing material particularly if mixed with other suitable media. The subsoil is not recommended for reuse in rehabilitation due to the limiting factors of apedal structure and high sodicity.
Saline soils	This soil type is not suitable for stripping and reuse as a topdressing medium in mine rehabilitation works due to high salinity.
Uniform sand	This soil type is not suitable for stripping and reuse as a topdressing medium in mine rehabilitation works due to its' single grain sandy structure.
Grey-brown gradational loam	The surface 8cm of this soil type is suitable for stripping and reuse as a topdressing medium in rehabilitation works. The subsoil is not recommended for reuse in rehabilitation due to the limiting factors of high stone content and apedal structure.

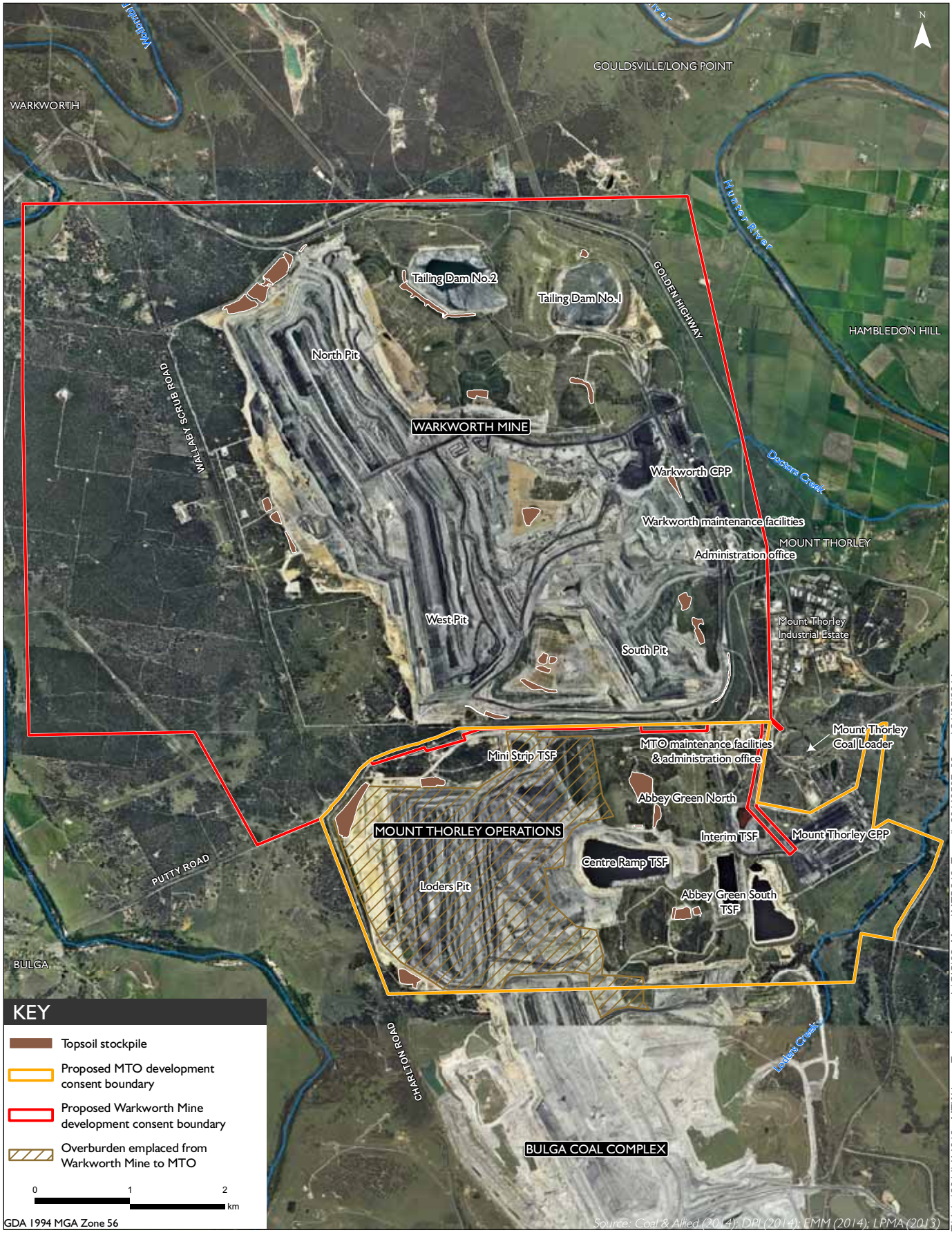
Approximately 506,781m^3 of topsoil has been stockpiled on-site for rehabilitation. The locations of these stockpiles in MTO are shown in Figure 13.1.

Brown duplex loam would account for the largest volume of topsoil followed by the Grey-brown gradational loams. The total stockpiles would provide an average respread depth of about 10cm for areas proposed to be rehabilitated to grassland (575ha) and trees over grassland (97.5ha). At other Hunter Valley mines a topdressing depth of 10cm has been found to be adequate for healthy pasture establishment on rehabilitated overburden. The depth of re-spreading topdressing material is not critical for tree establishment on the balance of the Site (483ha).

13.2.2 Biophysical strategic agricultural land

As described in Section 6.4, the NSW Government released its *Strategic Regional Land Use Policy*. This policy seeks to balance the growth of extractive industries with the need to protect, among other things, biophysical strategic agricultural land (BSAL) (ie land which is naturally capable of sustaining high levels of productivity with minimal management).

As part of the *Upper Hunter Strategic Regional Land Use Plan* (SRLUP), soils in the vicinity of the Site have been mapped using desktop information (such as historical soil landscape maps) identifying BSAL. A review of the BSAL mapping indicates there is no BSAL within approximately 2km of the Site. Therefore, the Upper Hunter SRLUP is not relevant to the proposal.



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Topsoil stockpile locations

Mount Thorley Operations 2014
Environmental Impact Statement
Figure 13.1

13.3 Impact assessment

13.3.1 Overview

The proposal would result in no new disturbances of remnant soils as pre-mining vegetation removal and topsoil stripping in the Site has been completed. The potential impacts on land capability from the proposal would result from the continuation of mining in Loders Pit and AGN and rehabilitation of mined areas over 21 years, including receipt of overburden from the adjacent Warkworth Mine should the Warkworth Continuation 2014 be approved.

Augmentation of the SOOP, adjacent to the AGS TSF, would be done within the existing footprint of the dam and not result in any additional area of disturbance.

13.3.2 Potential acid generating material

The potential for acid generation from the topsoil and subsoil (regolith) within the Site is low. Acid sulphate soil (ASS), which is the main cause of acid generation within the soil mantle, is commonly found less than 5m above sea level. There has been little history of acid generation from regolith material from the Singleton area (approximately 100km from the coast).

13.3.3 Land and soil capability

A quantitative comparison of pre and post-mining land and soil capability classifications is not possible in this study as rural land capability classes were not quantified at the time of the previous development application.

The previous assessment (ERM Mitchell McCotter 1995) suggested the land would have been a mix of Class 3 and Class 4 agricultural land under the agricultural suitability classification system used by the then NSW Agriculture and soil conservation Classes V, VI and VII under the rural land capability system (DLWC 1988). No highly productive agricultural land was identified. The two classification systems have since been replaced by the OEH (2012) guideline *The land and soil capability assessment scheme*.

Class V land is suitable for grazing with occasional cultivation. However, structural soil conservation measures are generally required. Class VI lands are suitable for grazing only and require soil conservation measures such as pasture improvement, stock control and fertilizer application that provide sufficient ground cover. Class VII land is unusable for agricultural or pastoral use.

As described in Chapter 2, the proposal includes alterations to Loders Pit which removes the final void. However, there may be two small depressions in the area of backfilled void and the recovery of the groundwater system and surface water infiltration in the backfilled void may result in the saturation of this area and formation of a shallow marsh.

The final landform for MTO proposes three vegetation types: grassland, trees over grass, and woodland. A qualitative assessment of the final landform using the OEH (2012) guideline indicates the post-mining landform is likely to be consistent with Class 7 land and soil capability. Class 7 land generally has limitations for most agricultural land uses but may be suitable for wood production, passive tourism, nature conservation or apiary.

It should also be noted that the post-mining capability classes are consistent with the proposed final land use which seeks to integrate biodiversity enhancement with sustainable agricultural practices, where practical, as well as adjacent land uses (ie Warkworth Mine and Bulga Coal Complex) planned rehabilitated land as presented in Chapter 12.

13.4 Management and monitoring

Management of land and soils capability at MTO would continue to be undertaken in accordance with the MTW MOP and the erosion and sediment control section in the MTW WMP. These documents were developed in accordance with industry best practice with consideration given to the full available range of reasonable and feasible mitigation and their effectiveness, inclusive of contingency plans to manage any residual risks, for implementation at the Site.

These plans include the following management and monitoring strategies which would continue to be implemented under the proposal to achieve the desired post-mining land capability and agricultural suitability outcomes.

Measures related to topsoil stripping and handling are as follows:

- soil stockpiles would be left as coarsely textured as possible to promote infiltration and minimise erosion until vegetation is established. Stockpiles that are planned for greater than 12 months storage would be seeded and fertilised to maintain soil structure and minimise weed growth. Stockpiles would be a maximum height of 3m; and
- an inventory of available soil would be maintained to ensure adequate topsoil materials are available for planned rehabilitation activities.

Measures related to topsoil re-spreading and seeding are as follows:

- where possible suitable topsoil would be re-spread directly onto reshaped landforms;
- where soil stockpiling has occurred, a weed assessment would be undertaken prior to re-spreading to determine if herbicide application and or 'scalping' of weed species is required;
- thorough seedbed preparation would be undertaken to ensure optimum establishment and growth of vegetation. The respread topsoil surface would be cultivated prior to, or during seeding, to reduce run-off and increase infiltration; Best results would be obtained by ripping when soil is moist and when undertaken immediately prior to sowing; and
- the spreading of topsoil, addition of soil ameliorants and application of seed would be carried out in consecutive operations to reduce the potential for topsoil loss to wind and water erosion.

Measures related to landform design, erosion and sediment control are as follows:

- regrading would be undertaken where required to produce slope angles, lengths and shapes that are compatible with the proposed land use and not prone to an unacceptable rate of erosion;
- the drainage features on the landforms would be capable of conveying runoff from the newly created catchments whilst minimising the risk of erosion and sedimentation;
- engineered waterways are also required for the transfer of runoff downslope and the collection of sediment laden runoff prior to offsite release. Recommendations include erosion blankets, ground-cover vegetation and/or rip rap; and
- spillways and sediment-control dams are recommended for the purpose of capturing sediment laden runoff prior to offsite release. They would be designed and located such that maximum predicted runoff and sediment loads are safely captured and transferred.

13.5 Conclusions

Most land disturbance activities have already been completed at MTO. The majority of the proposal's activities are completion of the final landform and its rehabilitation. Topsoil stockpiles are currently placed around MTO for future rehabilitation activities.

The total volume of topsoil available for rehabilitation provides for an approximate average respread depth of 10cm for areas proposed to be rehabilitated to grassland and trees over grassland. This depth is considered adequate for healthy grassland establishment on rehabilitated overburden. The depth of re-spreading topdressing material is not critical for tree establishment.

The rehabilitated landform would be revegetated to areas of grassland, trees over grassland and woodland. A marsh may form over the backfilled void of Loders Pit. The post mine agricultural use would be marginal and suitable for wood production, passive tourism, nature conservation or apiary.

The proposed management and monitoring measures would reduce the potential for degradation within the Site and would assist achieve the desired post-mining land capability and agricultural suitability outcomes.

Chapter 14

Visual amenity

Chapter 14 — Visual amenity

14 Visual amenity

14.1 Introduction

This chapter provides a summary of the visual amenity study for the proposal prepared by Integrated Design Solutions, which is presented in full in Appendix H.

The chapter describes the existing visual landscape, the changes that are predicted as a result of the proposal and the potential visual amenity impacts associated with these, and the proposed mitigation measures to address these impacts.

14.2 Existing environment

As described in Chapter 2, the land surrounding MTO comprises predominantly mines and supporting infrastructure including Warkworth Mine to the north, MTIE to the north-east and MTCL to the east, and Bulga Coal Complex to the south. To the west of the Site is a landscape of grazing areas mixed with areas of sparse and dense woodland. Beyond the Brook are a number of rural and rural residential properties in Bulga village, some of which are elevated. The existing visual character in the vicinity of the Site includes views of mining operations, grazing and cropping.

The landscape character of the local area is dominated by moderate to gently sloping hills with several locally dominant ridges. The highest natural point is Charlton Ridge from where the land slopes down to the undulating land along the Hunter River and Wollombi Brook with open views along and across the floodplains and cleared rural lands. Rehabilitated overburden emplacement areas are a feature of the existing landscape including areas within MTO, Warkworth Mine, Bulga Coal Complex and Wambo Mine.

Features within MTO's disturbance boundary are visible from surrounding view points, including those to the west in Bulga village and users of the surrounding road network including Putty Road, Charlton Road and the Golden Highway. A bund has been constructed in recent years along the Site's western boundary with Charlton Road which reduces views from most viewpoints along this road.

The primary visual catchment of the Site is the area containing the majority of views of the proposal and is defined primarily by the surrounding topography. The visual catchment units (VCUs) of the Site are areas of visual uniformity which make up the overall landscape setting.

The VCUs within the primary visual catchment are shown in Figure 14.1, and are as follows:

- Hunter River and Wollombi Brook floodplains;
- rural hills;
- rural footslopes;
- town and village areas;
- surrounding ranges; and
- mine and industrial areas.

The VCUs are described in detail in Appendix H.

14.3 Impact assessment

14.3.1 Visibility of the proposal

The proposal has the potential to alter the visual amenity of the environment in the context of the current approved operations at MTO. As noted in Section 2.2, the proposal seeks a continuation of all aspects of current operations. This includes the following activities that have potential and/or current visual effects under the existing approvals:

- progression of Loders Pit westwards to completion (ie towards Charlton Road) and mining of AGN;
- westward continuation of overburden emplacement; and
- continuation of night lighting upon overburden emplacement areas and on mining equipment.

The proposal also includes the transfer of overburden from Warkworth Mine to assist in the final landform which represents a minor alteration to approved operations. Due to the extended period of operation proposed, the period over which the visual effects are experienced would be extended. The visual assessment undertaken considers how these existing impacts could be mitigated over the period of operations at MTO.

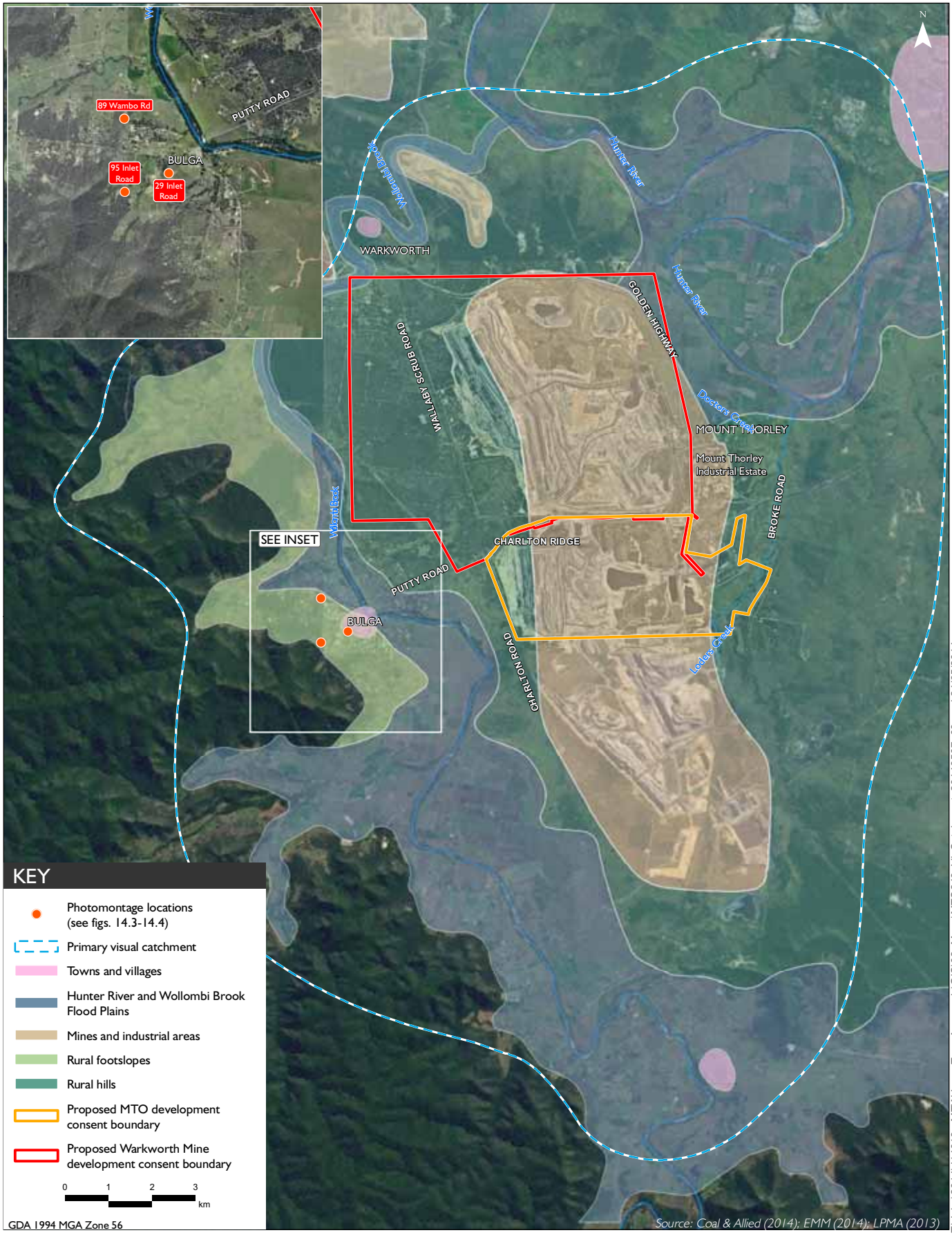
The major change as a result of the proposal would be the infill of the void in the final landform that would remain as part of the current approvals. This would create a final landform more in keeping with the pre-mining environment but would not result in additional visual impacts.

14.3.2 Method

To determine the potential visual impacts of the proposal, the assessment considered the visual effect and visual sensitivity in the context of the existing landscape.

Visual effect is a measure of the level of contrast a development would have within its landscape setting. The magnitude of a development's visual effect is determined by considering the level of contrast or integration with its surroundings and the proportion of the view that includes the proposed development for the given level of contrast or integration. The proportion of the view is determined by measuring the occupied percentage of the Primary View Zone (PVZ), the area occupied by an arc created by sight lines radiating vertically and horizontally at angles of 30 degrees around the centre view line from the eye.

A viewshed analysis was undertaken using GIS modelling software to determine the aspects of the proposal visible from within the primary visual catchment and was used in the assessment of visual effect. Inputs into the GIS model included the proposed mine plans, topographical contours, and vegetation height of the surrounding area. Vegetation was estimated at a height of 12m, which is considered to be conservative as vegetation to the west of Warkworth Mine varies between 10 and 20m. This analysis determined that from the north, south and east there is not likely to be any noticeable level of change in the visual effects in comparison to the existing approvals. The potential impacts from the west however the potential high impacts under the existing approvals may be extended from some view points in the west, including residential properties in and around Bulga. The viewshed analysis for Bulga village is shown in Figure 14.2.



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Primary visual catchment and visual character units

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Figure 14.1

Visual sensitivity is a measure of how critically a change to the existing landscape will be viewed by people from different land use areas in the vicinity of a development. For private dwellings, visual sensitivity would be high for visible mine elements less than 2.5km away, high to moderate for elements 2.6 to 7.5km away, moderate for elements 7.5 to 12.5km away, and low for elements more than 12.5km away.

Visual impacts are determined through the consideration of visual effect and visual sensitivity in conjunction, as shown in Table 14.1.

Table 14.1 Visual impact

Visual effect	Visual sensitivity		
	High	**Moderate**	**Low**
High	High visual impact	High/moderate visual impact	Moderate/low visual impact
Moderate	High/moderate visual impact	Moderate visual impact	Moderate/low visual impact
Low	Moderate/low visual impact	Moderate/low visual impact	Low visual impact

Visual impacts of the proposal are described in the following sections.

14.3.3 Visual sensitivity

Residences within MTO's primary visual catchment are within a range of up to 7.5km and, therefore, the visual sensitivity of these residences is high or high/moderate.

14.3.4 Potential visual impacts

Photomontages were prepared as part of the study for two locations to represent examples of a high and high/moderate visual impacts. These photomontages, shown in Figures 14.3 and 14.4, illustrate the existing view, the view without mitigation measures applied, and the view with an example of the mitigation measures described in Section 14.4 applied.

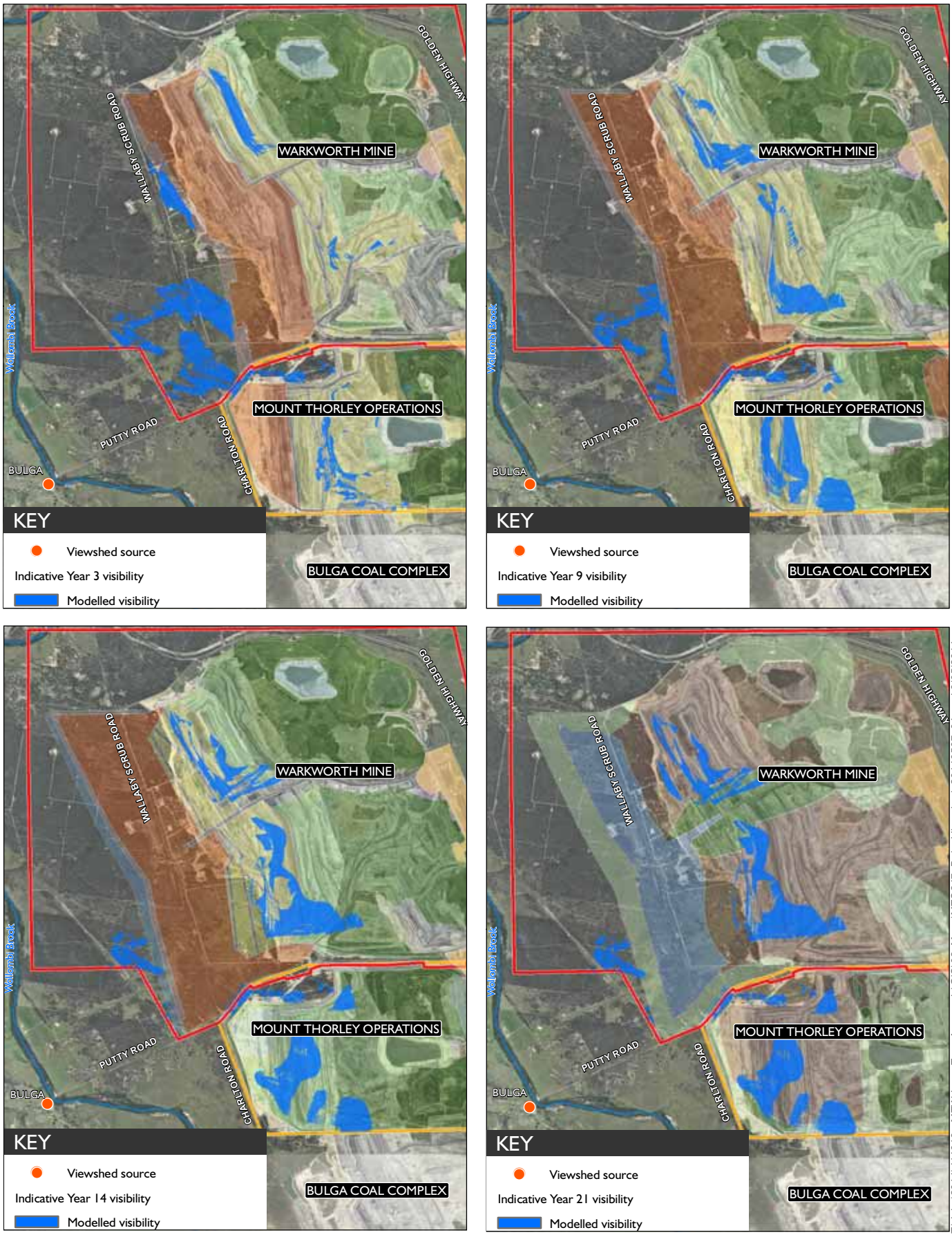
The visual impacts would generally be low/moderate for a majority of the primary visual catchment, with more prominent views and greater impacts to residences in elevated locations in and around Bulga village. Impacts on areas within the primary visual catchment are described in the sections below.

a. Views from the north

The VCUs in the primary visual catchment to the north of the Site are towns and villages, rural hills, mines and industrial areas, and Hunter River and Wollombi Brook floodplains.

Warkworth Mine and intervening topography and vegetation means there is no views from Warkworth village or the rural foothills to the north of MTO. There would be views from some sections of the Hunter River floodplain and rural foothills, including rural residences, to the north-east of the Site, however, the visual effects would not be noticeably different from those under the current development consent.

Putty Road forms the northern boundary to the Site and due to its proximity it has a high sensitivity however the visual impact would be low as the views would not be significantly different from those under the current development consent.



Bulga viewshed analysis - all years

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Figure 14.2

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95 Inlet Road, Bulga

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Figure 14.3

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29 Inlet Road, Bulga

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Figure 14.4

b. Views from the east

The VCUs in the primary visual catchment east of the Site are rural hills, mines and industrial areas, and Hunter River and Wollombi Brook floodplains.

Mining and overburden emplacement areas at MTO are screened from sensitive viewing locations in the east. Views from the east would be limited to minor local roads, MTIE, and rural land but would be screened by intervening vegetation. These views would not be noticeably different from those under the current development consent and impacts would be low.

c. Views from the south

The VCUs in the primary visual catchment south of the Site are rural hills, towns and villages, mines and industrial areas, and Hunter River and Wollombi Brook floodplains.

Views from the south are largely concealed by topography, vegetation and the mining activities at the Bulga Coal Complex. Some viewpoints do, however, exist from the south-west. From these exposed areas the existing overburden emplacements at MTO are visible and would continue to advance westwards under the development consent and the proposal. These locations have a high visual sensitivity and the overburden emplacement would have a high/moderate visual effect prior to rehabilitation. The visual impact in comparison to the current development consent would, however, be low.

d. Views from the west

The VCUs in the primary visual catchment west of the Site are towns and villages, mines and, rural hills, rural footslopes, and Hunter River and Wollombi Brook floodplains.

A visual bund has been constructed on the Site boundary along Charlton Road and extending north along Putty Road. The bund has been vegetated and native trees and shrubs are establishing on the faces. This bund screens views from these roads and reduces views of the overburden emplacement from more distance locations to the west.

Views from some south-westerly viewpoints along Putty Road as well as from some parts of Bulga village would exist and the visual effects would range from low to high depending on the location/elevation but would not be noticeably different to those under the existing development consent.

Bulga village has a high level of visual sensitivity. Views in the lower lying areas including Wambo Road are screened and the visual impacts would be low to moderate. More open views exist in locations around Bulga village including along Inlet Road (see Figures 14.3 and 14.4) and Putty Road south of the Bulga Bridge, where impacts would be moderate.

Residential properties to the west would have a high level of sensitivity, with some properties in elevated locations around Bulga village potentially experiencing high visual impacts depending on the orientation of the property and intervening screening provided by vegetation. Appropriate mitigation would be implemented, where requested (see Section 12.4). The proposed accelerated rehabilitation programme would further provide visual mitigation.

14.4 Management and monitoring

As part of the Warkworth Extension 2010, a MTW Visual Impact Management Plan (VIMP) was developed to the draft stage in accordance with industry best practice with consideration given to the full available range of reasonable and feasible mitigation and their effectiveness, inclusive of contingency plans to manage any residual risks, for implementation at the Site. It detailed the management of MTW's visual impacts. Mitigation currently implemented at the Site, together with elements of the VIMP as it applies to the proposal, are described below. The draft VIMP would be revised and adapted to the proposal, should it be approved. Mitigation strategies specific to the proposal are also detailed below.

14.4.1 Current mitigation measures

Onsite mitigation measures currently in place for the approved operations at MTO include:

- structure design to minimise visual impacts, consistent with engineering principles and practice, and any site constraints;
- direction of lighting away from offsite area to the greatest degree possible, and the use of sensor lighting where permanent lighting unnecessary; and
- construction of small bunds, vegetated and built screens along appropriate locations at the Site boundary.

14.4.2 Visual Impact Management Plan

Elements of the draft VIMP that apply to the proposal include:

- examination, in detail, of any high sensitivity viewing points and determination of opportunities for relevant screening treatments including site boundary treatments or mitigation measures to individual residences;
- minimisation of the amount of pre-rehabilitation areas exposed to view by establishing grass cover to remove colour contrast; and
- establishment of planting patterns of trees and grasses in rehabilitation areas to create a high level of visual integration with the surrounding landscape.

14.4.3 Proposal specific mitigation

In order to reasonably and appropriately determine mitigation for any viewpoint with high sensitivity viewing point a Site Specific Visual Assessment (SSVA) would be undertaken on request for properties in Bulga village, the process for which would be described in the VIMP. Any landowner may request a SSVA, which may result in appropriate screening treatments at the affected property or between the property and the source.

For the small number of individual residences within the primary visual catchment, which may have high visual impacts at some stage of the proposal, suitable mitigation measures would be implemented, subject to agreement with the landowner. This is likely to constitute vegetation screening; however, all mitigation measures would be guided by an SSVA and associated consultation with the affected property owners.

14.5 Conclusions

The current approved operations at MTO would generate a range of visual effects that are in keeping with those that would typically be expected from the ongoing operation of an open cut coal mine. The approved operations would generate an incremental change to the existing landscape and the proposal would have a low level of change in comparison to the current approved operations. The main variation would be the time over which these impacts would be experienced.

The visual impacts would for the most part be low; however, some sensitive assessment locations may experience higher impacts. The highest impacts occur from the west, in particular, from a limited number of residential properties in the area around Bulga village. Impacts are partially limited by the intervening vegetation and topography; however, properties on elevated slopes may experience high visual impacts.

The VIMP would describe a process for SSVAs which would be available to individual landowners in Bulga Village and would prescribe specific mitigation measures. The proposed onsite mitigation measures aim to reduce potential visual impacts on the public domain through vegetation and bund screening along the site boundaries.

Chapter 15

Groundwater

Chapter 15 — Groundwater

15 Groundwater

15.1 Introduction

This chapter provides a summary of the groundwater study for the proposal prepared by Australasian Groundwater and Environmental Consultants Pty Ltd (AGE), which is presented in full in Appendix I.

The chapter includes a description of the existing groundwater environment, including the current status of the regional and local groundwater systems. The study considered existing mining areas and the proposed rehabilitation. To adequately assess the potential impacts resulting from the proposal, the assessment methodology incorporated all of the existing and approved operations at the mine. The assessment results thus represent the potential impacts resulting from the whole of MTO including the changes resulting from the proposal. Consequently, it must be recognised that some of the predicted effects are due to the activities from already approved operations that would occur irrespective of the proposal.

It is important to note that no new mining is proposed at MTO beyond the extent of the current development consent. The only proposed change to the approval is the backfilling of Loders Pit with spoil from Warkworth Mine, and using a portion of the pit as a tailings storage facility. The groundwater study assessed the potential impact of these minor alterations together with ongoing operations on the groundwater regime around the mine.

An independent peer review of the groundwater model was completed as required by the AIP by Dr Frans Kalf from Kalf & Associates Pty Limited. The review interrogated the hydrogeological modelling, assumptions, descriptions and their clarity and validity. In addition, the review also took into consideration all relevant aspects as set out in the Secretary's requirements and the requirements of the Australian Groundwater Modelling Guidelines and the AIP. The outcomes of the peer review are reflected in the groundwater study.

The management and monitoring measures that would be implemented to prevent or minimise the potential impacts are also discussed in this chapter.

15.2 Existing environment

15.2.1 Climate and surface water

Climate and rainfall data used in the study area (defined as the model domain adopted for the groundwater study) was obtained from the BoM's Jerrys Plains Station and local data recorded at MTW and Bulga Coal Complex. The monthly rainfall records were used to calculate the Cumulative Rainfall Departure (CRD – also known as rainfall residual mass) which shows trends in rainfall relative to the long-term average and provides a historical record of relatively wet and dry periods. The CRD for the Jerrys Plains Station indicates that the district experienced above average rainfall between 2007 and 2012, followed by a general decline in rainfall.

The most prominent watercourse in relation to groundwater for the proposal is Wollombi Brook west of the Site. Stream flow data from NOW gauging stations on Wollombi Brook at Warkworth (No. 210004) and Bulga (No. 210028) shows that peaks in stream flow are in response to rainfall events. Between peak rainfall events the stream flow shows a steady recession. Stream flow in the Wollombi Brook at Warkworth has been continuous since 2010. Prior to early 2010, Wollombi Brook at both Bulga and Warkworth had extended periods of no flow. In addition, flow volumes during flood events were higher downstream of the Site (Warkworth) than upstream (Bulga). This indicates that there is surface and/or groundwater input to Wollombi Brook between these stations.

The Hunter River is in the north and north-east sections of the study area. The Hunter River characteristics are described in Chapter 16 together with other aspects of the existing surface water environment. The majority of the Hunter River and associated alluvium is hydraulically separated from MTW by the sub-crop of Permian coal measures being mined.

15.2.2 Geology and hydrogeology

The geologic strata at MTO can be categorised into the following hydrogeological units:

- shallow weathered bedrock (regolith) near the ground surface that is mainly present in the more elevated mining areas and is largely dry;
- very low yielding sandstone, siltstone and conglomerate that comprise the majority of the Permian interburden/overburden and is considered a low permeability aquitard (an aquitard is defined as a low permeability unit that retards groundwater movement vertically between strata); and
- low to moderately permeable coal seams that range in thickness from 1 to 6m and are the prime water bearing strata within the Permian sequence, containing brackish to saline water.

The geology and a hydrogeological cross-section of the study area are shown in Figures 15.1 and 15.2, respectively.

The alluvium along Wollombi Brook is considered an important groundwater resource, mainly used for agriculture and industrial purposes. This alluvial aquifer is largely restricted to the main channel of Wollombi Brook and only extends a short distance up the associated tributaries. While Figure 15.1 shows the alluvium extending into the MTO mining area, this is based on 1:100,000 scale mapping and excavation within the approved mining area shows the Loders Pit would not intersect the alluvium. The alluvium is typically less than 20m thick, with many of the private bores intersecting between 10 and 15m of sediment.

The Permian deposits occur as a regular layered westerly dipping sedimentary sequence. These are the coal seams currently mined at MTO and at surrounding mines including Warkworth Mine, Bulga Coal Complex and Wambo Mine. As shown in Figure 15.2, the coal seams outcrop to the west of the Hunter River alluvium and are more than 200m below the ground surface to the west where the Wollombi Brook alluvium occurs. Groundwater usage from the coal seams is limited by the generally brackish to saline nature of the groundwater and the low and variable yields. The main users of this resource are the underground mines in the area.

15.2.3 Recharge and discharge

Recharge is a natural process whereby water moves downward from the surface to the water table. Recharge to the alluvium occurs via rainfall infiltration, hill slope runoff and leakage from rivers and streams when and where the surface water levels are above the water table in the alluvium. Recharge to the Permian coal measures occurs where coal seams outcrop or sub-crop close to the surface such as within and to the east of MTO.

In the Hunter Valley, recharge to the Permian coal measures is low, typically below 1 per cent of annual rainfall, while recharge to alluvium is between 5 and 10 per cent of rainfall, dependant on alluvial composition.

Natural discharge processes in the system are through groundwater flow into water courses as base flow when the water table in adjacent aquifers is higher than either the stream bed or the water levels in the surface water body.

Dewatering associated with mining and groundwater use by private landholders is the other main discharge process. Evapotranspiration, occurring where the water table is within the plant root zone, is another component.

A comparison of Wollombi Brook water levels to rainfall and groundwater levels, indicates there is connectivity (ie recharge and discharge) between Wollombi Brook and the alluvium system.

15.2.4 Water quality

Groundwater quality monitoring has been undertaken at MTW since 1993 recording pH, electrical conductivity (EC) and concentrations of selected major ions. Monitoring results indicate both the Hunter River alluvium and Wollombi Brook alluvium have relatively saline water quality, while the underlying coal seams have moderately saline to saline water quality. Concentrations of ions are lowest in Wollombi Brook and highest in the deeper Permian coal seams.

15.2.5 Groundwater users

Groundwater users were identified in 2010 through a search of the NOW groundwater database (PINEENA) and a bore census. Ten privately-owned groundwater bores were identified west of the Site, north of the village of Bulga, as shown in Figure 15.3. Of the bores identified, seven were relatively shallow, at less than 25m in depth, indicating that these bores are likely to be constructed in the alluvial sediments. The remaining groundwater bores had a depth greater than 60m and are expected to be constructed in the underlying bedrock. An updated search of the PINEENA groundwater database in 2013 identified no new bores within the predicted zone of depressurisation since 2010.

15.2.6 Groundwater dependent ecosystems

There is one potential groundwater dependent ecosystem (GDE) of relevance to the proposal; namely, the Hunter Valley River Oak Forest. It occurs in a thin riparian zone along Wollombi Brook as shown in Figure 15.3.

15.2.7 Existing groundwater interactions

Mining removes overburden and interburden material to access and remove the coal seams. The coal seams store water, although typically saline and of poor quality. The overburden and interburden units typically have low ability to transmit groundwater. The removal of overburden and coal seams draws groundwater into the pit and reduces groundwater pressures, referred to as depressurisation, leading to a zone of lower groundwater levels (or drawdown) around a mine.

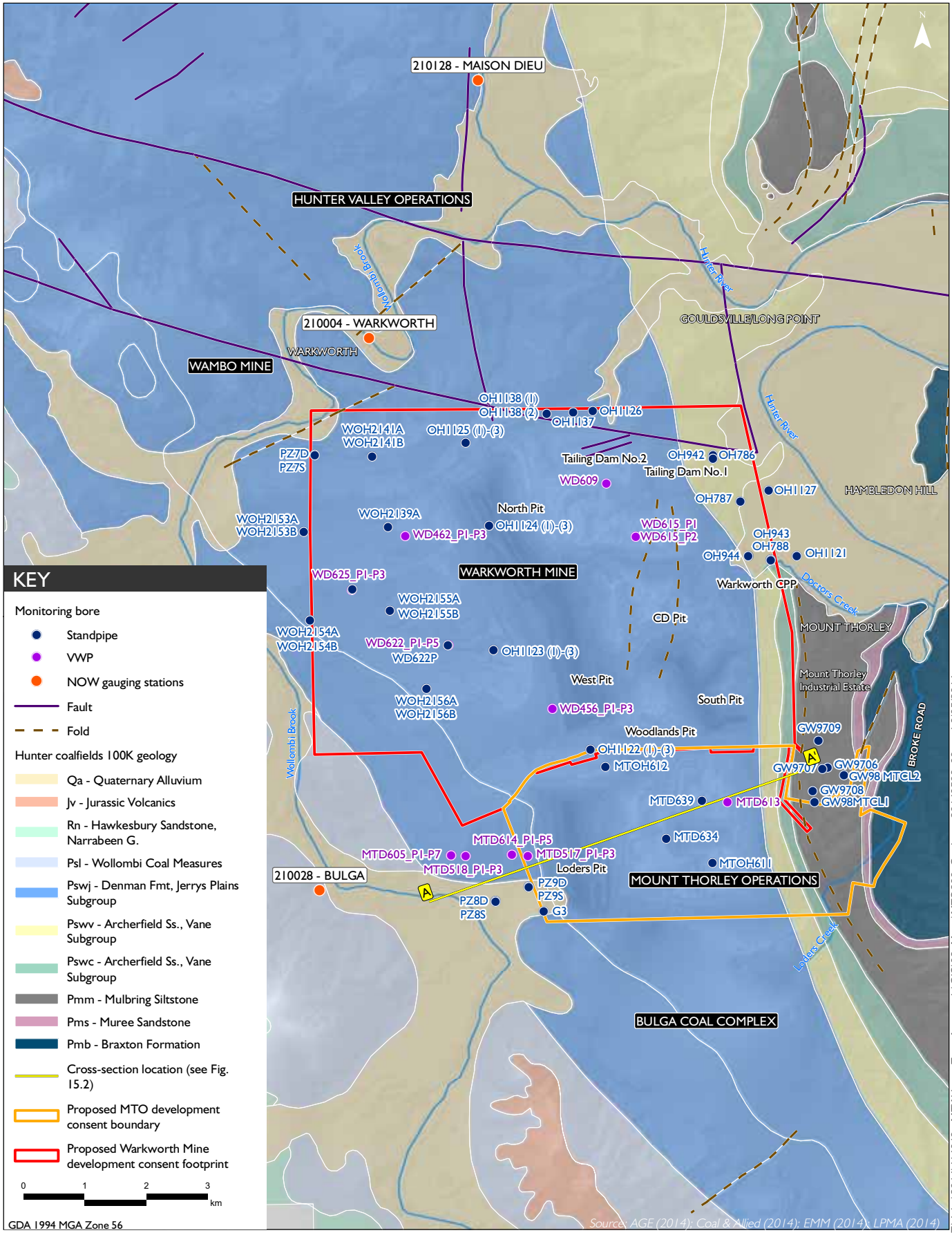
A long history of mining has depressurised the coal seams west of MTW resulting in declining groundwater levels, which are greatest near the active pits. No measureable drawdown has been recorded in the Wollombi alluvium. Adjacent mines including Warkworth Mine, Bulga Coal Complex and Wambo Mine, extract similar coal seams as MTO. There is potential for these operations to cause cumulative impacts on groundwater pressures in the coal seam across their area of influence. The groundwater study investigated the contribution of MTO to the cumulative impacts.

