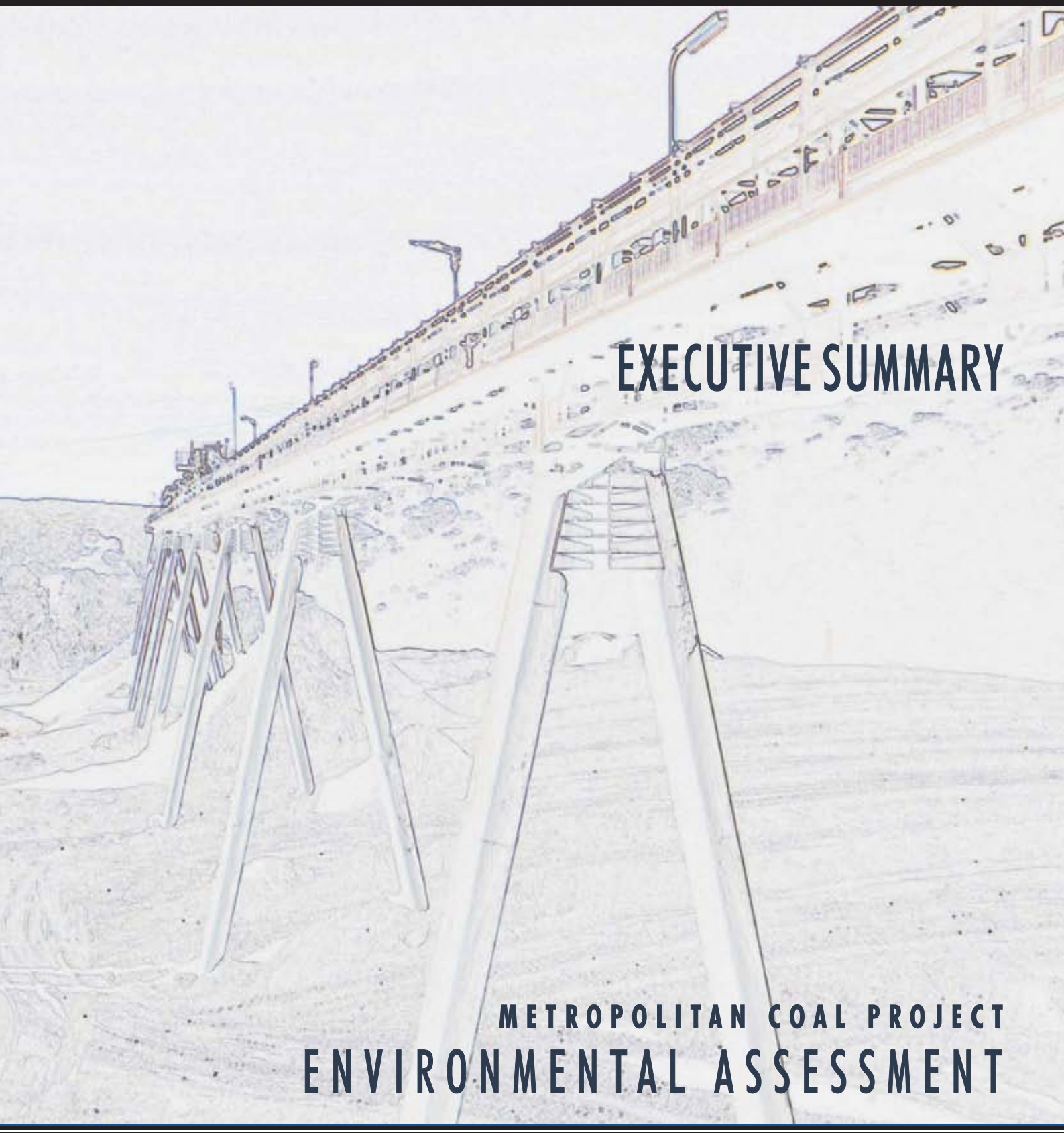

EXECUTIVE SUMMARY

METROPOLITAN COAL PROJECT
ENVIRONMENTAL ASSESSMENT

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ES1 INTRODUCTION

This document is an Environmental Assessment (EA) for the Metropolitan Coal Project (the Project). The Project comprises continuation, upgrade and extension of underground coal mining operations and surface facilities at the existing Metropolitan Colliery.

The Metropolitan Colliery is located approximately 30 kilometres (km) north of Wollongong in New South Wales (NSW) (Figure ES-1) and the existing Metropolitan Colliery Major Surface Facilities Area is located in the town of Helensburgh (Figure ES-2).

The Metropolitan Colliery is owned and operated by Helensburgh Coal Pty Ltd (HCPL), a wholly owned subsidiary of Peabody Pacific Pty Limited (Peabody Pacific). Peabody Pacific is the Australasian subsidiary of Peabody Energy, the world's largest private sector coal company.

ES1.1 BACKGROUND

The Metropolitan Colliery is one of the earliest established and longest running coal mining operations in Australia, with history dating back to the 1880s. The Metropolitan Colliery is located within Consolidated Coal Lease (CCL) 703 and a portion of CCL 724 (Figure ES-3) which is sub-leased from BHP Billiton Endeavour Coal Pty Ltd.

Completed Underground Mining Areas are shown on Figure ES-3. Longwall mining of the Bulli Seam commenced in 1995. HCPL is currently mining Longwalls 14 to 19A (Figure ES-3).

The underground mining operations are supported by the Metropolitan Colliery's surface facilities. The surface facilities include administration buildings, workshop, bath house and ablution facilities, haul roads, access road, fuel and consumables storage facilities, hardstand areas, a Coal Handling and Preparation Plant (CHPP), stockpiles (including run-of-mine [ROM] coal, product coal and coal reject stockpiles) and associated coal handling infrastructure (e.g. conveyors, transfer points and buffer bins) (Figure ES-4).

Existing water management infrastructure includes dams, sediment ponds, water diversions and a water treatment plant. Other existing surface facilities include Ventilation Shaft No. 3 (Figure ES-3) and supporting electrical yard.

Coal extracted from the underground mining operations is transferred by conveyor to the Major Surface Facilities Area. ROM coal is crushed, screened and washed at the CHPP. The Metropolitan Colliery currently produces up to approximately 1.5 million tonnes per annum (Mtpa) of hard coking and semi-hard coking product coal. The majority of product coal is transported by train to the Port Kembla Coal Terminal to domestic and overseas customers (Figure ES-1). A small proportion of the product coal is also transported by truck to the Corrimal and Coalcliff Coke Works for domestic use (Figure ES-1).

CHPP coal reject material is transported by truck to the Glenlee Washery which is owned and operated by SADA Services Pty Limited (Figure ES-1).

ES1.2 PROJECT DESCRIPTION

The Project would involve the continuation of underground mining operations at the Metropolitan Colliery.

The Project would extend into two proposed Mining Lease Application areas (MLA 1 and MLA 2) which adjoin CCL 703 to the west and north-west (Figure ES-3). The Project would also involve the transfer of the sub-leased portion of CCL 724 from BHP Billiton Endeavour Coal Pty Ltd to HCPL (Figure ES-3).

The Project underground mining operations within the tenements described above would be supported by the Metropolitan Colliery's surface facilities.

The main activities associated with development of the Project would include:

- on-going surface and underground exploration activities in the Project Underground Mining Area and Current Underground Mining Area;
- continued development of underground mining operations (Figure ES-3);
- upgrades of the existing mining and materials handling systems to facilitate an increased ROM coal production rate (up to approximately 3.2 Mtpa);
- continued use of the existing Metropolitan Colliery Major Surface Facilities Area and the existing supporting infrastructure;
- production of approximately 2.8 Mtpa of hard coking and semi-hard coking coal (including minor quantities of thermal coal) for export and domestic markets;

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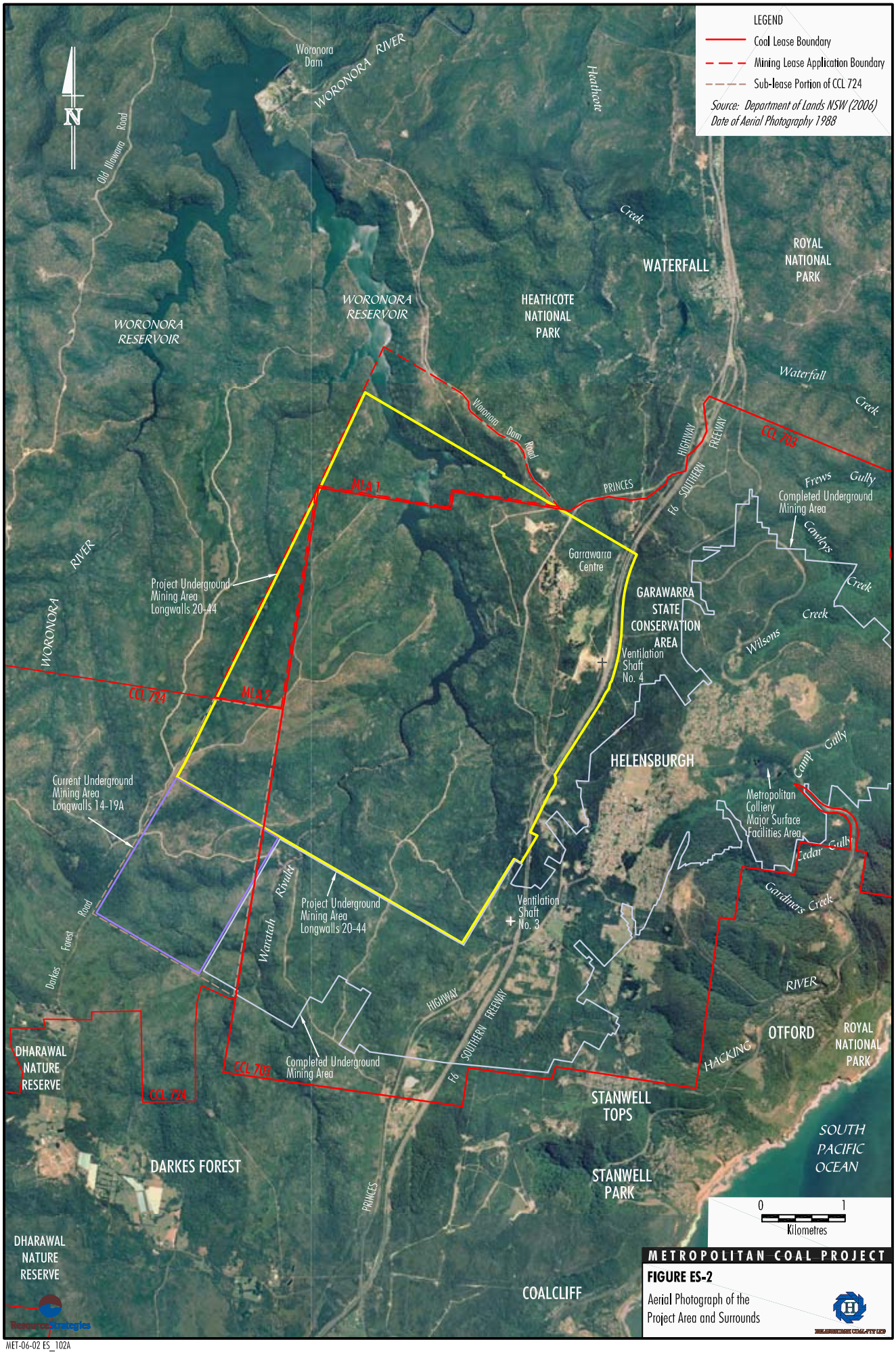