Figure 15.4 shows the contours and generalised gradient for Permian groundwaters, which generally flow towards the Site as a result of historical mining.

15.2.8 Water licensing

As described in Section 6.3.7 the two key pieces of legislation for the management of water in NSW are the WM Act and the Water Act. Operations at MTO have the potential to interact with water sources that require licensing under these Acts, namely:

- the Permian groundwater described in Section 15.2, which is not yet covered by a water sharing plan and is therefore still under the Water Act; and
- Wollombi Brook and associated alluvium which is covered by the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 (WSPHUAWS).



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Geology and monitoring bores

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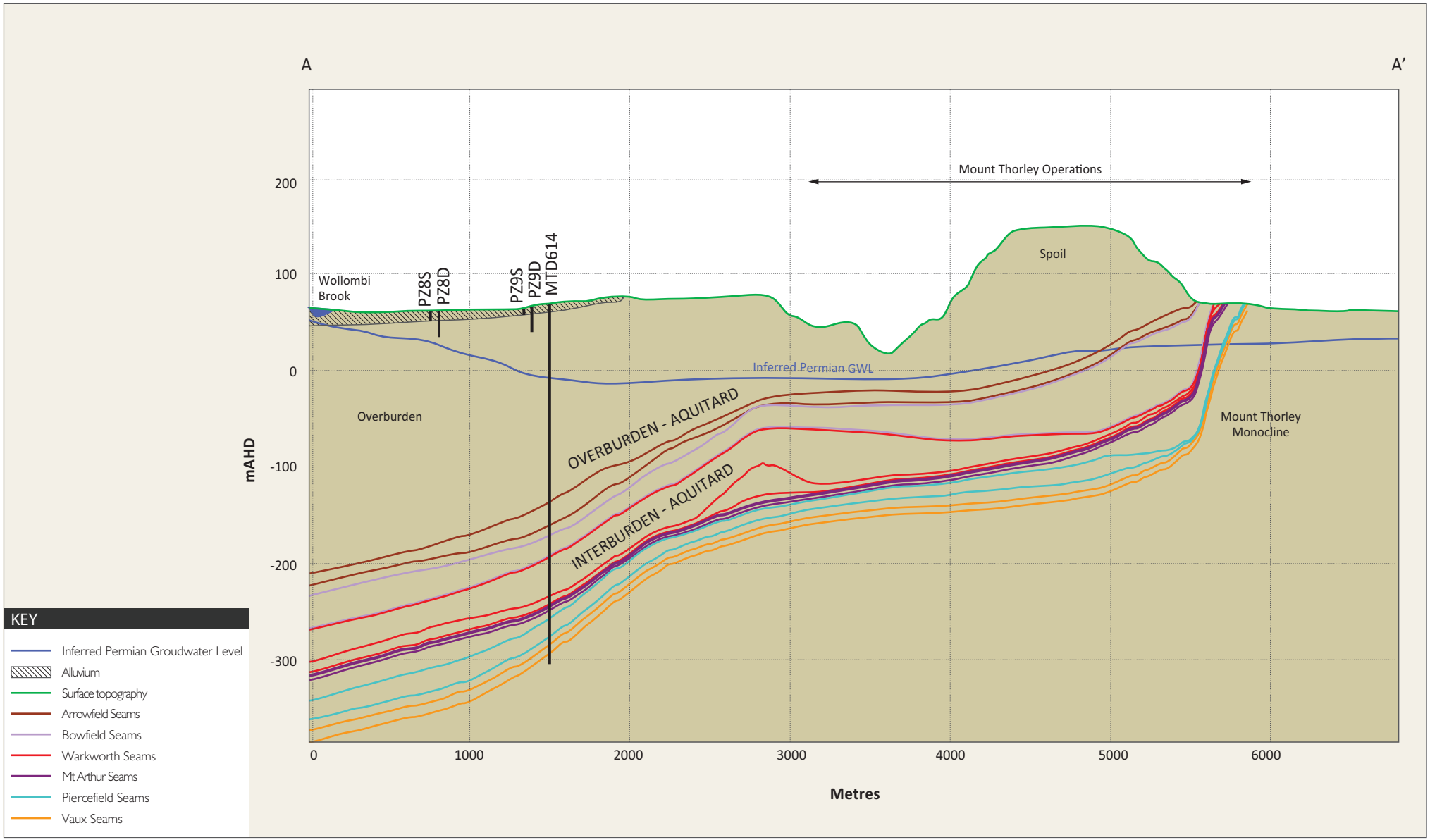
Figure 15.1



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Hydrogeological cross-section

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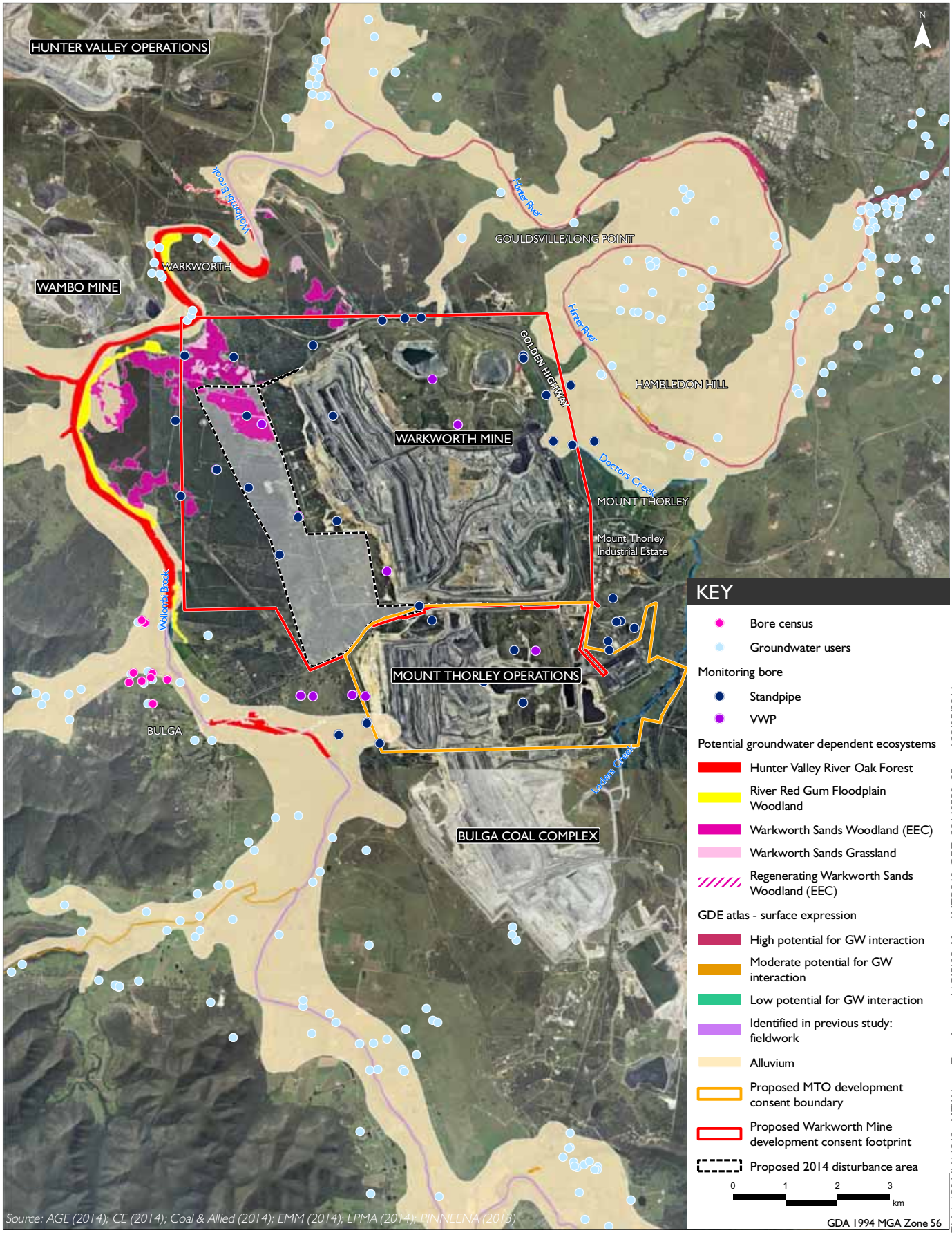
Environmental Impact Statement
Figure 15.2



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Groundwater users and GDEs

Mount Thorley Operations 2014
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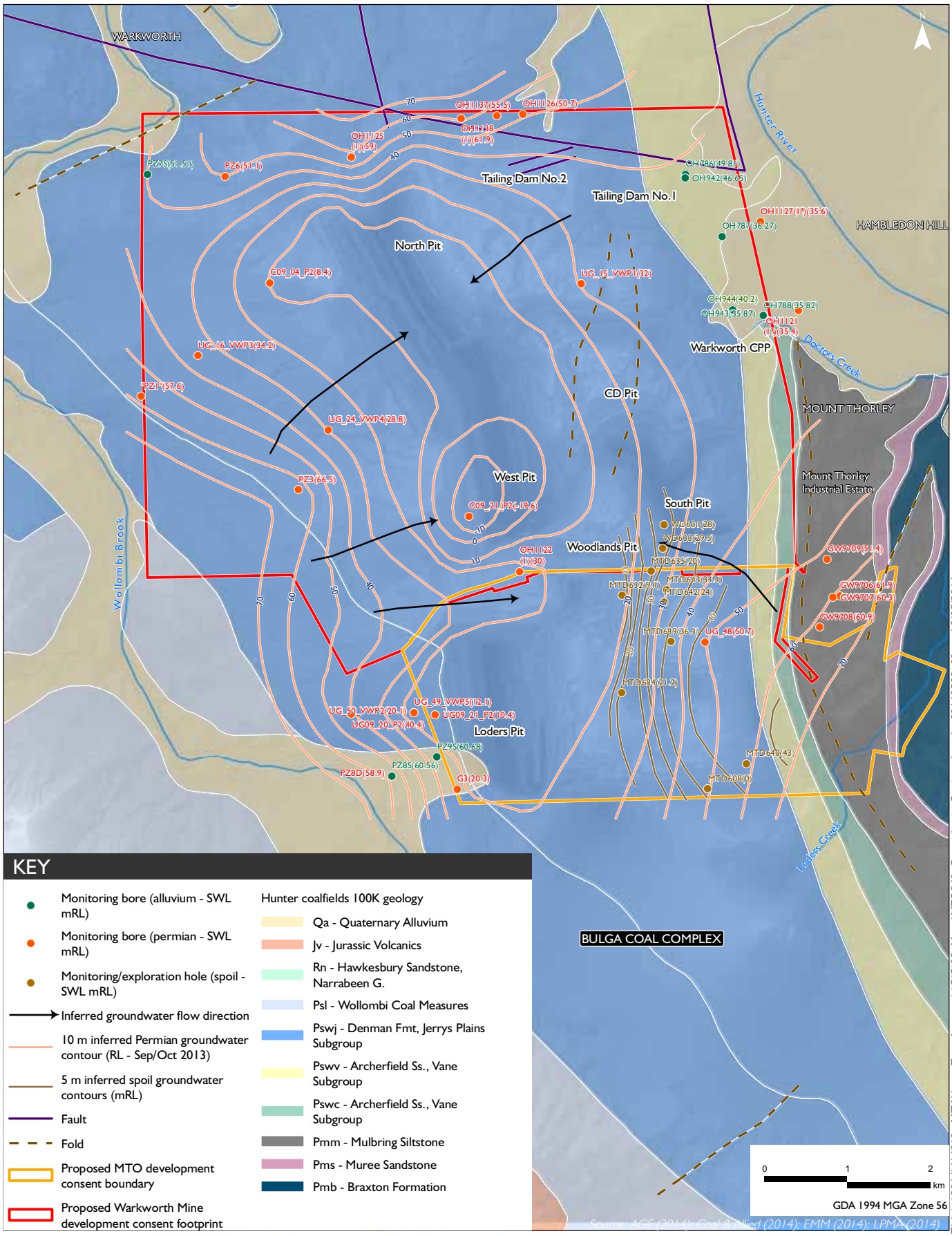
Figure 15.3



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Groundwater contours

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Figure 15.4

15.3 Impact assessment

15.3.1 Groundwater modelling

A numerical groundwater flow model was used to assess the impacts from MTO on the groundwater regime and address the requirements of the AIP. The consistency of the proposal with the AIP is presented in Section 15.3.3.

The MER (2002) model simulated the impact of mining from 1981 until 2020 as part of the groundwater impact assessment that supported the DA for the current development consent. A review of the MER (2002) model indicated it was relatively conservative and the magnitude and extent of depressurisation in the Permian coal measures was less than predicted at most monitoring sites. The new groundwater model was developed for the Warkworth Extension 2010 EA (AGE 2010), and has been refined since this time, and rigorously calibrated with data from the extensive MTW monitoring network. The model has successfully predicted the impacts from existing operations at MTO as verified by monitoring results providing further confidence in the predictions presented in the EIS.

In summary, the impact of the proposal on groundwater resources was assessed by:

- developing a numerical model (MODFLOW SURFACT) using the available information on the hydrogeological regime;
- calibrating the model using available historical mine stresses at MTW, Bulga Coal Complex and Wambo Mine (1980 to 2013), groundwater levels and stream flows recorded in the area;
- assessing the uncertainty and variability in the calibration by running multiple models with randomly generated parameters held within measured and realistic bounds;
- simulating the impacts of the operations from 2015 to the end of 2035;
- assessing the uncertainty and variance in the predictions; and
- simulating impacts on the groundwater regime post-closure for a further 1,000 years following completion of mining.

Two scenarios were modelled, namely:

1. The proposal and surrounding mining activities.
2. Surrounding mining activities only.

The results of these modelled scenarios are presented in the following sections.

As outlined in Section 15.1, Dr Frans Kalf reviewed the modelling undertaken during key stages of the investigation. Recommendations made by Dr Kalf were incorporated into the modelling during the study. The groundwater study, Appendix I, contains a copy of the peer review report.

15.3.2 Predicted impacts

i Approved water take

As there is no change to the approved mining footprint, assessed in the Mitchell McCotter (1995) EIS, under this proposal, the existing water take within approved limits.

ii Alluvium

There would be no drawdown in the Wollombi Brook alluvium except on the eastern margin directly west of MTO where drawdown is predicted to be about 1m at the end of mining (see Figure 15.5). Current monitoring confirms this finding with an alluvial bore immediately adjacent to Loders Pit showing a declining trend attributed to mining, but with distant sites remaining unaffected.

The maximum water take under the proposal from the Wollombi Brook alluvium (at year 2020 which corresponds with the end of mining in Loders Pit is estimated at 195ML/year. Maximum take from the Hunter River alluvium is undetectable.

iii Groundwater users

The AIP stipulates any bores where the maximum cumulative decline in groundwater levels is predicted to exceed 2m due to mining should have a make good agreement between the landholder and the applicant. The modelling predicted no drawdown in any privately-owned water supply bores within alluvium or the porous and fractured rock aquifers in the Permian aquifer from the proposal.

iv Wollombi Brook base flow

Depressurisation of the Permian strata, resulting from current and historical mining in the region, has resulted in the reduction of upward flow from the Permian. This results in a reduction in groundwater discharge to the Wollombi Brook alluvium, reducing the hydraulic gradient between the underlying alluvium aquifer and the bed of the river and, in turn, reducing the base flow to the Wollombi Brook.

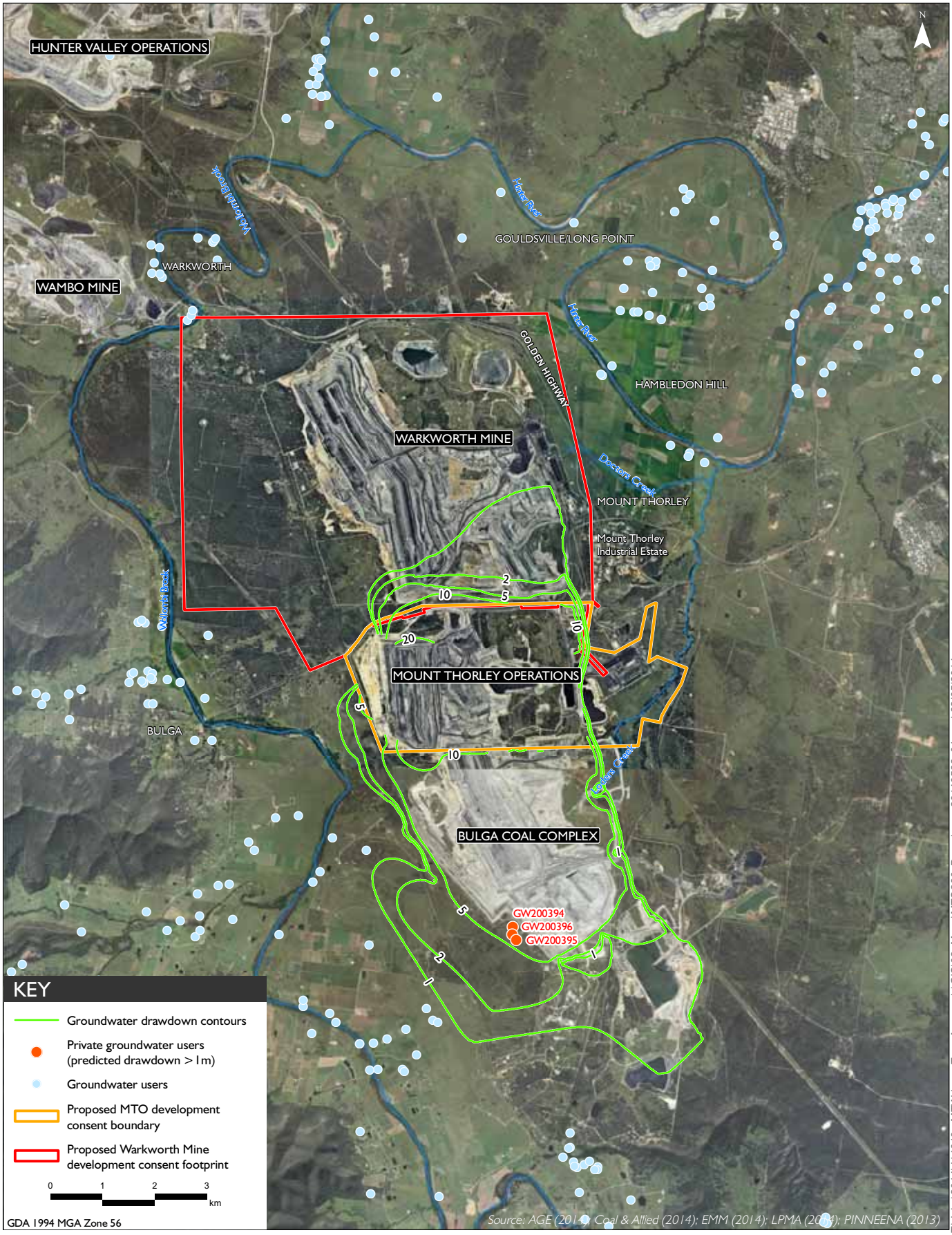
The modelling indicates the flow to the Wollombi Brook alluvium (at year 2019) would reduce by a maximum of 195ML/year due to the proposal. This would induce a loss in baseflow in Wollombi Brook peaking at 110ML/year. The majority of the loss in Wollombi Brook base flow from all mines in the region is predicted to be in the upper reach above the stream gauge at Bulga and the mid reach to the stream gauge north of MTO, with only negligible loss in the lower reach to the confluence with the Hunter River.

Hunter River base flow would not be impacted.

v Groundwater dependent ecosystems

The Hunter Valley Oak Forest community occurs on the eastern bank of Wollombi Brook, about 4km from the Site and within the alluvial aquifer. This vegetation community may be extracting groundwater from the shallow alluvial aquifer, however it would not be affected by the proposal as the zone of drawdown as defined by the 1m drawdown contour remains constrained within the immediate vicinity of the Loders Pit highwall.

The groundwater model does not predict a significant change in the water table for the Wollombi Brook alluvium or Hunter River alluvium and, therefore, any associated or aquatic and riparian ecosystems would not be impacted by the proposal.



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Groundwater drawdown in the alluvium

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Figure 15.5

vi Pit inflows

Groundwater inflows to Loders Pit are a combination of leakage through spoil and seepage through the Permian coal measures. The majority of inflows are from rainfall seepage through the spoils and leakage through the base of the TSFs. These inflows are not groundwater and are not required to be licensed and, therefore, are not discussed further in this section.

Modelling results indicate inflows from the Permian are initially 389ML/year in 2015. After the Loders Pit is backfilled with spoil and mining ceases the seepage from the Permian gradually reduces until the voids in the spoil fill with water.

vii Post mining recovery

The proposal includes backfilling the Loders Pit void to the approximate height of the ground surface in the vicinity of the levee in the south-west corner of the lease. Groundwater, surface runoff and rainfall inflows would slowly fill the backfilled void forming a watertable within the backfilled area and potentially breaking though as a window lake in the lowest lying areas. As the water body begins to form in the backfilled depression, the rate of groundwater inflow to the dewatered area would slow and eventually a state of equilibrium would occur where inputs are balanced by outputs and the water level would stabilise. The water level would be influenced by the balance of groundwater seepage, surface water runoff and infiltration with losses from evaporation. The rate of recovery would be dependent on rainfall (for example, several wet years would reduce the time for groundwater aquifers to recover).

Groundwater levels within the backfilled depression are modelled to recover within about 200 years to the final landform surface.

The mounded groundwater or ponded open water in the backfilled depression in Loders Pit was calculated to have a median salinity of 3,000µS/cm. As discussed in this section, the outflow of this water to the Wollombi Brook alluvium is not considered a salinity risk under the AIP.

viii Water quality post mining

The AIP requires that any increase in the long-term average salinity in a highly connected surface water source at the nearest point to the activity cannot exceed one per cent. As indicated in Section 15.3.2.iii, the modelling has predicted a reduction in Permian groundwater discharge to the Wollombi Brook alluvium as mining progresses. The reduction in base flow of more saline groundwater to Wollombi Brook means there is limited potential for surface water salinity to increase in the Wollombi Brook during the life of the proposal and thus the proposed mining complies with the AIP requirement.

Further to this, the modelling indicates that it is likely that the groundwater within the spoils would rise above pre-mining levels. Over time, it is possible for the groundwater to flow from the spoil towards Wollombi Brook and the alluvium in the south-west corner of the rehabilitated Loders Pit. A salinity balance indicates that the salinity of the groundwater leaving the rehabilitated site would be less saline than groundwater in the Wollombi Brook alluvium. As a result, the landform that would remain post mining would not degrade the beneficial use of the alluvial groundwater post-mining.

The AIP requires no increase in the salinity of base flow in streams fed by groundwater by more than 1 per cent (ie practically undetectable increase in salinity). The stabilised net outflow of groundwater from the backfilled void post mining would be less than 0.35ML/day, and the out flowing water would have less salinity than the water that is naturally present within the alluvial system. Therefore, the impact of the mining on the salinity of the base flow in the Wollombi Brook would be practically undetectable, as required by the AIP.

15.3.3 Aquifer Interference Policy

i Overview

The AIP covers water licensing and assessment processes for aquifer interference activities within NSW (refer also to Section 6.3.7).

The AIP was designed to address the 'incidental' take of groundwater from significant developments (ie mines) which was not accounted for in the Water Act or the WM Act. The AIP ensures that all groundwaters are accounted for, in order for a WSP to be implemented and function effectively. A WSP is used to set out the rules for the sharing of water in a particular water source between water users and the environment and outline rules for the trading of water in a particular water source.

The AIP forms the basis for assessment of aquifer interference activities under the EP&A Act. It clarifies the need to hold water licences under the WM Act and Water Act and establishes whether 'minimal impact' occurs.

The AIP outlines highly productive and less productive groundwater sources, as well as high and minimal impact interference activities. The alluvial aquifers associated with Wollombi Brook and the Hunter River are both potentially highly productive aquifers, while low permeability units and saline groundwater within the Permian coal measures are classed as a less productive groundwater source.

ii Assessment against policy

A full assessment of against the AIP is given in Appendix I, including:

- accounting for, or preventing the take of water;
- determining water predictions in accordance with the AIP; and
- other requirements to be reported in accordance with the AIP.

An overview of the outcomes against the Policy is given below. The proposal is generally consistent with the objectives of the AIP.

The modelled maximum amount of water that would be taken from each connected groundwater or surface water source on an annual basis from MTO during operations and post-mining are detailed in Table 15.1. This water take is already approved for the current operation.

Table 15.1 Water accounting

Stage of proposal	Permian coal measures (ML/year)	Wollombi Brook alluvium (ML/year)	Wollombi Brook surface water (ML/year)	Hunter River alluvium (ML/year)	Hunter River surface water (ML/year)
Operations	389	195	110	0	0
Post-mining	0.8	60	0[1]	0.3	0[1]

Notes: 1. *Accounted for in the alluvial take.*

No extension to the spatial limit of approved mining is proposed and the risks to groundwater systems are considered to remain low. The proposed backfilling of the Loders Pit reduces the long-term take of groundwater from the alluvium and Permian and compared to the current development consent that allows an open cut to remain, the proposal is considered to offer a net environmental benefit.

An uncertainty analysis undertaken of modelling results indicated that the predicted impacts on the alluvium and Permian groundwater units have a relatively high degree of certainty with limited error bands around the predictive results. The uncertainty analysis is fully described in Appendix D of the groundwater study (Appendix I).

There are no predicted impacts on private landholder bores in the alluvium.

iii Water licensing

As described in Section 6.3.7, water licensing to account for take from the proposal is required under the Water Act and WSPHUAWS.

It is the applicant's responsibility to ensure that the necessary licences are held with sufficient share component and water allocation to account for all water taken from a groundwater or surface water source as a result of an aquifer interference activity, both for the life of the activity and after the activity has ceased.

15.4 Management and monitoring

Groundwater at MTW is currently managed in accordance with the MTW WMP, prepared in consultation with NOW and the EPA. The MTW WMP was developed in accordance with industry best practice with consideration given to the full available range of reasonable and feasible mitigation and their effectiveness, inclusive of contingency plans to manage any residual risks, for implementation at the Site.

The MTW WMP is available on Rio Tinto Coal Australia's website:

(http://www.riotintocoalaustralia.com.au/documents/MTW_Water_Management_Plan_(Approved_31Jan2013).pdf).

15.4.1 Trigger values

Trigger values provide a quantifiable measure for identifying adverse changes in groundwater levels and quality.

The MTW WMP specifies trigger values for important parameters such as pH, EC and TSS. In the absence of licence or applicable ANZECC (2000) criteria, the approach to trigger level monitoring and reporting would continue under the proposal (ie water quality trigger levels would be based on the 95th and 5th percentile of baseline data and compared to monitoring results on a monthly basis).

A site specific investigation into trigger level exceedance would be undertaken if:

- professional judgement determines that the single deviation or a developing trend could result in environmental harm; or
- three consecutive measurements exceed trigger values.

15.4.2 Data management and reporting

Data management and reporting would include:

- establishment of trigger levels;
- quarterly review of groundwater levels and field water quality against trigger levels, with site specific investigations initiated, as detailed in Section 15.4.1; and
- all groundwater data being stored in a database with suitable QA/QC controls.

15.5 Conclusions

As a result of the long history of mining at MTW and associated groundwater monitoring, the groundwater systems within and surrounding the mines are well understood.

The main water bearing units are the Permian strata and the Wollombi Brook and Hunter River alluvium. Groundwater levels within the Permian strata are highly influenced by existing mining and flow towards the active pits. Water level measurements within the Wollombi Brook alluvium indicate the groundwater system appears relatively unaffected by current mining, and contains brackish to saline groundwater.

A detailed assessment of the proposal was completed using a calibrated groundwater model. The groundwater modelling was independently reviewed with outcomes reflected in the study. Results of the numerical groundwater model indicate the proposed backfilling of the Loders Pit reduces the long-term take of groundwater from the alluvium and Permian and compared to the current development consent that allows an open pit to remain. The proposal, therefore, offers a net environmental benefit reducing water take from the groundwater systems post-mining.

The proposal is generally consistent with the objectives of the AIP. Coal & Allied would obtain the necessary licensing if required for any additional water take associated with the proposal in accordance with the access licence dealing rules established by the water sharing plan.

Groundwater would continue to be managed under the existing groundwater management system and in accordance with the MTW WMP. A number of management and monitoring measures specific to the proposal would be implemented and incorporated into the MTW WMP.

Chapter 16

Surface water

Chapter 16 — Surface water

16 Surface water

16.1 Introduction

This chapter provides a summary of the surface water study for the proposal prepared by WRM Water and Environment (WRM), which is presented in full in Appendix J.

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

The water management systems at MTO and Warkworth Mine are integrated and referred to in this chapter as the MTW WMS. The surface water study has been prepared based on the combined impacts of the subject proposal and the Warkworth Continuation 2014. Unless a discussion on Warkworth Mine is required to understand the management processes, the studies relevant to MTO have been the focus of this chapter.

16.2 Existing environment

16.2.1 Rainfall and evaporation

Rainfall and evaporation data were taken from BoM rainfall stations at Bulga (Down Town) and Jerrys Plains. A synthetic rainfall dataset was also obtained for the Site using the Queensland Department of Science, Information Technology, Innovation and the Arts (DSITIA) Data Drill rainfall.

The mean annual rainfall over the long-term (1884 to 2013) at the Jerrys Plains station is 645mm. The mean annual rainfall over the coincident period (1960 to 2013) is 668mm and 695mm at Jerrys Plains and Bulga, respectively. This indicates that rainfalls are around 4 per cent higher at Bulga than Jerrys Plains. The annual average rainfall from Data Drill is 658mm for the period 1889 to 2012 and 650mm for the period 1960 to 2012.

The mean annual pan evaporation at Jerrys Plains for the period 1957 to 1972 was 1,641mm. The mean annual lake evaporation from Data Drill for the period 1889 to 2012 was 1,390mm. This indicates that annual average lake evaporation is more than double the annual average rainfall for the Site.

16.2.2 Regional drainage network

The Site is on the southern side of the Hunter River, and the eastern side of Wollombi Brook.

The Hunter River has a catchment area of approximately 16,400km^2 to Singleton and includes the Glennies Creek Dam and Glenbawn Dam upstream of the Site. The combined catchment area of these dams is about 9 per cent of the Hunter River catchment to Singleton (ie about 1,533km^2).

16.2.3 Local drainage network

Wollombi Brook drains in a north-easterly direction and joins the Hunter River approximately 3.5km north of the Site. The clean catchment area west of the Loders Pit (Salt Pan Creek) drains westward towards Wollombi Brook.

The local drainage network is shown in Figure 16.1. Loders Creek to the east is utilised by MTO as a discharge location under the Site's EPL 1976. This is further discussed in Section 16.2.6.

16.2.4 Streamflow

Streamflow data used in the study was obtained from three NOW stream gauging stations in the vicinity of the Site, comprising:

- Station No. 210001 – Hunter River at Singleton (approximately 28km downstream of Wollombi Brook confluence). The catchment area of the river to the gauge is approximately 16,400km^2;
- Station No. 210004 – Wollombi Brook at Warkworth (approximately 7km upstream of the Hunter River confluence). The catchment area of the brook to the gauge is approximately 1,848km^2; and
- Station No. 210028 – Wollombi Brook at Bulga (20km upstream of the Hunter River confluence). The catchment area of the brook to the gauge is approximately 1,672km^2.

The locations of these, and other NOW stations referenced in this chapter, are shown in Figure 16.1. Recorded flow information from these stations is discussed below.

i Hunter River

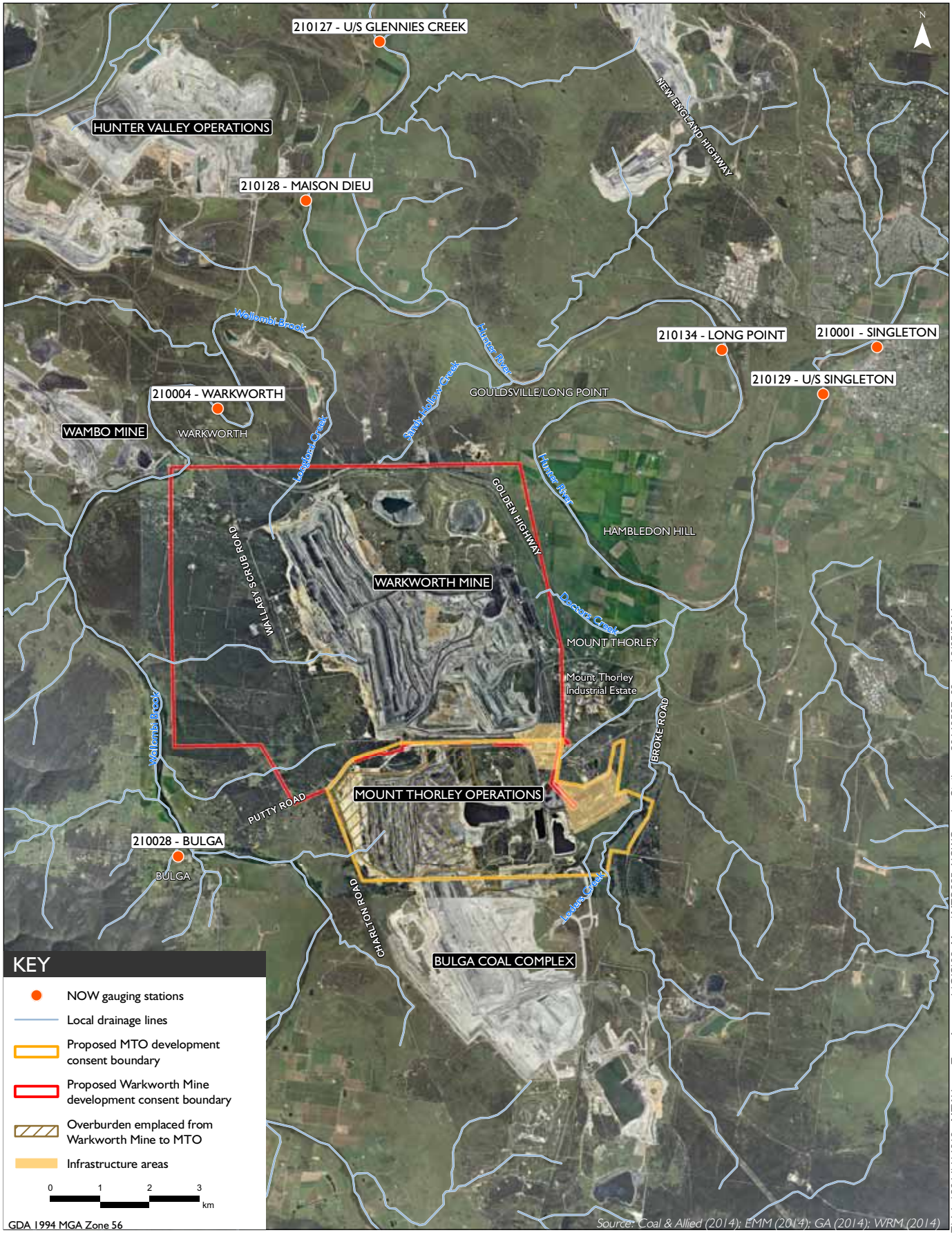
The data from Station No. 210001 indicates that, under current catchment conditions, the Hunter River is perennial with a minimum flow rate of 10ML/day. The median flow rate is about 300ML/day and the flow rate is greater than 100ML/day for 95 per cent of the time. The data also indicates that the raising of Glenbawn Dam in 1988 has increased the frequency of low flows and moderately reduced the frequency of high flows.

ii Wollombi Brook

The data from Stations No. 210004 and No. 210028 indicates the Wollombi Brook is ephemeral, with a flow rate of 2ML/day at Warkworth and 0.2ML/day at Bulga for 80 per cent of the time. The median flow rate is about 40ML/day at Warkworth and 30ML/day at Bulga. The data also indicates that, during flood events, water levels at Warkworth may be affected by backwater from the Hunter River.

An analysis of annual runoff versus rainfall for Wollombi Brook at Station No. 210028 found that there is very little runoff when annual rainfall is less than 400mm. However, when annual rainfall exceeds this value, the volume of surface runoff increases substantially. There are no large water storages on Wollombi Brook.

An analysis of flow data at Stations No. 210004 and No. 210028 indicates that a loss of flow (potentially in the order of 10 to 50ML per month) is sometimes observed along the reach of Wollombi Brook adjacent to the Site, despite an additional catchment area of 176km^2 between the two stations. Given the significant surface and groundwater entitlements in the area, some loss of flow along this reach is not unexpected. However, due to the large number of potential locations for extraction of flow, it was not possible to accurately determine where the flow loss is occurring.



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Local drainage network and NOW stream gauging locations

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Figure 16.1

16.2.5 Surface water quality

i NOW monitoring

Hunter River water quality data has been collected by NOW since the 1970s, including from the Hunter River (Station No. 210001) and Wollombi Brook (Station No. 210004). Additionally, electrical conductivity (EC) has been monitored continuously from Wollombi Brook since 1992 and from the Hunter River upstream of Singleton (Station No. 210129) since 1993.

The Australia and New Zealand Environment Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand have prepared a guideline for water quality management for use throughout Australia and New Zealand based on the philosophy of ecological sustainable development. These guidelines are referred to as the ANZECC (2000) water quality guidelines.

The NOW water quality data at Stations No. 210001, No. 210004 and No. 210129 were compared against the ANZECC (2000) water quality guidelines for different environmental values of receiving waters including aquatic ecosystem protection, irrigation water supply, livestock water supply and recreation. A summary of results for the Hunter River and Wollombi Brook is provided in Table 16.1. The comparison shows water quality in the Hunter River generally meets the ANZECC water quality guidelines for ecosystem protection while water quality in Wollombi Brook generally meets the ANZECC water quality guidelines for irrigation.