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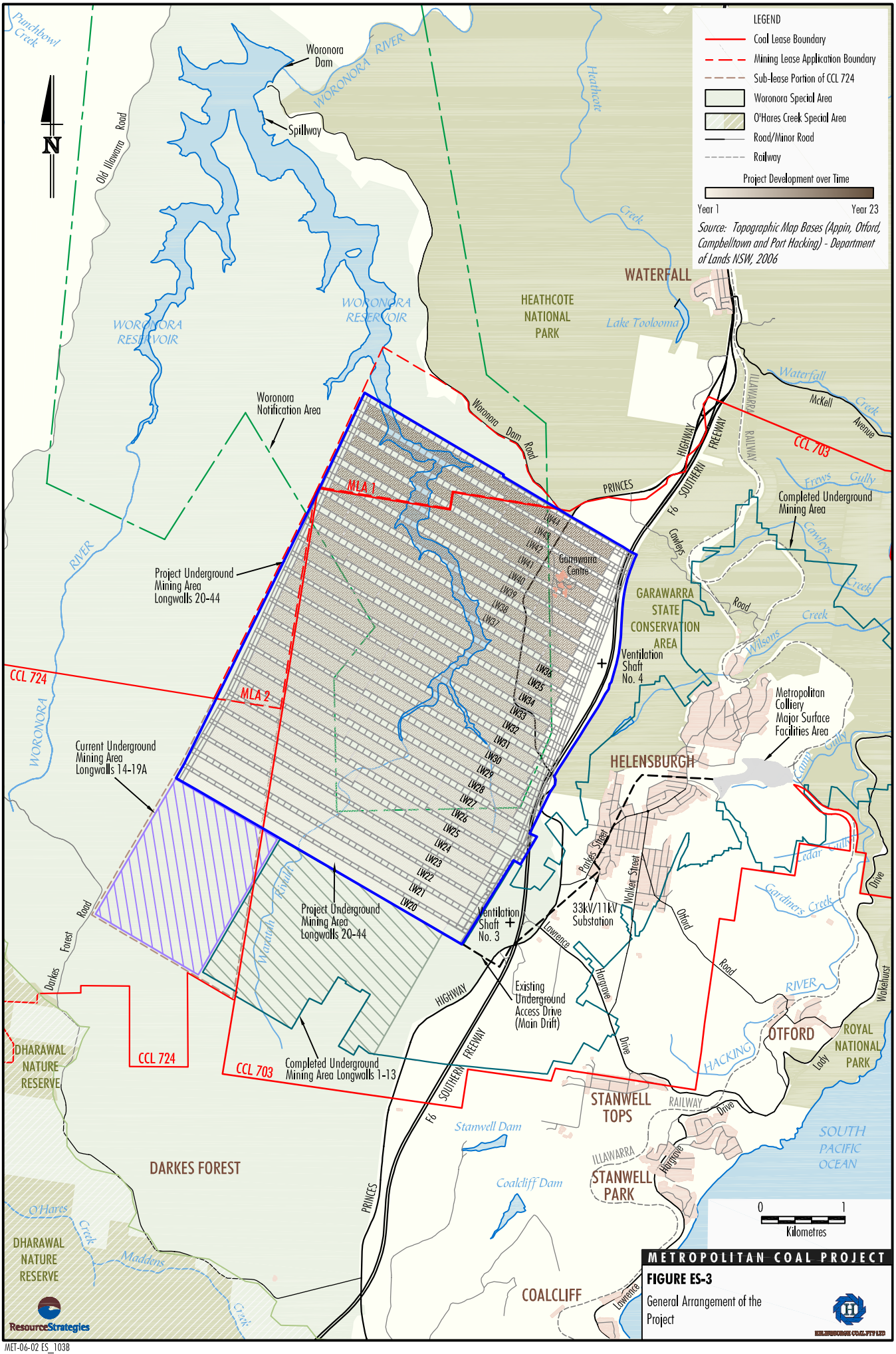

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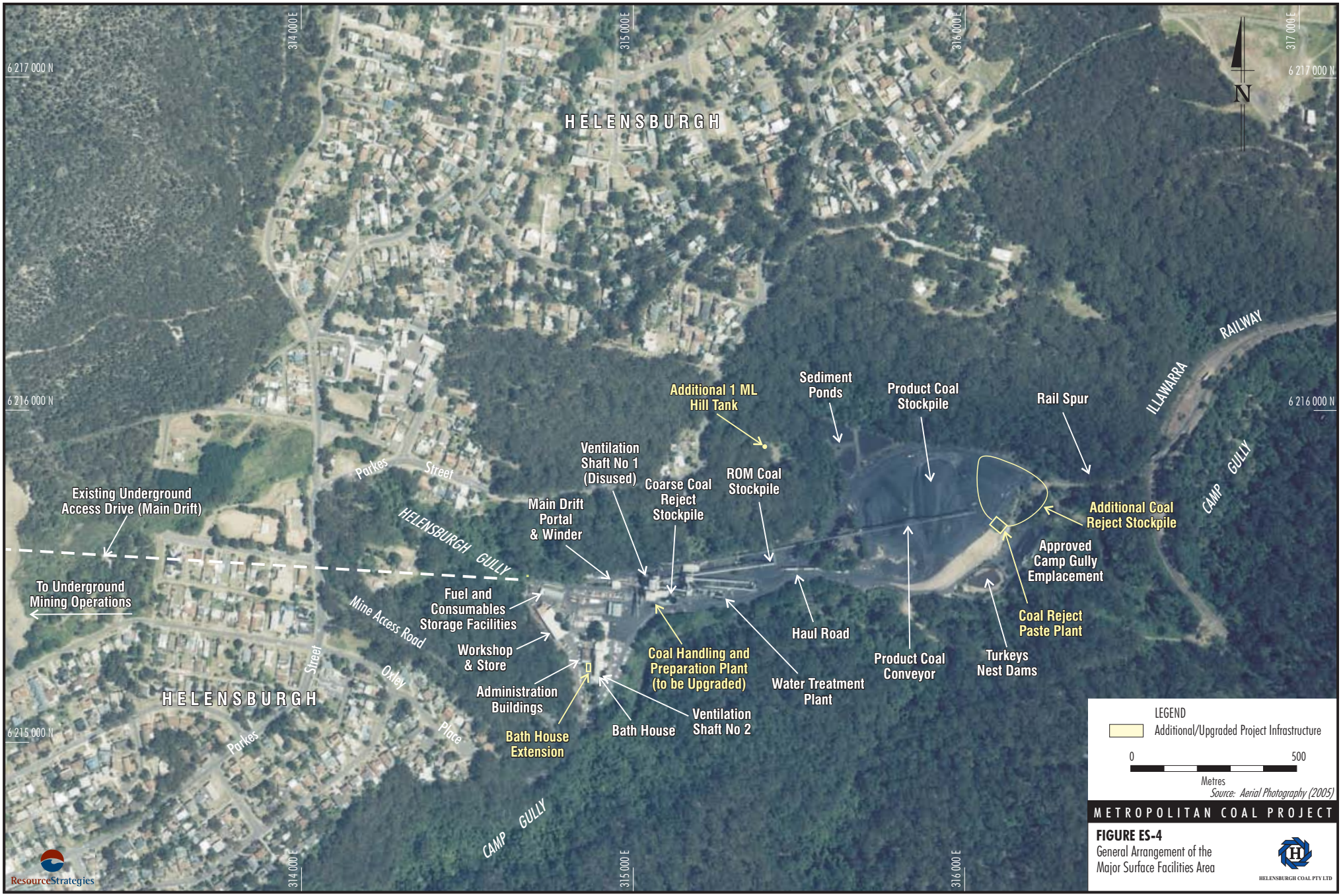

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- upgrades of the CHPP to facilitate increased production of washed coal, including the addition of a beneficiation circuit;
- coal reject would continue to be produced, with quantities to increase in line with increased ROM coal production;
- continued transport of coal reject to the Glenlee Washery (Figure ES-1) (with annual road movements capped at the existing maximum rate);
- continued transport of product coal by road to Coalcliff and Corrimal Coke Works (Figure ES-1);
- construction of a coal reject paste plant and associated coal reject stockpile, pumping, pipeline and underground delivery systems to facilitate the underground backfilling of the mine void using coal reject materials as an integrated component of the longwall mining operation;
- train loading and train movements associated with the transport of product coal to Port Kembla Coal Terminal (Figure ES-1) 24 hours per day, seven days per week;
- surface access and associated works within the Woronora Special Area (Figure ES-3) and surrounds that is required for environmental monitoring, management and remediation of mine subsidence;
- upgrades and/or extension of the existing supporting infrastructure systems (e.g. underground access, water management system, yard area, conveyor transfers and drives, ventilation, gas management and electrical systems) as required;
- extension of the life of the Metropolitan Colliery by approximately 23 years; and
- other associated minor infrastructure, plant, equipment and activities.

Upgrades of electricity transmission infrastructure to supply the future requirements of the Project (and/or the future requirements of Helensburgh) undertaken by the electricity supplier are not included as part of the Project or assessed in this EA.

Table ES-1 provides a summary snapshot of the Project components including upgrades and extensions as compared with a summary of the existing Metropolitan Colliery operations.

Project Construction/Development Activities

Project construction/development activities would generally be limited to the following key components:

- longwall mining machinery upgrades;
- upgrades of underground materials handling systems;
- upgrades of the CHPP;
- electricity supply upgrades; and
- development of a coal reject paste plant and underground goaf injection system.

Underground Mining Operations

Underground mining operations would continue at the Metropolitan Colliery with development to extend to the west and north of the Current and Completed Underground Mining Areas (Figure ES-3). Underground mining operations would continue to be conducted 24 hours a day, seven days a week.

As shown on the Project general arrangement (Figure ES-3), the Project Underground Mining Area comprises a rectangular area approximately 3.5 km wide and 5 km long. The operational methodology and type of equipment currently in use at Metropolitan Colliery for Longwalls 14 to 19A would also be used for the Project Longwalls 20 to 44.

Within the Woronora Notification Area (Figure ES-3), the longwall layout has been varied to conform with the preliminary guideline provided by the Dams Safety Committee *Mining in Notification Areas of Prescribed Dams*. In accordance with the Dams Safety Committee guideline, longwall panel and chain pillar widths would be varied within the Project Underground Mining Area depending on the proximity to the Woronora Reservoir (Figure ES-3).

Table ES-1
Project Snapshot

Project Component	Summary of Existing Metropolitan Colliery Operations	Summary of Metropolitan Coal Project
Underground Mining and ROM Coal Production	• Production of approximately 1.8 Mtpa of ROM coal.	• Production of up to approximately 3.2 Mtpa of ROM coal.
Product Coal	• Production of approximately 1.5 Mtpa of hard coking and semi-hard coking coal for export and domestic markets. • Product coal is transported by train to the Port Kembla Coal Terminal and by truck to the Corrimal and Coalcliff Coke Works.	• Production of approximately 2.8 Mtpa of hard coking and semi-hard coking coal (including minor quantities of thermal coal) for export and domestic markets. • Continued product coal transport by train to the Port Kembla Coal Terminal with increased rail movements in line with increased coal production. • Trucking of product coal to the Corrimal and Coalcliff Coke Works would continue at the existing maximum rate of annual road movements.
Coal Reject Management	• Coal reject is produced at the CHPP, stockpiled temporarily and then transported by truck to the Glenlee Washery. • HCPL currently retains a Wollongong City Council approval for development of a Coal Reject Emplacement in Camp Gully (Figure ES-4). To date, no coal reject has been emplaced at this location.	• Coal reject would continue to be produced, with production to increase in line with increased ROM coal production. • Temporary stockpiling of up to 50,000 tonnes adjacent to the existing product coal stockpile (Figure ES-4). • Trucking of coal reject to Glenlee Washery would continue at the existing maximum rate of annual road movements. • Construction of a coal reject paste plant and associated infrastructure to facilitate underground backfilling of the mine void by goaf injection.
General Surface Facilities and Supporting Infrastructure	• Existing general surface facilities include administration buildings, coal handling infrastructure, bath house, workshops, equipment service facilities, car park, washdown and fuel storage facilities. • Extensive supporting infrastructure including systems associated with: - underground drift access and conveyors; - electricity supply, reticulation and control; and - ventilation and gas management.	• The existing surface facilities would be utilised, however, the Project would include the upgrade of some infrastructure and construction of additional components as required. • Supporting infrastructure systems would be extended and upgraded as required.
Life of Mine	• Longwalls 14 to 19A are currently scheduled for completion in 2010.	• An additional mine life of approximately 23 years.
Employment	• HCPL currently has an operational workforce (staff and on-site contractors) of approximately 320 people.	• The operational workforce is expected to remain at approximately 320 people. • It is anticipated that a peak construction workforce of up to 50 employees would be required.

Longwall Mining Operation

The longwall miner utilises a series of hydraulic roof supports to provide a working area for the shearer and the machine operators. Once each slice of coal is removed from the longwall face, the hydraulic roof supports are moved forward, allowing the roof and a section of the overlying strata to collapse behind the longwall machine (referred to as forming the "goaf").

In order to start each new longwall panel, the longwall machine is separated into components and re-assembled in the installation roadway of the next panel.

ROM coal is conveyed from the longwall miner to the surface either directly to the ROM coal bin or is stacked to the ROM coal stockpile adjacent to the CHPP.

ES1.3 PROJECT APPROVAL PROCESS

This EA has been prepared to accompany a Project Application made for the Project, in accordance with Part 3A of the *Environmental Planning and Assessment Act, 1979* (EP&A Act). The Project was determined to be a "Major Project" to which Part 3A of the EP&A Act applies in accordance with the *State Environmental Planning Policy (Major Projects) 2005* on 8 October 2007 by the Director-General of the NSW Department of Planning, as delegate of the NSW Minister for Planning.

This EA considers the potential environmental impacts of the Project in accordance with the Director-General's Environmental Assessment Requirements (EARs) issued by the Department of Planning on 30 July 2008. The EARs were issued in accordance with the requirements of Part 3A of the EP&A Act and Part 1A of the *Environmental Planning and Assessment Regulation, 2000.*

ES2 PROJECT CONSULTATION PROGRAMME

HCPL is committed to an open and constructive consultation programme, which aims to:

- identify interested parties and stakeholders;
- inform government and other stakeholders of the nature and status of the Project by presenting information in a number of formats and venues, to facilitate a clear understanding of the Project;
- identify issues of concern to stakeholders for consideration in the Project planning and design process and in this EA; and
- establish dialogue between HCPL and government and community stakeholders that would be on-going, should the Project be approved.

The consultation programme has provided an effective avenue to identify issues of concern or interest to stakeholders and to address these issues in this EA document, where applicable.

ES2.1 SOUTHERN COALFIELD INQUIRY

The NSW Government announced a strategic inquiry into underground mining in the Southern Coalfield on 6 December 2006. An Independent Expert Panel was appointed to conduct the inquiry.

Approximately 56 written submissions were made to the Southern Coalfield Inquiry by a range of public, non-government and government agencies and interest groups. The Southern Coalfield Inquiry therefore provided an opportunity for a range of stakeholders with an interest in mining in the Illawarra Region to express their views and raise issues with underground mining in the region.

The Southern Coalfield Inquiry Independent Expert Panel reported in July 2008. The key issues raised in the Southern Coalfield Inquiry and the findings and recommendations of the Independent Expert Panel as described in the Southern Coalfield Panel Report have been considered in this EA.

ES2.2 GOVERNMENT AGENCIES

Initial Project briefings with Government agencies commenced in the second half of 2006.

In order to facilitate information exchange between key State Government agencies and HCPL, working groups were established at both the technical and executive levels. Information exchange and the progressive presentation and discussion of baseline data and assessment findings from the key environmental studies occurred during the preparation of this EA and supporting appendices.

The Metropolitan Colliery Technical Working Group generally met monthly between May 2007 and the finalisation of the EA and comprises representatives from the Sydney Catchment Authority, Department of Primary Industries-Mineral Resources and HCPL.

The Project Executive Working Group was formulated by the Department of Planning to provide a venue for executive level consultation with key State Government agencies.

Presentations were made by HCPL at approximately monthly intervals from February 2008 to familiarise the relevant managers from the key agencies with the Project and to inform the Project planning, design and environmental assessment process. The Project Executive Working Group comprises representatives of Department of Planning, Sydney Catchment Authority, Department of Primary Industries-Mineral Resources, Department of Environment and Climate Change, HCPL and Peabody Pacific.

A range of State and Local Government agencies were consulted during the preparation of the EA, including:

- Subsidence Management Plan Interagency Committee.
- Department of Environment and Climate Change.
- Department of Primary Industries-Mineral Resources.
- Sydney Catchment Authority.
- Mine Subsidence Board.
- Roads and Traffic Authority.
- Department of Water and Energy.
- South Eastern Sydney Illawarra Area Health Service.
- Dams Safety Committee.
- Heritage Branch (Department of Planning).
- Department of Lands.
- Sydney Metropolitan Catchment Management Authority.
- Wollongong City Council.
- Wollondilly City Council.
- Campbelltown City Council.

Consultation was also undertaken with the Commonwealth Department of the Environment, Water, Heritage and the Arts.

ES2.3 INFRASTRUCTURE OWNERS

There are a range of infrastructure items in the Project area that could potentially be affected by mine subsidence. HCPL consulted with a range of agencies with an interest in infrastructure in the Project area during the preparation of the Subsidence Assessment and/or as a component of the wider consultation programme.

This consultation included the validation of the particulars of infrastructure items and the provision of draft subsidence predictions for key infrastructure for consideration by infrastructure owners, where relevant.

ES2.4 NON-GOVERNMENT ORGANISATIONS

The Southern Coalfield Inquiry provided an opportunity for a range of organisations to present their views on mining in the Southern Coalfield (Section ES2.1). The Southern Coalfield Inquiry particularly provided a forum for the expression of concerns from a wide range of environmental non-government organisations. A number of these non-government organisations specifically included comments and concerns in their submissions to the Southern Coalfield Inquiry regarding the current (and future) operations of the Metropolitan Colliery in the Woronora Special Area. These submissions were considered during the preparation of this EA where relevant.

ES2.5 PUBLIC CONSULTATION

HCPL formed a Community Reference Group for the Metropolitan Colliery in May 2008.

The Metropolitan Colliery Community Reference Group comprises thirteen members from the local community. The Community Reference Group met on four occasions prior to completion of this EA and provided a mechanism to discuss the existing Metropolitan Colliery, the Project environmental assessment process and key findings of the air, noise, surface water, groundwater, Aboriginal heritage, non-Aboriginal heritage, rock bar restoration and transport assessments.

The Community Reference Group has also acted as a forum for issues of interest to the Community Reference Group participants and/or the wider community to be raised.

Private Landholders

While the vast majority of the Project Underground Mining Area and surrounds is located on lands held by Sydney Catchment Authority in the Woronora Special Area, portions are also owned by the Health and Administration Corporation, and some private landholdings are located adjacent to the Princes Highway and in the corridor between the Princes Highway and F6 Southern Highway. HCPL contacted the private landholders to discuss the Project and provide subsidence predictions to the landholders.

Aboriginal Community

Project consultation with Aboriginal stakeholders was extensive during the development of the Project EA and has been undertaken in general accordance with the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* and *National Parks and Wildlife Act 1974: Part 6 Approvals Interim Community Consultation Requirements for Applicants*.

Metropolitan Colliery Website

Peabody has a website that provides Project information and contact details for the Metropolitan Colliery. The website can be found at:

http://www.peabodyenergy.com.au/nsw/metropolitan-mine.html

ES3 ENVIRONMENTAL ASSESSMENT

The following subsections outline the primary findings of the EA with respect to the key issues.

ES3.1 ENVIRONMENTAL RISK ANALYSIS

In accordance with the Project EARs, an Environmental Risk Analysis was undertaken to identify the potential environmental impacts of the Project and identify key issues for further assessment in the EA.

The Environmental Risk Analysis was facilitated by SP Solutions and comprised a multi-disciplinary team. The key issues identified in the Environmental Risk Analysis are addressed in the EA.

ES3.2 LAND RESOURCES

The Project would require the development of an additional ventilation shaft and limited areas of land disturbance associated with on-going surface exploration activities, environmental monitoring equipment installation and other Project surface activities such as stream restoration.

Potential impacts of the Project on land resources including soil erosion, land contamination and bushfire risks have been considered. Erosion and sediment control strategies, general measures to reduce the potential for contamination of land and bushfire management measures for the Project are described in the EA.

ES3.3 SUBSIDENCE

Subsidence is the vertical and horizontal movement of the land surface as a result of the extraction of underlying coal. A Subsidence Assessment was prepared for the Project by Mine Subsidence Engineering Consultants and includes predictions of the potential subsidence effects of the proposed mine plan(s), sensitivity analysis of these predictions and assessment of the potential subsidence effects on the natural and built environment, paying particular attention to significant features.

The proposed longwall widths for Longwalls 20 to 44 are much narrower than the typical longwall widths that are currently being extracted at other collieries in the Southern Coalfield. These narrower longwall widths reduce surface subsidence movements, effects and consequences relative to those for the typical wider longwall widths.

Subsidence Impact Assessment for Key Surface Features

Cracking and dilation of bedrock along Waratah Rivulet and its tributaries may result in the localised diversion of a portion of the surface flow into subterranean flows or leakage through rock bars or from pools. Potential changes in stream bed gradients could occur, however, are anticipated to be small relative to the existing grades. The potential for scouring of the stream banks or changes to stream alignment as a result of mine subsidence effects is considered to be low.

Any cracking of the bedrock at the bases of some upland swamps is expected to be isolated and of a minor nature, due to the relatively low magnitudes of the predicted strains and the relatively high depths of cover. The minor cracking within the swamps would generally not be expected to propagate through swamp soil profiles. Swamp grades vary naturally and the predicted maximum tilts induced by mine subsidence are generally orders of magnitude lower than the existing natural grades within the swamps. Significant changes in grade within the swamps as a result of mine subsidence are not anticipated.

The magnitudes of the predicted systematic and/or valley related movements are likely to result in some fracturing of sandstone at cliffs and overhangs, and potentially some cliff instabilities and rock fall. The lengths of potential cliff instabilities along the cliffs and overhangs resulting from the extraction of the Longwalls 20 to 44 are anticipated to be less than 3% of the lengths of these cliffs and overhangs. The incidence of rock falls is expected to be low.