Table 16.1 Comparison against ANZECC water quality guidelines

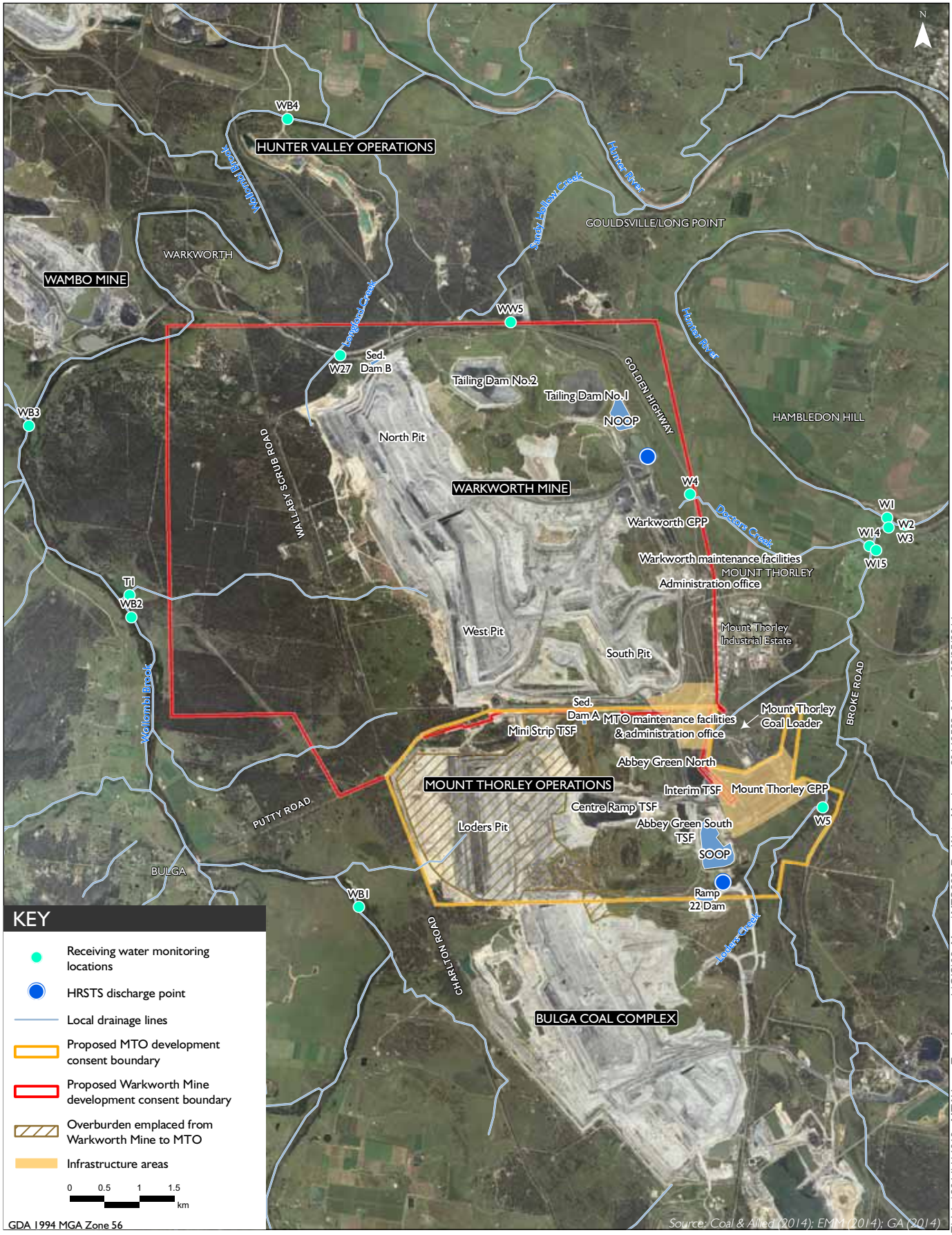
Hunter River[1]	Wollombi Brook[2]
Moderately alkaline, with a median pH of 8.24.	Slightly alkaline, with a median pH of 7.56.
Fresh, with a median EC of 621µS/cm.	Fresh, with a median EC of 595µS/cm.
Has a median value greater than the ANZECC guideline trigger value for pH (ecosystem protection), total nitrogen (ecosystem protection) and total phosphorus (ecosystem protection).	Has a median value greater than the ANZECC guideline trigger values for chloride (irrigation) and sodium (irrigation).
Has a median value lower than the ANZECC guideline trigger value for all other monitored parameters.	Has a median value lower than the ANZECC guideline trigger value for all other monitored parameters.

Notes: 1. Based on water quality data from NOW Stations No. 210001 and No. 210129.

2. Based on water quality data from NOW Station No. 210004.

ii Coal & Allied monitoring

Coal & Allied undertakes surface water quality monitoring of receiving waters and site dams at the locations shown in Figure 16.2. A summary of the monitoring results for receiving waters and site dams is provided below.



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Coal & Allied surface water quality monitoring locations

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Figure 16.2

a. Site dams

The primary saline water storages in the existing MTW WMS (ie SOOP Dam, Dam 1N and Dam 9S) are routinely monitored for EC, pH and turbidity. Additionally, a comprehensive analysis of water quality in a number of saline and sediment dams is undertaken on a quarterly basis.

Review of the Coal & Allied's water quality monitoring results for the site dams indicates that:

- Dams 1N, 6S and 9S are characterised as brackish and strongly alkaline, with median ECs of approximately 7,000µS/cm and median pH values of 8.7 to 9.0; and
- water quality of sediment dams varies considerably in salinity from fresh to brackish, with median ECs of between 300 and 8,400µS/cm, and in pH from moderately alkaline to very strongly alkaline, with median pH values between 7.9 and 9.8.

b. Receiving waters

Controlled discharges at MTW are directed from Dam 1N (within Warkworth Mine) and from Dam 9S (within MTO) to Doctors Creek and Loders Creek, respectively, which are tributaries of the Hunter River located east of the Site. These discharges are regulated by conditions contained in the MTO and Warkworth Mine EPLs and the HRSTS. Runoff from undisturbed areas and small areas of disturbed catchment is treated via onsite sediment dams. Overflows from these sediment dams discharge to Wollombi Brook and Loders Creek.

Review of the Coal & Allied water quality monitoring results for MTO receiving waters indicates that:

- Hunter River upstream of the Loders Creek confluence has a median EC of 645µS/cm and a median pH of 8.0;
- Hunter River downstream of the Loders Creek confluence has a median EC of 630µS/cm and a median pH of 8.1;
- Loders Creek has a median EC of 4,200µS/cm and a median pH of 8.1;
- Wollombi Brook has a median EC of 680µS/cm and a median pH of 7.5; and
- Salt Pan Creek has a median EC of 16,810µS/cm and a median pH of 8.1.

Water quality monitoring results for Loders Creek are influenced by controlled discharges under the HRSTS. Pre-mining water quality data (BHP Ltd, 1980) at Loders Creek indicated ECs varying between 2,000µS/cm and 14,200µS/cm, with an average of 7,100µS/cm. The salinity was attributed to seepage from the Saltwater Creek coal measures which outcrop in areas of Loders Creek (MER, 2012).

iii Analysis of water quality

An analysis of data for EC and Total Suspended Solids (TSS) as measured in the Hunter River, from both NOW and Coal & Allied monitoring locations, indicates that there is a slight decrease in EC downstream of the Loders Creek confluence. Additionally, the median EC downstream of Loders Creek is lower than upstream of Glennies Creek, indicating the controlled releases from the existing MTW WMS do not appear to be adversely affecting salinity in the Hunter River. The TSS levels increase slightly across the Loders Creek confluence.

16.2.6 Existing water management system

The MTW WMS is a network of infrastructure (ie dams, pipelines and contour drains) which controls the movement of water around MTW and prevents the unscheduled release of water offsite. Water is managed according to its type which is determined by catchment area, quality and use. The main types of water managed in the study area include mine water, sediment water and clean water.

The main elements of the existing MTW WMS and a schematic diagram of the conceptual configuration are presented in Figures 2.8 and 2.9 of Appendix J. The existing MTW WMS is described in detail in the MTW WMP.

16.3 Site water balance

16.3.1 Methodology

The computer based OPSIM model was used to simulate the site water balance for the proposal. The model simulates the operation of all major components of the proposed MTW WMS, including:

- climatic variability – rainfall and evaporation;
- catchment runoff;
- controlled discharges (under the HRSTS) and uncontrolled overflows;
- groundwater inflows; and
- site water usage (CPP, haul road dust suppression and stockpile dust suppression, vehicle wash).

The simulation method used and water balance model calibration are fully described in the study in Appendix J.

16.3.2 Proposed water management system

The proposed MTW WMS has been developed in conjunction with the mine planning and operational teams to develop a WMS that has minimal impacts on surface water resources. The proposed MTW WMS is a continuation of the current MTW WMS described above in Section 16.2.6.

i Proposed mine water storages

The proposal includes a number of new or modified storages are proposed at MTO as described below.

- SOOP Dam: primary water storage for MTO, also referred to as Dam 6S. Increase in the storage capacity to 2.2GL within the same footprint.
- Ramp 22 Dam: sediment dam situated at the current Dam 10S and Dam 11S location at MTO. Joint sediment dam with Bulga Coal Complex to the south. Runoff from both MTW and Bulga Coal Complex would be directed to this dam.
- Sediment Dam A: sediment dam at MTO to capture runoff from future spoil and rehabilitated areas. The exact location is yet to be confirmed.

It is noted that the Warkworth Continuation 2014 also seeks approval for a new mine water storage, as well as minor storages associated with sediment and erosion control. These have been included here as the MTW WMP transfers water between the two sites as needed. The locations of these storages can be seen in Figure 2.3. The proposed Warkworth Mine storages comprise:

- NOOP Dam: saline water storage located directly to the north of Dam 1N at Warkworth Mine. The NOOP Dam has a proposed capacity of 740ML; and

- Sediment Dam B: sediment dam location at Warkworth Mine to capture runoff from future spoil and rehabilitation areas. The exact location is yet to be confirmed.

ii Layout and operation

The changes to the approved mining operations would result in a number of potential changes to the MTW WMS layout. These changes are described below for each of the mine stages used in the assessment.

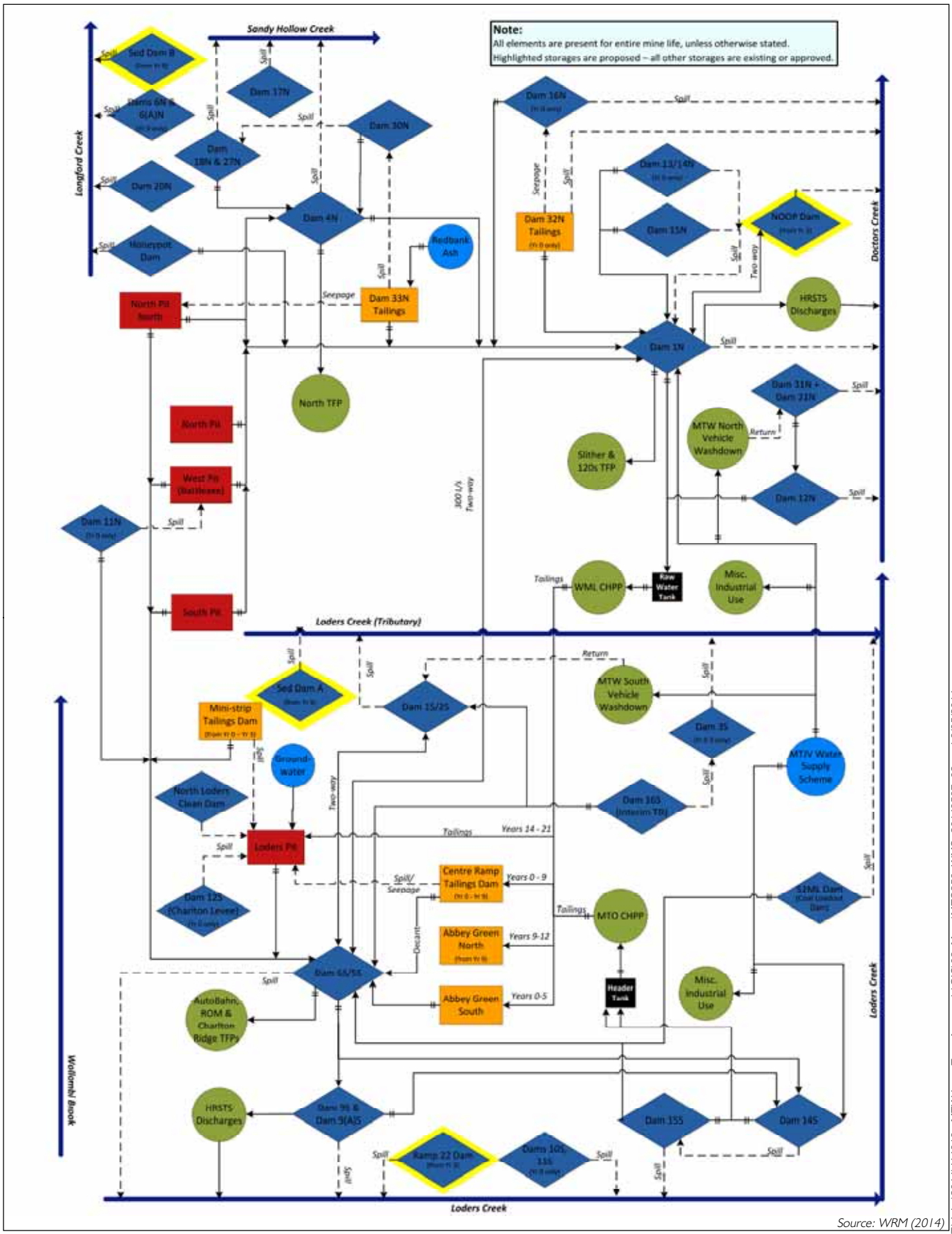
- Indicative Year 3 mine plan: tailings are directed to both the CRTSF and AGS. Construction of the NOOP Dam is complete. Construction of Ramp 22 Dam is complete, replacing Dam 10S and 11S. Dam 32N (Tailings Dam No.1) has been capped and rehabilitated. Dam 6N and Dam 12S have been mined out.

- Indicative Year 9 mine plan: tailings are directed to the CRTSF and AGN TSF. Mining has been completed in Loders Pit, which has been partially backfilled. Mini-strip TSF has been rehabilitated. Sediment Dam A has been constructed. The AGS is covered and rehabilitated.

- Indicative Year 14 mine plan: tailings are directed to the partially backfilled depression in Loders Pit. The CRTSF has been capped and rehabilitated. Sediment Dam B has been constructed. The AGN TSF is covered and rehabilitated.

- Indicative Year 21 mine plan: no changes to the MTW WMS layout. Considerable areas of the Site have now been rehabilitated.

A schematic of the existing MTW WMS, with proposed changes highlighted, is shown in Figure 16.3. The proposed changes to the MTW WMS have been designed to avoid discharge (for example, an uncontrolled release) and to minimise environmental impacts when discharge (for example, under the rules of the HRSTS) is necessary. Further detail on the proposed changes to the MTW WMS and the proposed operating rules used in the model are detailed in Appendix J.



Source: WRM (2014)

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Managed by Rio Tinto Coal Australia

Proposed water management system
Mount Thorley Operations 2014
Environmental Impact Statement
Figure 16.3

iii Groundwater inflows, catchments, and water quality

The groundwater inflow rates to MTW were predicted in the groundwater study (see Appendix J). Groundwater inflows to the MTO WMS are predicted to occur for Years 1 to 5, with no inflow after Year 6 when mining is completed and the depression in Loders Pit is being filled in.

iv Water demands

A summary of the water demands over the life of the proposal is presented in Table 16.2.

Table 16.2 Water demand summary (ML/year)

Demand	2014	2017	2023	2028	2035
CPP gross (net)[1]	6,591 (2,466)	7,168 (2,731)	7,168 (2,731)	7,168 (2,731)	7,168 (2,731)
Haul road dust suppression[2]	1,623	1,510	1,423	1,144	1,107
Misc. industrial use and vehicle washdown – gross (net)[1]	135 (126)	146 (136)	146 (136)	146 (136)	146 (136)
Total – gross (net) [1]	**8,349 (4,215)**	**8,824 (4,377)**	**8,737 (4,290)**	**8,458 (4,011)**	**8,421 (3,974)**

Notes *1. Net rates include return.*

2. Long-term average (dependent on rainfall), based on haul road lengths of 92.6km, 87.2km, 70.1km and 68.1km for 2017, 2023, 2028 and 2035 year indicative mine plans, respectively.

v Proposed sediment dams

Conceptual sediment dam locations have been proposed based on the indicative mine plans and are shown in Figures 6.4 to 6.11 of Appendix J. The locations and sizes of the sediment dams are conceptual for inclusion in the water balance modelling and would be refined and confirmed through detailed design and incorporated into the MTW WMP.

Sizing of the proposed sediment basins has been undertaken in accordance with the Blue Book (DECC 2008) requirements for Type D basins in consideration of the following parameters:

- Sediment Dam A – catchment area of 238ha with a 5 day management period volume of 105ML; and
- Sediment Dam B – catchment area of 102ha with a 5 day management period volume of 45ML.

vi Hunter River Salinity Trading Scheme

MTO currently has approval to discharge under the rules of the HRSTS. The proposal's modelling rules for HRSTS discharges were based on Hunter River stream flow and salinity, and discharge dam volumes and salinity. Historically, there have been sufficient credits available for trade and, therefore, it was assumed that the number of salt credits held by MTW is not a limitation to releases.

The proposal includes an upgrade to the approved discharge point at MTO (ie Dam 9S) to increase the maximum discharge rate to 300ML/d. The maximum discharge rate at Warkworth Mine (ie Dam 1N) would remain at 100ML/d.

16.3.3 Summary of water balance results

Water balance results have been analysed in two ways:

- by mine stage – the results for each climatic realisation are averaged over the duration of each mine stage (summarised in Section 16.3.3i); and
- annual statistical results - a statistical analysis is performed on an annual basis and reported as a percentile (summarised in Section 16.3.3ii).

i Overall site water balance by mine stage

A summary of the MTW water balance, averaged over each stage of the modelled mine life is provided in Table 16.3.

Table 16.3 MTW water balance results summary

	Volume (ML/a)				
Process (Mine Stage Duration)	**Year 0 (2 years)**	**Year 3 (4 years)**	**Year 9 (7 years)**	**Year 14 (5 years)**	**Year 21 (4 years)**
Inflows					
Rainfall runoff	3,524	3,846	4,111	4,210	4,278
Groundwater	186	10	0	0	0
External raw water requirements	1,251	1,807	1,720	1,803	1,803
ROM moisture	877	978	978	978	978
Redbank power station	25	25	25	25	25
Total inflows	**5,873**	**6,665**	**6,833**	**7,016**	**7,084**
Outflows					
Evaporation	495	656	751	607	817
Fine tailings moisture retention	1,774	1,965	1,965	1,965	1,965
Haul road dust suppression[1]	1,627	1,511	1,420	1,138	1,108
Misc. industrial demand and vehicle wash	126	136	136	136	136
Product coal moisture	1,008	1,110	1,110	1,110	1,110
Coarse rejects moisture	572	633	633	633	633
HRSTS discharges	561	453	240	316	315
Offsite sediment dam releases	91	214	340	316	315
Offsite saline dam releases	0	0	0	0	0
Total outflows	**6,253**	**6,679**	**6,803**	**6,274**	**6,450**
Change in site water inventory	***-380***	***-14***	***+30***	***+742***	***+634***

Note: Haul road dust suppression requirements reduce over time as rehabilitation progresses following mining (particularly at MTO).

ii Annual statistical results

In interpreting the results of the water balance study, it should be noted that the results provide a statistical analysis of the performance of the MTW WMS over the 21 years of mine life, based on a number of realisations with different climatic sequences. The 50th percentile probability represents the median results, the 10th percentile represent 10 per cent exceedance and the 90th percentile results represent 90 per cent exceedance. There is an 80 per cent chance that the result would fall within the 10th and 90th percentiles and a 98 per cent chance the result would fall between the 1st and 99th percentiles. The results show the percentile chance of a particular value on each day, and do not represent continuous results from a single model realisation; for example, the 50th percentile trace does not represent the model time series for median climatic conditions.

The results of the water balance modelling show that external water may be required to meet all site demands. Total external water requirements are characterised as:

- a minimum of 140ML/a of external raw water from the Hunter River would be required for the life of the proposal. This is consistent with site demands of industrial use and vehicle wash of around 140ML/a which are supplied from raw water sources only;
- there is a 90 per cent chance that at least 450ML of external water would be required in any year of the proposal life;
- a step change in external raw water requirement occurs in around Year 2 which is consistent with the decrease in pit inflows at MTO and an increase in production at Warkworth Mine. It is noted that although mining in Loders Pit is completed in 2020, 'pumpable' Permian groundwater inflows reduce to zero in around 2016 due to evaporative losses from the pit face and moisture retained in extracted ROM coal. From Year 3 onwards the external water requirements are generally consistent with:
    - a 50 per cent chance that between 1,500 to 2,000ML/a of external water would be required; and
    - a 10 per cent chance that between 3,000 to 3,700ML/a of external water would be required.

The current MTJV allocation is 1,012ML/a (at 100 per cent Available Water Determination (AWD)).

The results of the water balance modelling indicate a low probability of pit inundation, and no offsite uncontrolled release (overflows) from saline storages.

Discharges under the HRSTS would continue to be required for site water management, with the following discharge characteristics:

- overall, much greater volumes are discharged from MTO than Warkworth Mine, which is consistent with the capacity of the discharges structures and dam volumes;
- there is a 50 per cent chance that controlled releases from MTO would not be required in any year of the proposal life; and
- there is a 10 per cent chance that controlled releases from MTO of between 1,000 to 2,000ML would be required in any year of the proposal life.

The model results presented above represent the application of the adopted MTW WMS rules over the mine life, regardless of climatic conditions. In reality, there are numerous options for adaptive management of the proposed MTW WMS to accommodate climatic conditions. For example, temporary adjustments to pumping arrangements could be made to accommodate very wet or dry periods. These alternative management approaches would be used to reduce the risks to the operations associated with climatic variability.

16.4 Impact assessment

16.4.1 Mine site water requirements

Likely mine site water requirements were determined from the water balance modelling as described above. A significant proportion of mine site water requirements would be sourced from water collected onsite, including rainfall runoff and groundwater inflows to the open cut pits (ie Year 0 and Year 3) which would be transferred to the MTW WMS for recycling.

Possible sources of additional water for the proposal, which would be negotiated on an as-needed basis when mutually beneficial, include the following:

- water sharing with Hunter Valley Operations, with this strategy successfully adopted in the past;
- water sharing with Bulga Coal Complex; and
- water sharing with Wambo Mine.

If required, additional water licences would be sought and purchased by Coal & Allied over the life of the proposal to meet external raw water demands. As all offsite water supplies for the proposal would be obtained from licensed sources, there would be no adverse impact on other licensed users who would still have access to their entitlement (subject to climatic conditions and the operation of the water supply scheme).

16.4.2 Loss of catchment

During active mining operations, the MTW WMS would capture runoff from areas that would have previously flowed to Wollombi Brook or the Hunter River.

The maximum total catchment area captured within the MTW WMS during the proposal is 10.5km^2 or 0.56 per cent of the Wollombi Brook catchment to the confluence of the Hunter River. Following completion of progressive rehabilitation, the Hunter River catchment area influenced by the combined proposal and Warkworth Continuation 2014 (excluding the Wollombi Brook catchment) would be restored to 99.96 per cent of its pre-mining area. The final landform would capture 8.6km^2 or 0.44 per cent of the Wollombi Brook catchment to the confluence of the Hunter River.

16.4.3 Surface water quality

The results of the water balance modelling indicate that, under the current model assumptions and configuration, no uncontrolled release of saline water occurs over the life of the proposal. Excess saline water is released in accordance with the existing rules of the HRSTS. There would be no downstream impacts on surface water quality as salinity would be in accordance with the acceptable limits under the HRSTS.

Potential impacts on surface water quality in the receiving waters would be managed through compliance with HRSTS discharge limits and implementation of the management measures described in Section 16.5.

16.4.4 Uncontrolled offsite releases

The results of the water balance modelling indicate that under the current model assumptions and configuration, there is a low risk of the MTW WMS for the proposal accumulating water over the 21 year life of the proposal. The results show that the system recovers well after each wet season.

Overflows of water from sediment dams would occur during wet periods that exceed the design standard of the sediment control system (as per the design intent). Monitoring water quality in sediment dams would continue, as described in Section 16.4.5ii.

16.4.5 Controlled releases under the Hunter River Salinity Trading Scheme

Controlled releases of saline water under the HRSTS may have the following impacts:

- impacts on the total flow volume in the Hunter River;
- impacts on stream condition, including bank erosion; and
- water quality impacts.

These potential impacts are discussed in the following sections.

i Hunter River flow volumes

Table 16.4 shows the net impact of the MTW WMS on Hunter River flow volumes over the life of the proposal. The results show that the median annual reduction in flows to the Hunter River varies between 16 and 75ML/year during the life of the proposal. Post-mining the median annual reduction is 104ML/year (approximately 0.02 per cent of the median annual Hunter River discharge to Singleton) due to a reduction in catchment areas and cessation of discharges and sediment dam overflows.

Table 16.4 Impact of water management system on flow volumes

Mine stage	Median runoff captured (ML/year)	Median discharge to Hunter River (ML/year)	Median sedimentation dam overflows (offsite)	Median net runoff reduction (ML/year)
Year 0 (existing)	225	181	25	19
Year 3	215	81	118	16
Year 9	231	40	116	75
Year 14	246	66	151	29
Year 21	243	48	154	41
Post-mining	104	0	0	104

An analysis of the impact of MTW HRSTS discharges on the Hunter River flow was undertaken based on simulated flow in the Hunter River over the life of the proposal. The results showed that the impacts of HRSTS discharges on the Hunter River flow characteristics are negligible during both wet periods and dry periods.

ii Stream condition

The proposed flow rate of the controlled discharge would be less than 300ML/day (3,500L/s) from Dam 9S to Loders Creek (increased rate of discharge from current approval), and less than 100ML/day (1,160L/s) from Dam 1N to Doctors Creek (no change to approved rate of discharge). It is possible that controlled discharges may occur at times when there is no natural flow in Loders Creek. The mine directly adjacent to MTO to the south (Bulga Coal Complex) is also currently seeking approval for an increased controlled discharge rate to Loders Creek. The Bulga Optimisation Project (Umwelt, 2014) has estimated a maximum sustainable discharge to the Loders Creek system with consideration of potential cumulative impacts of discharges from both MTO and Bulga Coal Complex. The results of the analysis are summarised as:

- there is one area of erosion risk identified in Loders Creek downstream of MTO discharges;
- hydraulic analysis indicates that limiting the peak discharge to 60 per cent of the bank full capacity would most likely ensure a low risk of erosion during discharges;
- bank full capacity in Loders Creek upstream and downstream of the Northern Dam tributary (a dam proposed in the BOP) is 23.6m^3/s and 43.4m^3/s, respectively. Therefore the maximum discharge at 60per cent of the bank full capacity is 14.2m^3/s (1,200ML/day) and 26.0m^3/s (2,250ML/day), respectively;
- due to the locations of the discharge points at Bulga Coal Complex, the Bulga Coal Complex discharge rates are limited by the upstream creek capacities. The discharge rates proposed for the Bulga Coal Complex are therefore much less than the 60per cent bank full flows for the downstream reaches of Loders Creek; and
- the Bulga Coal Complex proposed maximum discharge rate upstream of the Northern Dam tributary is 300ML/day and 800ML/day downstream of the Northern Dam tributary.

The MTO and Bulga Coal Complex combined maximum discharge rates of 600ML/day upstream of the Northern Dam tributary and 1,100ML/day downstream of the Northern Dam tributary are significantly less than the 60per cent bank full capacity of Loders Creek. Therefore, it is considered that there is a low potential risk of erosion during discharges in Loders Creek downstream of the MTO discharge location.

As specified under the rules of the HRSTS, controlled discharges may only occur when the 'high' or 'flood' flow block is passing MTW. Therefore, controlled releases from the proposal would only occur when the Hunter River is in an increased state of flow (at least 2,000ML/day). Based on the comparatively low controlled discharge rate, it is not expected that controlled discharges would result in adverse hydraulic impacts on the Hunter River, such as increased bed and bank erosion.

iii Water quality

Discharges under the HRSTS are controlled so that the salt concentration in the Hunter River Lower Sector (downstream of Glennies Creek confluence) does not exceed 900µS/cm. An important component of meeting the salinity goal is to discharge the salt load evenly throughout the discharge period to avoid short periods of elevated salinity in the Hunter River.

Controlled discharges under the proposal would continue to be released in accordance with HRSTS and EPL 1976 and EPL 1376 requirements for MTO and Warkworth Mine, respectively.

A comparison was undertaken of the Coal & Allied and NOW water quality monitoring data in the Hunter River in the vicinity of MTW, with the ANZECC (2000) water guideline trigger values and site water quality monitoring at the discharge dams. The comparison showed that discharge dam water quality (median) is:

- better than Hunter River water quality and the lowest recommended ANZECC guidelines trigger value for manganese, selenium, phosphorus (total) and zinc;
- better than the lowest recommended ANZECC trigger value, but worse than the Hunter River water quality for arsenic, boron, barium, calcium, calcium carbonate, iron (filtered), potassium, lithium, magnesium, rubidium, and strontium;
- poorer than the lowest recommended ANZECC trigger value but better than the Hunter River water quality for aluminium; and
- poorer than the lowest recommended ANZECC trigger value and the Hunter River water quality for chloride, sodium and sulphate.

It is likely that the elevated sodium and chloride concentrations are the main component of salts generated onsite, discharges of which are controlled by the HRSTS. The ANZECC (2000) water guideline trigger value of 115mg/L for sodium and 175mg/L for chloride applies to irrigation of sensitive crops. A trigger value of 300mg/L for sodium and 400mg/L for chloride applies for recreational use. There are no sodium or chloride trigger values for livestock drinking or ecosystem protection.

The median sulphate levels in the discharge dams exceed the ANZECC (2000) water guideline trigger value for recreational use (400mg/L), and are equal to the ANZECC (2000) water guideline trigger value for livestock drinking use (1,000mg/L).

As controlled discharges occur during high flow events in the Hunter River, significant dilution of discharges is expected. The 'worst case' dilution ratio for MTW discharges to Hunter River flows is 1:5 (400ML/day discharge rate to 2,000ML/day minimum flow required in the Hunter River flow for discharge under HRSTS). In the immediate vicinity of the Loders Creek confluence with the Hunter River, inside a mixing zone, contaminant concentration would be elevated compared to adjacent areas. However, secondary velocity currents induced by the nearby channel bends and turbulence induced by the riparian vegetation would promote mixing of the discharge water with the Hunter River flow. It is therefore likely that complete mixing of the discharge water with the river flow would occur within a few hundred metres of the outlet.

16.4.6 Flooding and stream geomorphology

The potential interactions between the proposed operations and the 100 year ARI design flood event for the Hunter River to the east and Wollombi Brook to the west has been investigated. The results of this examination are presented below.

i Hunter River flooding

A desktop assessment was undertaken to assess flood levels along the Hunter River adjacent to the Site.

Water level data for the Hunter River is available adjacent to the study area at Mason Dieu (Station No. 210128), Long Point (Station No. 210134), Upstream Singleton (Station No. 210129) and Singleton (Station No. 210001) (see Figure 16.1). Of these stations, only gauge levels from Long Point and Singleton can be translated into Australian Height Datum (AHD) levels. The peak levels at these stations and Station No. 210004 and Station No. 210028 on Wollombi Brook are shown in Table 16.5 for the June 2007 flood which is the largest flood event since the 1955 event and the third largest event on record.

Table 16.5 June 2007 peak flood levels

Station Number	River	Station name	Peak water level (m AHD)
210134	Hunter River	Long Point	48.98
210001	Hunter River	Singleton	41.67
210028	Wollombi Brook	Bulga	63.48
210004	Wollombi Brook	Warkworth	56.30

The minimum ground level along the eastern boundary of MTW is approximately 50m AHD, which is about 1m higher than the maximum June 2007 flood level recorded at Long Point, about 5km to the north-east. Therefore, the proposal would not result in any additional flood risk to infrastructure adjacent to the Hunter River.

ii Wollombi Brook flooding

The HEC-RAS steady state hydraulic model was used to estimate the 100 year annual recurrence interval (ARI) design flood levels in Wollombi Brook adjacent to the Site. The model was calibrated to recorded flood levels and discharges for the June 2007 event.

Estimated flood levels for the 100 year ARI design event vary from 59.4m AHD to 65.7m AHD at the villages of Warkworth and Bulga, respectively. Figure 16.4 shows the 100 year ARI design flood extent.

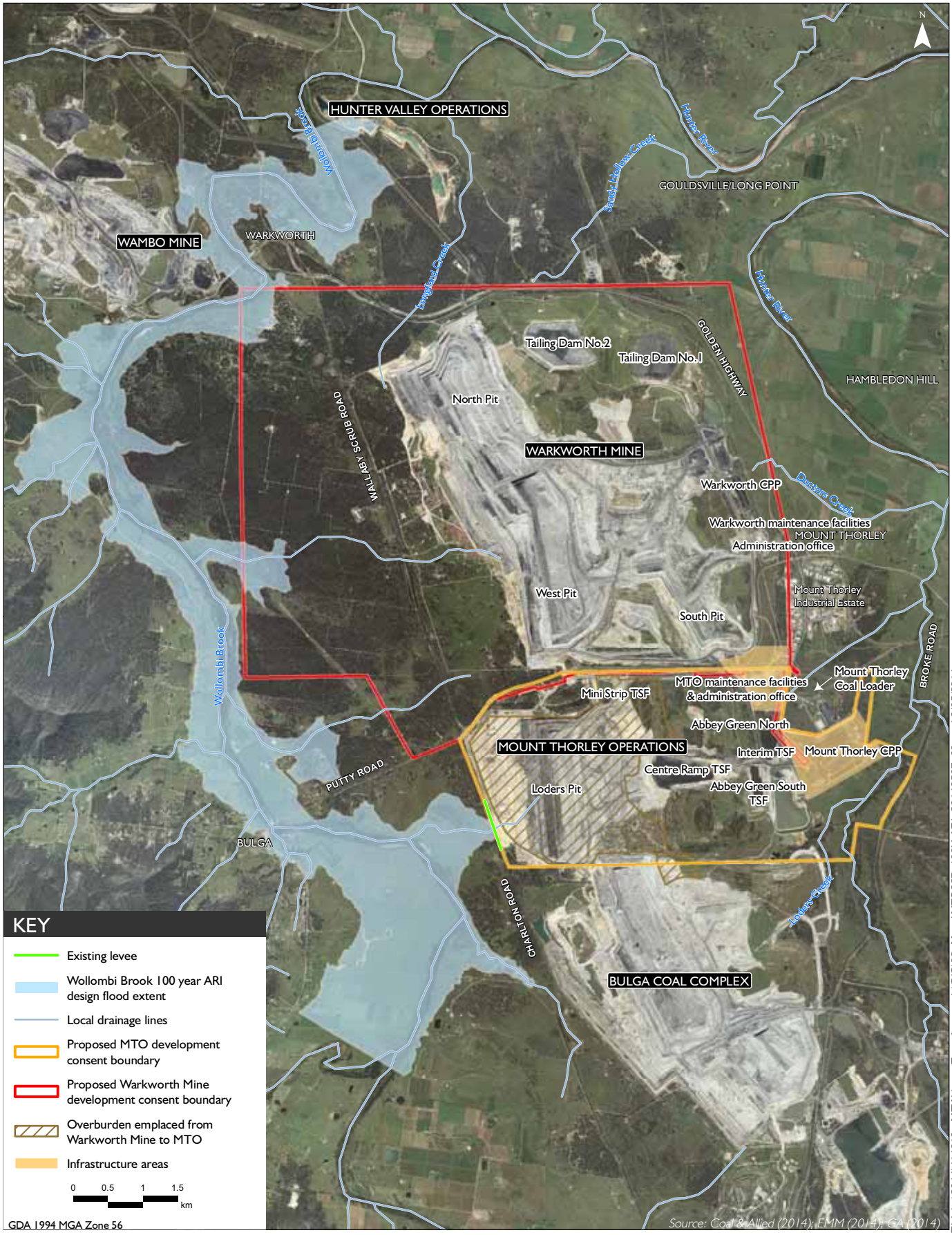
The results of a flood study for Wollombi Brook indicate that the proposal is outside the 100 year ARI flood extent. An existing levee across Salt Pan Creek prevents flood waters from Wollombi Brook entering Loders Pit at MTO. Therefore, the proposal would not impact on flooding behaviour in Wollombi Brook and would not have any measurable effect on the geomorphology of Wollombi Brook.

16.4.7 Water allocations

The proposed MTW WMS has been designed to minimise the capture of clean runoff wherever possible.

Dams solely for the capture, containment and recirculation of mine affected water to prevent the contamination of a water source are excluded works and are exempt from the requirement for water supply works approvals and a Water Access Licence under the WM Act. On this basis, water captured in the site water management structures, is not subject to licensing.

Table 16.6 shows the estimated average volume of water captured within the MTW WMS over the life of the proposal.



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Wollombi Brook 100 year ARI design flood extent

Mount Thorley Operations 2014

Environmental Impact Statement

Figure 16.4

Table 16.6 Surface water allocations

Water type		Surface water		
Water sharing plan		Hunter unregulated and alluvial water sources		Hunter regulated river
Water source		Lower Wollombi Brook	Singleton	Hunter regulated river
Predicted annual take (ML/year)	**Average**	10	73	1,876
	Maximum	18	135	4,410
Predicted annual impact on water source (%)	**Average**	0.1	8	3.3
	Maximum	0.3	14	7.7
MTW current licences		187 units[1]	280 units[1]	1,012 units
Additional water potentially required for the integrated operation (ML/year)	**Average**	0	0	864[2]
	Maximum	0	0	3,398[2]

Notes 1. These values are not Water Access Licenses held by MTW, they have been calculated as harvestable rights.

2. These volumes may be obtained from surplus mine water from nearby mining operations under water sharing agreements.

The total unregulated river access entitlement for the Hunter Unregulated and Alluvial Water Sources is 80,619 units (ML/year). The Site is located on the boundary of the Singleton Water Source and the Lower Wollombi Brook Water Source, which have unregulated river access component shares of 960 units (ML/year) and 6,663 units (ML/year), respectively.

As can be seen in Table 16.6, the predicted average annual impacts of the proposal on the share components for the Singleton Water Source and for the Lower Wollombi Brook Water Source under the Hunter Unregulated and Alluvial Water Sources Water Sharing Plan is 73ML/year and 10ML/year, respectively. These levels represent approximately 8 per cent and 0.1 per cent, respectively.

The total surface water entitlement (general and high security access licences) for the Hunter Regulated River water source is 151,792 units (ML/year). The Site is in Management Zone 2, which has an entitlement of 57,094 units (ML/year). The existing MTW WMS holds approximately 1,012ML/year of high security units of Hunter River water shares under the MTJV Supply Scheme.

Water demands for the operation are reviewed regularly as a requirement of the MTW WMS. In the event that a shortfall for MTW is identified, the operations would be adjusted to ensure that its water requirements are satisfied.

16.5 Management and monitoring

Surface water at MTW is currently managed in accordance with MTW WMP, prepared in consultation with NOW and the EPA. The MTW WMP was developed in accordance with industry best practice with consideration given to the full available range of reasonable and feasible mitigation and their effectiveness, inclusive of contingency plans to manage any residual risks, for implementation at the Site.

The impacts of the proposal on surface water resources would be mitigated through the implementation of the following measures to be documented in a revision of the MTW WMP:

- control the flow and storage of water of different qualities across the Site through the proposed MTW WMS;
- a sediment control plan to reduce sediment loads from disturbed area runoff;

- drainage of the final landform; and
- a surface water monitoring programme to continually assess environmental impacts and ensure that the MTW WMS is meeting its objectives of managing impacts on receiving waters.

An overview of each of these management measures is provided in the following sections.

16.5.1 Water management system

A key objective of the proposed MTW WMS is to minimise the risk of uncontrolled releases from mine site storages. To achieve this objective, operation of the proposed MTW WMS would continue to be based on the following principles:

- diversion of clean surface water runoff away from areas disturbed by mining activities;
- operation of the MTW WMS to ensure no uncontrolled releases of water from the Site;
- collection of potentially sediment-affected runoff in sediment dams for treatment prior to release from Site;
- transfer of groundwater and seepage inflows to the open cut pits to the water system for reuse;
- collection of contaminated water from industrial areas for treatment in an oil and grease separator prior to recycling in the MTW WMS; and
- minimisation of fresh water usage by recycling water from the water system before taking additional water from external sources.

The MTW WMS includes specific triggers for water quality and flow requiring action. These would continue to be in place under the proposal. In addition, an important component of the proposed MTW WMS would be to ensure that contingency measures are in place to accommodate either a surplus or deficit of water onsite.

Appropriate water licences or external source would be obtained to meet the potential shortfall in water during dry conditions. Mine operations would also be planned to ensure that mining can continue during extended wet periods when water may accumulate in the open cut mining areas.

The revised MTW WMP would detail reporting and action procedures to identify any lack of compliance with objectives and a process for implementing corrective actions.

16.5.2 Erosion and sediment control

The design of sediment control measures for the proposal would continue to be based on the principle of ensuring that runoff from disturbed areas is separated from clean area runoff and collected in sediment dams for treatment. Design of proposed erosion and sediment control measures would be based on the recommended design standards in the following guidelines:

- *Managing Urban Stormwater, Soils and Construction – Volume 1 4th edition* (Landcom 2004); and
- *Managing Urban Stormwater, Soils and Construction, Volume 2E Mines and Quarries* (DECC 2008).