The magnitudes of the predicted systematic and valley related movements have the potential to cause surface cracking, including surface tension cracking near the tops of slopes. The size and extent of surface cracking on slopes is expected to be minor, which is consistent with that observed during the extraction of previous longwalls at the Metropolitan Colliery. Mine subsidence would be unlikely to result in any significant slope failure, as such failures have not been observed as the result of longwall mining in the Southern Coalfield.

Open Aboriginal heritage sites can potentially be impacted by the cracking of sandstone resulting from systematic movements and/or valley related movements. Any cracking of the exposed sandstone is expected to be isolated and of a minor nature, due to the relatively low magnitudes of the predicted strains and due to the relatively high depths of cover. Overhang sites can potentially be impacted by the cracking of sandstone, rock falls or water seepage through joints which may impact artwork. The Project may result in the cracking of sandstone and where cracking coincides with an overhang, may result in an isolated rock fall and consequent impact to heritage sites.

Infrastructure, improvements and private land holdings located within the potential extent of mine subsidence effects include: the Garrawarra Complex; the Illawarra Railway; public roads (e.g. F6 Southern Freeway and Princes Highway); fire trails, four wheel drive tracks and other minor roads; bridges; electrical services (e.g. electricity transmission lines and towers); Sydney Water infrastructure; telecommunications lines (e.g. optical fibre and copper cables); houses; rural building structures (e.g. farm sheds, garages and other non-residential structures); tanks; farm dams; and survey marks. Potential impacts to each of these are assessed in the EA and are considered to be manageable.

Mitigation Measures, Management and Monitoring

Prior to the commencement of longwall mining and periodically during the life of the Project, Subsidence Management Plans would be developed in consultation with the relevant authorities. The Subsidence Management Plans would further document the monitoring and management measures for potential subsidence impacts on key surface features.

Management, mitigation and monitoring measures of relevance to potential subsidence impacts on groundwater, surface water, aquatic ecology, terrestrial flora and fauna, and Aboriginal and non-Aboriginal heritage are described below.

Also described below is HCPL's proposed subsidence monitoring and adaptive management approach with respect to subsidence effects at the Waratah Rivulet over the life of the Project.

Potential subsidence impacts on items of surface infrastructure arising from the Project would be managed by the preparation and implementation of suitable management and response plans via the Subsidence Management Plan process.

ES3.4 GROUNDWATER

A Groundwater Assessment for the Project was conducted by Heritage Computing (Dr Noel Merrick).

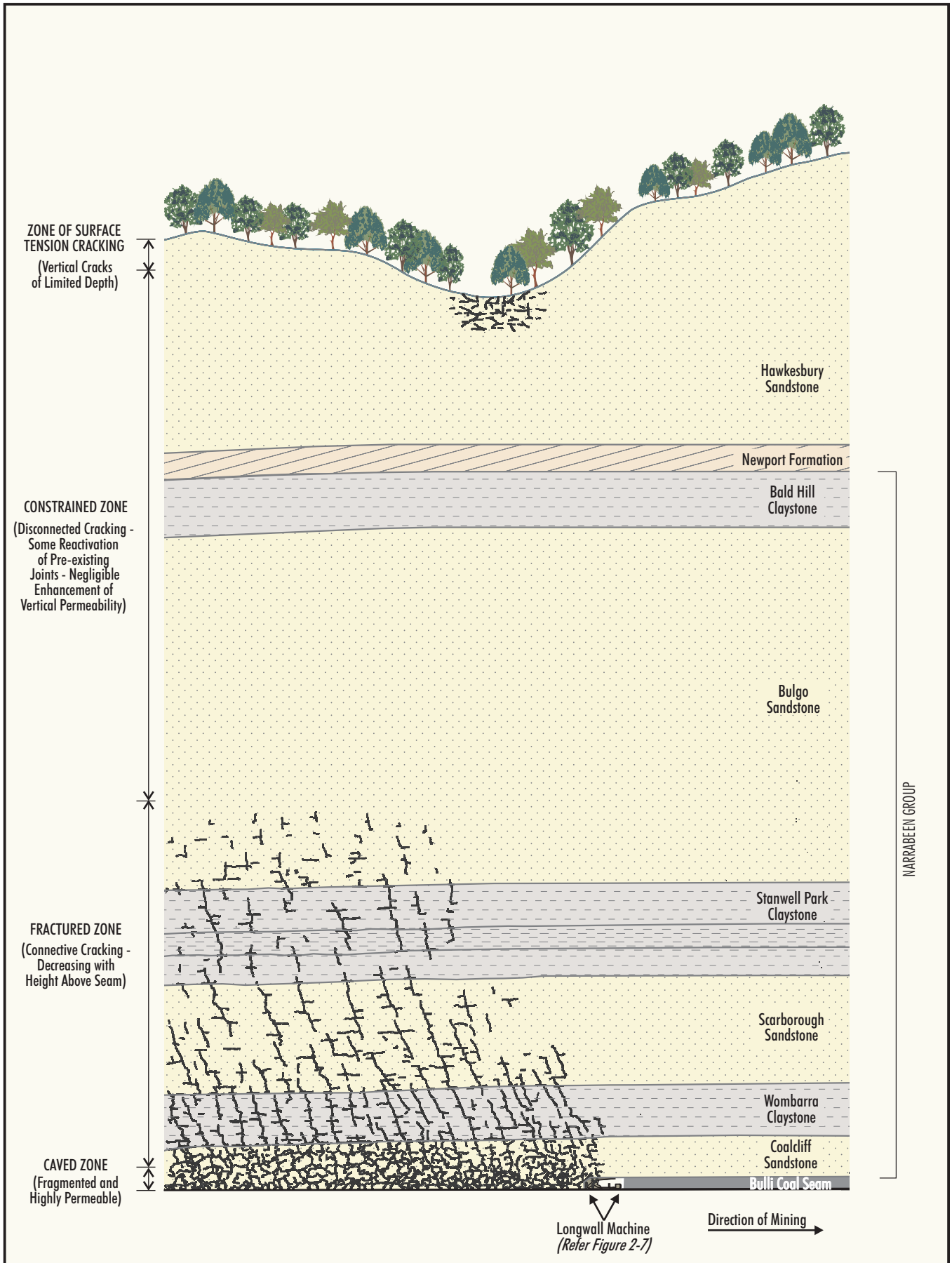
Existing Environment

A number of groundwater studies and monitoring programmes have been undertaken at the Metropolitan Colliery and surrounds and a comprehensive data set was analysed. Examination of the hydrogeological data has facilitated an understanding of the existing groundwater systems and the scale and nature of the existing effects of the Metropolitan Colliery (and other nearby mines) on local and regional groundwater systems.

Hydrogeological Regime

A conceptual model of the hydrogeological regime was developed based on the review of hydrogeological data, which supports three separate groundwater systems, including:

- Perched groundwater system – generally above and independent of the regional groundwater table (typically less than 20 m below the ground surface).
- Shallow groundwater system - the shallow groundwater system is separate from the perched groundwater system and defines a regional water table (typically less than 100 m below the ground surface).
- Deep groundwater system – there is a hydraulic disconnect between the deep groundwater system and shallow groundwater systems due to the low permeabilities of the Bald Hill Claystone and the Upper Bulgo Sandstone which lie beneath the Hawkesbury Sandstone (Figure ES-5) that hosts shallow groundwater. The deep groundwater system is typically more than 100 m below the ground surface.



After: Geosensing Solutions (2008), Heritage Consulting (2008)

METROPOLITAN COAL PROJECT

FIGURE ES-5
Schematic - Longwall Mining and Subsidence Profile

ResourceStrategies

Not to Scale

HELENSBURGH COAL PTY LTD

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Recharge to the groundwater system is from rainfall and from lateral groundwater flow. Although groundwater levels are sustained by rainfall infiltration, they are controlled by ground surface topography and surface water levels. A local groundwater mound develops beneath the sandstone hills with ultimate discharge to incised creeks and waterbodies. Loss by evapotranspiration through vegetation where the water table is within a few metres of the ground surface occurs within upland swamps and outcropping sandstone.

The only recognised economic aquifer in the area is the Hawkesbury Sandstone. The Hawkesbury Sandstone is a low yield aquifer of generally good quality beneath the Woronora Plateau and the Illawarra Plateau. There are seven registered bores in the vicinity of the Metropolitan Colliery.

Groundwater dependent ecosystems that occur within the Project Underground Mining Area and surrounds are described in Sections ES3.6 and ES3.7.

Upland Swamp Hydrology

Upland swamps on the Woronora Plateau occur in small headwater valleys that are characteristically sediment choked and swampy. The presence of upland swamps is related to their topographic position, the lithology of the bedrock and the hydrological balance on the plateau.

Broadly, upland swamps can be classified as headwater upland swamps or in-valley upland swamps. The hydrological characteristics of the headwater and in-valley upland swamps are described in the EA.

All swamps within the Project Underground Mining Area are classified as headwater upland swamps. One in-valley upland swamp is situated outside of the Project Underground Mining Area, but within the potential extent of mine subsidence effects. This in-valley swamp overlies completed Longwalls 7 and 8 and consequently has already experienced mine subsidence from operations in the Completed Underground Mining Area.

Potential Impacts

Perched Groundwater Systems

Excess rainfall produces a permanent perched water table within swamp sediments and outcropping sandstone that is independent of the regional water table in the Hawkesbury Sandstone. As the swamps are essentially rainfall-fed, water levels within upland swamps fluctuate seasonally with climatic conditions.

Surface cracking resulting from mine subsidence within the upland swamps is not expected to result in an increase in the vertical movement of water from the perched water table into the regional aquifer as the sandstone bedrock is massive in structure and permeability decreases with depth.

Any changes in swamp moisture as a result of cracking are expected to be immeasurable when compared to the scale of seasonal and even individual rainfall event based changes in swamp groundwater levels.

Shallow Groundwater Systems and Inflows to the Woronora Reservoir

Permanent mining-induced changes in the groundwater levels of shallow aquifers in connection with streams and ecosystems at the Metropolitan Colliery have not been observed to occur.

Stream beds at the Metropolitan Colliery have experienced cracking in response to subsidence effects. This has been observed to result in the diversion of a portion of surface water flows through fractures beneath the stream bed to move as underflow through the aquifer immediately beneath the stream, with emergence further downstream. There is no evidence that cracking in streambeds causes any net change in the overall water balance of a stream.

As there is an alternation of thick sandstone/claystone lithologies, there is a constrained zone in the overburden that remains rigid and acts as a bridge which isolates shallow and deep aquifers. At the substantial depths of cover at the Project, there would not be connective cracking from the mined seam to the surface.

Based on the analysis of the conceptual groundwater system, there would be no loss of groundwater yield to the Woronora Reservoir.

Depressurisation of the Deep Groundwater System

Immediately above a mined coal seam, rocks collapse into the void created by removal of the coal to form a caved zone and a fractured zone develops above the caved zone (Figure ES-5). This causes aquifer properties to change (e.g. permeability and porosity) and results in a higher vertical permeability as a result of mining.