16.5.3 Drainage of final landform

The rehabilitated overburden east of mining operations would be drained using the approach currently adopted at MTW which is based on:

- topsoiling and revegetation of the finished landform;
- construction of contour drains across the batter slope to minimise the potential for rilling and gullying of the finished landform;
- collection of inflows from contour drains in rock chutes which flow downslope; and
- flows from rock chutes are directed to sediment basins prior to release from site.

16.5.4 Surface water monitoring programme

The existing MTW surface water monitoring programme is described in Section 16.2.6. The existing surface water monitoring locations and frequencies of the receiving waterways are considered appropriate to identify any changes in water quality associated with the proposal.

The site dam watering monitoring programme would be updated to include additional locations as new dams are constructed with EC, pH and TSS monitored on a monthly basis and a comprehensive analysis undertaken annually.

16.6 Conclusions

The proposed MTW WMS has been developed in conjunction with the mine planning and operational teams to minimise impacts on surface water resources. The proposed MTW WMS is a continuation of the current MTW WMS, and the results of the surface water study indicate that the impacts of the proposal on surface water resources are unlikely to be significantly different to the existing approved operations and would not have a significant impact on surface water quality of the adjacent water features.

Chapter 17

Aboriginal cultural heritage

Chapter 17 — Aboriginal cultural heritage

17 Aboriginal cultural heritage

17.1 Introduction

This chapter provides a summary of the Aboriginal cultural heritage study for the proposal prepared by Central Queensland Cultural Heritage Management Pty Limited, which is presented in full in Appendix K.

The chapter describes the current Aboriginal cultural heritage management systems in place which apply to operations at MTO. Whilst the proposal does not result in additional disturbance, it summarises the significance of Aboriginal cultural heritage items previously identified at MTO, and the management measures which would continue to be implemented to manage Aboriginal cultural heritage values from the proposal.

17.2 Existing environment

17.2.1 Existing operations

As described earlier, MTO was approved for mining in 1996 (DA 34/95). The assessment which accompanied the development application included an Aboriginal cultural heritage assessment, which identified Aboriginal places within the areas to be disturbed and these are managed in accordance with the development consent (see Section 17.2.2).

17.2.2 Aboriginal cultural heritage management

The management of Aboriginal cultural heritage is integrated across MTW. A suite of policies, protocols and processes in the areas of community engagement, heritage management and relationships with Aboriginal communities, have been developed and implemented by Coal & Allied in its approach to Aboriginal cultural heritage management at MTW. Current Aboriginal cultural heritage management consists of:

- implementation of the Cultural Heritage Management System (CHMS);
- ongoing consultation through the CHWG; and
- preparation and implementation of management plans required under relevant development consents.

Further detail on these is provided in the following sections.

i Cultural Heritage Management System

The CHMS is comprised of a series of comprehensive cultural heritage management policies and protocols, or work standards, that apply across all of Rio Tinto Coal Australia's operations, including MTW. The overarching objective of the CHMS is to efficiently manage and mitigate the risks on cultural heritage in order to provide timely and authorised access to land for mining and associated development activities. The CHMS has been developed in accordance with industry best practice to ensure that all activities and ground disturbances associated with mining operations comply with Rio Tinto Coal Australia's internal policies as well as with State and Commonwealth legislation, and other statutory regulations, governing the management of Aboriginal cultural heritage. The CHMS has given consideration to the full available range of reasonable and feasible mitigation and their effectiveness, inclusive of contingency plans to manage any residual risks, for implementation.

ii Cultural Heritage Working Group

Coal & Allied is committed to active, meaningful and transparent engagement with the Aboriginal community as the basis for successful management of cultural heritage issues for all projects and operations. The CHWG was established in September 2005 so that Rio Tinto Coal Australia, Coal & Allied and the Aboriginal community could jointly develop and implement an integrated cultural heritage consultation and management process in the Upper Hunter Valley.

The CHWG is currently comprised of representatives from Coal & Allied, Upper Hunter Valley Aboriginal community groups, corporations and 82 Registered Aboriginal Parties (RAPs) and other stakeholders, including the Wanaruah Local Aboriginal Land Council. The CHWG provides a regular forum for discussions, meeting at least four times a year, and oversees all matters pertaining to cultural heritage associated with Coal & Allied owned and operated lands, projects and operations in the Upper Hunter Valley.

The CHWG regularly reviews the progress and outcomes of Rio Tinto Coal Australia's cultural heritage processes and management programmes, revising and refining elements of the process by consensus. The CHWG is recognised by both DP&E and OEH as an appropriate consultative forum. The procedures adopted in running the CHWG conform to published OEH consultation requirements by way of establishment, composition, and timeframes for consultation.

iii Management plans

The MTO Archaeology and Cultural Heritage Management Plan (ACHMP) sets out the protocols for managing Aboriginal cultural heritage affected by mining activities at MTO. Aboriginal cultural heritage outside the boundary of the development consent is also subject to interim protective management measures developed in consultation with the CHWG and in accordance with the CHMS.

As a result of the approval of Modification 5 in 2012, changes to the development consent required the preparation of a Heritage Management Plan (HMP) for MTO in accordance with Condition 34. A similar condition was included in the Project Approval for the Warkworth Extension 2010 (PA 09_0202, now disapproved) which included the western portions of the MTO mining area. It was agreed between Rio Tinto Coal Australia, the then DP&I (now DP&E), and the CHWG that a single integrated HMP addressing both sets of consent conditions would be developed to cover the entire MTW mining area and adjoining Coal & Allied owned lands. A draft MTW HMP was prepared in consultation with the CHWG prior to approval for the Warkworth Extension 2010 being disapproved but has not yet been implemented.

iv Aboriginal cultural heritage assessment studies

Aboriginal cultural heritage investigations associated with MTO commenced in the early 1980s, with the frequency and types of work undertaken increasing notably from the late 1990s onwards. Since the modification of the development consent in 2002, which contemporised consent conditions, and the subsequent development of the ACHMP, a limited range of Aboriginal cultural heritage investigation and management programmes have been undertaken within the mining leases. These programmes have largely been in response to the expansion of the existing mining operations at AGN. Two detailed Aboriginal cultural heritage surveys of the Site were undertaken for the Warkworth Extension 2010 (Central Queensland Cultural Heritage Management 2010) and the Ramp 22 Sedimentation Dam Study (RPS 2013). A further two studies were undertaken within MTO's mining lease, outside of the Site, by Scarp Archaeology (2009 and 2011).

Additional cultural heritage surveys are currently being undertaken in the south-eastern portion of the Site to refresh the knowledge of Aboriginal cultural heritage in this currently undeveloped portion of the MTO lease. All Aboriginal cultural heritage investigations were undertaken in consultation with the active participation of Aboriginal community members and, from 2005, under the auspices of the CHWG.

The locations of Aboriginal cultural heritage areas or objects identified as a result of these studies are shown in Figure 17.1 and discussed in Section 17.3.3. These have been registered on the Aboriginal Heritage Information Management System (AHIMS) maintained by OEH, as well as included into the MTW Cultural Heritage Management Database (CHMD) established by Coal & Allied. The information held within the CHMD is regularly updated as a result of ongoing site inspections, monitoring, and implementation of agreed management measures. The CHMD is a key element within the preparation and operation of management plans and associated management arrangements.

17.3 Impact assessment

17.3.1 Methodology

Aboriginal cultural heritage assessments are required to be prepared in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (ACHCRP, OEH 2010). Extensive consultation has been undertaken for activities at MTW as well as specifically for the proposal. Consultation has occurred through the CHWG and the relevant requirements of the ACHCRP or the former *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation Guidelines* (DEC 2005a).

As the proposal does not include any additional disturbance to that currently approved, the impact assessment was made with regard to MTO's existing development consent granted in 1996 for mining and associated activities. Under the development consent, all impact areas have been assigned management measures, and a systematic reassessment survey across the undeveloped south eastern portions of MTO commenced in mid-2013. As a result, the reassessment was made with the understanding that no further impacts to known Aboriginal heritage would occur because the proposal is within the existing limits of disturbance.

The Aboriginal cultural heritage assessment has relied on the findings of previous studies undertaken at MTW including surveys of the Site. The OEH generally requires that data used in preparing impact assessments, management plans and strategies should be derived from surveys undertaken no more than five years prior. However, the studies previously undertaken for the Site are considered to be more than adequate for the purpose of informing this impact assessment as they were undertaken using a systematic and comprehensive strategy consistent with current best practice. Further, additional studies have not identified a fundamental change in the scale or nature of the issues requiring management, and the technology used for site recording remains state-of-the-art. There have not been any significant changes in landform condition due to land use, erosion or sedimentation that would have significantly altered the patterns of distribution, site form or condition identified. In addition, all activities under the proposal would be within the existing limits of disturbance.

17.3.2 Consultation

Although the proposal does not include additional disturbance, given the integration of heritage management across MTW and beyond, consultation for Warkworth Mine also focussed discussions on MTO. This consultation has included:

- an extensive Aboriginal community consultation process undertaken as part of the Aboriginal Cultural Heritage Assessment for the Warkworth Extension 2010 (Central Queensland Cultural Heritage Management 2010);
- Aboriginal community consultation undertaken as part of the fulfilment of the conditions of the now disapproved Warkworth Extension 2010(PA 09_0202);
- community consultation undertaken recently as part of the Bulga Ramp 22 Sedimentation Dam project, and subsequent approval of an Aboriginal Heritage Impact Permit for this area by OEH in April 2014; and
- consultation specific to the proposal undertaken at CHWG meetings held on 3 April and 7 May 2014. An inspection of the Site and Loders Creek ACHCA by the RAPs was undertaken on 29 April. Copies of the draft Aboriginal cultural heritage assessment (Appendix K) were provided to the RAPs for their feedback the week of 19 May 2014.

Overall, since 2008 there have been 30 Aboriginal community consultation meetings conducted under the auspices of the CHWG with regard to the Warkworth Extension 2010 and/or the HMP. Matters pertaining to the identification, significance assessment and management of Aboriginal cultural heritage associated with the Site have been discussed at a number of these meetings.

A number of specific matters regarding the proposal were raised by the RAPs and stakeholders which have been considered and addressed within the proposed management measures detailed in Section 17.4. These include:

- the confirmation of the cultural importance of the remaining undeveloped areas around Loders Creek and the desirability of it being included within an Aboriginal cultural heritage conservation area (ACHCA);
- a desire to incorporate the pre-mining landscape topography into post-mining final landform design for the Site; and

- a desire to establish an access corridor, within the MTO mining lease, along Wollombi Brook to provide connectivity between the southern end of the proposed Wollombi Brook Aboriginal Cultural Heritage Conservation Area (WBACHCA), associated with the Warkworth Continuation 2014, and the ACHCA established for the adjacent Bulga Coal Complex mining operation.

In addition, the overall outcomes of the above consultation were that, while the RAPs and stakeholders would prefer that no additional disturbance to Aboriginal cultural heritage occur as a general principle, the proposed management measures (summarised in Section 17.4) are acceptable for managing Aboriginal cultural heritage impacts at MTW. To date, Coal & Allied has not received correspondence from any CHWG participants that is inconsistent with this.

17.3.3 Results

A considerable number of places containing Aboriginal cultural heritage have been identified and recorded at MTW and in adjacent Coal & Allied owned lands. Those relevant to MTO and the proposal are shown in Figure 17.1. For the purposes of this EIS, the places have been identified within two broad groupings based upon their location, as follows:

- places within the Site; and
- places within the proposed Loders Creek ACHCA.

Each of the categories is considered below. It should be noted that the discussions below do not specifically include those Aboriginal cultural heritage places which have been identified and recorded within the Warkworth Continuation 2014 Site.

i The Site

A total of 103 places containing Aboriginal cultural heritage objects have been identified and recorded within the Site as shown in Figure 17.1 and summarised in Table 17.1. Of these, 55 have previously been destroyed under consents granted under the NP&W Act. The 48 extant places (including one partially destroyed place 37-6-2717; AG-PAD-1) primarily consist of stone artefacts although areas of potential archaeological deposit (PAD) have also been identified.

Table 17.1 Aboriginal cultural heritage places located within the Site

Place Type	Number	%
Stone artefact(s)	98	95.2
Stone artefact/PAD	2	1.9
PAD	3	2.9
Total	**103**	

The Site has been extensively mined and, in places, substantially rehabilitated. The remaining extant Aboriginal cultural heritage places are predominantly across the south-eastern corner of the Site. The only exception to this is the partially destroyed PAD (37-6-2717; AG-PAD-1) in the north-east. The extant Aboriginal cultural heritage places identified within the Site would not be disturbed under the proposal.

Coal & Allied is committed to completing the systematic and comprehensive reassessment of the south-eastern corner of the Site which commenced in mid-2013. All extant Aboriginal cultural heritage would continue to be managed consistent with the provisions of the current ACHMP. Impact management measures for these places are outlined in Section 17.4.2.

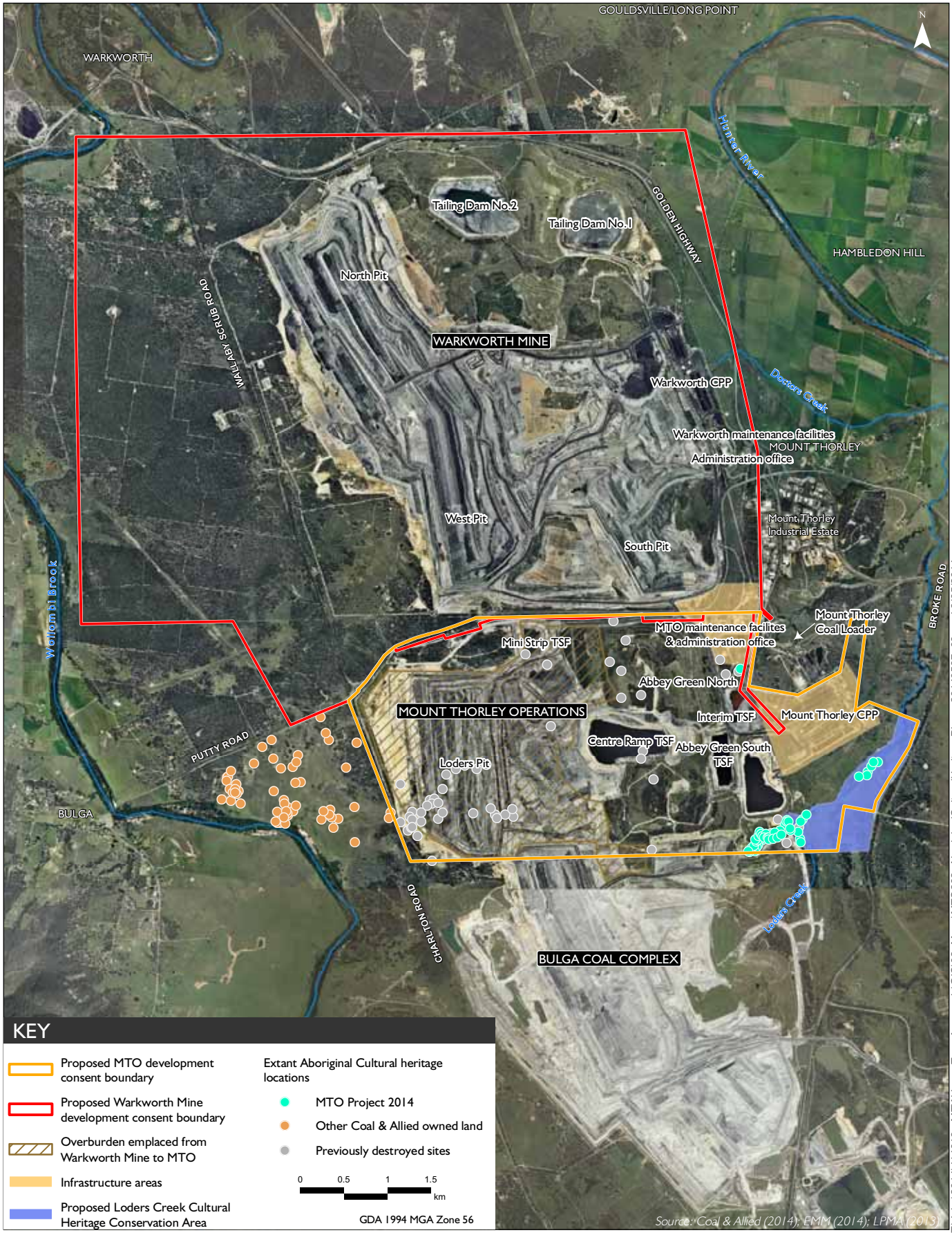
ii Loders Creek Aboriginal Cultural Heritage Conservation Area

The proposed Loders Creek ACHCA has been developed on the basis of discussions at previous CHWG meetings, where the RAPs confirmed the cultural importance of the remnant undeveloped areas along Loders Creek and the appropriateness of permanently protecting this area as an ACHCA. This area is proposed to be conserved irrespective of no predicted impacts of the proposal on Aboriginal cultural heritage.

The vast majority of the proposed Loders Creek ACHCA lies within the remaining undeveloped south-eastern portion of the Site and includes a small section in the far south-eastern corner that is managed by Coal & Allied and partly covered by any mining tenement (see Figure 17.1). The proposed ACHCA covers approximately 87ha, of which 70.6ha lies within the Site. The ACHCA represents the remaining remnant riparian landscape within the Site. The Loders Creek ACHCA is located adjacent to Glencores' Bulga Surface Operations mine and Coal & Allied has consulted with Bulga Surface Operations about the proposed conservation area.

Whilst being the subject of previous Aboriginal cultural heritage investigations, Coal & Allied is conducting a reassessment of this area to refresh the currency and comprehensiveness of its understanding of the Aboriginal cultural heritage of this area. These commenced in mid-2013, with those surveys completed focussing on the undeveloped portions of the Site immediately to the west of the proposed Loders Creek ACHCA. While these did extend into the very westernmost portion of this area, the reassessment surveys of the vast majority of the proposed Loders Creek ACHCA remain to be completed. All Aboriginal cultural heritage, both extant and as may be identified and recorded during the completion of the reassessment surveys, would continue to be managed consistent with the provisions of the current ACHMP.

Places within this area are also within the overall Site discussed above. A total of 19 Aboriginal cultural heritage places have been identified and recorded within the Loders Creek ACHCA (see Figure 17.1). One of these places (37-6-0657 – B47) has previously been destroyed under a consent granted under the NP&W Act. The remaining 18 extant places are almost exclusively dominated by places containing stone artefacts, although one PAD has also been identified. When originally identified and recorded, this PAD was not associated with any surface Aboriginal cultural heritage objects. Impact management measures for these places are outlined in Section 17.4.3.



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Managed by Rio Tinto Coal Australia

Aboriginal cultural heritage places

Mount Thorley Operations 2014

Environmental Impact Statement

Figure 17.1

17.3.4 Potential impacts

The proposal would not result in any disturbance beyond currently approved limits. Therefore, the proposal would not explicitly impact on Aboriginal cultural heritage.

i Significance assessment

The significance of extant cultural heritage within the Site is provided below.

As shown above, there is substantial Aboriginal cultural heritage present within the MTW mining leases. For the Aboriginal people of the Upper Hunter Valley such places are of cultural significance. There are two distinct categories of cultural place that attract Aboriginal cultural significance:

- places of cultural significance through their association with creator beings, spirit beings, culture heroes, traditional activities, historical events or contemporary values where there may not be any physical material – sometimes referred to as intangible cultural heritage although very tangible to enculturated Aboriginal people; and

- places where there is material cultural heritage (either organic or inorganic) that derives from cultural activities of Aboriginal people, commonly called archaeological material and constitutes the objects protected under the NP&W Act.

Only the latter category of place (ie material cultural heritage) has been identified within the Site. The extant Aboriginal cultural heritage places identified within the Site would not be disturbed under the proposal and none are the subject of any specific requirements to address issues of cultural sensitivity. Further, it is considered that there are no Aboriginal cultural heritage places with scientific values that constitute a constraint on the proposal.

ii Scientific significance

The great majority of Aboriginal cultural heritage places identified within the MTW mining leases are typical of the regional archaeology of the Upper Hunter Valley. The places are concentrated along drainage lines with a particular focus around permanent sources of water. These areas also have generally been subjected to a long history of disturbance through a range of land uses including vegetation removal, grazing, farming and the development of formal and informal access tracks.

In general, the majority of the Aboriginal cultural heritage places which have so far been identified and recorded are unlikely to yield significant additional information with regard to patterns of land and resource use either locally or regionally. Further, it is difficult to date the majority of these cultural heritage places, given sample sizes both within individual places and across place types, together with factors (such as landuse) that affect the preservation of objects and sites over time and, therefore, affect their scientific value. As such, further archaeological research into the majority of the identified Aboriginal cultural heritage places is not considered warranted from a scientific viewpoint.

Despite this, recommendations for each identified and recorded Aboriginal cultural heritage place identified have been subject to review by Coal & Allied and the Aboriginal community (through of the CHWG), and reporting finalised consistent with comments received from those parties. The decisions of the CHWG and Rio Tinto Coal Australia, informed by the recommendations, have been accepted by OEH and the ACHMP developed to capture those decisions, with each recorded place managed in a manner consistent with the scientific significance assessment. The only situation in which scientific assessments of significance have not been accepted in their entirety has been where such assessments impose a lesser management requirement than those specified in the ACHMP, which set a minimum standard for compliance with Aboriginal cultural significance.

The remaining extant Aboriginal cultural heritage places within the Site consist of both isolated stone artefact(s) and more extended concentrations of stone artefacts. These are almost exclusively located along the margins of Loders Creek. The potential for PADs also exists along this creek both in conjunction with surface cultural material and separately. A considerable portion of the remaining undeveloped portions of this creekline is proposed to be conserved within the Loders Creek ACHCA. The remnants of a previously identified and partially destroyed PAD are also further to the north.

Notwithstanding any statement of scientific significance relating to any particular site, Rio Tinto Coal Australia has committed to providing for the management of all cultural heritage objects and areas identified during surveys through the ACHMP.

iii Significance to the Aboriginal community

In general, the cultural heritage places for which the Aboriginal community has shown the strongest concerns are also those that have been identified as having a higher scientific significance. There are a number of such places identified as such within the MTW mining leases which have been identified on that basis and these were outlined above. However, the potential for items of higher significance only exist where there are extant or potential Aboriginal sites, namely along the margins of Loders Creek where impacts would not occur.

Through discussions with RAPs, the cultural importance of the remnant undeveloped areas along Loders Creek was identified and a proposal to protect in the long-term this area as an ACHCA was supported. The key ongoing objective in the development of the Loders Creek ACHA would be to establish a co-management regime in partnership with the Aboriginal community through the development of a comprehensive and well considered management strategy supported by an appropriate community-based governance structure.

17.4 Management and monitoring

The proposal would not result in any disturbance beyond currently approved limits and would not explicitly impact on Aboriginal cultural heritage. Irrespective of this, additional studies and consultation have been undertaken for the broader MTW area and have included contemporising previous investigations and management strategies for MTO.

The Aboriginal cultural heritage impact management measures which have been developed for the collective management of Aboriginal cultural heritage impacts across MTO fall into a series of categories as follows:

- the finalisation of the MTW HMP;
- management of Aboriginal cultural heritage within the Site; and

- management of Aboriginal cultural heritage within the Loders Creek ACHCA.

The proposed management measures within each of these areas are outlined separately below. The measures would be an extension of existing management arrangements and processes developed in consultation with the CHWG.

17.4.1 Integrated Heritage Management Plan

As noted previously, considerable work had been done developing an integrated HMP for MTW. A completed consultation draft which documented existing agreed principles, protocols and processes for Aboriginal cultural heritage management has been provided to the RAPs and stakeholders. Should both the proposal and the Warkworth Continuation 2014 be approved, the MTW HMP would be finalised and implemented.

17.4.2 Onsite management and monitoring

A total of 48 extant places (or remnant portions thereof) containing Aboriginal cultural heritage are located within the Site. Specific mitigation related to the management of these Aboriginal cultural heritage places include:

- completing the reassessment surveys of the remaining undisturbed portion of the Site to the south-east of Loders Creek with a view to finalising the area to be included in the proposed Loders Creek ACHCA;

- continuing to manage all Aboriginal cultural heritage within the area (both as currently known and as may be identified from the completion of the reassessment surveys) in accordance with the provisions of the CHMS and the ACHMP (or HMP);

- appropriate buffering and barricading of places assessed as vulnerable to unintended harm, owing to the proximity of roads or tracks or other operational infrastructure in accordance with existing protection procedures and protocols as outlined within the provisions of the CHMS and the ACHMP (or HMP); and

- monitoring of all Aboriginal cultural heritage places within these areas in accordance with such procedures and protocols as outlined within the provisions of the CHMS and the ACHMP (or HMP).

17.4.3 Loders Creek Aboriginal Cultural Heritage Conservation Area

Coal & Allied is committed to the establishment of the Loders Creek ACHCA as follows:

- the Loders Creek ACHCA would be established for the long-term conservation and management of Aboriginal cultural heritage places and values. In particular, it would provide for the protective management and cultural maintenance of the remaining undisturbed portion of Loders Creek within the Site;

- the Loders Creek ACHCA would be protected permanently from future mining, exploration drilling and associated development disturbance;

- the Loders Creek ACHCA would be managed in accordance with a specific management plan developed in consultation with the CHWG and other stakeholders including DP&E and OEH. This plan would include the following matters:

- the establishment of strictly controlled non-access zones and protocols around culturally sensitive areas as determined in consultation with the CHWG;

- the establishment of areas for use by the Aboriginal community for cultural and community purposes;

- the establishment of areas for active Aboriginal cultural heritage and landscape management, including vegetation rehabilitation;

- the processes and protocols by which ongoing Aboriginal community access to the Loders Creek ACHCA can be facilitated; and

- the plan would be integrated with the MTW HMP;

- the Aboriginal community, through a Coal & Allied ACHCA management committee, would oversee the implementation of the management plan; and

- Coal & Allied would continue to ensure an active Aboriginal community role in both Aboriginal cultural heritage and environmental management activities for the Loders Creek ACHCA.

17.5 Conclusions

The proposal would not result in any disturbance beyond currently approved limits. Therefore, the proposal would not explicitly impact on Aboriginal cultural heritage. Irrespective of this, additional studies and consultation have been undertaken for the broader MTW area and have included contemporising previous investigations and management strategies for MTO.

Extensive studies and community consultation have been undertaken previously in relation to the identification and management of Aboriginal cultural heritage within the MTW mining leases. In 2005, Rio Tinto Coal Australia established the CHWG to integrate consultation and management for its operations in the Upper Hunter Valley. Aboriginal cultural heritage places identified within the MTW mining leases are currently managed under the auspices of the CHWG and the ACHMP.

A considerable number of places containing Aboriginal cultural heritage have been identified and recorded at MTW and in adjacent Coal & Allied owned lands. A total of 48 extant places, primarily consisting of stone artefacts, have been identified within the Site and a number of management measures are proposed for these places. In addition, Aboriginal cultural heritage at MTO would continue to be managed under the auspices of the CHWG and the ACHMP (or HMP). In particular, the Loders Creek ACHCA would be established for the long-term conservation and management of Aboriginal cultural heritage places and values.

Chapter 18

Historic heritage

Chapter 18 — Historic heritage

18 Historic heritage

18.1 Introduction

The chapter describes the existing historic heritage items and places within the Site and surrounds, the impacts of the proposal on these items and places, and proposed mitigation measures.

18.2 Existing environment

18.2.1 Historical context

The earliest European presence in the Hunter region dates back to the 1790s, when coal was discovered by a party of escaped convicts. The resource was exploited at a low level and shipped to Sydney, but difficult terrain hampered attempts to explore the region (Weir Phillips 2012). More in-depth survey of the coastlines east and north of the Hunter region were undertaken by John Oxley in 1818, and the following year the countryside was explored by John Howe, Chief Constable of Windsor (ERM 2002a; Weir Phillips 2012). Government plans for the establishment of free settlements in the Hunter Region followed, and soon after towns became established around the higher population areas, such as Jerry's Plains in the 1830s and Bulga in the 1840s.

Plans for the construction of the Great North Road were developed in the early 1820s to accommodate the influx of settlers moving into the Hunter Valley. Between 1829 and 1830 the road was extended by convict gangs from Wollombi to Broke, and branch lines to Patrick's Plains (Whittingham/Singleton) and Cockfighter's Creek (Warkworth) were added (Nexus Archaeology and Heritage 2006; Bill Jordan and Associates 2006; Karskens 1982).

The land became used for a variety of purposes, with pastoral grazing and wheat growing being the primary industries. At Warkworth, originally known as Cockfighter's Creek, the land remained primarily used for grazing and little development occurred, apart from a few hotels constructed along the road alignment in the 1840s for people travelling between the Hunter Valley and Sydney (RPS 2012).

From the early 1900s until World War II, dairying was the primary industry in the Hunter Valley (RPS 2012). In the lands around Bulga and Warkworth, lucerne growing was popular and to a lesser extent viticulture supported by timber felling, fruit production and grazing.

In 1942, during World War II, a Royal Australian Air Force (RAAF) base with a landing strip was established in Warkworth as a satellite to its parent base in Bulga. The base included hideouts to conceal bomber aircraft and a number of buildings including mess facilities and ablutions blocks, and petrol storage tanks. As the threat of attack dissolved with end of the war, the base was eventually decommissioned and the majority of assets were auctioned and removed by 1949.

Acquisition of coal mining leases in the Hunter began in the 1970s to 1980s.

18.2.2 Methodology

The historic heritage study was prepared in accordance with the Heritage Act and the Australia ICOMOS Charter for Places of Cultural Significance (the Burra Charter). It included:

- a five day field survey of the study area and surrounds;
- a search of relevant statutory and non-statutory heritage registers;
- a review of existing historic heritage studies undertaken within and adjacent to the study area;
- contextual background research including a review of primary and secondary archival records; and
- consultation with the Cultural Heritage Advisory Committee (CHAC).

18.2.3 Existing historic heritage

The heritage register search found no registered heritage items or places within the study area. Seven registered heritage items and places are within a 7.5 km radius of the study area as described in Table 18.1 and shown in Figure 18.1.

Table 18.1 Registered heritage items and places

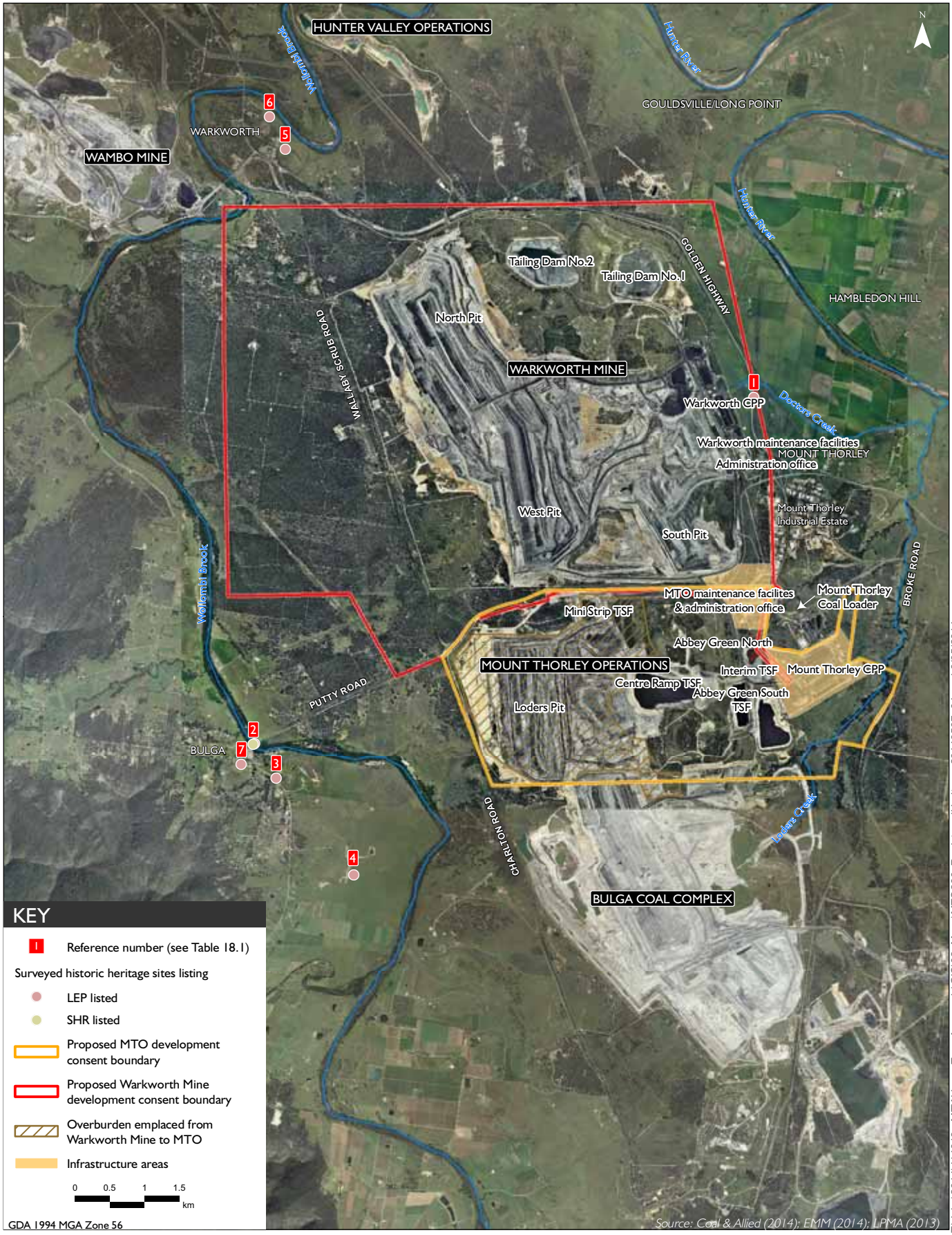
Location on Figure 18.1	Register ID	Name	Location	Distance from centre of study area (km)
1	LEP#I40	Brick Farm House	Golden Highway, Mount Thorley	4.5
2	LEP#I8; SHR 01459	Bulga Bridge	213 Main Road, Bulga	6
3	LEP#I10; TNSW#R1330	Mount Leonard Public School	2099 Putty Road, Bulga	6.5
4	LEP#I9; NTNSW#R1331	Mount Leonard	2201 Putty Road Bulga	7
5	LEP#I143;NTNSW#R5782	St Phillips Church	Off High Road, Warkworth	7
6	LEP#A6	Former Queen Victoria Inn Ruins	Jerrys Plains Road	7
7	LEP#I11	War Memorial Gates	19 The Inlet Road, Bulga	7.5

Notes: LEP = Singleton LEP 2013, NTNSW = National Trust of New South Wales, and SHR = State Heritage Register.

Additional historic heritage features (ie not registered) within the study area and surrounds were identified during the review of existing studies, contextual background research, and the field survey. Three non-registered historic heritage features are either within or on the boundary of the study area, namely:

- MTW-045, Kangaroo Downs Cattle Run – adjacent to Loders Creek, off Broke Road;
- MTW-046, Kangaroo Downs Bridge Remains – adjacent to Loders Creek, off Broke Road; and
- GNR-016, Cattle Run and Yards – on a 2.5 m embankment on the western side of Charlton Road.

These are on land that would not be disturbed under the proposal. Further, Kangaroo Downs Cattle Run and Bridge Remains, are within the proposed Loders Creek ACHCA which is to be conserved in the long-term due to its cultural heritage significance.



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Registered heritage places
Mount Thorley Operations 2014
Environmental Impact Statement
Figure 18.1

18.3 Impact assessment

All activities, including coal extraction, would be within disturbance areas approved under the development consent. Therefore, none of the historically significant heritage items and places identified in Section 18.2 would be impacted by the proposal.

18.4 Management and monitoring

The proposal is not anticipated to impact any registered, or non-registered, historic heritage items or places. Therefore, no mitigation measures specific to the proposal are warranted.

In the unlikely event that sites of potential historic heritage value are encountered or uncovered unexpectedly during operation, a Chance Finds Procedure would be implemented to assist in the process for identifying and reporting such places.

18.5 Conclusions

A historic heritage study for the proposal did not identify any registered heritage items within the study area. Three non-registered historic heritage items or places were identified within or on the boundary of the study area. Two of the items, Kangaroo Downs Cattle Run and Bridge Remains, are within the proposed Loders Creek ACHCA which is to be conserved in the long-term due to its cultural heritage significance. None of these items or places would be impacted by the proposal.

Chapter 19

Traffic and transport

Chapter 19 — Traffic and transport

19 Traffic and transport

19.1 Introduction

This chapter provides a summary of the traffic and transport study prepared by EMM, which is presented in full in Appendix L.

The chapter describes the existing transport network and summarises the impacts of the predicted traffic generation of the proposal on the capacity and performance roads, intersection and rail line capacity.

The MTO and Warkworth Mine workforces and coal transport are integrated across MTW. Therefore, the study considered the traffic and transport impacts due to the subject proposal and the Warkworth Continuation 2014. The structure of the study is based on the *Guide to Traffic Generating Development* (RTA 2002), which is the standard template for the preparation of traffic impact studies for major projects in NSW.

19.2 Existing environment

19.2.1 Local road network and site access

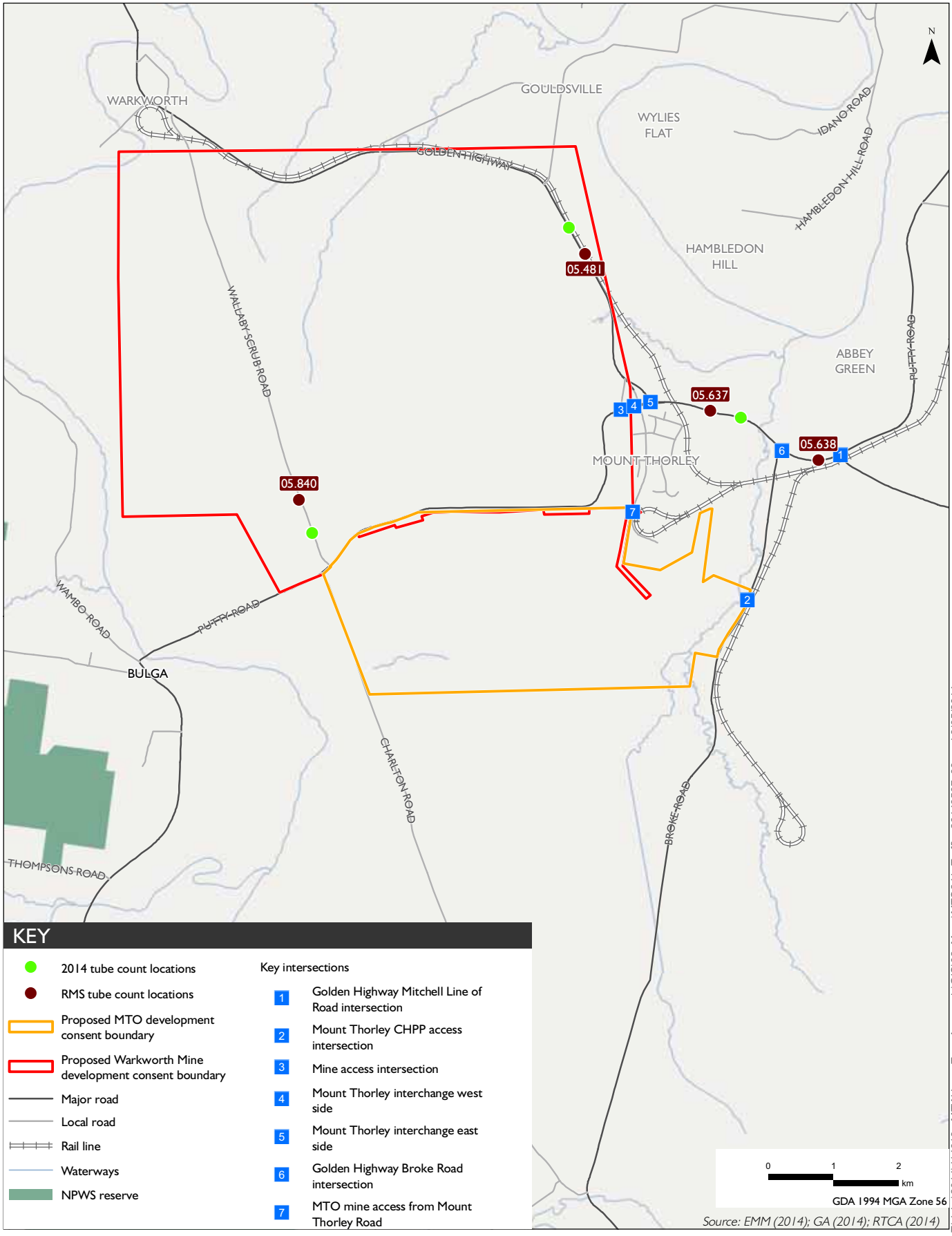
The assessment considered impacts on the regional and local road network, including the Golden Highway, Putty Road, Wallaby Scrub Road, Charlton Road and Broke Road. The road network in the vicinity of the Site is shown in Figure 19.1.

The Golden Highway, east of Mount Thorley, is the primary route for most MTW generated traffic. Approximately 80 per cent of the existing MTW workforce resides in the east and travels via the Golden Highway and Putty Road or Mitchell Line of Road routes which connect to Singleton and other Hunter Valley townships. The remainder of the existing MTW workforce travels from either the west via Putty Road, the north via the Golden Highway, or the south via Broke Road with proportions of approximately 7 per cent, 8 per cent and 5 per cent, respectively.

The main vehicular access to the mine facilities are via three intersections, namely:

- Warkworth Mine access/Putty Road, at Lydes Lane, approximately 200m west of the Mount Thorley Interchange (west side);
- MTO CPP access/Broke Road, approximately 2km south of the Golden Highway; and
- MTO access/Mount Thorley Road, at the southern end, near the location of the MTCL rail loop.

These intersections are shown in Figure 19.1 as Intersections 3, 2 and 7, respectively.



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Local road network and survey locations

Mount Thorley Operations 2014
Environmental Impact Statement

Figure 19.1

19.2.2 Current traffic volumes

i Daily traffic volumes

Daily traffic volume surveys for the study were undertaken by EMM in March 2014 at the locations shown in Figure 19.1. Other daily traffic volume surveys include Roads and Traffic Authority (RTA), now RMS, surveys between the years 1980 and 2004 and recent surveys undertaken in 2009 for the Warkworth Extension 2010 (Parsons Brinkerhoff 2010) and in 2011 for the Bulga Optimisation Project (ARC 2013).

The historic growth trends and future growth projections for the daily traffic volumes on the local road network to the year 2017 have been determined from these surveys, as summarised in Table 19.1.

It is noted that the Hunter Expressway was opened on 22 March 2014. Over time, the Expressway will likely generate changes to regional traffic patterns. Though these cannot be definitively quantified at this time, it is noted that the Expressway provides a more direct, faster and safer option than has existed to this point, to link the Upper Hunter and the M1 Motorway, and that this option will be available to drivers currently using Wallaby Scrub Road and Charlton Road.

ii Peak hour traffic volumes

Peak hour intersection traffic counts were undertaken by EMM on Tuesday 4 March 2014 at three intersections:

- Golden Highway/Mitchell Line of Road (Intersection 1 on Figure 19.1);
- MTO CPP access/Broke Road (Intersection 2 on Figure 19.1); and
- Warkworth Mine access/Putty Road (Intersection 3 on Figure 19.1).

The results of the intersection traffic counts, including peak hourly traffic volumes and the proportions of heavy vehicles, are summarised in Tables 19.2 to 19.4 for the three intersections surveyed.

Table 19.1 Summary of base daily traffic volumes from surveys on the regional road network

RTA-RMS location ref[1]	Route and nearest cross street	Year 1984	Year 1998	Year 2001	Year 2002	Year 2004	Year 2009	Year 2011	Year 2014	Per cent annual traffic growth between the 1984 or 1998 and 2004 RTA surveys	Future trend volume in Year 2017[2]
05.481	Golden Highway (north of Putty Road at Mount Thorley)	4,200	6,256	7,059	-	5,572	-	-	3,314	-	3,512[3]
05.637	Golden Highway (between Broke Road and Mount Thorley)	5,180	-	-	-	-	-	-	8,346	+1.2%	8,847
05.638	Golden Highway (between Broke Road and Mitchell Line of Road)	5,160	7,164	7,966	-	8,143	-	9,355	9,860[4]	+1.7%	10,452
05.840	Wallaby Scrub Road (between Golden Highway and Putty Road	-	-	-	660	-	777	-	875	+2.0%	928

Note: 1. RTA-RMS locations shown in Figure 19.1.

2. The traffic growth projection is calculated from the current base year 2014 to the year 2017, using a linear traffic growth projection at +2 per cent annually (the highest rate observed from the traffic surveys in previous years).

3. The +2 per cent per annum future traffic growth projection is still assumed to apply to this route despite negative actual growth in recent years (since 2001).

4. The year 2014 daily traffic volume has been estimated from comparison of the Golden Highway peak hourly traffic flows east and west of the Broke Road intersection.

Sources: RMS, PB (2010), ARC (2013) and EMM (2014).

Table 19.2 Summary of peak hourly traffic at Golden Highway/Mitchell Line of Road intersection

Road	Direction	Morning peak hour			Afternoon peak hour		
		All traffic	Heavy vehicles	Percentage heavy*	All traffic	Heavy vehicles	Percentage heavy*
Mitchell Line of Road (south of Golden Highway)	N'bound	537	28	5%	73	14	8%
	S'bound	172	10		338	20	
Golden Highway (west of Mitchell Line of Road)	E'bound	328	17	5%	704	31	7%
	W'bound	944	42		212	32	
Golden Highway (east of Mitchell Line of Road)	E'bound	172	7	4%	384	11	5%
	W'bound	423	14		157	18	

*Note: * Percentage heavy vehicle traffic is the average proportion based on the traffic flow in both directions.*

Table 19.3 Summary of peak hourly traffic at MTO CPP access/Broke Road intersection

Road	Direction	Morning peak hour			Afternoon peak hour		
		All traffic	Heavy vehicles	Percentage heavy*	All traffic	Heavy vehicles	Percentage heavy*
MTO CPP access (west of Broke Road)	E'bound	2	0	0%	22	0	0%
	W'bound	12	0		0	0	
Broke Road (south of MTO CPP access)	N'bound	123	5	4%	140	5	5%
	S'bound	246	11		100	6	
Broke Road (north of MTO CPP access)	N'bound	123	5	4%	159	5	4%
	S'bound	256	11		97	6	

*Note: * Percentage heavy vehicle traffic is the average proportion based on the traffic flow in both directions.*

Table 19.4 Summary of peak hourly traffic at Warkworth Mine access/Putty Road intersection

Road	Direction	Morning peak hour			Afternoon peak hour		
		All traffic	Heavy vehicles	Percentage heavy*	All traffic	Heavy vehicles	Percentage heavy*
Warkworth Mine access (north of Putty Road)	N'bound	101	4	2%	8	0	4%
	S'bound	111	0		73	3	
Putty Road (west of Warkworth Mine access)	E'bound	38	2	4%	31	1	8%
	W'bound	12	0		48	5	
Putty Road (east of Warkworth Mine access)	E'bound	139	1	2%	102	4	6%
	W'bound	103	3		54	5	

*Note: * Percentage heavy vehicle traffic is the average proportion based on the traffic flow in both directions.*

19.2.3 Intersection performance

The performance of a road network is generally reflected in the performance of key intersections. The Signalised (and Unsignalised) Intersection Design Research Aid (SIDRA) traffic analysis programme was used to assess the existing and future traffic capacity at the following intersections with the potential to be impacted by the proposal:

- Warkworth Mine access/ Putty Road;
- MTO CPP access /Broke Road;
- Golden Highway/Broke Road; and
- Golden Highway/Mitchell Line of Road.

The peak hour traffic performance of intersections is quantified in terms of 'level of service' and 'degree of saturation'. Level of service is an index of the operation of traffic at an intersection and is based on the average delay per vehicle. The current RMS intersection operation standards for level of service are summarised in Table 19.5.

Table 19.5 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).

Degree of saturation provides an overall measure of the capability of the intersection to accommodate the traffic levels. A degree of saturation of 1.0 indicates that an intersection is operating at capacity. 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.

The SIDRA analysis results for the current intersection performance during the morning and afternoon peak hour periods are summarised in Table 19.6.

Table 19.6 Peak hour SIDRA performance at key intersections (including current mine traffic)

Intersection	Peak hour period	Degree of saturation	Average delay (seconds/vehicle)	Level of service
Golden Highway/Mitchell Line of Road	Morning	0.700	20.6	B
	Afternoon	0.270	19.0	B
Golden Highway/Broke Road*	Morning	0.386	31.6	C
	Afternoon	0.369	16.5	B
MTO CPP access/Broke Road	Morning	0.138	12.5	A
	Afternoon	0.074	12.5	A
Warkworth Mine access/Putty Road	Morning	0.093	12.9	A
	Afternoon	0.063	13.0	A

Note ** The current peak hour intersection traffic volumes have been determined from volumes at the two adjoining intersections.*

The intersections assessed are currently operating at acceptable conditions, with minimal traffic delays at most locations. The Golden Highway/Broke Road intersection is operating at satisfactory conditions (level of service C) during the morning peak hour. The highest degree of saturation occurs at the Golden Highway/Mitchell Line of Road intersection and is associated with the westbound left turn movement from Mitchell Line of Road during the morning peak hour. At the Golden Highway/Broke Road intersection, although the degree of saturation is lower, the right turn traffic delays are higher at over 30 seconds per vehicle.

19.2.4 Mine traffic generation

i Car and other light vehicle traffic

The workforce at MTW is approximately 1,300 persons of whom about 25 per cent are office/business employees, 65 per cent are day or night shift operations workforce and 10 per cent are contractors.

The majority of the workforce is based at Warkworth Mine where 80 per cent of the combined mining workforce facilities and car parking activity is located. Workforce numbers are greatest during the daytime when day shift and office/business staff are present.

The combined maximum number of employees and contractors travelling to and from work at MTW on any given day (or 24 hour period) is 878 persons (comprised of 423 day/night shift operations staff, 50 office/business staff and 30 contractors). The potential daily car traffic movements generated by this workforce is a maximum of 1,756.

ii Heavy vehicle traffic

The external road transport of mining supplies and other consumables for the mine operations and maintenance activities, generally represent approximately 40 truck and other service vehicle deliveries (80 movements) each weekday, mainly using delivery routes between the mines and either Singleton, Maitland or Newcastle.

19.2.5 Road safety

Intersection traffic safety and sight distances were observed by EMM on 20 March 2014. The intersection traffic safety and sight distances are considered good at all the intersections potentially affected by the proposal.

The high design standard of the Golden Highway in the vicinity of Mount Thorley (with marked centre lines and sealed shoulders on all sections) provides a comparatively higher standard of travel safety for traffic using this route in comparison to other roads in the area; for example, Wallaby Scrub Road, Charlton Road, Broke Road and Putty Road.

19.2.6 Internal road network

Extensive internal coal haulage is undertaken using the internal private roads within MTW which transport ROM coal to CPP facilities and also transfer overburden material within and between MTO and Warkworth Mine.

Two private road crossings of Putty Road already exist for these movements and the proposal provides for an optional underpass beneath Putty Road, in place of a third approved, but yet to be constructed, bridge crossing.

19.2.7 Existing rail conditions

The product coal transport operations for the proposal utilise rail transport for export via the Port of Newcastle using the MTW (Whittingham) branch line. The location of the Whittingham branch line in relation to the overall Hunter Valley rail network used for coal transport is shown in Figure 19.2.

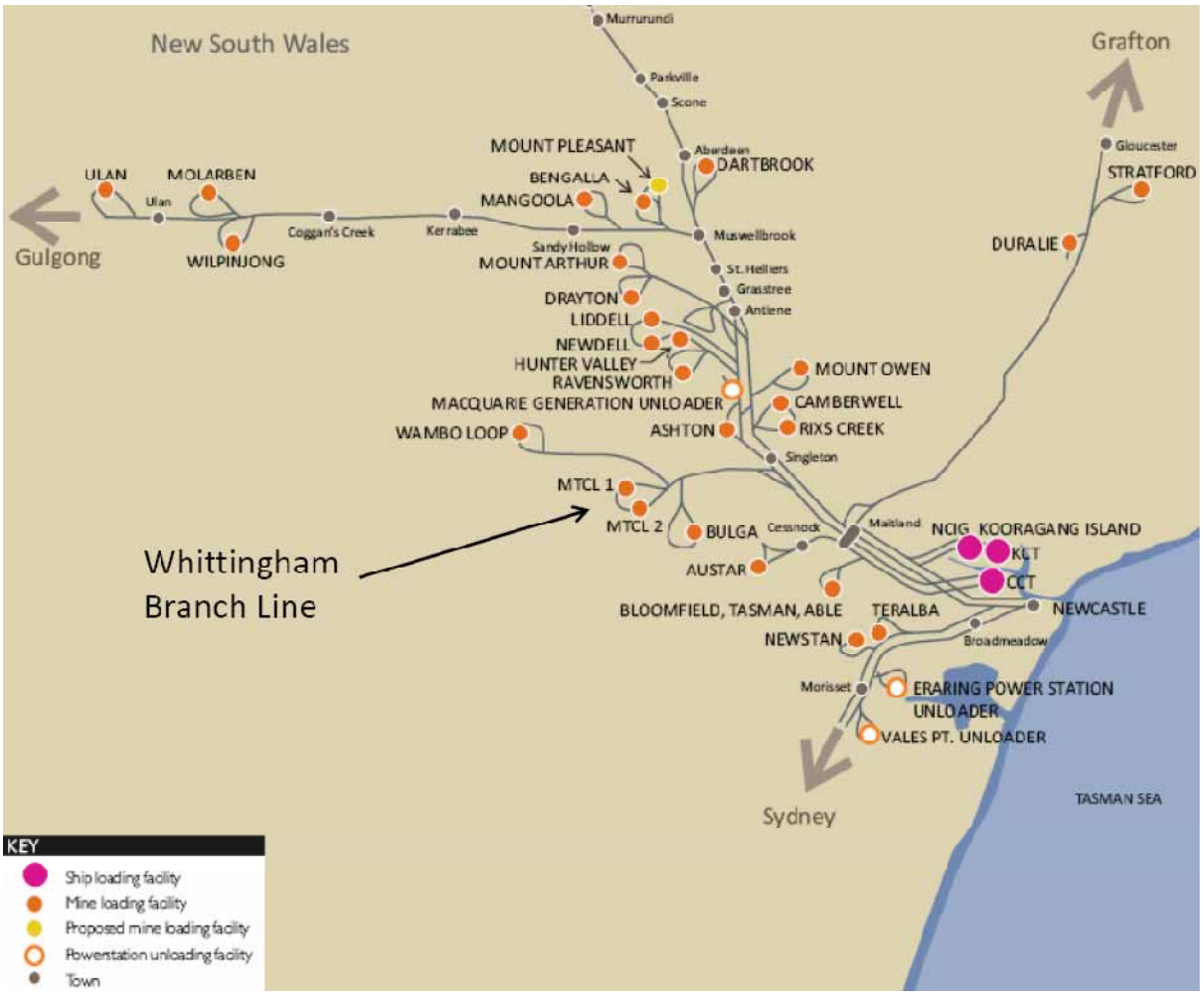


Figure 19.2 Hunter Valley rail network

On the Whittingham branch line there are three coal loading loops which serve MTW, Bulga Coal Complex, and Wambo Mine. At MTW there are two coal loading points (MTCL 1 and MTCL 2) which serve the Warkworth CPP and MTO CPP conveyor loading systems. An additional coal loading loop on the Whittingham branch line at Hunter Valley Operations (South) has also been approved but is not yet constructed.

The capacity of the existing Whittingham branch line (which is single track) is adequate for the current usage (ARTC 2013). The primary future constraint to this rail line capacity is generally the availability of coal train paths where the Whittingham branch junction meets with the Hunter Valley main line, to the south of Singleton. The railway junction capacity has recently been improved by the completion of the third track at Minimbah Bank.

19.3 Impact assessment

19.3.1 Proposal related traffic and transport

Average employee traffic generated by MTO and Warkworth Mine on external public roads would not change under the proposal as there would be no changes to the combined MTW workforce. With the substantial shift workforce numbers, the typical maximum number of persons travelling to and from MTW each weekday is approximately 878.

Approximately 80 daily truck movements are currently generated on public roads by MTW operations (40 truck deliveries each day for maintenance and other activities). This truck traffic would remain at generally similar levels in future years.

The volumes and methods of product coal transported from the mines by rail would remain as per the current operations.

Traffic generation associated with construction activities at SOOP and MTO CPP, including contractor vehicles and truck traffic, are considered part of MTW's normal operational traffic movements, similar to those which are occurring currently.

19.3.2 Road network impacts

i Methodology

The background information review included the previous traffic impact assessments and road safety investigations undertaken by Parsons Brinkerhoff in 2010 for the Warkworth Extension 2010, and the Bulga Optimisation Project (ARC 2013). This background information was supplemented with the data obtained from surveys undertaken within the local road network described in Section 19.2. To enable a thorough and detailed assessment, analyses were undertaken for three future traffic scenarios.

- Scenario 1 – Year 2017 traffic situation including base network traffic growth at +2 per cent per annum.
- Scenario 2 – Year 2017 traffic situation including base network traffic growth at +2 per cent per annum and the detoured traffic from the proposed closure of Wallaby Scrub Road at relevant intersections (for example this traffic does not affect the Golden Highway/Mitchell Line of Road intersection).

- Scenario 3 – Year 2017 traffic situation including base network traffic growth at +2 per cent per annum, the detoured traffic from the proposed closure of Wallaby Scrub Road, and the Bulga Optimisation Project year 2017 construction traffic movements from a workforce of 25 persons at relevant intersections (for example this traffic does not affect the Warkworth Mine access/Putty Road intersection).

The year 2017 traffic conditions were assessed as this year represents the first full year of operations, following the proposed closure of Wallaby Scrub Road proposed under the Warkworth Continuation 2014 proposal. The predicted future background traffic growth to the year 2017 is assessed at +2 per cent per annum, which corresponds to the higher end of the range of recent recorded traffic growth rates on the major road network shown in Table 19.1. Beyond the year 2017, the future traffic growth rates for Wallaby Scrub Road and other traffic routes are not able to be reliably forecast as a result of future regional traffic changes from the opening of the Hunter Expressway.

ii External traffic movements

a. Traffic impacts on road networks

The road network traffic impacts of the proposal are quantified in Table 19.7 in terms of the typical percentage contribution of MTW generated traffic towards the current (2014) total daily vehicle traffic movements, at locations on the external roads potentially affected by the proposal.

Table 19.7 Proportional impact of MTW generated traffic on external roads

Road location	Current daily traffic volume (2014)	Daily traffic movements generated by MTW	Proportion of current daily traffic volume generated by MTW
Golden Highway (north of Putty Road at Mount Thorley)	3,314	128	3.8%
Golden Highway (between Broke Road and Mount Thorley)	8,346	1,546	18.7%
Golden Highway (between Broke Road and Mitchell Line of Road)	9,860*	1,456	14.9%
Mitchell Line of Road (south of the Golden Highway and Putty Road)	5,958*	692	11.7%
Broke Road (south of the MTO CPP access intersection)	3,240*	90	2.8%
Putty Road (west of the Warkworth Mine access towards Bulga Village)	686*	146	21.4%

*Notes: *2014 daily traffic volumes estimated from comparisons of peak hourly intersection traffic volumes with the EMM 2014 surveyed peak hourly and daily traffic volumes.*

On most major roads in the locality, the current MTW daily traffic movements shown in Table 19.7 represent between 11 to 22 per cent of the total daily traffic movements. On other roads, such as Broke Road and the Golden Highway route north of Mount Thorley, MTW has a lesser effect on existing traffic flows, representing only 3 to 4 per cent of the total daily traffic movements currently.

The effects of heavy vehicle traffic movements represent between 4 and 5 per cent of the total MTW generated daily traffic, which is not disproportionate with other current traffic sources.

It is noted that the road and intersection traffic surveys for the study were undertaken shortly before the Hunter Expressway opened on 22 March 2014. The expressway may reduce the future regional through traffic usage of routes such as Wallaby Scrub Road and Charlton Road, by providing a faster and safer route for the longer distance traffic travelling between Sydney and some Upper Hunter locations.

b. Traffic impact at intersections

The future (year 2017) peak hour traffic operations at the intersections potentially affected by the proposal have been analysed using the SIDRA intersection model for the three future traffic scenarios described above. The results for the future traffic scenarios are summarised in comparison to the current year 2014 intersection analysis results in Table 19.8.

Table 19.8 Summary of year 2017 peak hour performance at intersections

Intersection	Peak hour period	SIDRA parameter	Base year (2014)	Future traffic scenario 1	Future traffic scenario 2	Future traffic scenario 3
Golden Highway/ Mitchell Line of Road	Morning	Dos	0.700	0.766	0.766	0.781
		Delay	20.6	22.5	22.5	23.1
		Los	B	B	B	B
	Afternoon	Dos	0.270	0.289	0.289	0.296
		Delay	19.0	19.5	19.5	19.7
		Los	B	B	B	B
Golden Highway/Broke Road	Morning	Dos	0.386	0.409	0.409	0.409
		Delay	31.6	34.1	34.6	34.9
		Los	C	C	C	C
	Afternoon	Dos	0.369	0.397	0.412	0.448
		Delay	16.5	17.1	18.2	18.5
		Los	B	B	B	B
MTO CPP access/Broke Road	Morning	Dos	0.138	0.145	0.150	0.156
		Delay	12.5	13.4	13.6	13.6
		Los	A	A	A	A
	Afternoon	Dos	0.074	0.078	0.086	0.093
		Delay	12.5	13.2	13.3	13.3
		Los	A	A	A	A
Warkworth Mine access/Putty Road	Morning	Dos	0.093	0.093	0095	0.095
		Delay	12.9	12.9	12.9	12.9
		Los	A	A	A	A
	Afternoon	Dos	0.063	0.063	0.063	0.063
		Delay	13.0	13.0	13.0	13.0
		Los	A	A	A	A

Notes: *Dos = degree of saturation*
Delay = average delay (seconds per vehicle)
Los = level of service

At the Warkworth Mine access/Putty Road and MTO CPP access/Broke Road intersections there would be no change to the level of service with the future (year 2017) intersection operations. The peak hour traffic delays at these intersections would increase marginally under the future traffic scenarios considered.

At the Golden Highway/Mitchell Line of Road intersection, the level of service and the future intersection traffic delays are also not generally affected under the scenarios considered with only a marginal increase in the average intersection traffic delays during the morning peak period. However, the degree of saturation for the left turn movements from Mitchell Line of Road would increase from 0.7 to a maximum of 0.781. This degree of saturation is indicative of a developing traffic capacity constraint at this intersection in the longer term beyond 2017, but still within acceptable standards.

At the Golden Highway/Broke Road intersection, the level of service and intersection traffic delays are not generally affected under the scenarios considered though, in the afternoon peak period, there would be a minor increase in the average intersection delays. There would continuing to be spare traffic capacity for the right turn movements from Broke Road at this intersection, which would accommodate any additional future traffic growth in the longer term, beyond 2017.

iii Car parking and alternate site access

There are no proposed changes to the MTW car parking areas. The capacity of the existing car parking areas is adequate for the workforce and visitor car parking requirements under the proposal.

Given the current patterns of predominantly industrial development in the Mount Thorley area (ie the MTIE), and distance from residential areas, the local and major roads would continue to have only minimal pedestrian and cyclist usage.

iv Cumulative impacts

The potential cumulative traffic impacts from the proposal and the construction work phases for the Bulga Optimisation Project have also been considered for 2017 which is the first year in which cumulative traffic impacts would potentially occur. Although the proposed construction stage workforce for the Bulga Optimisation Project would be up to 300 persons during the early years of construction in 2014 and 2015 (ARC 2013), this workforce would be greatly reduced (to approximately 25 persons) by the year 2017, such that minimal cumulative traffic impacts are anticipated from the two proposals in that and subsequent years. The MTW workforce and other traffic related contributions to cumulative road traffic impacts (with other mining projects) would remain unchanged under the proposal.

In terms of future intersection operations, there would also be minimal cumulative traffic impacts of the proposal, including the effects of the Wallaby Scrub Road closure (as proposed under the Warkworth Continuation 2014), in combination with the Bulga Optimisation Project. The relevant intersection traffic impacts detailed in Table 19.8, show potentially affected intersections would have sufficient spare capacity to accommodate the predicted cumulative traffic increases, with minimal intersection capacity or delay impacts.

The recent RMS intersection improvement works at the Golden Highway/ Broke Road intersection have substantially improved the peak hour traffic delays and level of service such that this intersection no longer represents a capacity constraint on the local road network.

19.3.3 Rail impacts

i Rail line capacity

The daily train movements for coal transport from MTW would be consistent with those loaded previously at MTCL and are not anticipated to increase above levels seen historically. As there is no projected increase in annual train movements, the MTW coal transport operations are not expected to cause any increase in delays to other users of the Whittingham branch line.

The current ARTC strategy includes a planned increase in the total processed export coal transported from existing and proposed mining operations using the Whittingham branch between the years 2013 and 2022 from 25 to 40Mtpa. This would increase the annual average daily number of loaded trains using the Whittingham branch from approximately 8.5 in 2013 to approximately 13.6 in 2022. While this is within the current operating capacity of a single track branch line, which can generally accommodate approximately one train movement hourly in each direction, it is believed that the limiting factor for the branch line capacity is the number of available train paths at the junction with the main line at Whittingham. This capacity would ultimately determine the capacity of the Whittingham branch line to accommodate the projected daily train loads beyond 2022.

ii Rail safety

The ARTC network expansion plans include significant expenditure to construct facilities that separate road vehicles from the high volume public level crossings to eliminate interaction. Notable crossings already completed include Range Road (Singleton), Golden Highway (adjacent to New England Highway intersection) and Hermitage Road (Belford). As there would not be an increase in daily train movements beyond those seen historically for MTW under the proposal, the number of MTW train interactions with users of existing public and private level crossings would not change.

Train movements under the proposal would continue to transport coal in a manner consistent with historical operations. Coal would be loaded onto trains provided by approved rail haulage companies who are licensed and approved to operate on the ARTC network. These companies must comply with the requirements of the Independent Transport Safety Regulator whose principal objective is to facilitate the safe operation of railways in NSW. Therefore, the proposal is not expected to impact rail safety.

19.4 Management and monitoring

As the proposal would not impact the road or rail networks, no specific road or rail transport impact management and monitoring measures are required.

19.5 Conclusions

Employee traffic generated by MTO and Warkworth Mine on external public roads would not change under the proposal as there would be no changes to the average combined project workforces. Truck traffic generated would also generally remain at similar levels under the proposal. Further, the proposal would not result in an increase in annual train movements. Therefore, no proposal specific road or rail management and monitoring measures are warranted.

Chapter 20

Social assessment

Chapter 20 — Social assessment

20 Social assessment

20.1 Introduction

This chapter provides a summary of the social impact assessment (SIA) prepared by EMM, which is presented in full in Appendix M.

The SIA has been prepared based on the combined impacts of the proposal and the Warkworth Continuation 2014. Except where discussion of Warkworth Mine is required to understand the SIA interactions, the findings relevant to MTO are the focus of this chapter.

The chapter describes the existing social environment and considers the key changes that are likely to result, either directly or indirectly, from the proposal. As the proposal is to continue operations beyond 2017, and combined with the Warkworth Continuation 2014, enable MTW to maintain 1,300 jobs over the longer term, the greater impacts on the socio-economic environment and community services are projected to occur if the proposal does not proceed.

The stakeholder perceived impacts and opportunities of the proposal have been determined through consultation and were assessed with the environmental and economic technical studies prepared as part of the EIS or considering external literature. This addresses the L&E Court judgement (par. 430) that states that the assessment of impacts should include consideration of the 'subjective fear or concern' of stakeholders and the 'concrete likely effects of the proposed development'.

This is the last technical study chapter presented in the EIS as it draws from the outcomes of the preceding economic and environmental studies.

20.2 Methodology

Social impacts include any intended or unintended changes to one or more of the following as a result of a proposal (Vanclay 2003):

- people's way of life (for example, how they live, work and play);
- their culture (for example, shared beliefs and values);
- their community (for example, cohesion, stability and character);
- political systems (for example, democratisation and participation);
- the environment (for example, impacts on amenity from dust and noise);
- people's health and well-being (for example, physical, mental, social, spiritual health and well-being);
- personal and property rights (for example, economic affects, disadvantage and civil liberties); and
- people's fears and aspirations (for example, fears about the future of the community and their children).

These changes are inter-related and the impacts have been considered in this chapter in three groups:

- socio-economic impacts;
- impacts on community services; and
- stakeholder perceptions and assessment outcomes.

People's perception of social impacts often varies depending on their location and experience with the proposal. For instance, those that live in close proximity tend to focus on matters relating to amenity and property values. Whereas those further from the proposal tend to focus on potential impacts associated with social infrastructure (for example, housing, schools, transport etc) and socio-economic benefits either direct or indirectly. Therefore, scale is an important consideration in a social impact assessment. For the purposes of this assessment, the following scales are used:

- Local community: The local community refers to those areas with close linkages to or in close proximity to the operation:
  - 'Near neighbours' defined as stakeholders who reside in the neighbouring villages of Bulga, Warkworth, Long Point and Gouldsville and those stakeholders who reside on properties in close proximity to the MTW operation. A particular focus on Bulga village is given in accordance with the Secretary's requirements.
  - In the context of the community profile (Section 20.2.1) this includes 'State suburbs' (SSCs) defined using available ABS census data and where there is a significant resident population. SSCs used in the SIA include the Bulga SSC, Broke SSC and Singleton SSC.
- Assessment area LGAs: Singleton LGA is the main area considered as part of the assessment as this is where the proposal is located. Maitland, Cessnock, Muswellbrook, and Upper Hunter Shire LGAs are also included given the socio-economic linkages between MTW and these LGAs.
- NSW is used given the resource is owned by the State and exploitation of the resource is a State decision.

The SIA also refers to the Hunter Region as the broader context area of the assessment. The methodologies employed as part of this assessment are detailed in the sections below.

20.2.1 Community profile

A community profile was developed for each geographic scale using the latest ABS census data (2011) together with a range of other data sources. The 2011 census forms the best available basis for the community profile. However, changes to the community profile over the last three years, including those resulting from the mining industry slowdown, are reflected in this chapter.

20.2.2 Employee and supplier surveys

Employees and suppliers of MTW were surveyed in March 2014. The surveys provide an insight into the ways in which MTW employees and suppliers contribute to, and participate in, the Hunter community.

i Employee survey

An invitation to complete the employee survey was sent by email to more than 400 MTW employees. Of this sample, 228 completed the survey online. Employees who do not have regular access to computers at work were invited to complete a paper-based survey at pre-shift meetings; resulting in the completion of 145 paper-based surveys. In total, 373 employees completed the survey.

The employee survey consisted of 18 questions related to place and status of residence, employment status and remuneration, and various questions on contribution and participation to the communities in the LGAs and the Hunter Region more broadly.

ii Supplier survey

An invitation to complete the online supplier survey was sent by email to over 450 suppliers and 256 valid survey responses were received.

The supplier survey consisted of 16 questions related to industry type, location, workforce size, supplier relationship with MTW, and the contribution and participation to LGAs and the Hunter Region more broadly.

20.2.3 Identification of stakeholders and perceived issues

i Rationale

In assessing social impact, consideration must be given to the foundation or rationale for concerns held and expressed in relation to a proposed development. The L&E Court has found that community concerns are required to be considered in assessing social impacts, and those concerns require support in objectively assessing evidence before a decision can be made of adverse impact. In *New Century Developments Pty Ltd v Baulkham Hills Shire Council* [2003] L&E Court 154, Lloyd J heard a merit appeal against the refusal by the Council of a DA for a Muslim prayer house. Lloyd J held that:

> 62 A fear or concern without rational or justified foundation is not a matter, by itself, that can be considered as an amenity or social impact pursuant to s 79C(1) of the EP&A Act (*Newton v Wyong Shire Council*, NSWLEC, McClellan J, 6 September 1983, unreported, *Jarasius v Forestry Commission of New South Wales* (1990) 71 LGRA 79 at 93 per Hemmings J; *Perry Properties Pty Ltd v Ashfield Municipal Council* (2000) 110 LGERA 345 at 350 per Cowdroy J). Where there is no evidence to support a rational fear it will be irrelevant that members of a community may have modified their behaviour arising from such an unjustified fear (*Dixon* at [71]).
>
> 63 It follows that in forming an opinion on the probable impact of a proposed development on the amenity of an area, tangible or otherwise, a court would prefer views from residents which are based upon specific, concrete, likely effects of the proposed development. That is consistent with the statement of Mason P in *Fairfield City Council v Liu* at [2] that "... the demonstrable social effect of a particular ... use is relevant under s 90(1)(d) [now s 79C]" (see also *Dixon* at [48]).

In *Telstra Corporation Ltd v Hornsby Shire Council* [2006] L&E Court 133, Preston CJ heard a merit appeal against the refusal by the Council of a DA for a mobile phone base station. Preston CJ held:

> 195 A fear or concern without rational or justified foundation is not a matter which, by itself, can be considered as an amenity or social impact pursuant to s 79C(1) of the EPA Act: *Newton v Wyong Shire Council*, unreported, LEC No. 40135 of 1982, 6 September 1983, McClellan J, pp 110, 11;*Jarasius v Forestry Commission of New South Wales* (1988) 71 LGRA 79 at 92; *Perry Properties Pty Ltd v Ashfield Municipal Council* (2000) 110 LGERA 345 at 350 [22]; *New Century Developments Pty Ltd v Baulkham Hills Shire Council* (2003) LGERA 301 at 316[62]. 'Mere local prejudice' or 'the resistance of uninformed opinion to innovation' is not a basis for rejecting a proposal: *Cecec (No. 8) Pty Ltd v Mosman Municipal Council* (1960) 5 LGRA 251 at 263; *Foreman v Sutherland Shire Council* (1964) 10 LGRA 261 at 269.

In *Bulga Milbrodale Progress Association Inc v Minister for Planning and Infrastructure and Warkworth Mining Limited* [2013] L&E Court 48, Preston CJ held that:

> 408... consideration of both the objective data for the broader community, and the experiential evidence from residents of the impacts at the local level, is required to have a complete picture of the likely social impacts of the Project.

As described below, a range of stakeholders were consulted to determine their perceptions of the proposal and its potential impacts and these are assessed with the technical assessment of the impacts. As is also described below, given that stakeholder consultation included both the proposal and the Warkworth Continuation 2014, most of the perceived impacts relating to near neighbours and residents of the local communities were focused on the Warkworth Continuation 2014.

ii Stakeholder identification

A plan was developed to identify key stakeholders and detail a programme for stakeholder consultation. This built upon regular and ongoing consultation with local and regional stakeholders undertaken by Coal & Allied throughout the life of the operation, and in particular since 2009 with regards future plans for the operation. A total of 151 stakeholders participated in the consultation process.

Approximately 44 per cent of participants in the SIA consultation process were near neighbours. Near neighbours included residents from the neighbouring communities of Bulga, Warkworth, Long Point and Gouldsville. Fifteen per cent of the participants were MTW employees and suppliers. Further details regarding the stakeholders groups and portion of stakeholders in each group is described in Chapter 7.

iii Determining stakeholder perceptions

The perceived impacts and opportunities of a proposal can be determined by a number of methods. One method is to randomly select and survey individuals across a community. This allows the proportion of a community that has particular perception of a development to be objectively quantified (within the statistical limitations of the sample size). This method often provides a large number of responses from stakeholders who have not actively considered the proposal prior to the survey. Further, as participants are randomly selected, many stakeholders who would like their views considered are not surveyed.

Another method to determine the perceived impacts and opportunities is to select and survey stakeholders who have an active interest in the proposal. This generally provides more in-depth responses and also provides an opportunity for those stakeholders who wish to express an opinion on the proposal to do so.

A combination of random and selected community participation was adopted for the assessment of stakeholder's perceptions of the proposal. Firstly, stakeholder identification and mapping was undertaken using the information sourced as part of the profiling activities, together with the existing stakeholder database developed by Coal & Allied's Communities Team as a part of its ongoing stakeholder consultation activities. Secondly, open community forums were held in Bulga and Singleton for those interested in the proposal to attend and share their views. This combined approach ensured an appropriate range of views was canvassed.

Stakeholder consultation was undertaken from March to May 2014. Given that the SIA was prepared to consider the combined impacts of the proposal and the Warkworth Continuation 2014, consultation included both proposals.

As noted in the section above, a large proportion of participants in the consultation process for the proposal were near neighbours (44 per cent of participants). Some of the near neighbours' comments on the proposals either fully, or mostly related mostly to the Warkworth Continuation 2014, given its proposal to extend mining operations westwards.

The key results of this consultation are therefore the qualitative stakeholder perceptions of a range of matters. These are provided in Section 20.4.2i alongside the technical assessment of each matter.

20.3 Existing environment

20.3.1 Community profile

The proposal is in the Singleton LGA, approximately 200km north-west of Sydney and 80km west of Newcastle (the largest city in the region) (See Figures 2.1 and 2.2). The Singleton LGA covers an area of approximately 4,893km^2 and includes the town of Singleton, the villages of Broke, Bulga, Milbrodale and smaller surrounding communities. A summary of the assessment findings is presented in Table 20.1.

Table 20.1 Demographic indicators

	SSCs			Assessment area LGAs					State
	Bulga SSC*	**Broke SSC***	**Singleton SSC***	**Singleton LGA**	**Maitland LGA**	**Cessnock LGA**	**Muswellbrook LGA**	**Upper Hunter Shire LGA***	**NSW**
Population 2011 (count of persons and per cent population change 2001-11)									
2001	N/A	N/A	N/A	20,384	53,718	45,071	14,746	N/A	6,311,168
2006	321	540	5,783	21,937	61,880	46,206	15,236	12,976	6,549,177
2011	358	636	5,510	22,694	67,478	50,841	15,791	13,753	6,917,660
% population change 2001-06	N/A	N/A	N/A	7.6%	15.2%	2%	3.3%	N/A	3.7%
% population change 2006-11	11.5%	17.7%	-4.7%	3.5%	9%	10%	3.7%	6%	5.6%
Demographic characteristics 2011 (% of total population)									
Male	183 (51%)	328 (51.6%)	2,741 (49.7%)	11,648 (51%)	33,005 (49%)	25,257 (50%)	8,163 (51.7%)	6,865 (49.9%)	3,408,878 (49%)
Female	175 (49%)	308 (48.4%)	2,769 (50.3%)	11,046 (49%)	34,473 (51%)	25,583 (50%)	7,628 (48.3%)	6,889 (50.1%)	3,508,780 (51%)
Indigenous	30 (8.3%)	11 (1.7%)	246 (4.5%)	845 (3.7%)	2,355 (3.5%)	2,456 (4.8%)	847 (5.4%)	537 (3.9%)	172,621 (2.5%)
Age groups 2011 (% of total population)									
0-4 years	18 (5%)	55 (8.6%)	338 (6.1%)	1,651 (8%)	5,043 (7%)	3,801 (7%)	1,246 (7.9%)	984 (7.2%)	458,736 (7%)
5-14 years	58 (16%)	78 (12.2%)	707 (12.8%)	3,381 (16%)	9,778 (14%)	7,064 (14%)	2,358 (14.9%)	1,922 (13.9%)	873,776 (13%)
15-24 years	48 (13%)	69 (10.8%)	798 (14.5%)	3,292 (16%)	9,036 (13%)	6,520 (13%)	2,195 (13.9%)	1,578 (11.5%)	893,101 (13%)
25-54 years	139 (39%)	256 (40.2%)	2,196 (39.9%)	9,564 (45%)	27,351 (41%)	19,732 (39%)	6,639 (42%)	5,257 (38.2%)	2,863,574 (41%)
55-64 years	58 (16%)	113 (17.7%)	571 (10.4%)	2,452 (12%)	7,710 (11%)	6,570 (13%)	1,680 (10.6%)	1,753 (12.7%)	810,290 (12%)
65+ years	39 (11%)	67 (10.5%)	900 (16.2%)	2,354 (11%)	8,561 (13%)	7,153 (14%)	1,676 (10.7%)	2,257 (16.3%)	1,018,180 (15%)
Same usual address 5 years ago 2011 (% of people aged 5 years and over with same address 5 years ago)									
% of persons	71%	59%	58%	57%	58%	60%	51%	58%	57%

Notes: ** due to changes in geographical boundaries between the 2001 and 2011 Census, comparisons between these years are misleading and subsequently are not included in this assessment for Bulga, Broke and Singleton SSCs, and Upper Hunter Shire LGA. Therefore, comparisons are limited to the 2006 and 2011 Census for these areas.*

Due to rounding, not all totals add to 100%.

i Population size, growth and future change

Singleton SSC has the largest population of the SSCs with 5,510 residents in 2011. Bulga and Broke had populations of 358 and 636 residents respectively in 2011. Maitland LGA had the largest population of the assessment area LGAs (67,474) followed by Cessnock LGA (50,841), Singleton LGA (22,694), Muswellbrook LGA (15,791) and the Upper Hunter Shire LGA (13,753). NSW had a population of 6,917,660.