Experience at the Metropolitan Colliery suggests that substantial depressurisation of the deep aquifers in the fractured zone above the goaf is restricted to a height of less than 130 metres (m) from the top of the goaf, while transient pressure effects have been observed to propagate to a height of about 300 m above the goaf. There is a pronounced increase in vertical hydraulic gradient in the deep groundwater system over the current Metropolitan Colliery longwalls.

Above goaf zones there would be substantial changes in fracture porosity and permeability, due to opening up of existing joints, new fractures and bed separation. Permeability increases would have accompanying reductions in hydraulic gradients, with associated changes in groundwater levels and pressures.

Groundwater modelling for the Project indicates that there is expected to be eventual recovery of deep groundwater system pressures over many decades following the cessation of mining.

Mitigation Measures, Management and Monitoring

Geological Investigation Programme

Geological investigations would be undertaken progressively over the life of the Project including exploration boreholes, mapping of geological structures intersected by underground workings, surface mapping and analysis of geomorphic expressions.

Groundwater Monitoring

The existing groundwater monitoring programme for Longwalls 14-17 at the Metropolitan Colliery would be augmented by the groundwater monitoring program developed for Longwalls 18 to19A in the Current Underground Mining Area. This groundwater monitoring programme and any supplementary components that may be required for the Project would be detailed in a Project Environmental Monitoring Programme.

Stream Restoration Measures

The injection of polyurethane into Waratah Rivulet rock bars provides a readily applicable management method to reduce the diversion of a portion of surface flows into sub-surface flow (Section ES4).

ES3.5 SURFACE WATER

A Surface Water Assessment for the Project was conducted by Gilbert and Associates and was peer reviewed by Dr Walter Boughton, an internationally recognised expert in hydrological studies.

Existing Environment

A range of surface water studies and sampling programmes have been undertaken at the Metropolitan Colliery and surrounds and a comprehensive data set has been analysed.

Regional Hydrology

The Project is situated on the Woronora Plateau, within the Woronora Reservoir and the Hacking River catchments. The Woronora Reservoir is a public water supply dam which supplies water to consumers within the Sutherland Shire Council area.

Local Hydrology – Project Underground Mining Area

The Project Underground Mining Area includes the Waratah Rivulet catchment and tributaries that flow directly to the Woronora Reservoir, as well as the upper reaches of the Woronora Reservoir (Figure ES-2). The headwaters of Cawley's Creek and Wilson's Creek, which drain in an easterly direction away from Woronora Reservoir into the Hacking River are also situated within the Project Underground Mining Area.

Woronora Reservoir Inflows

Gilbert and Associates examined whether stream flows were being lost from the Woronora Reservoir catchment as a result of existing mining at the Metropolitan Colliery using three different methods, namely:

- the examination and comparison of stream flows from mined and nearby unmined catchments;

- modelling of stream flows with and without a flow loss factor to examine whether the observed stream behaviour supported a loss from Waratah Rivulet; and
- a comparison of modelled and recorded inflows into the Woronora Reservoir.

In summary, a comprehensive analysis of stream flow data and data on the yield behaviour of Woronora Reservoir indicates that past mining at the Metropolitan Colliery has had no discernable effect on the inflow to, or yield from, the reservoir. Modelled and observed cumulative Woronora Reservoir inflows are shown on Figure ES-6. This finding is supported by the Southern Coalfield Panel Report which states:

> *No evidence was presented to the Panel to support the view that subsidence impacts on rivers and significant streams, valley infill or headwater swamps, or shallow or deep aquifers have resulted in any measurable reduction in runoff to the **water supply system** operated by the Sydney Catchment Authority or to otherwise represent a threat to the water supply of Sydney or the Illawarra region.*

Dr Walter Boughton concurs that Waratah Rivulet stream hydrographs, comparisons of flow in the Waratah Rivulet with other unmined streams (e.g. Woronora River and O'Hares Creek) and calibrations of the Australian Water Balance Model indicate that there is no evidence of any transmission loss or similar loss in the low flows in the Waratah Rivulet that might be attributed to effects of underground mining.

Surface Water Quality

Surface water quality monitoring has been conducted on Waratah Rivulet and other local streams. Extensive surface water quality sampling has been conducted by HCPL and Sydney Catchment Authority on Waratah Rivulet. In general, water quality at all sites has been good with concentrations of most indicators low relative to the Woronora Reservoir Bulk Water Supply Agreement Limits and the recommended Australian and New Zealand Environment and Conservation Council guidelines for the protection of aquatic ecosystems in upland rivers.

The overall water quality of most indicator parameters has not been noticeably affected by mining at the Metropolitan Colliery. Mine subsidence effects on water quality in the Waratah Rivulet have resulted in localised and transient changes (spikes or pulses) in iron, manganese and to a lesser extent aluminium and minor associated increases in electrical conductivity.

The pulses described above have not had any measurable effect on water quality in Woronora Reservoir downstream (Figure ES-6).

Metropolitan Colliery Stream Restoration Trial

HCPL has conducted a restoration trial using polyurethane at a rock bar known as WRS4 on the Waratah Rivulet in consultation with the Sydney Catchment Authority. The objective of the trial was to investigate the effectiveness of polyurethane grouting products and associated injection methods in reducing the hydraulic conductivity of the fractured rock mass. Successful restoration of the WRS4 rock bar was confirmed through measurement of the decrease in hydraulic conductivity and further evidenced by the return of water flowing over the rock bar (Section ES4).

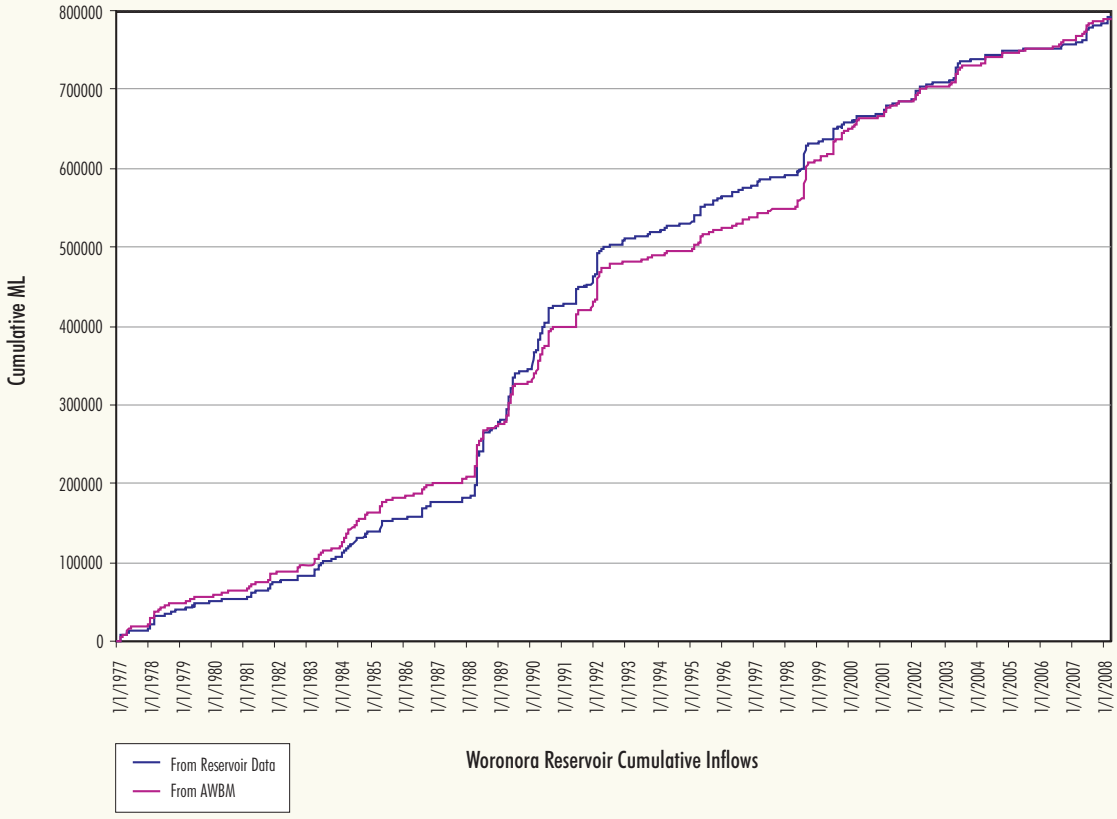
Potential Impacts

Woronora Reservoir Inflows

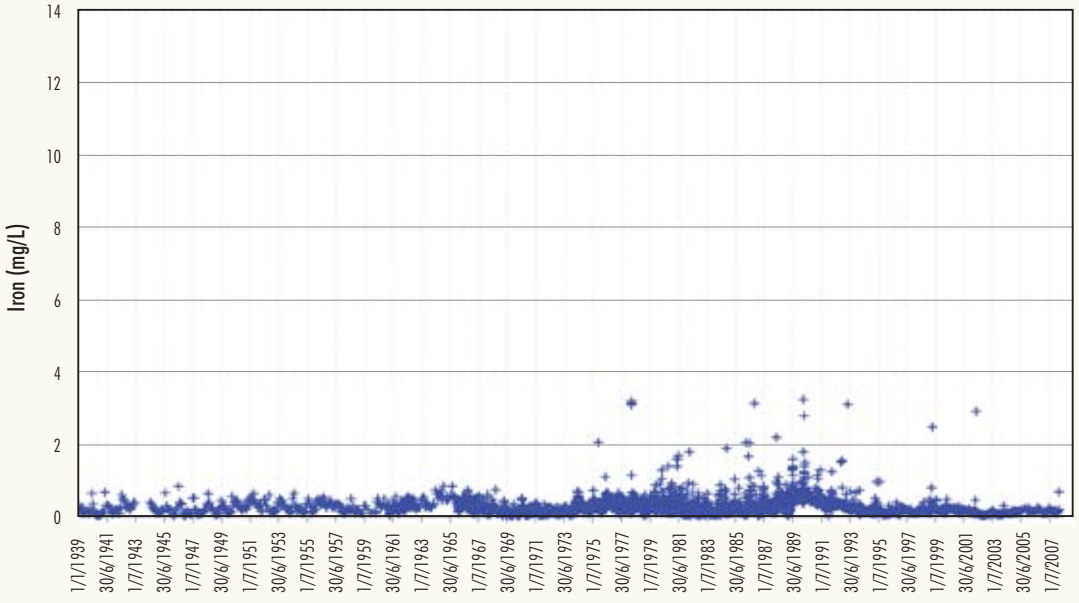
Based on the analysis of the effects of mining at the Metropolitan Colliery on inflows to the Woronora Reservoir it was concluded that:

- On the basis of recorded data from streamflow gauging stations in the area, streamflow patterns and magnitudes in the region are consistent.
- Recorded streamflow data from Waratah Rivulet indicates that there is no evidence of flow loss at low flows in periods of prolonged dry weather and flow recession as might be expected if flow were being affected by mining activity.
- The observed behaviour is consistent with no losses occurring from the catchment.
- There has been no discernable departure of streamflow model-predicted inflows to the Woronora Reservoir from those calculated using recorded reservoir data following commencement of mining.

These conclusions are consistent with the findings of the Groundwater Assessment. Detailed groundwater investigations have shown that the geological and hydrogeological regimes in the Metropolitan Colliery area are such that there is no mechanism by which the Project could result in a detectable loss of groundwater contribution to reservoir yield.