The population profile in the assessment area has changed significantly over the last five years, although rates of change are different between the LGAs and SSCs. Population growth in the region centred on the junction of Cessnock, Maitland and Singleton LGAs, and also in the areas around Aberdeen and Scone.

Between 2006 and 2011, the population in the key regional centres of Maitland and Cessnock grew at 9.1 per cent and 10.0 per cent, respectively. Singleton grew at 3.5 per cent and NSW at 5.6 per cent. The population growth in these areas was slightly faster than in the previous five year period. Growth was higher in Maitland and Cessnock as these centres are the focus of Greenfield house development and regional development planning initiatives. Bulga SSC and Broke SSC grew between 2006 and 2011, with a population growth of 11.5 per cent and 17.7 per cent (an increase of 37 and 96 persons respectively).The population in the Singleton SSC declined by 4.7 per cent.

The rates of population growth in the assessment area LGAs were slightly higher than in the previous five-year period between 2001 and 2006, excluding Maitland and Singleton which decreased.

The impact of the growth of the mining industry is evident in patterns of migration to the area, which contributed significantly to population growth between 2006 and 2011, with around 20 per cent of current residents having lived outside the area in 2006.

It is estimated that the Hunter Region population will grow from 622,000 in 2012 to about 762,000 in 2036 (Deloitte Access Economics 2013). By this time, the population of the lower Hunter Region (Newcastle, Lake Macquarie, Port Stephens, Maitland and Cessnock LGAs) is projected to reach approximately 640,000 people (growing from 520,000 in 2012). Population growth in the upper Hunter Region (Upper Hunter, Gloucester, Muswellbrook, Singleton, Dungong and Great Lake LGAs) of which this assessment area is a part is likely be more variable as a result of the cyclical nature of the dominant mining and agriculture sectors, which heavily influence the size and demographic composition of smaller LGAs.

ii Population structure

There are a slightly higher proportion of males in Singleton LGA (51 per cent) and Muswellbrook LGA (51.7 per cent) when compared with Maitland LGA, Cessnock LGA and the Upper Hunter Shire LGA (49 to 50 per cent) and NSW (49 per cent).

There is a higher proportion of Indigenous persons in the region than in NSW (2.5 per cent), particularly in the suburb of Bulga (8.3 per cent), and the LGAs of Muswellbrook (5.4 per cent) and Cessnock (4.8 per cent).

There are more young people aged 5 to 14 years, 15 to 24 years, and working adults aged 25 to 54 years residing in the Singleton LGA relative to the NSW average (see Table 20.1).

In addition to the information presented in Table 20.1 since 2006, Singleton LGA has experienced a 20 per cent decline in the 5 to 15 year age group and increases in the 20 to 29 year age group. This is likely through in-migration associated with the mining workforce.

With the exception of in the Singleton LGA, the 55-64 and 65+ age groups generally had the biggest contributor to population growth in the region. Bulga SSC and Broke SSC in particular had a substantially older population, with relatively low numbers of young children aged 0 to 4 years and a significant reduction in the primary family-formation age groups between 25 and 35 years old.

iii Income and employment

Personal and business incomes increased across the region between 2006 and 2011. Increases were greater than for NSW as a whole with individual incomes rising substantially in Singleton and Muswellbrook LGAs in conjunction with mining investment. The other LGAs in the area were closer to the NSW average, except for Cessnock LGA where incomes remained substantially lower than the average, despite a growth in both personal and family incomes between 2006 and 2011. Incomes in the SSCs in the assessment area were also generally similar or higher than NSW averages.

The Hunter Region is currently underpinned by the key industries of coal mining; agriculture (particularly dairy, beef cattle, vegetable growing and pasture production) and associated service industries; horse breeding; power generation; tourism; viticulture and wine making; and defence.

Mining is the dominant industry of employment across the assessment area, representing up to 22 per cent of the workforce in Singleton LGA, and up to 21 per cent in Bulga, well above the proportion of mining employment in NSW of 1.6 per cent of the total workforce. While not evident in these 2011 figures, the slowing of the coal mining sector is starting to impact the regional economy and the labour market. Recent job losses have also occurred in the wider industry, with approximately 1,500 direct mining jobs lost in the Hunter Valley over the last 18 months (NSW Mining 2014) not including layoffs that occurred in May 2014. These job losses and their respective flow-on effects are representative of the indicators described above (refer to Section 3.2).

iv Education

Education attainment levels in the assessment area, particularly in Muswellbrook and Cessnock LGAs, are generally below the NSW average.

Data from the 2011 Census shows that Year 12 completion rates increased across the assessment area LGAs but remained well below the state average, so much so that that the gap between the area and the state actually widened between 2006 and 2011. Year 12 completion rates among younger residents (aged 18 to 24) declined slightly across most of the area and most noticeably in Muswellbrook LGA, related to the availability of work and other training options in the mining industry.

Education continues to be identified by HVRF (2013) as a critical area for the future sustainability of the area, particularly given the growth in knowledge-based employment nationally and the likelihood of declining mining industry employment over the long-term.

v Housing

There is a predominance of separate houses, as opposed to semi-detached and unit housing within the assessment areas. There was also a higher proportion of dwellings being purchased and a lower proportion being rented in the assessment area compared to NSW as a whole.

The proportion of occupied private dwellings generally reflects the NSW average in all LGAs except the Upper Hunter Shire.

Median mortgage repayments in Singleton LGA and Bulga SSC were higher than the NSW average. Between 2006 and 2011, mortgage repayments also increased more rapidly in these LGAs than across NSW. Over the last five years, the regional residential housing market has outperformed NSW benchmarks and those for comparable regions in Sydney and Wollongong.

Rental price growth for three-bedroom houses slowed markedly over the year to June 2013. At the same time, indications are that vacancy rates have increased to 2.9 per cent for the Hunter Region as a whole in June 2013. Anecdotally, this trend has accelerated with the slowing of the mining industry and, as of June 2014, a large number of dwellings are for sale or are available for rent.

vi Infrastructure

There has been substantial infrastructure investment across the assessment area LGAs, with most major projects associated with mining and related rail and port infrastructure, particularly the Hunter Valley Coal Chain (HVRF 2013b). Major resources and energy projects completed by mid-2013 within the region had a total estimated value of $674million (BREE 2013). While the bulk of this expenditure flows out the region, the stimulatory effect on local employment and business is evident, reflecting a robust regional economy to 2013. The $1.7billion 40km long Hunter Expressway between Newcastle and the Upper Hunter is now open.

vii Community perception of changes in the region

Just over 60 per cent of stakeholders consulted identified a positive change in the region compared with five years ago, including: more/better shops (most frequently nominated in Singleton and Maitland); better services and/or facilities (most frequently nominated in Muswellbrook); the Hunter Expressway (most frequently nominated in Cessnock); improvements related to housing (most frequently nominated in Maitland and Muswellbrook).

20.3.2 Workforce profile

The existing MTW workforce profile was reviewed to understand the potential impacts of the proposal on the workforce and social infrastructure and services.

i Employees

The average workforce currently employed at MTW is approximately 1,300 persons including contractors.

The MTW workforce demographics are characterised by:

- the employee workforce is predominantly male (about 90 per cent of all employees), as is the contractor workforce (about 75 per cent of all contractors);
- Indigenous employees represent about two per cent of the total MTW workforce, with a similar representation within the contractor workforce; and
- the dominant age group across both employees and contractors is 35-39 years (16 per cent of employees and 21 per cent of contractors).

ii Employees residential locations

The employee survey showed that the majority of MTW employees and long-term contractors are from the region or have settled in the region and intend to stay:

- almost three quarters of MTW employees and long-term contractors live in the Mid and Upper Hunter region: Singleton LGA (35 per cent), Cessnock (19 per cent) and Maitland LGA (17 per cent);
- the majority of the workforce have lived in their current suburb for less than 10 years; and
- the majority of the workforce (61 per cent) have a mortgage, 16 per cent own their property outright while 20 per cent rent, and 3 per cent live with friends or family.

iii Household income and expenditure

The employee survey showed that the average pre-tax income (gross) earned from work at MTW is $124,514.

A third of employees estimated that they spend between 70 per cent and 90 per cent of their income in the LGA in which they live. The remainder estimate that they spend between 30 per cent and 80 per cent of their income in the LGA in which they live.

iv Charitable contributions and community participation

More than 30 per cent of employee survey respondents stated that they currently undertake some form of voluntary work in the community. Of these respondents, the majority carried out this work for sporting or community recreation organisations. Respondents also carried out voluntary work for emergency services; children, youth or parenting organisations; education or training organisations; and community or welfare organisations.

20.3.3 Supplier profile

i Overview

In 2013, MTW spent:

- $188million on 228 local suppliers from Upper Hunter, Muswellbrook, Singleton, Maitland and Cessnock LGAs;
- $147million on 377 suppliers from the rest of NSW; and
- $238million on 198 suppliers from the rest of Australia.

Supplier organisations were mainly mining (32 per cent), manufacturing (29 per cent), wholesale trade (7 per cent) and construction (7 per cent) industries (MTW Supplier Contribution and Participation survey 2014).

The regional offices of supplier organisations were mainly in Singleton (26 per cent), Newcastle (19 per cent) and Maitland (12 per cent) LGAs, with 'Other LGAs' (23 per cent) typically being LGAs in Sydney, Brisbane and the Central Coast.

Two-thirds of suppliers indicated that they employed 20 people or less (66 per cent) while 18 per cent indicated that they employed 21 to 30 employees (MTW Supplier Contribution and Participation survey 2014).

ii Value of relationship with MTW

The average value of the supplier relationship with MTW in the last financial year (total amount spent by MTW on their goods and/or services in 2012/13) was estimated by supplier survey respondents to be approximately $2million, with the aggregate value for the 214 respondents of approximately $256million (MTW Supplier Contribution and Participation survey 2014).

The majority of respondents derive 30 per cent or less of their revenues directly from MTW with some 7 per cent relying on more than 40 per cent of their revenues directly from MTW.

20.3.4 MTW community engagement and investment

The Coal & Allied Community Relations programme manages and supports relationships with a range of stakeholder groups across both MTW and Hunter Valley Operations, including: community groups; near neighbours; Aboriginal community and groups; government (particularly local government); education sector; industry and business associations; non-government organisations including research institutions, strategic community partners; and, to some extent, media and local suppliers.

Current community activities and programs include:

- Consultation and engagement: near neighbour engagement programme (including one-on-one and group events); council engagement; business community and industry forum engagement; schools engagement; community events; Aboriginal community engagement; MTW Community Consultative Committee.

- Community development: investment across three funds – Community Development Fund (CDF) and Aboriginal Community Development Fund (ACDF); and Site Donations Committee. The CDF was initiated in 1999. In 2011, Coal & Allied announced the continuation of the CDF and committed $4.5million to distribute to eligible projects between January 2012 and December 2014. The aim of the fund is to support projects and programmes that would create opportunities that would provide a lasting benefit to the wider community. The ACDF was initiated in 2006 and is a 20 year commitment to the Aboriginal Community of the Hunter Valley. Since its inception, the fund has spent over $3million on projects that would deliver long-term, sustainable outcomes for the Upper Hunter Valley Aboriginal community in areas such as business development, education and training and health. The fund currently contributes approximately $600,000 annually and has an additional $900,000 in a Future Fund. The MTW Site Donation Committee provides annual funding for community projects in accordance with the funding guidelines of the Committee. This includes projects which contribute to near neighbour communities, including the Bulga community.

- Communications: key communications are undertaken and maintained through the Singleton shopfront; Coal & Allied Information Line; website and email; quarterly newsletters, factsheets and media; site tours/open days; internal communication, input into external monitoring and compliance activities, community involvement in monitoring; regular CCC meetings and other forums/groups.

Community awareness of the company's community engagement and investment activities is high, with 60 per cent of residents surveyed in the Hunter Region indicating they are aware or very aware of the CDFs. Of those who were aware, six in ten either agreed (45 per cent) or strongly agreed (15 per cent) that the Coal & Allied CDF was benefiting the local community by providing support for appropriate and effective programs (HVRF 2013).

20.4 Impact assessment

This section describes the proposal's potential social impacts based on the existing social and economic conditions, social infrastructure capacity, and stakeholder perceptions determined through consultation.

20.4.1 Socio-economic impacts

i Perceived socio-economic impacts

As part of the stakeholder consultation process, stakeholders were asked to consider the socio-economic impacts if the proposal did not proceed.

Some stakeholders, particularly near neighbours, felt that there would be minimal negative impacts if the proposal (and Warkworth Continuation 2014) did not proceed, suggesting that most employees would continue at MTW in the short-term or move to other mining operations.

Other stakeholders identified job losses as an immediate and critical impact if the proposal (and Warkworth Continuation 2014) did not go ahead. These stakeholders commonly described the loss of 1,300 jobs at MTW operations and the negative impacts this would have on the local economy and community. The commonly identified impacts of these job losses included:

- workers and their families moving away from the area;
- workers and their families faced with unemployment and financial difficulties;
- reduced local spending;
- decreased local businesses;
- population decline; and
- reduced community life and participation.

These stakeholders also commonly identified the flow-on negative impacts on local suppliers, other businesses and on the local economy and community generally. These matters are discussed below.

ii Continuation of employment and net benefits

The economic study (refer to Chapter 8) considered the net economic benefits and the regional and state impacts of the proposal (the proposal scenario) relative to a no development case (referred to as the reference scenario). In the reference scenario, it assumed that the development application for the proposal (and Warkworth Continuation 2014) is refused.

The reference case is provided as a basis for conservatively evaluating the incremental value of the proposal. However, as described earlier, the reference case is not likely to eventuate as mining under this scenario would not be economically viable. The SIA adopts the same conservative assumption as the economic study.

The two scenarios differ in terms of their production and employment (and associated costs) profiles. For the proposal scenario, current average employment and production levels would continue until 2030 and decline toward the end of the open cut life with production complete by the end of 2035. In the reference scenario, coal production and employment would begin to decline from 2016 onwards and would cease by 2021.

The economic study prepared by BAEconomics (Appendix E) states that while mining activity was historically very high, a number of indicators suggest that significant declines in Australian thermal coal prices, amongst other factors, over the past two years have had a negative impact on activity. Capital investment in new tangible assets in the mining sector has fallen by more than half between December 2012 and December 2013. These trends are consistent with the expectation by the HVRF that few additional mining investment proposals will progress in the medium term, excepting those required to maintain economic production that require minimal upfront capital.

In addition, HVRF's Upper Hunter Region Economic Indicators (HVRF 2014), states that 'business conditions in the Upper Hunter through calendar year 2013 were the most difficult, and affected the greatest number of businesses, since the HVRF's Business Survey began in 2001'.

The effects of the mining slowdown are also being observed in the labour market. In a reversal of past trends, there is now an excess of qualified mining engineers in NSW (Australian Journal of Mining 2014), as well as a shortage of positions for mining apprentices and trainees in the Hunter Valley (Australian Mining 2013). HVRF note that the unemployment rate in the Hunter Valley region has increased notably since 2011.

HVRF's measure of employment intentions suggest that further weakness in the Hunter region labour market can be anticipated. Employment intentions have declined since December 2011. HVRF's most recent measures are lower than during the Global Financial Crisis. Similar trends are also evident in the HVRF's Household Survey, which suggests that consumer confidence and purchasing intentions in the Hunter Valley region remains negative.

It has been assumed in the economics study that, in the event that the proposal is refused and MTW closes by 2021, 30 per cent of employees made redundant would be re-employed in the same year, and that 40 per cent of employees made redundant would be re-employed in the subsequent year. The remaining 30 per cent of people are assumed to either leave the workforce altogether or to move interstate. Based on the declining economic conditions described above and the significant recent loss of jobs at other mines in the Hunter Valley, these are considered to be conservative assumptions.

The economic study considers both direct economic benefits and flow-on effects (or benefits) of the proposal scenario in net present value terms. These are detailed in Chapter 8. As noted, almost three quarters of MTW employees and long-term contractors live in the Mid and Upper Hunter region and around $464million in additional disposable income would flow to that region.

Significant positive flow-on effects are also expected for the Mid and Upper Hunter region and the Singleton LGA including around $227million in additional income and additional annual employment of around 214 full-time equivalent workers. The flow-on effects for the Singleton LGA are around $84million in additional income and additional annual employment of around 61 full-time equivalent workers.

These benefits would not be realised should the proposal be refused.

iii Direct employee contribution to the regional economy

The employee survey estimated the percentage income that is spent by participants in their LGA. Over two-thirds of employees estimated that they spent between 30 per cent and 80 per cent of their incomes in their LGA. Almost a third of all employees estimated their local spend in the 70 per cent to 90 per cent band (Figure 20.1). A much higher percentage was spent in the entire Hunter Region.

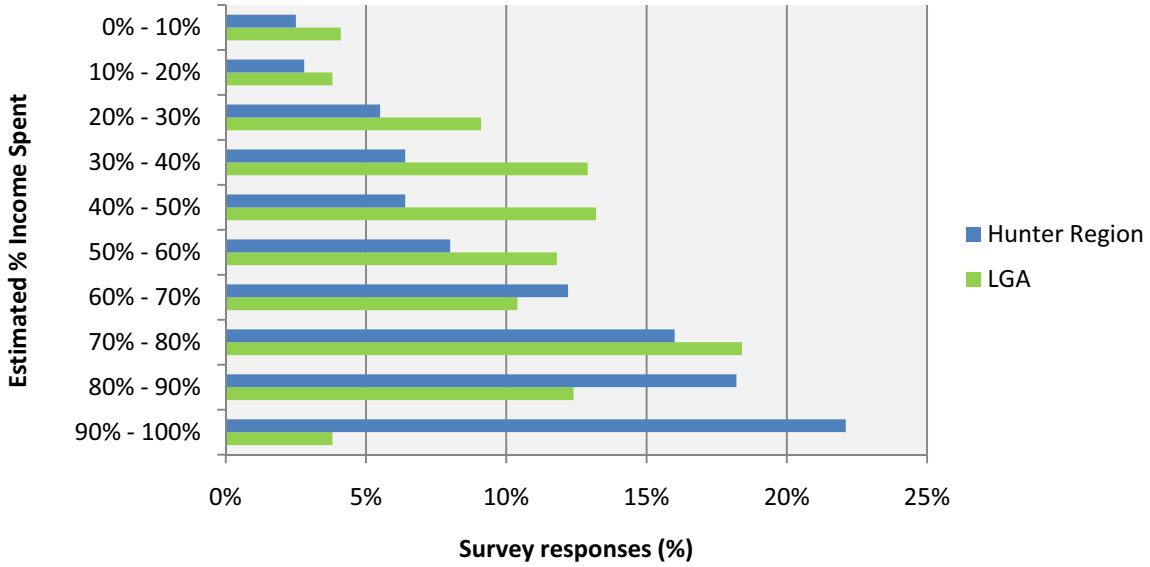


Figure 20.1 Estimated income spent in LGAs and the Hunter Region

The MTW employee contribution to the regional economy would be substantially reduced should job losses occur and current employees either left the region to find employment, stayed in the region but were unable to find employment or their income was reduced in an alternative working place in the region.

iv Population decline

The stakeholder consultation process identified a common concern that workers and their families would move away from the area if the proposal was not to proceed. The potential impacts of these concerns can be assessed by comparing the two possible scenarios discussed in the economic study above. These scenarios include the proposal scenario (assuming the proposal is approved) and the reference scenario (assuming the proposal is not approved).

As described in Section 20.4.1ii, the economic study reference scenario (Appendix E) conservatively assumed that of the employees made redundant, 70 per cent (910 people) of would be re-employed in the same year or the subsequent year. The remaining 30 per cent (390 people) were assumed to either leave the workforce altogether or to move interstate. If it is assumed that of those who are not re-employed, that 50 per cent move from the region, 195 former employees would leave the region.

Assuming the impacts on the workforce in the reference scenario are equal across all regions, the impacts within the different LGAs are presented in Table 20.2.

Table 20.2 Employee residential location and impacts of reference scenario

LGAs	Percentage of workforce	Employees	Re-employed (70%)	Not re-employed Remain in the region (15%)	Not re-employed Leave the region (15%)
Upper Hunter and Muswellbrook	3.0	39	12	27	6
Singleton	34.9	454	136	318	68
Maitland	17.1	222	67	155	33
Cessnock	19.4	252	76	176	38
Great Lakes	1.5	20	6	14	3
Dungog	0.8	10	3	7	2
Port Stephens	8.1	105	32	74	16
Newcastle	6.9	90	27	63	14
Lake Macquarie	6.1	79	24	55	12
Other	2.2	29	9	20	4
Total	**100**	**1,300**	**390**	**910**	**195**

Notes: 1.Totals may differ due to rounding.

Based on an average number of people in each household of 2.7 (2011 census data for Singleton LGA) and assuming that 195 former employees leave the region as a household unit, a total of 527 people would leave the region in the reference case. The approximate distribution of these departures is provided in Table 20.3.

Table 20.3 Population decline in the reference case

Area	Not re-employed Leave the region (15%)	Population decline (employees + family members)*
Upper Hunter and Muswellbrook	6	16
Singleton	68	184
Maitland	33	89
Cessnock	38	103
Great Lakes	3	8
Dungog	2	5
Port Stephens	16	43
Newcastle	14	38
Lake Macquarie	12	32
Other	4	11
Total	**195**	**527**

*Notes: * Based on an average household size of 2.7.*
Totals may differ due to rounding.

Flow-on benefits (jobs) from direct employment include additional jobs in the community. Reducing direct employment therefore also reduces these flow-on jobs in the community. Therefore, the total number of people leaving the region would be expected to be greater than the 527 former employees and their families.

v Impact on housing market

Consultation with stakeholders (including Singleton residents, businesses and real estate agents) suggested that the recent contraction of the coal industry had contributed to the weakening of the property market through decreased demand. Local business stakeholders (Singleton-based real estate agents) suggested that the market was 'over-heated' during the coal mining boom, and that current soft property market figures may reflect a recalibration of the market towards a more realistic and stable trend.

This is demonstrated in recent property market data for the Singleton LGA (Housing NSW 2014) which shows a decline in sales results and a dramatic fall in rental returns for Singleton LGA. Median sales prices fell consistently in 2013 (almost 9 per cent annual decline for all properties) and rental returns fell by approximately 25 per cent on average in the 12 months to December 2013.

A population decline due to workers made redundant by the closure of MTO and Warkworth Mine moving out of the region or a decline in the financial resources of previous employees would be likely to contribute to reduced property sales, sale prices and rental property demand.

vi Reduced local spending and decline in businesses

MTW spends a significant amount of money in the local area on local and regional suppliers, supporting a variety of businesses. In 2013, MTW spending on suppliers (based upon the postcode from which the good or service was invoiced) included:

- $188million with 228 local suppliers from Upper Hunter, Muswellbrook, Singleton, Maitland and Cessnock LGAs;
- $147million with 377 suppliers from the rest of NSW; and
- $238million with 198 suppliers from the rest of Australia.

The above figures correlate with the results of an online survey of suppliers to MTW in March 2014.

Under the reference scenario, the majority of spend by MTW on suppliers within the local area, as well as significant amount of spend by employees within the local area would cease by 2021, if not beforehand. This significant reduction of spend per year (hundreds of millions of dollars) in the local area would significantly impact local businesses, particularly those that demonstrated a degree of reliance on MTW for their business.

20.4.2 Community services and participation

i Education

Participants of the employee survey were asked to indicate the number of children they had in educational facilities in the Hunter Region. Of the 337 employees who responded to the employee survey, 209 had families. These employees had a total of 184 children attending educational facilities in the Hunter Valley. Therefore, there is an average of 0.55 children per employee or 715 in total. The departure of 15 percent of the workforce would include a reduction in the number of children in the region by a similar proportion and, therefore, 107 children would no longer attend an education facility in the region (Table 20.4).

Table 20.4 Educational attendance by MTW employees

Facility	Estimated number of children of MTW employees	Number leaving the region (assumed 15%)
Childcare facility	186	28
Primary school	279	42
High school	186	28
Newcastle University	36	5
Technical college	29	4
Total	**715**	**107**

While the reduction in population will lower demand for school places and health services it is likely that this could place stress on future funding for these services particularly for smaller local community schools such as Milbrodale, Broke and Jerrys Plains Public Schools that had 11, 59 and 21 enrolments in 2013, respectively.

ii Employee contributions to community organisations

During the survey of suppliers and employees in March 2014, employees and suppliers were asked a series of questions relating to their direct contribution to, and participation in, community organisations and activities.

In the employee survey, 123 employees (33 per cent of responses, representing approximately 9 per cent of the current workforce) stated that they currently undertake some form of voluntary work, which is higher than the proportion of residents in Singleton LGA that volunteers (HVRF 2013b and ABS 2011). Of those that indicated current voluntary work activities, the majority carried out this work for sporting or physical recreation organisations (50 per cent of responses) followed by emergency services (21 per cent), children and youth (20 per cent), education and training (13 per cent) and community/ welfare (12 per cent) (see Figure 20.2).

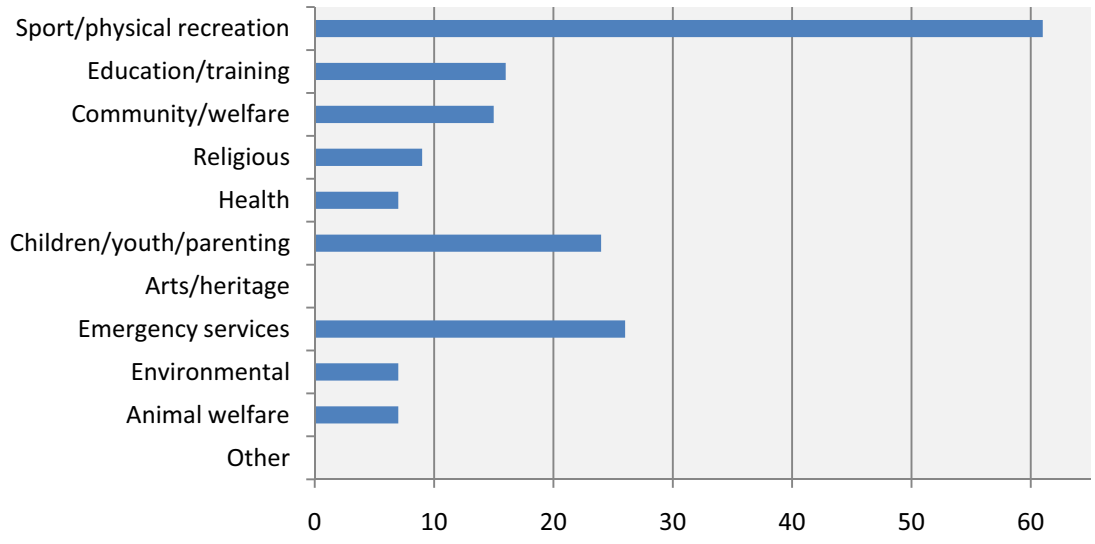


Figure 20.2 Organisation type for voluntary work

The majority of employees (73 per cent) estimated that they dedicate between one and 10 hours per month to voluntary work in the Hunter Region. About 22 per cent dedicated 10 to 20 hours per month to voluntary work (see Figure 20.3). Of those that indicated current voluntary work activities, the majority carried out this work for sporting or physical recreation organisations (49.6 per cent of responses) followed by emergency services (21.1 per cent), children/ youth (19.5 per cent), education/ training (13.0 per cent) and community/ welfare (12.2 per cent).

MTW employees contribute to community life and participate in community organisations. This would be substantially reduced if employees made redundant leave the region to seek work. The flow-on effect for organisations which require volunteers may be a loss of capacity to carry out community activities through the loss of MTW employees and their voluntary contributions.

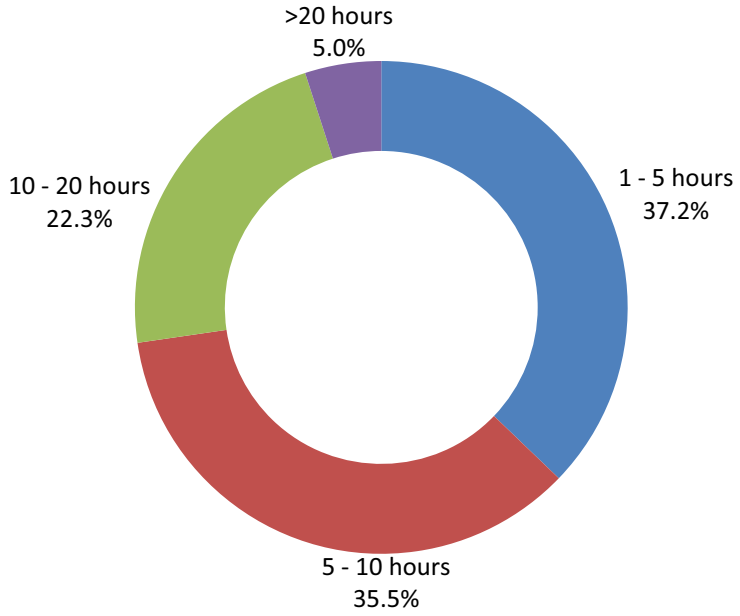


Figure 20.3 Hours per month dedicated to voluntary work

iii Supplier contributions to community organisations

About 75 per cent of suppliers surveyed indicated that they make direct financial contributions to community organisations (for example, charities, community services and health care) in the Hunter Region. The organisations supported included sporting (84 responses), welfare (65 responses), emergency services (55 responses), education (42 responses) and health (41 responses) organisations. The financial contribution on these community organisations for the past 12 months is shown in Figure 20.4.

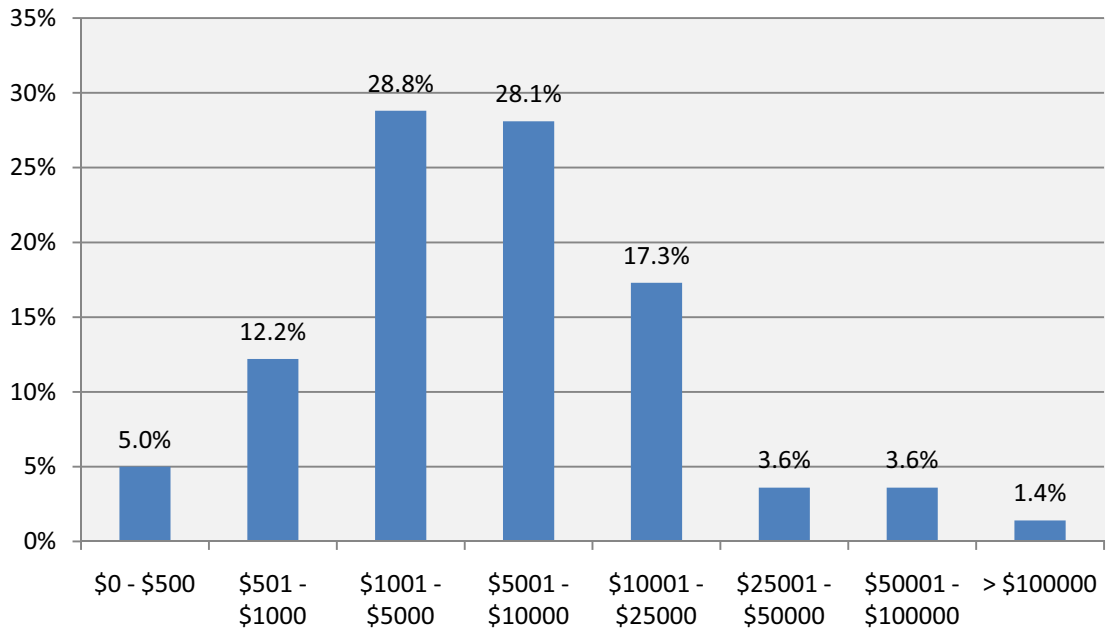


Figure 20.4 Total financial contributions of suppliers to community organisations in the past 12 months

Suppliers also made many non-financial contributions to community organisations in the Hunter Region as shown in Figure 20.5. For example, donating equipment (48 responses), allowing employees time off work to contribute (44 responses), use of supplier's services and facilities (42 responses). It is noted that totals add to 101 per cent due to rounding.

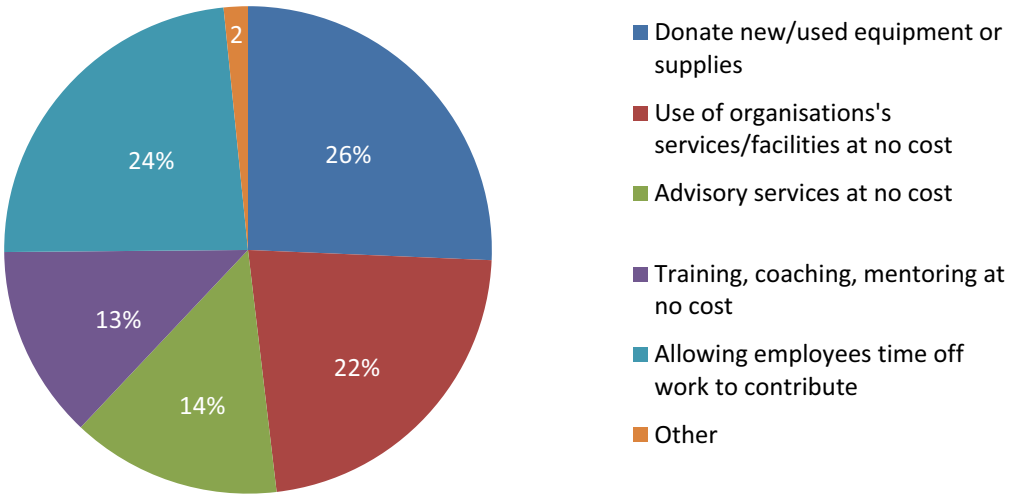


Figure 20.5 Type of non-financial contributions made by supplier to community organisations

Suppliers are also actively engaged in, and contribute to, community organisations, particularly through volunteer work.

The continued use of suppliers by MTW contributes to the financial success of these suppliers and allows them and their employees to contribute to, and participate in, community organisations in the region. In the absence of the proposal under the reference scenario, the financial viability and the contributions of some of these suppliers would, at the least, be reduced.

20.4.3 Stakeholder perceptions and study outcomes

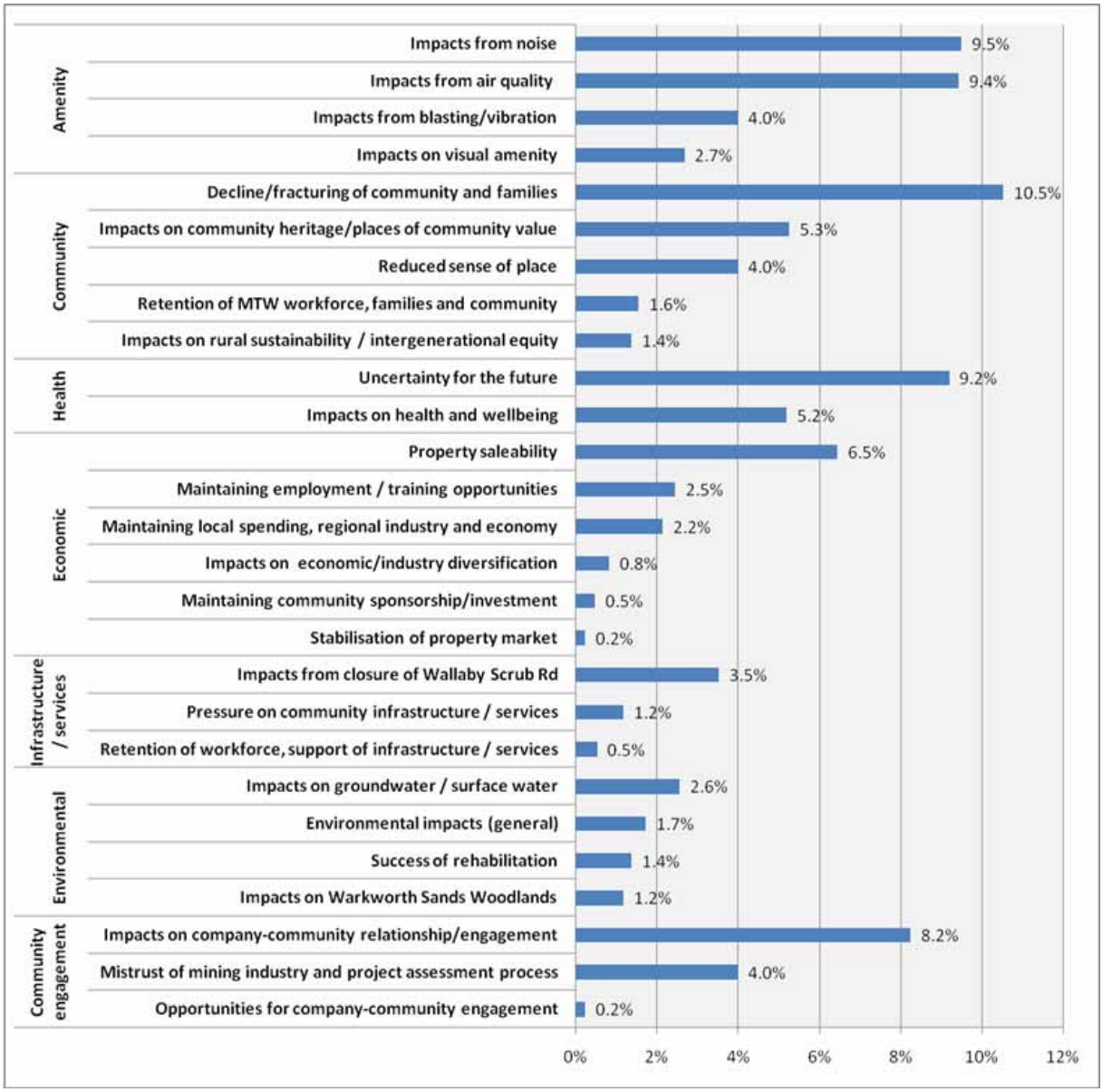
The technical studies are central in understanding and addressing impacts but it is important to understand stakeholder perceptions of impacts and opportunities so they can be considered in designing appropriate social management, mitigation or enhancement strategies. This section provides an assessment of the perceived impacts and opportunities associated with the proposal. It also provides a technical assessment of each of these perceived impacts and opportunities sourced from relevant technical studies and literature.

The perceived impacts and opportunities are categorised into seven groups:

- amenity;
- environmental;
- community;
- health and well-being;
- economic;
- infrastructure and services; and
- community engagement, relationships and governance.

The frequency that participating stakeholders identified specific impacts and opportunities is shown in Figure 20.6 providing an indication of key areas of focus for assessment. Table 20.5 provides a summary of perceived impacts and opportunities and the technical assessment of the impacts and opportunities. They provide particular attention on Bulga village which contributed to approximately 20 per cent of the survey completed for the SIA.

Many of the matters raised related to the Warkworth Continuation 2014; however, given aspects of the proposals are linked, where applicable these are provided in Table 20.5.