Woronora Reservoir Cumulative Inflows



Recorded Iron Concentrations - Woronora Reservoir 1939-2007

Source: Gilbert and Associates (2008)

METROPOLITAN COAL PROJECT

FIGURE ES-6
Woronora Reservoir
Cumulative Inflows and
Recorded Iron Concentrations

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All the investigations undertaken to date show that subsidence induced underflow re-emerges downstream of the subsidence area with no evidence of flow loss to Woronora Reservoir.

Stream Flows

Subsidence predictions for the Project indicate that the maximum valley closure and upsidence movements at watercourses within the Project Underground Mining Area are within the range where fracturing of bedrock (and the consequent diversion of a portion of the total stream flow as underflow) could occur.

The effects of underflow would be most noticeable during periods of low flow and on the frequency of no flow, while the effects on the frequency and magnitude of high flows would be negligible.

During prolonged dry periods when flows recede to low levels, a greater proportion and in some areas, all of the lower flows would be conveyed via the fracture network. Previous observations of pools in tributaries subject to mine subsidence indicate that although mine subsidence has the potential to increase the rate of leakage (and consequently pool level recession) of pools, it is likely that a portion of the pools subject to Project mine subsidence effects would hold some water during prolonged dry periods. These latter pools would remain full during most typical wetting and drying cycles.

The extent or degree of potential effect is temporary in that natural infilling (healing) processes have been observed to occur and due to the implementation of HCPL's restoration commitment at key rock bars on Waratah Rivulet.

Water Quality

The effect of subsidence on water quality is expected to be similar to that already observed (i.e. transient pulses of iron, and to a lesser extent, manganese, aluminium and conductivity increases which would likely occur following any instances of fresh cracking of the creek bed).

Project activities (e.g. on-going surface exploration activities, the upgrade and extension of surface infrastructure, access tracks, environmental monitoring and management activities, stream restoration activities and other minor Project-related surface activities) have the potential to increase soil erosion/sedimentation or result in water contamination (e.g. fuel leakages from equipment or uncontrolled spills).

As water releases from the Major Surface Facilities Area to Camp Gully, which flows to the Hacking River would continue to be constrained by the existing EPL No. 767, it is expected there would be no material effect to downstream water quality.

Upland Swamp Hydrology

Any changes in swamp moisture as a result of cracking are expected to be immeasurable when compared to the scale of seasonal and even individual rainfall event based changes in swamp groundwater levels.

Swamp grades vary naturally and the predicted maximum mining-induced tilts are generally orders of magnitude lower than the existing natural grades within the swamps. The predicted tilts would not have any significant effect on the localised or overall gradient of the swamps or the flow of water.

Any minor mining-induced tilting of the scale and nature predicted is not expected to significantly increase lateral surface water movements which are small in relation to the other components in the swamp water balance.

Mitigation Measures, Management and Monitoring

Adaptive Management Approach for Waratah Rivulet

The Project incorporates significant adaptive management measures (Section ES-4) that would allow for the monitoring of impacts on the Waratah Rivulet, and if monitoring indicates the environmental impacts are greater than is considered acceptable, then adaptive management measures including modification of mining geometry would be implemented, as required.

Stream Restoration at Key Rock Bars

As described in Section ES4, successful restoration of the WRS4 rock bar indicates polyurethane injection is a technically feasible method of restoring pool characteristics at the larger rock bars along Waratah Rivulet.

HCPL is committed to undertaking restoration activities at rock bars WRS5, 6, 7 and/or 8, where future assessment indicates the need (Section ES4).

Water Quality Management Measures

Temporary erosion and sediment controls would be installed prior to the commencement of construction activities. Erosion and sediment control measures would be designed in accordance with applicable water management principles and guidelines.

Surface Water Monitoring

A surface water monitoring programme would be developed for the Project and detailed in an Environmental Monitoring Programme. The frequency, parameters and locations monitored as part of the surface water quality monitoring programme would be described in the Environmental Monitoring Programme.

A Surface Water Management Plan would also include any applicable water quality monitoring at the Major Surface Facilities Area.

Monitoring would also be undertaken as a component of HCPL's adaptive management approach for Waratah Rivulet.

Water Releases – Camp Gully

Water releases from the Major Surface Facilities Area to Camp Gully would continue to be undertaken in accordance with the requirements of EPL No. 767.

ES3.6 AQUATIC ECOLOGY

An Aquatic Ecology Assessment was prepared for the Project by BIO-ANALYSIS. Peer review was undertaken by Dr David Goldney of the Western Research Institute.

Existing Environment

Aquatic macrophytes are not naturally abundant in either Waratah Rivulet or the tributaries of Waratah Rivulet or Woronora Reservoir. The streams are naturally rocky with little sediment habitat available for aquatic plants to establish.

The most abundant macroinvertebrate taxa were Atyidae, Leptophlebiidae, Cenidae, Leptoceridae and Dytiscidae in the streams and Atyidae, Dytiscidae, Libellulidae and Physidae in the Woronora Reservoir. Only two native fish (Long-finned Eel, *Anguilla reinhardtii* and Australian Smelt, *Retropinna semoni*) and the introduced Mosquito Fish (*Gambusia holbrooki*) were recorded by the surveys. The dam wall of the Woronora Reservoir is likely to be a major barrier to migration of fish.

No threatened aquatic biota listed under the *Threatened Species Conservation Act, 1995, Fisheries Management Act, 1994* or *Environment Protection and Biodiversity Conservation Act, 1999* were recorded.

Potential Impacts

Potential impacts of the Project on aquatic ecology include habitat alteration, potential mine subsidence impacts on biodiversity (aquatic macrophytes, macroinvertebrates, fish, threatened aquatic biota and riparian vegetation), and other potential direct, indirect and cumulative impacts.

Mine subsidence has the potential to impact on aquatic plants through exposure and desiccation. The Project is unlikely to have a significant impact on the composition or distribution of aquatic macrophytes. This is supported by the monitoring of aquatic macrophytes at Metropolitan Colliery to date.

Localised impacts on assemblages of aquatic macroinvertebrates may occur as a result of changes in aquatic habitat. No significant long-term impacts on assemblages of macroinvertebrates have been found as a result of mine subsidence at the Metropolitan Colliery.

Subsidence, cracking and the consequent diversion of a portion of stream flow may impact on aquatic macroinvertebrates at small scales, for short periods of time and the assemblages would recover quickly.

The temporal extent of any effects would be mitigated by natural healing mechanisms observed in the Completed Underground Mining Area and through the implementation of HCPL's stream restoration commitments.

Given the depauperate fish fauna assemblage and the presence of the Woronora Reservoir, it is unlikely that the Project would further significantly impact on fish fauna within the Project Underground Mining Area or surrounds.

It is unlikely that any threatened aquatic biota would occur given the location of the Woronora Dam, which is a barrier to fish migration upstream, the habitat requirements of species that could potentially occur, and the absence of records to date.

Other direct and indirect potential impacts of the Project on aquatic biota and their habitats have been assessed (e.g. increased soil erosion/sedimentation, water contamination, diversion/pumping of stream flow around surface activities and greenhouse gas emissions/climate change effects).

Mitigation Measures and Management

Measures have been developed to minimise impacts on aquatic biota and their habitats and would be detailed in a Flora and Fauna Management Plan to be developed for the Project.

The Flora and Fauna Management Plan would include measures to minimise potential impacts of surface activities on surface water quality (e.g. erosion and sediment control and fuel management measures).

HCPL would operate at the Major Surface Facilities Area in accordance with the requirements of EPL No. 767 which regulates the controlled discharge of treated water to Camp Gully.

As described in ES4.2, a Waratah Rivulet Management Plan would be developed in consultation with the relevant authorities to reflect an adaptive management approach to mining and the Waratah Rivulet.

The aquatic ecology monitoring programme would be designed to monitor subsidence-induced impacts on aquatic ecology and monitor the response of aquatic ecosystems to the implementation of stream restoration works. The aquatic ecology monitoring programme would be described in detail in the Flora and Fauna Management Plan.

Compensatory measures and other ecological initiatives for the Project are also described in the EA.

ES3.7 TERRESTRIAL FLORA AND FAUNA

Baseline terrestrial flora surveys were conducted for the Project by Bangalay Botanical Surveys. Baseline terrestrial fauna surveys were conducted for the Project by Western Research Institute and Biosphere Environmental Consultants.

An investigation of upland swamps and impacts of underground mining was also conducted by FloraSearch to inform the assessment of upland swamps.

A Flora and Fauna Impact Assessment was prepared for the Project by FloraSearch and Western Research Institute.

Peer review was undertaken by Dr David Goldney of the Western Research Institute.

Existing Environment

Terrestrial Flora

Vegetation communities mapped by Bangalay Botanical Surveys include woodlands on sandstone or lateritic soils, heaths and mallee heaths, upland swamps, riparian scrub, tall open forests and sandstone forests.

The upland swamps within the Project Underground Mining Area and immediate surrounds are not situated in the four key clusters of swamps identified by the Department of Environment and Climate Change as being of particular conservation significance in the Southern Coalfield. However, it is recognised that upland swamps are of particular ecological significance.

The upland swamps within the Project Underground Mining Area are classified as headwater upland swamps. One in-valley upland swamp overlies Metropolitan Colliery Longwalls 7 and 8 and consequently has already experienced mine subsidence from completed mining operations. Site inspections of this in-valley swamp by FloraSearch indicate that the previous mine subsidence has not had a detrimental effect on vegetation health, vegetation community composition or abundance in the swamp and the swamp is considered to be in a healthy condition.

Four threatened flora species were recorded in the Project Underground Mining Area and/or surrounds, *viz*. Bynoe's Wattle (*Acacia bynoeana*), Thick-leaf Star-hair (*Astrotricha crassifolia*), Prickly Bush-pea (*Pultenaea aristata*) and Deane's Paperbark (*Melaleuca deanei*). Possible occurrences of a further two threatened species, namely, *Leucopogon exolasius* and *Epacris purpurascens* var. *purpurascens* were also recorded during the baseline flora surveys, however the identification of these species could not be confirmed due to the lack of fertile fruiting or flowering parts required for positive identifications.

One endangered ecological community listed under the *Threatened Species Conservation Act, 1995* was recorded in the Project Underground Mining Area and surrounds, *viz*. Southern Sydney Sheltered Forest on Transitional Sandstone Soils in the Sydney Basin Bioregion Endangered Ecological Community. In addition, the O'Hares Creek Shale Forest Endangered Ecological Community occurs to the south of Longwalls 20 to 44 in the vicinity of Longwalls 18 to 19A (Current Underground Mining Area).

Terrestrial Fauna

Five broad habitat types were identified in the Project Underground Mining Area and surrounds, namely, forest, woodland, heath and mallee, riparian (and associated watercourse) and upland swamp. The habitats are variable and of high quality although the majority of vegetation communities are in early to mid-successional stage following the 2001 bushfire.

Of the four priority fauna habitats mapped in the Greater Southern Sydney Region, upland swamps are located in the Project Underground Mining Area and surrounds. The Project Underground Mining Area and surrounds do not contain Grassy Box Woodlands, Alluvial Forests and Woodland or Coastal Wetlands and Saltmarsh, which are also considered to be priority fauna habitats.

Thirteen threatened fauna species were recorded during the baseline fauna surveys: Giant Burrowing Frog, Red-crowned Toadlet, Broad-headed Snake, Black-necked Stork, Square-tailed Kite, Grey Falcon, Eastern Ground Parrot, Turquoise Parrot, Eastern Pygmy-possum, Squirrel Glider, Grey-headed Flying Fox, Eastern Bentwing Bat and Large-footed Myotis. In addition, diggings were recorded that could potentially belong to the threatened Southern Brown Bandicoot or Long-nosed Potoroo, or the protected Long-nosed Bandicoot.

Potential Impacts

Potential impacts of the Project on terrestrial flora, fauna and their habitats include those associated with mine subsidence effects (e.g. surface cracking, buckling and/or dilating and changes to surface or groundwater hydrology) and other direct, indirect or cumulative impacts.

The size and extent of surface cracking on slopes and ridgetops as a result of the Project is expected to be minor. The magnitude of the predicted subsidence effects is considered too small to influence the hydrological processes that sustain the existing vegetation in these areas or the availability of non-persistent sources of water to terrestrial fauna.

Any impacts on vertebrate fauna due to surface cracking (e.g. creation of areas capable of 'trapping' some ground dwelling fauna) are likely to be relatively minor.

Given the predicted low incidence of rock fall, the potential impacts on flora and fauna are likely to be minor.

As has been observed at Metropolitan Colliery previously, potential mine subsidence impacts on riparian vegetation are expected to be relatively minor (i.e. localised area of dieback), with effects to vegetation condition predominantly being temporary (i.e. recovery has subsequently occurred) and limited in extent.

Mine subsidence effects on watercourses are described in Section ES3.5. In consideration of the nature of the potential impacts and the lifecycle components of terrestrial vertebrate fauna that may utilise the riparian/watercourse habitat, it is unlikely that any vertebrate population would be put at risk by the potential subsidence-related impacts.

There is concern that mine subsidence effects may significantly affect the water balance of upland swamps, with subsequent desiccation of the swamp, increased susceptibility to fire, erosion and associated loss of specialised swamp biota. However, given the groundwater and surface water assessments for upland swamps described in Sections ES3.4 and ES3.5, it is unlikely that upland swamp vegetation or terrestrial fauna species habitats would be impacted.

Other direct and indirect potential impacts of the Project on terrestrial flora, fauna and their habitats have been assessed (e.g. vegetation clearance/habitat disturbance, fire, weeds and pests, the plant pathogen, *Phytophthora cinnamomi*, amphibian Chytrid fungus, dust, noise, fauna traps, road traffic, artificial lighting and greenhouse gas emissions/climate change effects). Cumulative impacts of the Project have also been considered.

The Project would include minimal vegetation clearance which would be progressively implemented over the life of the mine. As a result, at any one time some small areas are likely to be disturbed, while previously disturbed areas would be in various stages of natural regeneration/rehabilitation.

Evaluations have been conducted to assess the potential impacts of the Project on threatened species, populations, ecological communities, and their habitats in accordance with the Draft *Guidelines for Threatened Species Assessment*.

On the basis of these evaluations, it is considered that the Project would be unlikely to have a significant effect on threatened flora or fauna.

Mitigation Measures and Management

Although the Project would avoid or minimise impacts on terrestrial flora, fauna and their habitats wherever practicable, several measures have been developed to mitigate unavoidable impacts of the Project.

A Flora and Fauna Management Plan would be developed for the Project that would detail the mitigation, management and monitoring measures to be implemented, including measures to maintain or improve the biodiversity values of the surrounding region in the medium to long-term.

The Flora and Fauna Management Plan would include protocols for the management of subsidence impacts on terrestrial flora and fauna, the management of sites where vegetation/habitat removal is necessary, measures for the control of weed and exotic pests, the diseases *P. cinnamomi* and amphibian Chytrid fungus, bushfire and natural regeneration/rehabilitation management measures.

Flora and fauna monitoring would be described in the Flora and Fauna Management Plan.

Compensatory measures and other ecological initiatives for the Project are also described in the EA.

ES3.8 ABORIGINAL HERITAGE

An Aboriginal Cultural Heritage Assessment was prepared for the Project by Kayandel Archaeological Services and was peer reviewed by R.G. Gunn.

The Project Aboriginal Cultural Heritage Assessment has been undertaken in accordance with the *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* and *National Parks and Wildlife Act 1974: Part 6 Approvals Interim Community Consultation Requirements for Applicants*.

Existing Environment

The Project Underground Mining Area is located within the Illawarra Local Aboriginal Land Council boundary (the Aboriginal heritage study area also extended into the Tharawal Local Aboriginal Land Council area to the west of the Current Underground Mining Area).

While semi-permanent water sources were available to Aboriginal groups within the area, variable climatic conditions may have affected the availability of water and in turn may have subsequently influenced the way Aboriginal people moved through and used the landscape over time.

The extensive outcropping of Hawkesbury Sandstone on steep slopes proximal to semi-permanent water provides ample opportunities for Aboriginal habitation sites. Local topographic features, such as ridgetops and plateau areas may have been used as access routes and vantage points by Aboriginal inhabitants.

Literature reviewed as part of the Aboriginal Cultural Heritage Assessment and comments received from the Aboriginal community suggest that many plants and animals on the Woronora Plateau were known to be exploited by Aboriginal people.

Previous Archaeological Investigations

Numerous Aboriginal heritage surveys, assessments, monitoring, site inspections and baseline recordings have been undertaken within the Project Underground Mining Area and surrounds over the past 37 years.

Cultural Heritage Assessment

The Aboriginal Cultural Heritage Assessment utilised the results of the extensive fieldwork and information base and the results of Project supplementary survey and inspections conducted by archaeologists and representatives of the Aboriginal community.

The aim of the Project supplementary survey and inspections was to provide the contemporary Aboriginal community the opportunity to inspect the area and Aboriginal heritage sites within the Project Underground Mining Area and surrounds in order to provide more informed comment on cultural significance and proposed management recommendations.

Assistance with surveys and cultural heritage advice was provided by 10 Aboriginal community groups.

A total of 188 Aboriginal heritage sites were identified within the Project Underground Mining Area and surrounds (Figure ES-7), consisting of:

- sandstone overhangs with art and/or artefacts and/or deposit and/or grinding grooves and/or engravings and/or potential archaeological deposit; and
- open sites with artefact scatters and/or engravings and/or grinding grooves and/or art and/or potential archaeological deposit.

It was noted during field surveys that many Aboriginal heritage sites are subject to on-going natural deteriorating processes unrelated to mining.

As part of the Aboriginal Cultural Heritage Assessment, the existing information (e.g. site cards, photos, site plans, detailed baseline recordings, previous archaeological reports) was reviewed for each of the known Aboriginal heritage sites. Based on this review and the site inspections, each site was assigned an archaeological significance ranking of low, moderate or high.

Five Aboriginal heritage sites within the Project Underground Mining Area and surrounds are listed on the Register of the National Estate. Nine Aboriginal heritage sites are deemed to be of high archaeological significance with 22 and 157 Aboriginal heritage sites deemed to be of moderate and low archaeological significance, respectively.

All Aboriginal heritage site types recorded within the Project Underground Mining Area and surrounds are represented elsewhere on the Woronora Plateau.

Aboriginal heritage sites within or surrounding the Project Underground Mining Area have been identified as being of specific cultural interest to the Aboriginal community. The Aboriginal community has also previously indicated that all Aboriginal heritage sites (both known and unknown), when considered collectively as a 'bundle', are culturally significant.

Potential Impacts

Project surface development works have the potential to directly impact Aboriginal heritage sites.

Potential impacts of mine subsidence on Aboriginal heritage sites include the cracking of sandstone and (where cracking coincides with a sandstone overhang) isolated rock fall.

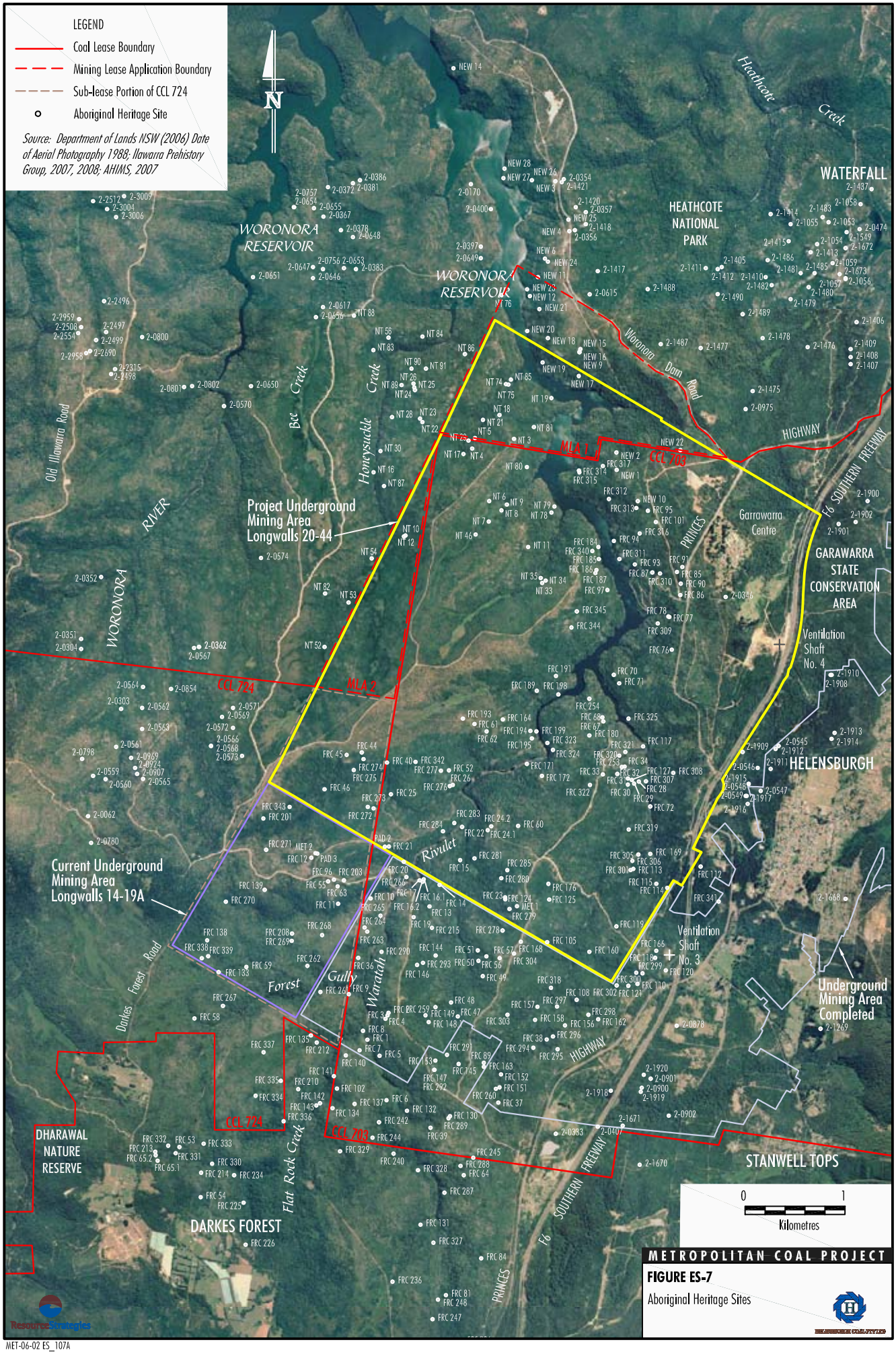
Potential fracturing of the exposed sandstone is expected to be isolated and of a minor nature, due to the relatively low magnitudes of the predicted strains and the relatively high depth of cover. The potential for fracturing to occur at the grinding grooves would, therefore, be considered low. Although impact is possible, based on experience in the Southern Coalfield, the likelihood of significant impact on sandstone overhang sites as a result of mine subsidence is also low.