Notes: *Percentages are based on the total number of responses (1,673) from the 151 participants.*
Data does not include results of the employee and supplier surveys

Figure 20.6 Perceived impacts and opportunities of the proposal

Table 20.5 Social impacts and opportunities from the proposal – perceived and technical studies

	Impact/opportunities	
	Perceived	**Technical assessment**
Amenity		
Noise	**Noise levels and impacts on amenity, health and well-being** Noise was the most frequently identified perceived impact. Near neighbours (that is, residents living in proximity to the mine with potential noise exposure) perceive that the proposal is very likely to contribute to noise (including low frequency noise), impacting on the amenity, health and well-being of residents in Bulga, Long Point and Gouldsville. The majority of responses relating to noise levels were related to the Warkworth Continuation 2014, as opposed to the proposal.	**Noise management** The applicant has committed to implementing best practice sound suppression on all major plant. Further, the applicant is in final stages of developing a pre-emptive real time noise modelling interface (a first in the NSW mining industry) and is using best practice real time noise monitoring and management techniques. This constitutes all reasonable and feasible mitigation that has and would be adopted under the proposal. **Assessment criteria** The Mining SEPP's non-discretionary standard for cumulative amenity noise levels at privately-owned residential dwellings is met for Bulga village, and noise impacts are predicted to be below the acceptable noise levels, and amenity of the village should not be reduced. Further, the Mining SEPP's non-discretionary standard for cumulative amenity noise levels is also met at other surrounding localities such as Gouldsville and Long Point. The L&E Court judgement (par. 64), notes that experience of noise levels from current mine operations is more than an expression of subjective fear or concern. However, while noise levels may be perceived differently by different stakeholders, the noise assessment used objective INP noise criteria designed to protect at least 90 per cent of the population living in the vicinity of industrial noise sources from the adverse effects of noise for at least 90 per cent of the time. **Project specific noise levels** The determining factor for the project specific noise levels (PSNLs) for all residences is the intrusiveness criteria. Background levels have been set at appropriate levels to determine these. A significant exceedance (>5dB(A)) of the PSNL is predicted to occur at one assessment location at Mount Thorley Industrial Estate (149) which is currently afforded acquisition rights from MTO under the development consent. It is noted that operational noise levels from the proposal are not expected to be materially different from current noise levels for locations east of the mine given relatively no changes to current activities in the eastern parts of the Site. Noise levels would be within 1 or 2dB(A) of the PSNLs for the majority of the residences at Bulga. As noted in Section 9.2.2, changes of 1 to 2dB are imperceptible. **Low frequency noise** Noise levels are predicted to meet relevant Broner criteria for low frequency noise and INP criteria for sleep disturbance at representative assessment locations. **Cumulative noise** Cumulative noise levels would satisfy the INP (and Mining SEPP) night time criterion at all but two representative assessment locations in Warkworth village (77) and Mount Thorley (146). As these are representative locations, the criterion is also likely to be exceeded at two neighbouring locations in Warkworth village (102 and 264) and two

Table 20.5 Social impacts and opportunities from the proposal – perceived and technical studies

	Impact/opportunities	
	Perceived	**Technical assessment**
		neighbouring locations in Mount Thorley Industrial Estate (144 and 915). It should be noted that these assessment locations are currently afforded acquisition rights from MTO or Wambo Mine with the exception of 264, which is inferred to have acquisition rights from Wambo Mine but is not currently included in its approval.
Air quality	**Air quality impacts** Near neighbours expressed concern that the proposal is likely to contribute to air quality impacts from dust mainly associated with the placement of overburden from Warkworth Mine at MTO. **Impacts of air quality on health and well-being** Some stakeholders perceive that air quality impacts on amenity, health and well-being of affected residents are likely. Some stakeholders feel that they have little capacity of these affected residents to cope with air quality impacts.	**Air quality management** Air quality goals are benchmarks set to protect the general health and amenity of the community in relation to air quality. Air quality impacts are currently managed through an existing integrated management system which involves the implementation of a monitoring network, best practice mitigation measures, and operational control strategies and measures with the objective of continuous improvement (see Section 10.5). Recent air quality monitoring results for 2012 and 2013 have shown that the MTO is complying with the relevant air quality criteria. **Assessment criteria** The Mining SEPP's non-discretionary standard for cumulative air quality is met at all but two privately-owned residential dwellings (assessment locations 77 and 264) which are in Warkworth village. These assessment locations, and one non-residence (102 – Warkworth Hall), may experience concentrations above the relevant air quality goals for 24-hour average and annual average PM_{10} (particulate matter with a diameter of 10µm or less). Assessment location 77 is currently afforded acquisition rights from a neighbouring mine. Assessment location 264 is inferred to have acquisition rights from a neighbouring mine but is not currently included in its approval. The Mining SEPP's non-discretionary standard for cumulative air quality at privately-owned residential dwellings is met for Bulga village and air quality impacts are predicted to be below the acceptable air quality concentrations and amenity of the village should not be reduced. **Particulate matter** Fifteen mine-owned assessment locations are predicted to experience concentrations above the relevant air quality goals for 24-hour average and annual average PM_{10}. A subset of these assessment locations may also experience concentrations above the relevant air quality goals for annual average total suspended particulate matter (TSP) and incremental and total annual average dust deposition. Dust from mining is generally coarse in fraction (> $PM_{2.5}$) whereas the fine fraction dust (< $PM_{2.5}$) of concern to human health typically originates from combustion sources. Cumulative $PM_{2.5}$ (particulate matter with a diameter of 2.5µm or less) concentrations would be below the National Environment Protection Measure (NEPC 2003) advisory reporting standards at all of the assessment locations where the concentrations of other pollutants are below the relevant air quality goals. **Diesel emissions and blast fume emissions** No air quality impacts are predicted to result from diesel emissions (NO_2 and CO) and blast fume emissions.

Table 20.5 Social impacts and opportunities from the proposal – perceived and technical studies

	Impact/opportunities	
	Perceived	**Technical assessment**
Blasting and vibrations	**Blasting and vibration impacts** Near neighbours perceived concerns relating to blasting and vibration impacts principally relate to the Warkworth Continuation 2014.	**Blasting and vibration impacts** The proposal is for continuation of mining operations which would remain within the current approved boundaries. Blasting impacts would therefore remain as previously assessed in past noise and vibration impact assessments for the proposal.
Visual amenity	**Visual amenity impacts** Near neighbours perceived concerns relating to visual impacts principally relate to the Warkworth Continuation 2014. However, given the proposal to emplace overburden from Warkworth Mine at MTO, consideration is given to potential visual impacts.	**Visual amenity impacts** Existing topography and vegetation would continue to provide screening to MTO as mining within Loders Pit continues and overburden is emplaced within the Site. Some residences west of the Site, such as elevated residences around Bulga village, may experience high visual amenity impacts. Progressive rehabilitation of disturbed areas and implementation of visual impact mitigation measures would be undertaken to minimise impacts on visual amenity. **Visual impact mitigation measures** Visual impact mitigation measures would be put in place to mitigate the potential impacts on the overall surrounding landscape. This would include vegetation and bund screening to the boundaries of the Site. In addition, site-specific visual assessments (SSVAs) would be available to individual landowners of potentially impacted properties. These SSVAs would prescribe specific mitigation measures, if the proposal is determined to have high or high/moderate visual impact at the property. The L&E Court judgement (par. 434) found that being able to see overburden emplacements are a constant reminder of the mine and that lights from the mine are intrusive and annoying. Implementation of the mitigation measures prescribed in SSVAs at impacted properties will be important to substantially reduce these amenity impacts. Progressive rehabilitation of the Site would further reduce the level of contrast in the viewing landscape and, ultimately, result in a higher level of visual integration.
Environmental		
Groundwater and surface water	**Groundwater impacts** Stakeholders perceived concerns regarding groundwater impacts related to the Warkworth Continuation 2014. **Surface water impacts** Stakeholders perceived that there would be impacts on surface water, particularly the potential continued deterioration of the Wollombi Brook which is considered to be an important environmental, social and community attribute, with several stakeholders citing its long-standing importance to Bulga for agricultural production and recreational activities.	**Groundwater** Given that stakeholders perceived concerns regarding groundwater impacts related to the Warkworth Continuation 2014, they are not assessed here. **Surface water** The results of the surface water study indicate that the impacts of the proposal on surface water resources are unlikely to be significantly different to the existing approved operations and would not have a significant impact on surface water quality of the adjacent water features. Surface water would continue to be managed under the MTW WMP and the existing MTW surface water monitoring programme. No additional mitigation measures, to those already implemented, are required for the proposal.

Table 20.5 Social impacts and opportunities from the proposal – perceived and technical studies

	Impact/opportunities	
	Perceived	**Technical assessment**
Rehabilitation and future land use planning	**Ineffective rehabilitation** Near neighbours and interested stakeholders perceived that past and present rehabilitation practices at MTW and at other mining sites throughout the Hunter Valley have been ineffective/unsuccessful and that little change in these practices is included as part of the proposal. Several stakeholders suggested that evidence is yet to emerge of open-cut coal mine rehabilitation leading to positive environmental and land use outcomes.	**Rehabilitation achieved and proposed** Rehabilitation at MTW is undertaken in a series of stages as mining progresses. Much of the rehabilitation to date has been in the north of the site predominately away from the public views and is consistent with the progression of mining. The 2013 Annual Environmental Review for MTW illustrates that the rehabilitation completed in 2013 exceeded the commitment outlined in the Mining Operations Plan (MOP). The cumulative rehabilitation undertaken during the MOP period of 126.2ha has also exceeded that committed to in the MOP (121.9ha) at this point in the mine life. The proposal includes commitments (see Chapter 12) to leading practice rehabilitation and future innovations in rehabilitation to achieve improved outcomes. Given this is the case, it is unlikely that ineffective rehabilitation would lead to social impacts.
Community		
Community and family cohesion	**Loss of population, community members and leaders** The residents of Bulga, Long Point and Gouldsville perceive there may be loss of population, community members and leaders as a result of acquisition and relocation, leading to the gradual decline of community (both facilities/services and existing community connections and village life) and disconnections between and within communities and families.	**Population** The proposal is required to enable continuation of operations at MTO beyond 2017, and so contribute to maintaining the current and the regional population in the medium-term. The decline of smaller rural communities is a broad concern across Australia including in parts of the middle and upper Hunter region that are experiencing decline. A wide range of factors are contributing to this such as improved communications which is encouraging migration to cities and centralisation of services, restructuring of rural industries and reduced employment opportunities, and population aging and non-replacement leading to towns falling below the critical threshold needed to maintain essential services. In contrast, Bulga has a number of significant attributes including retail and community facilities (service station, general store, tavern, community hall, sports ground and fire brigade) and it is well located to service the tourist trade being proximal to attractions like wineries and is on the Putty Road tourist route. Consequently, Bulga has experienced both a growth in population and housing prices, has a relatively robust age structure and relatively low rates of population turnover. Predicted impacts from the proposal will not necessitate property acquisitions in Bulga village. It is also important to note that in contrast to perceptions any property acquisition rights included in an approval are upon the request of the landowner and are not compulsory. If a landowner does not wish to take up their acquisition rights they are not required to. Any landowner with acquisition rights under an approval can also choose when they might like to have their property acquired, if at all, during the life of the development. For example, if the landowner is happy at the start of the project to stay but 10 years later choose to take up their acquisition rights, the rights will still exist and can be validly processed under the approval. The Bulga population has increased 11.5 per cent or 37 persons between the 2006 and 2011 census. However, it is acknowledged that local stakeholders reflect on gradual population decline in nearby villages such as Warkworth, Camberwell and Ravensworth. Even with the replacement of population that may occur with leasing any acquired

Table 20.5 Social impacts and opportunities from the proposal – perceived and technical studies

	Impact/opportunities	
	Perceived	**Technical assessment**
		properties, or with the new owners living or leasing properties sold by owners voluntarily relocating, concern remains regarding the loss of existing community connections, activity and village life. ABS data shows that Bulga SSC's population increased by 11.5 per cent from 321 to 358 persons between 2006 and 2011, which is double the NSW rate of 5.6 per cent for the same period. In this period, Singleton's population declined by 4.7 per cent. While the proposal would contribute to maintaining the current and the regional population, individual community members would continue to make decisions based on individual circumstances about whether to stay in the area. ABS data has shown that Bulga has a lower population turnover rate than the NSW average: in 2011, 71 per cent of people in the Bulga SSC were recorded at the same address they were five years earlier (compared to 57 per cent for both Singleton and NSW). This suggests that community connections would be relatively strong. It also suggests that the majority of residents consider Bulga to be an attractive place to live and, assuming an acceptable level of amenity can be maintained by the proposal, will continue to be so.
Places of community value and sense of place	**Loss of sense of place** Near neighbours are worried by the loss of the places of community value and uncertainty regarding the future of the Bulga community. These worries are more related to the Warkworth Continuation 2014 than the proposal. Loss of sense of place has been associated with 'solastalgia', which is defined as the distress that is produced by environmental change impacting on people while they are directly connected to their home environment. People exposed to environmental change can experience negative effects that are exacerbated by a sense of powerlessness or lack of control over the unfolding change process.	**Loss of sense of place** A 'loss of sense of place' is a concern of some Bulga residents. Bulga experiences low population turnover and residents have relatively positive health, employment, crime rate and property ownership characteristics that are illustrative of a stable and cohesive community. The reference case would have a subsequent 'loss of sense of place' for a different set of stakeholders if viable mining could not be maintained. These would include employees, particularly those that reside in the Singleton LGA (35 per cent of the workforce) and others where the present level of social services could not be maintained (for example student numbers and school closure).

Table 20.5 Social impacts and opportunities from the proposal – perceived and technical studies

	Impact/opportunities	
	Perceived	**Technical assessment**
MTW workforce and their families	**Retention of MTW workforce and their families** A range of stakeholders identified positive opportunities for the community from the proposal. These opportunities were largely identified for the broader Singleton LGA as a result of the retention of the MTW workforce and their families as a result of the proposal. It was described that the workforce and their families contribute to the community, not only economically (through local spending and support for local business), but also through community participation (attendance at local schools, participation in sporting and other community events and community volunteering).	**Indirect contributions of the proposal on the community** The local community is experiencing impacts from the recent downturn in the coal industry including a decline in population and the loss of mine workers and their families. Approximately 35 per cent of the MTW workforce lives in Singleton LGA, 56 per cent of the workforce have children who attend educational facilities in their local LGA and approximately 33 per cent participate in volunteering in their local LGA. The MTW workforce and their families contribute to the local and regional economy and community through high levels of local spend and through the continuing use of community facilities and participation in the community, such as through volunteering. The employee and supplier survey results indicate that there would be benefits to small to medium sized enterprises (SMEs) from the retention of the workforce. The proposal would ameliorate some of uncertainty in the community resulting from the recent downturn in the coal industry.
Intergenerational and intra-generational equity	**Rural sustainability and intergenerational equity** Some stakeholders perceived that there would be impacts on rural sustainability and intergenerational equity as a result of loss of family and community heritage and the loss of rural villages, environment, community and other associated livelihoods (for example, local business and agriculture). These impacts were perceived as potentially permanent and significant due to the perceived inability to replace the heritage, community and land values of the area post-mining.	**Final landform and land uses** Following the completion of mining and rehabilitation, a final landform will remain that is safe, stable, free draining, and non-polluting. This will be integrated with the surrounding landscape. The final landform will support final land uses including for the conservation of native vegetation and for agriculture for existing and future generations. The impacts the proposal on heritage and land-values are described above and below, respectively. **Direct and indirect employment** The proposal contributes to social equity by providing direct and indirect employment. It would result in the transformation of a geological resource into physical and human capital through investment in infrastructure and workforce training, and, indirectly, through contributions to governments which would enable greater investments in public infrastructure and services.
Health and well-being		
Health and well-being– community uncertainty	**Health impacts** Stakeholders, particularly near neighbours, raised concerns regarding health impacts from the proposal. Perceived health impacts related to stress as a result of uncertainty for the future; and concerns about the health impacts of poor air/water quality.	**Stress-related health impacts** Health and well-being impacts need to be considered at a community level. In a study of the health of Hunter Valley communities in proximity to coal mining and power generation, Merrit et al. (2013) found that: > There were no significant differences in management rates of mental health conditions in the Hunter Valley region compared with the rest of rural NSW. Management rates of depression and anxiety were not higher, nor were prescription rates of antidepressants.

Table 20.5 Social impacts and opportunities from the proposal – perceived and technical studies

Impact/opportunities	
Perceived	**Technical assessment**
Stress and uncertainty Some stakeholders were concerned about health impacts from stress and uncertainty – for themselves, their family and the community. This uncertainty was most often related to: the acquisition process; the future of Bulga and its community; potential decline of community and fracturing of families; a mistrust of the proposal assessment process; uncertainty regarding ability to sell properties, property values, and related impacts on investments/assets and their future.	This indicates that similar levels of anxiety are experienced in Hunter Valley region compared to rural NSW as a whole although the causes of anxiety may vary between regions. **Health impacts of dust** The air quality and greenhouse gas study was completed in accordance with the applicable NSW and Commonwealth guidelines, standards and impact assessment criteria which take into account the known health effects of particulates on sufferers of asthma, lung conditions and heart disease. Air quality assessment criteria are designed to protect urban communities. Compared to the urban environment, there are less fine particulates in dust from mining and these particulates do not contain combustion products. Therefore, the assessment criteria provide a high level of conservatism when used to determine the acceptable levels of dust from mining projects in rural settings. The assessment results based on these criteria are described in above in 'Impacts on air quality'. **Health impacts of blast fumes** The impacts of blast fumes have been assessed based on guidelines, standards and impact assessment criteria. With the implementation of blast restrictions when required, blasts would not result in assessment criteria being exceeded. The assessment results based on these criteria are described in above in 'Impacts from blasting/vibration'. **Impacts on rainwater tanks** Lucas et al. (2009) investigated the potential for health impacts from coal dust deposited on rooftops and washed into water tanks. With the exception of two mine-owned residences, the incremental dust deposition predicted for the proposal at private and mine-owned residences is less than the 2g/m^2/month incremental criterion in all modelling years. Taking the predicted dust deposition levels, the spatial separation of residences from the mine and the findings of Lucas et al. (2009) into account, the potential for adverse impacts to rainwater tanks from the deposition of coal dust is low, even at the closest residences. **Impacts of mining on health** Merrit et al. (2013) conducted an analysis of general practice data for rural communities in close proximity to coal mining and coal-fired power generation in the Hunter Valley to identify unusual patterns of illness. The study in the NSW Public Health Bulletin concluded that: > There was no evidence of a significant difference in problems managed or medications prescribed by [general practitioners] GPs for residents of communities potentially affected by heavy industrial activity (coal mining and power generation) in the Hunter Valley region of NSW compared with residents in the remainder of rural NSW during the period 1998–2010. The diverging trend for respiratory problem management over time is worthy of further exploration.

Table 20.5 Social impacts and opportunities from the proposal – perceived and technical studies

	Impact/opportunities	
	Perceived	**Technical assessment**
		The 'diverging trend' refers to a comparison of the management rates of respiratory problems (as a group) during the period 2005–2010 with those for 1998–2004. This indicated that there was no significant change in the Hunter Valley region despite a significant decrease for the remainder of rural NSW over this period. However, the statistical significance of this difference could not be determined due to the sample size. **Other** Particular areas of concern to stakeholders regarding community uncertainty are addressed elsewhere in this chapter in the following sections: • uncertainty surrounding the acquisition process; • the future of Bulga and its community; • potential decline of community and fracturing of families; • a mistrust of the proposal assessment process; and • uncertainty regarding the ability to sell properties, property values, and related impacts on investments/assets and their future.
Vulnerable groups	**Impacts to vulnerable groups** Some stakeholders expressed concern that some vulnerable groups would be exposed to impacts on: their health from the amenity impacts; their economic and asset base due to a perceived inability to sell properties/assets; and indirectly through the potential loss of community services and facilities in light of a perceived decline in community.	**Vulnerable groups** Particular areas of concern to stakeholders regarding vulnerable groups are addressed elsewhere in this chapter: • potential amenity impacts of the proposal (from noise, dust and vibration); • health matters related to mining; • potential impacts on property values and ability to sell; and • the potential for fracturing of the community. **Mitigation measures** Notwithstanding this, it is recognised that vulnerable groups, including older members of the community, may not adapt to change and can be more susceptible to impacts, perceived or otherwise. In recognition of this concern, Coal & Allied propose to contribute to a Bulga and Near Neighbour Amenity Resource which would provide services such as property maintenance to residents surrounding the operation. Vulnerable near neighbour residents would have access to this resource.

Table 20.5 Social impacts and opportunities from the proposal – perceived and technical studies

	Impact/opportunities	
	Perceived	**Technical assessment**
Economic		
Properties value, saleability and investor confidence	**Negative impacts on property values and saleability** Near neighbours raised concern that the proposals would have a negative impact on property values and ability to sell in line with current and historical trends. **Positive impacts on property values and saleability** Stakeholders living in Singleton perceived favourable property market opportunities as maintenance of the current workforce would help to stabilise the property market after recent decreases in sales results and rental returns. Some stakeholders (including Singleton residents, businesses and real estate agents) suggested that the recent contraction of the coal industry had contributed to the weakening of the property market through decreased demand. Local business stakeholders (Singleton-based real estate agents) suggested that the market was 'over-heated' during the coal mining boom, and that current soft property market figures may reflect a recalibration of the market towards a more realistic and stable trend.	**Recent property market trends** Recent property market data for the Singleton LGA show a decline in sales results and a dramatic fall in rental returns for Singleton LGA. Median sales prices fell consistently in 2013 (almost 9 per cent annual decline for all properties) and rental returns fell by approximately 25 per cent on average in the 12 months to December 2013. The issue of devaluation of properties was considered by Stubbs (2012) who examined the purchase price of properties within Bulga during the lodgement and determination of the application for the Warkworth Extension Project in 2010 and 2011 and early 2012. The application was lodged on 1 March 2010 and the EA was placed on exhibition from 30 April to 15 June 2010. The matter was considered by the PAC and an approval granted on 3 February 2012. The approval was subsequently appealed in the L&E Court. Stubbs (2012) examined the sale price of all properties sold in Bulga between 1 April 2008 and 23 May 2012. She noted that the purchase price of properties did not appear to have been affected by the lodgement and assessment of the application, with median property values in Bulga and surrounds increasingly considerably since that time ($282,500 median sale price in the two years prior to lodgement, and $450,000 median sale price since the lodgement) (Stubbs 2012). **Property market stabilisation** The proposal would aim to maintain current workforce levels across MTW operations, which should contribute to population levels in the Singleton LGA (with 35 per cent of MTW employees residing in Singleton LGA) and, subsequently, partly assist in stabilising the property market. Coal & Allied would continue to manage residential properties via the open market. Coal & Allied utilises the services of local real estate agents to manage its properties to a high standard of maintenance and management.
Property maintenance and impact management costs	**Property maintenance and impact management costs** Near neighbours perceived that the impacts of current operations, particularly dust and vibration impacts, have a direct and ongoing economic cost and that the proposals would intensify those impacts. Near neighbour communities are not generally connected to mains water supply, so properties are reliant on tank water.	**Assessment of impacts** Air quality studies indicate that dust would be within the relevant guidelines. No additional blasting (to that currently approved) as proposed as part of the proposal. **Water tanks** Regardless of proximity to mining water tanks generally require routine maintenance to ensure that water quality is maintained. The impacts of the proposal on rainwater tanks are summarised in 'Health and wellbeing impacts'. While there would be no significant impacts to private residences directly attributable to the proposal, Coal & Allied propose contribution to a Bulga and Near Neighbour Amenity Resource to provide services to residents surrounding the operation.

Table 20.5 Social impacts and opportunities from the proposal – perceived and technical studies

	Impact/opportunities	
	Perceived	**Technical assessment**
Employment and training	**Employment and training opportunities** Stakeholders identified employment, expenditure on suppliers' services and associated opportunities for skills development and scholarships as primary benefit of both the proposal and the Warkworth Continuation 2014. **Contribution to economic growth** Experience with the growth of the coal industry since the late 1990s gave some stakeholders confidence that the proposal would significantly contribute to employment and economic growth in the Singleton LGA. Local business stakeholders were confident that the proposal would deliver employment and skills development opportunities across the Singleton LGA. Many stated that small downturns in coal industry activity were immediately felt by local suppliers and that the proposal would stabilise supplier workforce numbers and supporting revenues.	**Ongoing workforce and suppliers** MTW currently employees a workforce of approximately 1,300 persons on average. Although Warkworth Mine and MTO are integrated operations and workforce numbers are difficult to assign to the respective development consents, an estimate of 63 per cent (819 persons on average) could be attributed to activities on the Warkworth Mine development application and 37 per cent (481 persons on average) to the MTO development application. The proposal aims to maintain current workforce levels across MTW operations, bringing with them employment and training opportunities and are expected to contribute employment and supplier revenue benefits into the medium-term, with economic opportunities for the region extending over the proposal life-cycle.
Representation of local residents, near neighbours, women, and Aboriginal and Torres Strait Islanders in the MTW workforce	**Representation of local residents, near neighbours, women, and Aboriginal and Torres Strait Islanders in the MTW workforce** Many near neighbour residents from Bulga, Milbrodale, Long Point/Gouldsville contended that few near neighbours were employed at MTW and that no new targets for lifting employment rates for near neighbour communities or local employment are included in the proposal and the Warkworth Continuation 2014. Some stakeholders perceive that women, and Aboriginal and Torres Strait Islanders are underrepresented in the workforce compared to mining industry averages. It was perceived that there are no new targets in the proposal for increasing female or Aboriginal and Torres Strait Islander workforce participation rates. Consequently, it is perceived that these groups would continue to be underrepresented.	**Locals in the workforce** As described in Section 20.3.2, almost three quarters of MTW employees and long-term contractors live in the Mid and Upper Hunter region: Singleton LGA (35 per cent), Cessnock (19 per cent) and Maitland LGA (17 per cent). In January 2014, MTW employed 24 people from direct near neighbour communities (for example, Bulga, Milbrodale, Warkworth and Maison Dieu) which equates to approximately 7 per cent of the labour force from those communities. Coal & Allied maintains a continued preference for employees and contractors to reside locally. **Women and Aboriginal people in the MTW workforce** About 12 per cent of the current workforce (both employees and contractors) are women. Rio Tinto Coal Australia's goal is to achieve 15 per cent female employment across it operations (RTCA 2014) which is the average proportion of female employees in the mining Australian industry (WGEA 2013). The Indigenous workforce (both employees and contractors) represent about two per cent of the total MTW workforce. Rio Tinto Coal Australia's goal is to achieve five per cent Indigenous employment across its operations (RTCA 2014). The proportion of Indigenous people in the Australian mining industry is four per cent. The MTW Diversity Action Plan has a focus on increasing Indigenous and female employment. Coal & Allied would continue to implement the MTW Apprenticeship and Graduate programme, drawing on local candidates, and consisting of:

Table 20.5 Social impacts and opportunities from the proposal – perceived and technical studies

	Impact/opportunities	
	Perceived	**Technical assessment**
		• five new apprenticeship positions each year; • Aboriginal scholarship programme in partnership with University of Newcastle, supporting two Aboriginal students per annum with a scholarship programme and vacation employment to complete their degrees; • two graduate positions per annum on a two year programme; and • two vacation student positions each year.
Local and regional businesses and industry	**Opportunities for local businesses** Local businesses generally speculated that the economic contribution of the proposal and the Warkworth Continuation 2014 would be the most significant opportunity, with continuity of work and the implications that continuity has for workforce planning and maintenance being cited as the most critical benefits for suppliers.	**Hunter Valley labour market outlook** The HVRF's measure of employment intentions suggest that further weakness in the Hunter Valley labour market can be anticipated. Employment intentions have declined since December 2011 with HVRF's most recent measures lower than those during the Global Financial Crisis of 2008. Similar trends are also evident in the HVRF's (2013b) Household Survey, which suggests that consumer confidence and purchasing intentions in the Hunter Valley remain negative. Overall, HVRF (2013b) conclude that the economic outlook for the Hunter Valley reflects the end of the previous expansion phase combined with a drive to achieve efficiencies, the effects of which are now being felt by local suppliers, contractors and operational employees. Continued MTW operations would assist in maintaining a proportion of supplier revenues. Coal & Allied would continue: • to engage with Singleton Council on key areas of common interest including attraction and retention of residents and long-term planning; • the preference for employees and contractors to reside locally; and • the development of the Coal & Allied Local Procurement Strategy incorporating the MTW operation.
Corporate community investment and sponsorship	**Continued contribution to, and investment in, local communities** Stakeholders reflected on the potential for continued contribution to, and investment in, local communities through the proposals, including: Aboriginal and Torres Strait Islander employment, education and training opportunities; direct contributions to community service providers; and, contributions made to training and life-skills programmes at Singleton High School.	**Continued contribution to, and investment in, local communities** Existing direct community contributions and investment from MTW operations would continue under the proposal. Employees and suppliers make financial and non-financial contributions to the regional community and participated significantly in community activities, which in turn, contribute to community way of life. The proposal would continue to provide employment and economic benefits to suppliers, allowing employees and suppliers to continue to contribute to the community. A proportion of the MTW Site Donation Committee annual funding would be dedicated for projects which contribute to near neighbour communities, including the Bulga community, and which are in accordance with the funding guidelines of the Committee.

Table 20.5 Social impacts and opportunities from the proposal – perceived and technical studies

	Impact/opportunities	
	Perceived	**Technical assessment**
Other industries and diversification	**Retention of skilled employees** Local business stakeholders perceived that it was difficult to retain skilled employees given their migration to mining jobs for higher salaries. **Two-speed economy** Several stakeholders commented on the mining industry's contribution to the creation of a 'two-speed economy', where those employed by or who contract to the industry enjoy substantial financial benefits whilst others deal with the inflationary effects on cost of living generated by spending of these benefits. **Diversification** Local government stakeholders perceived that there is insufficient planning regarding structural diversification of the Singleton LGA economy.	**Requirement for skilled employees** The proposal would continue current requirements for skilled workers and would continue to be a focus of planning in the Singleton LGA, generating potential for continued skills migration from other industries in the region and potential for maintenance of the status quo when it comes to structural diversification planning. **Structural diversification required** The imperative for structural diversification has become even more apparent since the end of the mining boom, with the HVRF (2014) noting that the medium-term outlook for increased non-mining productivity in the region would depend on business capacity to invest in innovation and skills to adapt to, and develop, new products, services and markets as the resources boom fades.
Infrastructure and services		
Infrastructure, services and local community facilities	**Pressure on local infrastructure and services** Local government stakeholders perceived that maintenance of MTW workforce numbers would continue to place pressure on local infrastructure, particularly through the frequency of heavy vehicle movements on local roads. However, local government representatives also noted the positive benefits of retention of MTW workforce on community infrastructure and services. A health professional suggested that maintenance of the MTW workforce would continue to place pressure on health and allied services, emergency services and emergency departments. Near neighbours perceived that the medium to long-term viability of community facilities and services in Bulga, including the Bulga Hall, tavern and store, would be impacted by proposal-related acquisitions and associated relocation of Bulga residents.	**Demand for local infrastructure and services** There would be no increase in the use of local infrastructure and demand for health and allied services, emergency services and emergency departments under the proposal, as the intention is to retain the current level of employment. Traffic would remain similar to current levels and safety levels would be unaffected. The proposal would contribute to the maintenance of the current average workforce levels across MTW operations, helping to stabilise population levels across the Singleton LGA. Subsequently, the contribution of MTW employees to council land rates would be maintained, helping to support the viability of current council services. The continued MTW workforce and their families would also help maintain the use of local businesses and services, particularly shops, services, schools and childcare facilities. A Voluntary Planning Agreement (VPA) would be negotiated with Singleton Council. The VPA presents an opportunity to ensure a proportion of the funds are dedicated to maintaining and/or improving facilities and services in Bulga village, other local neighbouring communities, and the Singleton LGA as a whole. As described in the noise section of this table, no residences in Bulga would be afforded acquisition rights under the proposal due the predicted noise levels being in exceedence of relevant regulatory criteria. Therefore, proposal related acquisitions would not impact the medium to long-term viability of community facilities and services in Bulga, including the Bulga Hall, tavern and store. The maintenance of the current workforce under the proposal, however,

Table 20.5 Social impacts and opportunities from the proposal – perceived and technical studies

	Impact/opportunities	
	Perceived	**Technical assessment**
	Near neighbour stakeholders perceived a failure to adequately plan for lease holdings at the tavern and store following acquisition. It was perceived that changes to these facilities would impact the way of life in the village and access to services, particularly for the elderly, ill and disabled. Local government stakeholder's identified the potential opportunity to stabilise population levels across the Singleton LGA. Subsequently, the contribution of MTW employees to council land rates would be maintained, helping to support the viability of current council services.	may contribute to the viability of the community facilities and services.
Community engagement/relationships and governance		
Company and community relationships	**Opportunities to improve historic community relations** Some stakeholders perceived that there were opportunities to improve historic community relations and management of the mine's current impacts. This perception has impacted community trust. **Positive community relations** Some stakeholders from local business and local government described positive interactions with individual staff at MTW but perceived a general history of relations with scope for improvement with the mine and a lack of ability to openly discuss, negotiate and engage as part of the local business and resident community.	**Opportunities to improve community relations** Since 2010, based on feedback received from a range of stakeholders, a suite of ongoing and proposal specific strategies have been developed by Coal & Allied for communications generally and to manage/ mitigate or enhance these proposal-related impacts and opportunities. These are provided in Sections 20.5.1 and 20.5.2.
Understanding of community and social impacts	**Opportunity to improve understanding of relationships** Some stakeholders perceived the opportunity to improve understanding of relationships with the community through the assessment process.	**Opportunity to improve understanding of relationships** The assessment of the proposal and the Warkworth Continuation 2014 provides an opportunity to build understanding of community and social impacts and to improve company-community relations. Stakeholder feedback also suggested some satisfaction with the consultation process itself, and the ability to 'be heard'.

Table 20.5 Social impacts and opportunities from the proposal – perceived and technical studies

	Impact/opportunities	
	Perceived	**Technical assessment**
Government major project assessment process, regulation, monitoring and public representation	**Confidence in government assessment processes** Stakeholders, including near neighbours, local businesses and council, and other interested stakeholders, perceived that the changes encompassed in the Mining SEPP have resulted in a loss of confidence in the NSW Government to adequately assess major mining projects, including this proposal, and to provide protection to, and representation of, the public. Stakeholders pointed to current allegations before the Independent Commission Against Corruption (ICAC) (during early-mid 2014) and the demonstrated connections between some mining companies and the NSW government (for example, improper donations). Stakeholders also discussed the impact on the ability to undertake a merits-based appeal on a project as an impairment of democratic rights. This proposal is seen by stakeholders to be relevant to the Mining SEPP amendments due to the timing and history of the proposal.	**Government assessment processes** Coal & Allied conduct its operations in accordance with NSW and Commonwealth legislation and internal high standards of conduct, including The Way We Work, its statement of business practice. As described in Chapter 6, the proposal will be considered by the NSW Government under the EP&A Act and a range of other legislation, regulations, policies and guidelines. These documents are frequently updated to ensure their ongoing relevancy. This EIS was prepared in accordance with current legislation and government policy and used the most recent and accurate scientific data relevant to the proposal. Feedback received from community and government stakeholder engagement together with the Secretary's requirements and the L&E Court judgement, provided guidance to the assessment approach, ensuring that all potential matters of relevance associated with the proposal were assessed.

20.5 Management and monitoring

20.5.1 Existing socio-economic initiatives

Coal & Allied would continue to implement a range of socio-economic initiatives under the proposal. These initiatives include the below.

- Continued management of Coal & Allied residential properties via the open market. Coal & Allied utilises the services of local real estate agents to manage its properties to a high standard of maintenance and management.
- Continued support for local primary schools – ie Broke and Milbrodale Public Schools.
- Continued engagement with Singleton Council on key areas of common interest including attraction and retention of residents and long-term planning.
- Continued dedication of a proportion of the MTW Site Donation Committee annual funding for projects which contribute to near neighbour communities, including the Bulga community, and which are in accordance with the funding guidelines of the Committee.
- Continued development of the Coal & Allied Local Procurement Strategy incorporating the MTW operation.
- Continued preference for employees and contractors to reside locally.
- Continued implementation of the MTW Diversity Action Plan, with a key focus on increasing Indigenous and female employment relative to the local demographic context.
- Continued implementation of the MTW Apprenticeship and Graduate programme, drawing on local candidates, and consisting of:
    - five new apprenticeship positions each year;
    - Aboriginal scholarship programme in partnership with University of Newcastle, supporting two Aboriginal students per annum with a scholarship programme and vacation employment to complete their degrees;
    - two graduate positions per annum on a two year programme; and
    - two vacation student positions each year.
- Enhance two-way flow of information and feedback between the MTW operation and the community through appropriate programmes such as a 'Community Scorecard'.
- Continued development of a mechanism to provide information on operational monitoring results and responses on a regular basis.
- Continued implementation of the Near Neighbour Engagement Programme (incorporating Bulga, Long Point, Warkworth, Mount Thorley, Milbrodale, Maison Dieu and Gouldsville) as part of Coal & Allied's Multi-Year Community Relations Plan, including:
    - community events (dinners/BBQs) in Bulga each year including optional site tours;

- a 'Closure 101' information session with the community to provide an overview of the Coal & Allied approach to mine closure planning, rehabilitation, future land use and management;

- specific consultation for mining related activities that require near neighbour community input and communication; and

- continued provision of a bi-annual open day to provide community stakeholders with the opportunity to visit the site and further understand the operation.

- Continued implementation of a Community Awareness Induction program for new and existing MTW site employees.

20.5.2 Proposal specific initiatives

Additional initiatives that relate specifically to the proposal and form part of the statement of commitments (see Table 21.1) are provided below. It is noted that management and monitoring measures related to social amenity and community sustainability are detailed in the relevant technical aspect chapters and are not repeated here.

Proposal specific mitigation comprises:

- the development of a Social Impact Management Plan (SIMP) to manage and monitor the implementation of strategies to reduce identified social impacts and enhance social opportunities. The SIMP would detail implementation responsibilities; timing; performance indicators and targets; and monitoring measures. The SIMP would be prepared in consultation with key stakeholders following the EIS public exhibition and submissions process. The key aims of the SIMP would be to:

  - reflect the findings and recommendations of the SIA and provide a short summary of findings;

  - summarise for all stakeholders the potential positive and negative impacts of the proposal, proposed mitigation and management strategies, and implementation actions;

  - be developed for the life of the proposal; and

  - promote an active and ongoing role for communities, local authorities and all levels of government through construction, operation and decommissioning of a proposal.

- the negotiation of a VPA with Singleton Council. The VPA would present an opportunity to ensure a proportion of the funds are dedicated to maintaining and/or improving facilities and services in Bulga, other local neighbouring communities, and the Singleton LGA as a whole.

- the establishment of a Bulga and Near Neighbour Amenity Resource to provide support to residents surrounding the operation.

20.6 Conclusions

Coal mining is a key industry and is the largest employer in Singleton, Cessnock, Muswellbrook LGAs, and the second largest employer in Upper Hunter Shire LGA. These LGAs have generally experienced population growth greater than the NSW average between 2006 and 2011 (with the exception of Singleton LGA). Average incomes in these areas have also increased by more than the NSW average. However, the recent slowdown in the mining industry has impacted the regional economy.

As the proposal is to continue operations beyond 2017, and combined with the Warkworth Continuation 2014, enable MTW to maintain 1,300 jobs over the longer term, the greater impacts on the socio-economic environment and community services are projected to occur if the proposal does not proceed.

These would include:

- workers and their families moving away from the area;
- workers and their families faced with unemployment and financial difficulties;
- reduced local spending;
- decreased local businesses;
- contribution to population decline;
- reduced viability of services such as local schools; and
- reduced community life and participation.

The stakeholder perceived impacts and opportunities of the proposal, paying particular attention to Bulga village, were determined through consultation and are compared to the outcomes of the environmental aspects and economic technical studies that form part of the EIS or with external literature. Matters raised often related to predominately to the Warkworth Continuation 2014, not the proposal.

The selection of stakeholders focussed on consulting with those who were concerned regarding the proposal. The majority of the perceived impacts or matters raised by stakeholders are addressed by the corresponding technical studies of the impact. Coal & Allied would continue to address these matters of concern for stakeholders through ongoing consultation process to inform stakeholders of the impacts of the proposal and proposed mitigation, management and enhancement strategies. This EIS forms an important part of this consultation.

In addition, a suite of continuing and new social initiatives strategies have been developed by Coal & Allied to manage or mitigate perceived impacts and to enhance opportunities, based on feedback from stakeholders. These strategies include the continued investment in the community and engagement with key stakeholders including Singleton Council and near neighbours and enhancement of the two-way flow of information and feedback between the MTW operation and the community through appropriate programmes such as a ‘Community Scorecard’.

A SIMP would be developed for the proposal to further develop these management and mitigation measures and detail a plan of implementation including responsibilities; timing; performance indicators and targets; and monitoring measures. The SIMP would be prepared in consultation with key stakeholders, following the EIS public exhibition and submissions process.

Chapter 21

Environmental management and commitments

Chapter 21 — Environmental management and commitments

21 Environmental management and commitments

This chapter describes the commitments made by Coal & Allied through the life of the proposal to manage potential impacts identified within the EIS. Commitments include management, mitigation and/or monitoring measures.

Environmental management at MTO has been discussed in general in Section 5.3 which includes management under Coal & Allied's accredited ISO 14001 EMS. This forms part of the Rio Tinto Coal Australia's HSEQ Management System and forms the basis for ongoing environmental management. The EMS is a management tool implemented by the company, rather than a consent requirement. It would continue to be implemented across MTO. The relevant plans, procedures and monitoring programmes contained within the EMS would be reviewed and modified to incorporate the commitments outlined in this chapter and reflect the changes to operations resulting from the proposal.

The technical assessments provide a number of measures to avoid or minimise the potential impacts resulting from the proposal. These measures have been considered in the context of existing operations at MTO and the EMS. Many of these measures are already in place as part of exiting controls and would continue to be implemented to minimise the potential impacts from the proposal.

Commitments relating specifically to the proposal, beyond those implemented in the current EMS, are presented in Table 21.1 below.

Table 21.1 Commitments

Item	Commitments
General	Upon receipt of development consent, all management plans relevant to the proposal will be updated with requirements as specified in this EIS and any subsequent response to submissions report.
Noise	Management and monitoring of noise will continue to be undertaken in accordance with the MTW Noise Management Plan. The noise management plan will be reviewed and updated to incorporate the proposal.
Air quality and GHG	Management and monitoring of air quality will continue to be undertaken in accordance with the MTW AQMP. The MTW AQMP will be reviewed and updated to incorporate the proposal.
Ecology	Management and monitoring measures to be implemented for ecology relate exclusively to rehabilitation and comprise: • progressive rehabilitation in accordance with the MOP; • rehabilitation of approximately 483ha of mined land rehabilitated to locally occurring ecological communities (including EEC), with an additional 97.5ha rehabilitated to trees over grass; • fauna habitat enhancement, such as the placement of logs, woody debris and other features to support fauna re-colonisation of rehabilitated areas; • implementation of a seed collection programme to ensure species abundance and diversity is available for planting out of the rehabilitation areas; • development of performance indicators and ongoing monitoring and reporting to track the progress of rehabilitation; and • final landform development with recognition of the pre-mining landform and incorporating existing rehabilitation areas consistent with adjacent vegetation communities.
Final landform and rehabilitation	Rehabilitation will continue to be undertaken in accordance with the MTW Rehabilitation Management Plan. Should the proposal and the Warkworth Continuation 2014 be approved, the plan will be updated to include objectives for combined MTW rehabilitation as described below. • closure strategy: - prepare a closure strategy in accordance with Rio Tinto's Closure Standard to evaluate and document closure and post closure options. • prepare a closure management plan for MTO prior to completion of mining which would: - develop and document a description of specific technical solutions related to infrastructure and facilities for the preferred closure option(s); - develop and maintain auditable details of closure cost; - develop a detailed communication plan; - develop and maintain a socio-economic mitigation programme; and - develop a full decommissioning plan five years prior to the estimated date of ceasing production at MTO. The decommissioning plan will contain specific details of how closure will be achieved.

Table 21.1 Commitments

Item	Commitments
	• Final land use: - integration of final land use with the rehabilitation undertaken by the surrounding mining operations, existing agricultural land and areas containing remnant vegetation, ultimately providing sustainable land uses agreed by a range of stakeholders; and - progressive incorporation of erosion and sediment control and water management structures into the final landform.
Visual	Management and monitoring of visual impacts will continue to be undertaken in accordance with the draft MTW VIMP which will be updated to include the following additional measures: • Site-specific visual assessment (SSVA): - a process will be developed to enable any landowner in Bulga village who perceives a significant visual impact from the proposal to receive an SSVA. The assessment will recommend appropriate mitigation if required for high impacts which will be implemented in consultation and agreement with the landowner.
Groundwater	Management and monitoring of groundwater will continue to be undertaken in accordance with the MTW WMP. The WMP will be reviewed and updated to include the additional management measures prescribed below. • A site specific investigation into trigger level exceedance would be undertaken if: - professional judgement determines that the single deviation or a developing trend could result in environmental harm; or - three consecutive measurements exceed trigger values. • Data management and reporting: - establishment of trigger levels; - quarterly review of groundwater levels and field water quality against trigger levels, with site specific investigations initiated; and - all groundwater data being stored in a database customised for MTW with suitable QA/QC controls. • Licensing: - retain and obtain appropriate water licences, as required, to account for modelled take.
Surface water	Management and monitoring of surface water will continue to be undertaken in accordance with the MTW WMP. The WMP will be reviewed and updated to include the following additional management measures: • Licensing: - retain and obtain appropriate water licences, as required, to meet operational requirements. • Surface water monitoring programme: - Update to include locations of new dams as they are constructed (eg Sediment Dam A) with EC, pH and TSS monitored monthly and a comprehensive analysis six monthly.

Table 21.1 Commitments

Item	Commitments
Aboriginal and cultural heritage	Management and monitoring to be implemented for Aboriginal and cultural heritage comprise: • Preparation of an integrated HMP. • Management of Aboriginal cultural heritage at the Site: - completion of reassessment surveys for the remaining undisturbed portion of the Site to the south-east of Loders Creek with a view to finalising the area to be included in the proposed Loders Creek ACHCA; - all Aboriginal cultural heritage within the area (both as currently known and as may be identified from the completion of the reassessment surveys) will continue to be managed in accordance with the provisions of the CHMS and the ACHMP (or HMP); - places assessed as vulnerable to unintended harm, owing to the proximity of roads or tracks or other operational infrastructure, will be appropriately buffered and barricaded in accordance with existing protection procedures and protocols as outlined within the provisions of the CHMS and the ACHMP (or HMP); and - all Aboriginal cultural heritage places within these areas will be monitored in accordance with such procedures and protocols as outlined within the provisions of the CHMS and the ACHMP (or HMP). • Management of Aboriginal cultural heritage within Loders Creek ACHCA: - the Loders Creek ACHCA will be established for the long-term conservation and management of Aboriginal cultural heritage places and values. In particular, it will provide for the protective management and cultural maintenance of the remaining undisturbed portion of Loders Creek within the Site; - the Loders Creek ACHCA will be protected permanently from future mining, exploration drilling and associated development disturbance; - the Loders Creek ACHCA will be managed in accordance with a specific management plan developed in consultation with the CHWG and other stakeholders including DP&E and OEH. This plan will include the following matters: ▪ the establishment of strictly controlled non-access zones and protocols around culturally sensitive areas as determined in consultation with the CHWG; ▪ the establishment of areas for use by the Aboriginal community for cultural and community purposes; ▪ the establishment of areas for active Aboriginal cultural heritage and landscape management, including vegetation rehabilitation; ▪ the processes and protocols by which ongoing Aboriginal community access to the Loders Creek ACHCA can be facilitated; and ▪ the plan would be integrated with the MTW HMP; - the Aboriginal community, through a Coal & Allied ACHCA management committee, will oversee the implementation of the management plan; and - Coal & Allied will continue to ensure an active Aboriginal community role in both Aboriginal cultural heritage and environmental management activities for the Loders Creek ACHCA.
Historic heritage	Management and monitoring to be implemented for historic heritage comprise: • implement a Chance Finds Procedure should sites of potential historic heritage value be encountered or uncovered unexpectedly during operation.

Table 21.1 Commitments

Item	Commitments
Social	Socio-economic initiatives to be implemented under the proposal comprise: • the development of a Social Impact Management Plan (SIMP) to manage and monitor the implementation of strategies to reduce identified social impacts and enhance social opportunities. The SIMP would detail implementation responsibilities; timing; performance indicators and targets; and monitoring measures. The SIMP would be prepared in consultation with key stakeholders, following the EIS public exhibition and submissions process. The key aims of the SIMP would be to: - reflect the findings and recommendations of the SIA and provide a short summary of findings; - summarise for all stakeholders the potential positive and negative impacts of the proposal, proposed mitigation and management strategies, and implementation actions; - be developed for the life of the proposal; and - promote an active and ongoing role for communities, local authorities and all levels of government through construction, operation and decommissioning of a proposal. • the negotiation of a VPA with Singleton Council. The VPA would present an opportunity to ensure a proportion of the funds are dedicated to maintaining and/or improving facilities and services in Bulga, other local neighbouring communities, and the Singleton LGA as a whole. • the establishment of a Bulga and Near Neighbour Amenity Resource to provide support to residents surrounding the operation.

Chapter 22

Alternatives

Chapter 22 — Alternatives

22 Alternatives

22.1 Introduction

The applicant considered and investigated a number of different options for mining areas, overburden emplacement and other components in developing the proposal described in this EIS that would achieve the objectives stated in Section 2.2. The following sections provide an overview of the options considered during the proposal design phase.

22.2 Design considerations

The need for the proposal is presented in Chapter 3. Whilst the proposal mostly includes the continuation of existing approved activities, options and alternatives for the proposal were considered to avoid or minimise impacts on sensitive features, principally to those related to groundwater, whilst needing to satisfy economic and financial viability requirements of the continued operation in the longer term.

22.2.1 Development consent timeframe

The operational integration of MTO and Warkworth Mine is critical to activities and environmental management at the respective mines. Options considered for the proposal included lodgement of a modification to the MTO development consent to extend the life of the development consent for a further five years. This timeframe would be required to ensure that the existing approved resources for extraction in Loders Pit would be mined within the modified consent life.

However, this option was discounted, principally due to the uncertainty regarding the permissibility and licensability of activities to occur at MTO following expiry of the modified consent, which would include the continued transfer or coal, water and rejects from Warkworth Mine and the processing of Warkworth Mine ROM coal at MTO CPP. This would also include the transfer of overburden should the Warkworth Continuation 2014 be approved.

The proposal would align the life of the development consent with Warkworth Mine as part of the integrated operations. A necessary outcome is that the ongoing activities associated with the transfer and processing of coal, via conveyors, reclaimers and the CPP as well as the transfer of overburden, waste and water at MTO (should Warkworth Continuation 2014 be approved) would generate emissions requiring environmental licensing and monitoring through existing legislative processes and mechanisms. By aligning MTO's development consent life with that of Warkworth Mine, it provides a clear delineation of responsibility in terms of licensing and other accountabilities to external stakeholders, including government agencies and the surrounding community.

The development consent period under the proposal aligns with that proposed under the Warkworth Continuation 2014 to promote the viability of both mining operations. The proposals provide MTW with its best opportunity of maintaining its current workforce of approximately 1,300 people on average.

22.2.2 Tailings storage capacity

The effective management of tailings is an important aspect of the integrated MTW. As part of MTW's mine planning process, the requirement for additional tailings capacity was identified. This capacity requirement is due to the production that forms part of the Warkworth Continuation 2014 proposal.

In assessing the need for additional tailings capacity, a number of options were considered. Firstly, the nature of the location of the proposed TSF was considered. There are two main options for the storage of tailings:

- the use of existing dams, or the construction of new dams at either MTO or Warkworth Mine; and
- utilisation of mining pits or part thereof, following the completion of mining before being filled with overburden.

At MTO, Loders and AGN Pits are approved to be mined and this would continue under the proposal. Mining in Loders Pit and AGN are scheduled for completion in approximately 2020 and 2022, respectively. Tailings emplacement at AGN remains incorporated into the development proposal for MTO.

As described in the previous section, overburden is proposed to be emplaced within Loders Pit upon completion of mining. The proposed fill level corresponds to the height of the natural ground at the base of the levee in the south-west corner of the lease where the alluvial associated with Salt Pan Creek interact with the existing mining lease boundary. Given this, preliminary investigations were undertaken to determine whether tailings could be emplaced in the completed Loders Pit prior to emplacement of overburden. Investigations included preliminary groundwater modelling to determine whether there would be any offsite impacts. These investigations concluded that tailings could be emplaced and then be capped with transfer of overburden commencing upon the successful completion of the capping and do not affect the long-term environmental outcomes in comparison to the currently approved operation. As a result, use of the northern part of Loders Pit as a TSF forms part of the proposal. In this way, the MTO final void is proposed to be backfilled.

In general terms, the removal of the approved final void in Loders Pit given the receipt of overburden and tailings from Warkworth Mine, subject to approval of its new development application is viewed as a long-term environmental improvement in the context of the current development consent.

22.3 Not proceeding with the proposal

Under the existing development consent, open cut mining may continue to occur within the approved area until June 2017. However, at achieved and projected rates of mining at MTO, a notable proportion of approved economic resource would remain in-situ at the end of the current consent period, sterilising an economically significant resource.

Should the proposal be refused, it is likely the applicant would prepare and a lodge a modification to extend the life of existing development consent to enable completion of the approved resources to be extracted. Should the Warkworth Continuation 2014 (which is proposing to mine the area north of Putty Road within MTO's mining tenement) also be refused, the applicant may also consider the need to relocate Putty Road to complete approved extraction of resources.

Furthermore, refusal of the development application would mean there would be insufficient overburden to complete the final landform as approved (if the Warkworth Continuation 2014 is also not approved) resulting in a substantial final void.

Chapter 23

Justification and conclusion

Chapter 23 — Justification and conclusion

23 Justification and conclusion

23.1 Justification

23.1.1 Introduction

Development consent for the proposal is required to prevent the sterilisation of coal resource that is approved for extraction but cannot be mined during the current consent period. It will also enable the ongoing provision of services to the adjacent Warkworth Mine which is critical to the viability of both mines and would result in an improved final landform at MTO amongst other benefits.

The sections below discuss the objects of the EP&A Act and the significance of the resource proposed for extraction, and provide consideration to the non-discretionary standards under the Mining SEPP and the conclusion to the EIS.

23.1.2 Objects of the EP&A Act

An assessment of the proposal against the objects of the EP&A Act was provided in Section 6.2.2. The assessment found that the proposal is consistent with these objects for the following important reasons:

- MTW contains a substantial coal resource on privately-owned land, within the footprint of existing mining leases, and supported by existing extensive physical and human infrastructure;
- it enables existing jobs to be maintained and does not seek an increase in the long-term average workforce which would create any additional demand for community services;
- it enables current socio-economic benefits to continue including community support initiatives, and payment of royalties which contribute towards State revenue to provide for community services and facilities;
- rehabilitation and conservation areas are proposed to offset ecological and heritage impacts and provide long-term protection and conservation of native animals, plants and cultural heritage; and
- community consultation was undertaken for the proposal with feedback received considered in preparation of the EIS.

The principles of ESD are discussed in following section.

23.1.3 Ecologically sustainable development

A definition of ESD is provided in Section 6.2.2. The principles of ESD are outlined in section 6 of the POEO Act 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 impacts can be avoided through the understanding of potential environmental impacts by undertaking a full environmental assessment, and incorporating effective mitigation or compensation measures into development proposals.

Options for avoidance through design were limited given the proposal mostly includes the continuation of existing approved activities and does not seek to extend the rate or spatial extent of mining. Nevertheless, avoidance and/or minimisation of impacts on sensitive features were considered for the proposal, with the preferred options chosen to provide an appropriate balance between environmental, social and economic impacts.

The environmental assessment of the proposal and the supporting technical studies were based on conservative assumptions ensuring that potential worst case impacts are determined. The principles of ESD require such impacts to be balanced against humanity's needs, including for energy and material well-being. Coal & Allied has committed to measures to prevent or minimise potential adverse environmental impacts from the proposal. Any residual impacts will be balanced against the provision of a cost effective and efficient means of energy generation which provides for humanity's current and future needs.

For these reasons, the proposal is consistent with the precautionary principle.

Social equity including intergenerational equity: the proposal contributes to social equity by providing direct and indirect employment. It would result in the transformation of a geological resource into physical and human capital through investment in infrastructure and workforce training, and, indirectly, through contributions to governments which would enable greater investments in public infrastructure and services. For example, MTW implements an apprenticeship and graduate programme, drawing on local candidates and consisting of five new apprenticeships each year; an Aboriginal scholarship programme; intake of two new graduates per annum on a two year programme; and two vacation students each year (see Section 20.5.1).

The assessment of worst case potential residual noise and air quality impacts determined that acquisition criteria will not be exceeded at any privately-owned residences not within either Warkworth Mine's or a neighbouring mine's existing acquisition zone during the proposed consent period.

Given the above, it is considered that the proposal would generally promote social equity including intergenerational equity.

Conservation of biological diversity and maintenance of ecological integrity: The proposal is entirely within previously disturbed land and is highly unlikely to have significant ecological impacts. Proposed rehabilitation would improve the biological diversity and ecological integrity of disturbed land within the Site.

Improved valuation and pricing of environmental resources: the economic study of the proposal included a comparison of the benefits and costs. The proposal would enable the ongoing operational integration of MTO and Warkworth Mine which is critical to viability of both mines. This would enable jobs to be maintained. Monetary estimates were determined for the intangible environmental, cultural and social impacts of the proposal. This approach is consistent with contemporary internationally good practice and, therefore, it is considered that the proposal assists in the valuation and pricing of environmental resources.

The general conclusion is that the proposal is consistent with ESD and its principles.

23.1.4 Significance of the resource

The economic significance of the resource was a consideration in the granting of the development consent in 1996. The proposal would prevent the sterilisation of approximately 28.6Mt of ROM coal. Notwithstanding the volume of coal to be extracted under the proposal, MTO continues to provide social and economic benefits by enabling more time to extract the economic resource, while providing services critical to the viability of Warkworth Mine.

The continued operation of MTW has significant social and economic benefits in the form of continuing employment for a workforce of approximately 1,300 persons, direct capital expenditure of some $1.5billion and royalties of some $617million. The economic benefits attributable to the MTO include continuing employment for a workforce of approximately 121 persons, $149million in direct net economic benefits and some $50million in royalties.

23.1.5 Non-discretionary standards

Clause 12AB of the Mining SEPP sets out a number of non-discretionary development standards for the purposes of section 79C(2) and (3) of the EP&A Act in relation to the carrying out of development for the purposes of mining. The proposal satisfies the non-discretionary development standards for cumulative noise level, airblast overpressure, ground vibration and aquifer interference as detailed in Section 6.2.5.

23.2 Conclusion

Mining activities at MTO have been occurring for over 30 years. It is a large-scale business built on many millions of dollars of investment seeking approval to continue operating across land it owns and over mining leases granted in 1981. Additional time is required to enable the extraction of a previously approved economic resource while providing ongoing services to Warkworth Mine such as receipt of overburden material and coal processing in the MTO CPP.

Environmental management at the Site is undertaken in accordance with a range of well established systems, plans, procedures and licences. Management approaches at MTO are underpinned by the principle of continuous improvement which is demonstrated by recent noise and dust management commitments such as fleet noise attenuation and real-time noise alarm system, predictive forecasting tools, advanced directional monitoring technology and community response officers on shift to assist with the management of noise, air quality and lighting.

Mining activities at MTO have approval until 22 June 2017 under its development consent. The proposal seeks a 21 year development consent period from the date of any approval. If approval is granted in 2014, operations at MTO are forecast to continue to end of 2035, an 18 year extension over the current approval. It is noted that mining of the existing approved open cut resources at MTO is anticipated to be complete for Loders Pit and AGN by approximately 2020 and 2022, respectively.

The proposal seeks a continuation of all aspects of MTO as it presently operates together with minor alterations to the approved operations. Of significance, all activities, including coal extraction, would be within disturbance areas approved under the existing development consent.

The proposal has enabled a contemporary assessment of the potential impacts of the ongoing operation of MTO with the EIS prepared using the most recent and accurate scientific data relevant to the proposal.

This EIS was prepared in accordance with current legislation and government policy, including the Mining SEPP amendments, and used the most recent and accurate scientific data relevant to the proposal. Feedback received from community and government stakeholder engagement together with the Secretary's requirements, provided guidance to the assessment approach, ensuring that all potential matters of relevance associated with the proposal were assessed.

Technical studies adopted conservative assumptions to enable the upper limit of potential environmental impacts to be determined. Noise and vibration and groundwater studies were independently peer reviewed. The proposal complies with the non-discretionary standards of the Mining SEPP relating to cumulative noise levels, airblast over pressure, ground vibration and aquifer interference. The footprint of the resource has been previously cleared.

The applicant has committed to proposal specific management measures where adverse impacts were assessed irrespective of the implementation of existing standard leading practice environmental management safeguards. Although Aboriginal cultural heritage would not be impacted under the proposal, conservation of cultural heritage items is proposed through the Loders Creek ACHCA.

The stakeholder perceived impacts and opportunities of the proposal, paying particular attention to Bulga village, were determined through consultation and compared to the outcomes of technical studies that form part of the EIS or with external literature. Matters raised related predominately to amenity, the physical environment, health and well-being, the economy, infrastructure and services, and community engagement, relationships and governance. Matters raised often related predominately to the Warkworth Continuation 2014, not the proposal.

As the proposal is to continue operations beyond 2017, and combined with the Warkworth Continuation 2014, enable MTW to maintain approximately 1,300 jobs over the longer term, the greater impacts on the socio-economic environment and community services are projected to occur if the proposal does not proceed.

Since 2010, based on feedback received from a range of stakeholders, a suite of ongoing and proposal specific strategies have been developed by Coal & Allied to improve communications generally and are further expanded to manage/ mitigate or enhance proposal-related impacts and opportunities.

In particular, a social impact management plan would be developed for the proposal to further develop these management and mitigation measures and detail a plan of implementation including responsibilities, timing, performance indicators/targets and monitoring measures. The social impact management plan would be prepared in consultation with key stakeholders, following the EIS/SIA, public exhibition and submissions process.

Overall, while the proposal has some residual social and environmental impacts, some of which are experienced by near neighbours, it should be approved as:

- it enables the extraction of resource already approved for mining;
- it allows for the ongoing provision of services to Warkworth Mine which is critical to the viability of both mines;
- it enables the completion of final landform at MTO;
- no additional disturbance would result from the proposed and impacts on near neighbours have been minimised to the greatest extent possible while maintaining an economically viable mine plan;

- it is consistent with the objects of EP&A Act;
- it meets all Government policies;
- MTO has a long history of minimal non-compliances with Government approvals;
- it ensures maximum return on hundreds of millions of dollars invested in the mine since it commenced operations and, as an existing mine, it has established access to product transport and distribution infrastructure such as road, rail and port;
- it provides a state significant economic benefit to the local, regional, state and national economies; and
- it contributes to the long-term security for approximately 1,300 jobs.

Abbreviations

Abbreviations

µm	micrometre
µg/m^3	micrograms per cubic metre
ABS	Australian Bureau of Statistics
ACHMP	Archaeology and Cultural Heritage Management Plan
ACHCA	Aboriginal Cultural Heritage Conservation Area
ACHCRP	Aboriginal Cultural Heritage Consultation Requirements for Proponents
ADCC	Aboriginal Development Consultative Committee
AGE	Australasian Groundwater and Environmental Consultants Pty Ltd
AGN	Abbey Green North
AGS	Abbey Green South
AHD	Australian height datum
AHIMS	Aboriginal Heritage Information Management System
AIP	NSW Aquifer Interference Policy 2012
AIS	agricultural impact statement
ANZECC	Australian and New Zealand Environment and Conservation Council
AQMP	Air Quality and Greenhouse Management Plan
ARC	ARC Transport & Traffic
ARI	average recurrence interval
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ARTC	Australian Rail Track Corporation
ASS	acid sulphate soils
AWD	available water determination
BCAM	biodiversity certification assessment methodology
BDT	beneficiated dewatered tailings
BMP	blast management plan
BoM	Bureau of Meteorology
BSAL	biophysical strategic agricultural land
CCC	community consultative committee
CCL	consolidated coal lease
CHMD	cultural heritage management database
CHMS	cultural heritage management system
CHWG	cultural heritage working group
CIC	critical industry cluster
CO	carbon monoxide
CO_2-e	carbon dioxide equivalent
CRD	cumulative rainfall departure

CPP	coal preparation plant
CRTSF	Centre Ramp Tailings Storage Facility
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	development application
dB	decibels
dB(A)	sound intensity with an 'A' contour filter
dB($L_{in\ Peak}$)	peak linear frequency response
DEC	NSW Department of Environment and Conservation
DCCEE	Commonwealth Department of Climate Change and Energy Efficiency
DECCW	NSW Department of Environment, Climate Change and Water
DIICSRTE	Commonwealth Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education
DLWC	NSW Department of Land and Water Conservation
DoE	Commonwealth Department of the Environment
DPC	NSW Department of Premier and Cabinet
DP&E	Department of Planning and Environment
DRE	Division of Resources and Energy
DSITIA	Queensland Department of Science, Information Technology, Innovation and the Arts
DS Act	NSW *Dams Safety Act 1978*
DSC	Dams Safety Committee
EA	environmental assessment
EC	electrical conductivity
EEC	endangered ecological community
EIS	environmental impact statement
EL	exploration lease
EMM	EMGA Mitchell McLennan Pty Limited
EMS	environment management system
ENM	environmental noise model
EPA	NSW Environment Protection Authority
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
EPL	environment protection licence
ERM	Environmental Resources Management Limited
ESD	ecologically sustainable development
FeS_2	pyrite
FFMP	Flora and Fauna Management Plan
FTE	full time equivalent
GDE	groundwater dependent ecosystem

GHG	greenhouse gases
GL	giga litre
GSSE	GSS Environmental Pty Limited
GWP	global warming potential
ha	hectares
HEC-RAS	Hydrologic Engineering Centres Rivers Analysis System
HMA	habitat management areas
HMP	heritage management plan
HRSTS	Hunter River Salinity Trading Scheme
HSEQ	health, safety, environment and quality
HSEQMS	health, safety, environment and quality management system
HVAS	high volume air samplers
HVRF	Hunter Valley Research Foundation
INP	NSW Industrial Noise Policy
IS	iso-thermal
ISO	International Organisation for Standardisation
kg	kilograms
km	kilometres
L&E Court	NSW Land and Environment Court
$L_{1,1min}$	noise level present for 1% of 1 minute
LEP	local environmental plan
$L_{eq,15min}$	15-minute A-weighted equivalent continuous sound pressure level
LGA	local government area
L_{max}	maximum noise level
m	metre
MGJ	million gigajoules
MIC	maximum instantaneous charge
Mining Act	NSW *Mining Act 1992*
Mining SEPP	State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007
ML	mega litres
mm/s	peak particle velocity measured in millimetres per second
MNES	matters of national significance
MOP	mining operations plan
Mt	million tonnes
MTCL	Mount Thorley Coal Loader
MTIE	Mount Thorley Industrial Estate
MTJV	Mount Thorley Joint Venture
MTO	Mount Thorley Operations
Mtpa	million tonnes per annum

MTW	Mount Thorley Warkworth
NDA	non-disturbance area
NEPC	National Environment Pollution Committee
NEPM	national environment pollution measure
NES	national environmental significance
NGA	national greenhouse accounts
NMP	noise management plan
NO_2	nitrogen dioxide
NOOP Dam	North Out of Pit Dam
NOW	NSW Office of Water
NPV	net present value
NP&W Act	NSW *National Parks and Wildlife Act 1974*
OD	origin-destination
OEH	NSW Office of Environment and Heritage
PAC	NSW Planning Assessment Commission
PAD	potential archaeological deposit
PB	Parsons Brinckerhoff
$PM_{2.5}$	particulates which are 2.5 millimetres in diameter
PM_{10}	particulates which are 10 millimetres in diameter
POEO Act	NSW *Protection of the Environment Operations Act 1997*
PPV	peak particle velocity
PRP	pollution reduction programme
REMP	Rehabilitation and Environmental Management Plan
RFS	Rural Fire Service
RMS	NSW Roads and Maritime Services
Roads Act	NSW *Roads Act 1993*
ROM	run of mine coal
RTA	NSW Roads and Traffic Authority
SA	statistical area
SAL	strategic agricultural land
SCADA	supervisory control and data acquisition
SD	statistical division
SEPP	State environmental planning policy
SEPP 33	State Environmental Planning Policy No. 33 – Hazardous and Offensive Development
SEPP 44	State Environmental Planning Policy No. 44 – Koala Habitat Protection
SEPP 55	State Environmental Planning Policy No. 55 – Remediation of Land
SIDRA	Signalised Intersection Design Research Aid
Singleton LEP	Singleton Local Environmental Plan 2013
SOOP	southern out-of-pit dam
SPCC	State Pollution Control Commission

SPL	sound power level
SRD SEPP	State Environmental Planning Policy (State and Regional Development) 2011
SRLUP	strategic regional land use policy
SSD	State significant development
SSI	State significant infrastructure
SSVA	site specific visual assessment
t	tonne
TARP	trigger action response plan
TEOM	tapered element oscillating microbalance
TSC Act	NSW *Threatened Species Conservation Act 1995*
TSF	tailings storage facility
TSP	total suspended particulate matter
TSS	total suspended solids
US EPA	United States Environment Protection Agency
VCA	voluntary conservation agreement
VCU	visual catchment unit
VIA	visual impact assessment
VIMP	visual impact management plan
VPA	voluntary planning agreement
WAL	water access license
Water Act	NSW *Water Act 1912*
WBACHCA	Wollombi Brook Aboriginal Cultural Heritage Conservation Area
WM Act	NSW *Water Management Act 2000*
WMS	water management system
WRM	WRM Water and Environment Pty Ltd
WSP	water sharing plan

References

References

Australian Groundwater & Environmental Consultants Pty Ltd (AGE) 2010, *Warkworth Mine Extension, Groundwater Impact Assessment*.

ARC Traffic + Transport with Transport and Urban Planning 2013, *Traffic Impact Assessment for the Bulga Mine Optimisation Project.*

Australia and New Zealand Environment and Conservation Council (ANZECC) 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Canberra.

Australian Bureau of Statistics (ABS) 2014, *ABS 5625.0 Private New Capital Expenditure and Expected Expenditure, Australia.*

Australian Bureau of Statistics (ABS) 2013, *3101.0 - Australian Demographic Statistics*.

Australian Bureau of Statistics (ABS) 2011, *Census of Population and Housing: Basic Community Profile – Singleton, Muswellbrook, Cessnock, Maitland, Upper Hunter Shire LGAs; Singleton, Broke and Bulga SSCs; and NSW*. Catalogue number 2001.0. ABS.

Australian Bureau of Statistics (ABS) 2006, *Census of Population and Housing: Basic Community Profile – Singleton, Muswellbrook, Cessnock, Maitland, Upper Hunter Shire LGAs; Singleton, Broke and Bulga SSCs; and NSW*. Catalogue number 2001.0. ABS.

Australian and New Zealand Minerals and Energy Council (ANZMEC) and Minerals Council of Australia 2000, *Strategic framework for mine closure*, Canberra.

Australian Rail Track Corporation (ARTC) 2013, *2013-2022 Hunter Valley Corridor Capacity Strategy.*

Bess, Rebecca, and Zoë O. Ambargis 2011, *Input-Output Models for Impact Analysis: Suggestions for Practi tioners Using RIMS II Multipliers*; in: 50th Southern Regional Science Association Conference, New Orleans Louisiana.

Bill Jordan and Associates 2006, *Cuneens Bridge Congewai Creek, Wollombi.*

Bureau of Resources and Energy Economics (BREE) 2013, Resources and energy major projects reports. Canberra: Australian Government.

Central Queensland Cultural Heritage Management 2010, *Aboriginal Cultural Heritage Assessment – Warkworth Extension Project*, prepared for Coal & Allied Operations Pty Limited.

Commonwealth of Australia 2006, *Handbook of Cost-Benefit Analysis*, January.

Commonwealth Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education (DIICSRTE) 2013a, *Australian National Greenhouse Accounts: National Greenhouse Accounts Factors,* Australian Government.

Commonwealth Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education (DIICSRTE) 2013b, *Australian National Greenhouse Accounts – State and Territory Greenhouse Gas Inventories*, Australian Government.

Commonwealth Department of the Environment (DoE) 2014, *Australian National Greenhouse Accounts – Quarterly Update of Australia's National Greenhouse Gas Inventory, September Quarter 2013.*

Coughlin, Cletus, and Thomas B. Mandelbaum 1991, *A consumer's guide to regional economic multipliers, Federal Reserve Bank of St. Louis Review*, January/February, 73(1).CSIRO Marine & Atmospheric Research 2013, *Upper Hunter Valley Particle Characterization Study Final Report.* Report prepared for the NSW Office of Environment and Heritage and the NSW Department of Health.

Deloitte Access Economics 2013, *Prospects and challenges for the Hunter region: A strategic economic study*. Report prepared for Regional Development Australia (RDA) Hunter, March.

Department of the Environment (DoE) 2014, Australian National Greenhouse Accounts – Quarterly Update of Australia's National Greenhouse Gas Inventory, September Quarter 2013.

Department of Industry, Innovation, Climate Change, Science Research and Tertiary Education (DIICSRTE) 2013a, Australian National Greenhouse Accounts – National Greenhouse Accounts Factors.

Department of Industry, Innovation, Climate Change, Science Research and Tertiary Education (DIICSRTE) 2013b, Australian National Greenhouse Accounts – State and Territory Greenhouse Gas Inventories.

Department of Land and Water Conservation (DLWC) 1988, Systems used to classify rural lands in New South Wales, viewed 12 June 2014, viewed 12 June 2014, http://www.environment.nsw.gov.au/resources/soils/systemsclassifylands.pdf.

Ecologically Sustainable Development Steering Committee 1992, *National Strategy for Ecologically Sustainable Development*, endorsed by the Council of Australian Governments.

Environmental Sustainability Unit – Mineral Resources 2013, *ESG3: Mining Operations Plan (MOP) Guidelines*, NSW Department of Trade and Investment, Regional Infrastructure and Services (NSW Trade & Investment).

ERM Mitchell McCotter 1995*, Extension of Mining at Mount Thorley Operations – Environmental Impact Statement.* Report prepared for Mount Thorley Operations.

Environment Resources Management Australia Pty Limited (ERM) 1995, *Extension of Mining at Mount Thorley Operations - Environmental Impact Statement*.

Environment Resources Management Australia Pty Limited (ERM) 2002a, *Mount Thorley Operations and Warkworth Mining Ltd Section 96(2) Modification of Development Consent – Statement of Environmental Effects.*

Environment Resources Management Australia Pty Limited (ERM) 2002b, *Extension of Warkworth Coal Mine – Environmental Impact Statement*, prepared for Coal & Allied on behalf of Warkworth Mining Limited.

Environment Resources Management Australia Pty Limited (ERM) 2008, *Hunter Valley Operations South Coal Project: Environmental Assessment Report,* prepared for Coal & Allied Operations Pty Limited.

EMGA Mitchell McLennan (EMM) 2014, *MTW Supplier Contribution and Participation survey.*

GSS Environmental (GSSE) 2010, *Warkworth Mine Extension – Soil Survey and Land Resources Assessment Report*, prepared for Warkworth Mining Limited.

Housing NSW 2014, *Rent and Sales Report no. 106.* September/ December 2013.

Hunter-Central Rivers Catchment Management Authority 2013, *Hunter-Central Rivers Catchment Action Plan.*

Hunter Valley Research Foundation (HVRF) 2013a, *Hunter Region Economic Indicators – June Quarter,* Maryville, NSW.

Hunter Valley Research Foundation (HVRF) 2013b, *Wellbeing Watch: A monitor of health, wealth and happiness in the Hunter*, Maryville, NSW.

Hunter Valley Research Foundation (HVRF) 2014, *Hunter Region Economic Indicators March Quarter 2014,* hvrf.com.au, viewed 13 June 2014.

Interagency Working Group on Social Cost of Carbon, 2013, Technical support document: Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866, United Sates Government.

Joint Ore Reserves Committee of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia (JORC) 2004, *Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves – the JORC Code – 2004 Edition.*

Karskens, G 1982, *As Good as Any in England: The Background to the Construction of the Great North Road,* in Karskens, G 1998, *Four Essays About the Great North Road,* Convict Trail Project Occasional Monograph Series.

Katestone Environmental 2010, *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining*. Prepared for the Office of Environment and Heritage.

Landcom 2004, *Managing Urban Stormwater: Soils and Construction – Volume 1*, *4th edition*.

Lucas S, Coombes P, Planner J, Welchman S 2009, 'Rainfall harvesting and coal dust: the potential health impacts of trace elements in coal dust in rainwater', *Air Quality and Climate Change*, vol. 43, issue 2 pp 23-30.

Mackie Environmental Research (MER) 2002, *Extension of Warkworth Coal Mine Assessment of Environmental Impacts Surface and Groundwater Management Studies*, August 2002.

Merritt, T., Cretikos, M., Smith, W. and Durrheim, D 2013, The health of Hunter Valley communities in proximity to coal mining and power generation, general practice data, 1998–2010. *NSW Health Bullet in* vol. 24, no. 2, pp. 57-64.

National Environment Protection Council (NEPC) 2003, *National Environment Protection (Ambient Air Quality) Measure,* Australian Government.

Nexus Archaeology 2006, *Assessment of Historical Archaeology: Cuneens Bridge at Wollombi, NSW.*

NSW Department of Environment and Climate Change (DECC) 2008, *Managing Urban Stormwater: Soils and Construction – Volume 2E Mines and Quarries.*

NSW Department of Environment and Conservation (DEC) 2005a, *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation Guidelines.*

NSW Department of Environment and Conservation (DEC) 2005b, *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*, NSW Government.

NSW Department of Environment, Climate Change and Water (DECCW) 2011, *NSW Road Noise Policy.*

NSW Department of Environment, Climate Change and Water (DECCW) 2009, *Waste Classification Guidelines.*

NSW Department of Land and Water Conservation (DLWC) 1988, *Systems used to classify rural lands in New South Wales,* NSW Government.

NSW Department of Planning and Environment (DP&E) 2012, *Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals.*

NSW Environment Protection Authority (EPA) 2000, *NSW Industrial Noise Policy.*

NSW Environment Protection Authority (EPA) 2013, *Upper Hunter Air Particles Action Plan*.

NSW Government 2012, *Strategic Regional Land Use Plan Upper Hunter*, Department of Planning and Infrastructure, Sydney.

NSW Office of Environment and Heritage (OEH) 2010a*, Aboriginal Cultural Heritage Consultation Requirements for Proponents.*

NSW Office of Environment and Heritage (OEH) 2012, *The land and soil capability assessment scheme,* NSW Government.

NSW Office of Water (NOW) 2012, *NSW Aquifer Interference Policy*.

NSW Roads and Traffic Authority (RTA) 2002, *Guide to Traffic Generating Development,* prepared by Transport Planning Section, Sydney Client Services on behalf of Network Development Branch.

NSW Treasury 2007, NSW Government Guidelines for Economic Appraisal.

Parsons Brinkerhoff 2010, *Traffic Impact Assessment for the Warkworth Mine Extension Project*.

Pearce, D., Atkinson and S. Mourato 2006, Cost-benefit Analysis and the Environment: Recent Developme nts, OECD.Planning NSW (2002), *The Guidelines for economic effects and evaluation in EIA*.

Probert, O 2014, 'Feast turns to famine for mining graduates', January/February, *Australian Journal of Mining*, January/February, p.6.

Resource Strategies 2003, *Wambo Development Project – Environmental Impact Statement.*

Rio Tinto 2013, *Closure Standard*, March 2013.

RPS 2013, *Aboriginal Cultural Heritage Assessment – Ramp 22 Sedimentation Dam,* report prepared for Coal & Allied – Mount Thorley Warkworth.

Rio Tinto Coal Australia (RTCA) (2014) *Sustainable Development Report 2013.*

Scarp Archaeology 2009, *Cultural Heritage Investigations Warkworth South west Study Area*, prepared for Rio Tinto Coal Australia.

Scarp Archaeology 2011, *Cultural Heritage Investigations Warkworth Southwest and Bulga Farm Study Area, Hunter Valley, Singleton LGA*, prepared for Rio Tinto Coal Australia.

State Pollution Control Commission of NSW (SPCC) 1986, *Particle size distributions in dust from open cut mines in the Hunter Valley*, Report Number 10636-002-71, prepared for SPCC by Dames & Moore, 41 McLaren Street, North Sydney, NSW, 2060.

Stubbs, J 2012, *Affidavit of Judith Doris Stubbs in Bulga* in Milbrodale Progress Association Inc v Minister for Planning and Infrastructure and Warkworth Mining Limited. Case No. 10224.

Umwelt Australia Pty Limited 2013, *Bulga Optimisation Project Environmental Impact Statement*, prepared by Umwelt Australia for Bulga Coal Management Pty Limited.

Validakis, V 2013, 'Apprentices feel mining slowdown in the Hunter', *Australian Mining*, 10 September.

Vanclay, F, 2003, SIA principles: International Principles for Social Impact Assessment. *Impact Assessment and Project Appraisal* 21(1), pp. 5–11.

Weir Phillips 2012, *Heritage Assessment Charlton Road Realignment – Bulga Optimisation Project, Singleton Shire*, New South Wales.

Workplace Gender Equality Agency (WGEA) (2013) Women in the workforce: by industry. July 2013. https://www.wgea.gov.au/sites/default/files/2013-07-25%20-%20Women%20in%20the%20workforce%20by%20industry_FINAL_0.pdf, viewed 13 June 2014.

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