Monitoring of approximately 41 Aboriginal heritage sites (subject to mine subsidence) has been undertaken between 1995 and 2008 at the Metropolitan Colliery. The majority of sites monitored had no observable change following mine subsidence, with observable change identified in six Aboriginal heritage sites.

It is expected that the majority of identified Aboriginal heritage sites would experience no significant change, particularly when compared to natural deteriorating processes unrelated to mining and given the conservative nature of the subsidence predictions.

Mitigation Measures, Management and Monitoring

An Aboriginal Cultural Heritage Management Plan would be developed for the Project in consultation with the Aboriginal community. The Aboriginal Cultural Heritage Management Plan would be active throughout the life of the Project and be flexible to incorporate on-going outcomes as a result of monitoring, survey and fieldwork, analysis and consultation.



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ES3.9 NON-ABORIGINAL HERITAGE

A Non-Aboriginal Heritage Assessment for the Project was conducted by Dr Michael Pearson of Heritage Management Consultants.

Existing Environment

Metropolitan Colliery Surface Facilities

Helensburgh (originally known as 'Camp Creek') began as a tent town for workers constructing the Illawarra Railway between 1884 and 1888, and for exploration workers looking for coal deposits in roughly the same period. Permanent settlement began once exploration in the area confirmed a mineable coal deposit. After the Metropolitan Colliery had commenced production in 1888, the town of Helensburgh grew around the Metropolitan Colliery.

Metropolitan Colliery was at full production by 1890 and by 1893 the Metropolitan Colliery was the highest producer in the Southern Coalfield. The Metropolitan Colliery heritage complex has been identified as a site of regional significance. The Non-Aboriginal Heritage Assessment identified 17 places and items of heritage significance at the Metropolitan Colliery.

Project Underground Mining Area

The Non-Aboriginal Heritage Assessment also reviewed the non-Aboriginal heritage items that are located above or in close proximity to the Project Underground Mining Area. A house and associated lands at 43-49 Princes Highway is listed on the Wollongong Local Environmental Plan. It comprises a simple building with a rusticated stone lower walls and fibro sheet upper walls, in a large rural paddock setting.

The Garrawarra Centre is located in the north of the Project Underground Mining Area (Figure ES-2) and is also listed on the Wollongong Local Environmental Plan. The Garrawarra Centre was established in 1909 as the first (and only) government controlled institution constructed specifically for the treatment of tuberculosis in NSW. It continued as a tuberculosis facility until 1957 when patient numbers had reduced to an extent that it was no longer required. After extensive remodelling it reopened in 1958 as the Garrawarra Hospital, for the chronically ill and the aged. It has operated as an aged care facility since this time, with additional infrastructure and modifications to existing buildings occurring periodically.

The Royal National Park and Garawarra State Conservation Area is listed as a place on the National Heritage List as the place is considered to have outstanding heritage value to the nation because of the place's importance in the course, or pattern, of Australia's natural or cultural history. Its historical values are specific to the Royal National Park.

Potential Impacts

Major Surface Facilities Area

Potential impacts to non-Aboriginal heritage items within the Major Surface Facilities Area include impacts associated with:

- upgrades/extensions to the CHPP, material handling (conveyor) systems, water management systems and electrical reticulation and control systems; and
- construction of additional infrastructure such as a demountable bathhouse, coal reject paste plant and associated coal reject stockpile, pumping, pipeline and underground delivery systems.

The specifics of these works would be determined by detailed engineering design.

Project Underground Mining Area

Subsidence predictions for the Garrawarra Centre are based on an east-west, full extraction, longwall layout. All buildings within the Garrawarra Centre were predicted to experience negligible tilt impacts, and, with the exception of the longer buildings (i.e. 40 m to 100 m in length) that have higher heritage significance, were predicted to experience strain impacts that would result in no more than hairline cracks or fine cracks which would not require repair.

For the longer buildings of higher significance MSEC provided conservative performance criteria that would result in predicted strain impacts of similar magnitude to that described above (i.e. resulting in no more than hairline cracks or fine cracks which would not require repair). HCPL has committed to these performance criteria in the Project Statement of Commitments, and detailed future mine design in the vicinity of the Garrawarra Centre would be constrained by these criteria.

Given the small predicted values of ground movement for the part-stone cottage at 43-49 Princes Highway, it is unlikely that any preventative measures would be required.

No potential impacts on the heritage values associated with the Royal National Park have been identified as it is located over 3 km from the proposed Project Underground Mining Area.

Heritage Management Consultants concluded that there would be negligible impact on heritage values (historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance) of the sites in the vicinity of the Project Underground Mining Area (or their settings) as a result of the Project.

Mitigation Measures and Management

Metropolitan Colliery Surface Facilities

A Conservation Management Plan would be developed for the Metropolitan Colliery. The Conservation Management Plan would provide guidance for management of heritage items during the detailed design, construction and operational phases of the Project.

Project Underground Mining Area

The expected Project impacts to the heritage values of the house and associated lands at 43-49 Princes Highway, and at the Royal National Park have been assessed as negligible to nil, and as such, no specific management measures are considered necessary.

The resolution of particular management issues pertaining to individual longwall panels or mining domains would be undertaken in Subsidence Management Plans that would be prepared progressively over the life of the Project.

Specific monitoring measures for non-Aboriginal heritage sites potentially impacted by the Project underground mining (e.g. the Garrawarra Centre) would be included in these Subsidence Management Plans as required.

The Non-Aboriginal Heritage Assessment concluded that the existing *Conservation Plan for Garrawarra Centre for Aged Care* is a suitable reference document for the management of heritage items at the Garrawarra Centre during the life of the Project (if required).

ES3.10 NOISE

A Noise Impact Assessment for the Project has been undertaken by Heggies in accordance with the requirements of the *NSW Industrial Noise Policy* (INP), *Environmental Noise Control Manual* (ENCM) and *Environmental Criteria for Road Traffic Noise* (ECRTN).

Background

Suburban residential areas of Helensburgh are located in close proximity to the Major Surface Facilities Area (Figure ES-4). Some residences in Helensburgh are therefore exposed to industrial noise associated with the operation of the Major Surface Facilities Area, and some residences and businesses are also exposed to transport noise associated with deliveries to the site and off-site road and rail transport of coal product and coal reject.

In recognition of the existing industrial noise generation of the Metropolitan Colliery and the close proximity of neighbouring residential areas, the Department of Environment and Climate Change has initiated a number of pollution reduction programmes (PRPs) for the Major Surface Facilities Area via EPL No. 767.

HCPL undertook a number of noise investigations and studies to address the requirements of noise PRPs. As a result of these investigations, HCPL has implemented a range of noise management and operational on-site noise reduction measures to reduce noise emissions of the Metropolitan Colliery.

Following the implementation of these Stage 1 noise controls, HCPL commissioned Heggies to complete a Stage 2 Noise Mitigation Investigation (*PRP 12 Noise Reduction Programme – Stage 2 Noise Mitigation Investigation).*

The *PRP 12 Noise Reduction Programme – Stage 2 Noise Mitigation Investigation* was prepared independently of HCPL's plans for the Project, however, the major findings and recommendations for noise reductions have been incorporated into the Project Noise Assessment and noise mitigation measures, where relevant.

Existing Environment

Noise Monitoring

Background noise surveys were conducted in December 2006 coinciding with the Christmas/New Year Metropolitan Colliery shutdown to characterise and quantify the acoustic environment in the absence of operations at the existing Metropolitan Colliery at residential locations proximal to the Major Surface Facilities Area and surrounds.

Ambient noise surveys were also conducted in November 2007 and March 2008 to coincide with normal Metropolitan Colliery operations to quantify noise levels (i.e. all noise sources) and to estimate the noise contribution of the existing Metropolitan Colliery operations at locations proximal to the Major Surface Facilities Area and at locations more remote from the Major Surface Facilities Area.

These measurements indicated existing mine noise levels at the nearest residences located in Oxley Place and Parkes Street (Figure ES-4) are up to 56 A-weighted decibels (dBA) during normal Metropolitan Colliery operations. These measurements also indicated the existing noise emissions of the Metropolitan Colliery decrease with distance from the Major Surface Facilities Area due to topographic effects and the built environment.

Road Traffic Noise Monitoring

Traffic noise measurements were also undertaken at three representative residential locations along the existing off-site haulage route including at one location on Lawrence Hargrave Drive and at two locations on Parkes Street. As is typically the case in suburban and urban areas in NSW, the traffic noise monitoring results indicated the traffic noise goals described in the ECRTN are already exceeded at residences located in close proximity to the local roads.

Project Operational Noise Criteria

In accordance with INP objectives, Project specific noise assessment criteria, which form the basis for impact assessment and determining mitigation requirements, have been derived for the Project based on the measured background levels and the noise criteria provided in EPL No. 767 for residences that are located in close proximity to the Major Surface Facilities Area.

Tables ES-2 and ES-3 provide Project specific intrusive criteria, and applicable amenity criteria for non-residential landuses.

Potential Impacts

Predictive noise emission modelling has been undertaken for three representative periods, based on the planned Project development including:

- the existing Metropolitan Colliery operations;
- Project Year 3 (combined operational and construction noise); and
- Project Year 15 (peak operational production period).

Predicted Intrusive Operational Noise Emissions

The modelling of existing Metropolitan Colliery and Project noise emissions indicates that no privately owned residences would experience an increase in operational noise as a result of the Project.

At the majority of private residences that are located in close proximity to the Major Surface Facilities Area, the Project is predicted to provide significant operational noise reductions in comparison to the existing noise emissions of the Metropolitan Colliery.

Operational noise levels at receivers near the Project boundary to the north are generally predicted to remain unchanged by the Project (or be slightly reduced) due to the contribution of train loading activities which are in close proximity and dominate noise emissions at these locations.

Predicted intrusive noise emissions exceed the relevant assessment criteria for some receivers nearest the Project boundary during all three noise emission scenarios. However, significant operational noise reductions would be achieved as the Project progresses, with the number of private residences in the Noise Affectation Zone falling from 29 to 14, as shown in Table ES-4.

The number of residences in the marginal noise management category increases, as Project noise emissions fall and dwellings move out of the Noise Affectation Zone into the Noise Management Zone (Table ES-4) with the progressive implementation of Project noise mitigation measures.

Figure ES-8 shows the predicted intrusive night-time noise emissions for Year 3 of the Project during north winds.

Predicted Amenity Operational Noise Emissions

Predicted Project amenity noise emissions are below the relevant assessment criteria (Table ES-3) for all non-residential receptors (i.e. Holy Cross Catholic Church, Holy Cross Primary School and nearby public recreation areas) surrounding the Major Surface Facilities Area during all noise emission scenarios.

Comparison of Project noise emissions to applicable residential amenity noise criteria indicates that the Project would reduce the number of residences with exceedances of the criteria from 14 (existing Metropolitan Colliery) to three residences in Year 3, and no exceedances of the applicable amenity criteria are predicted in Project Year 15.

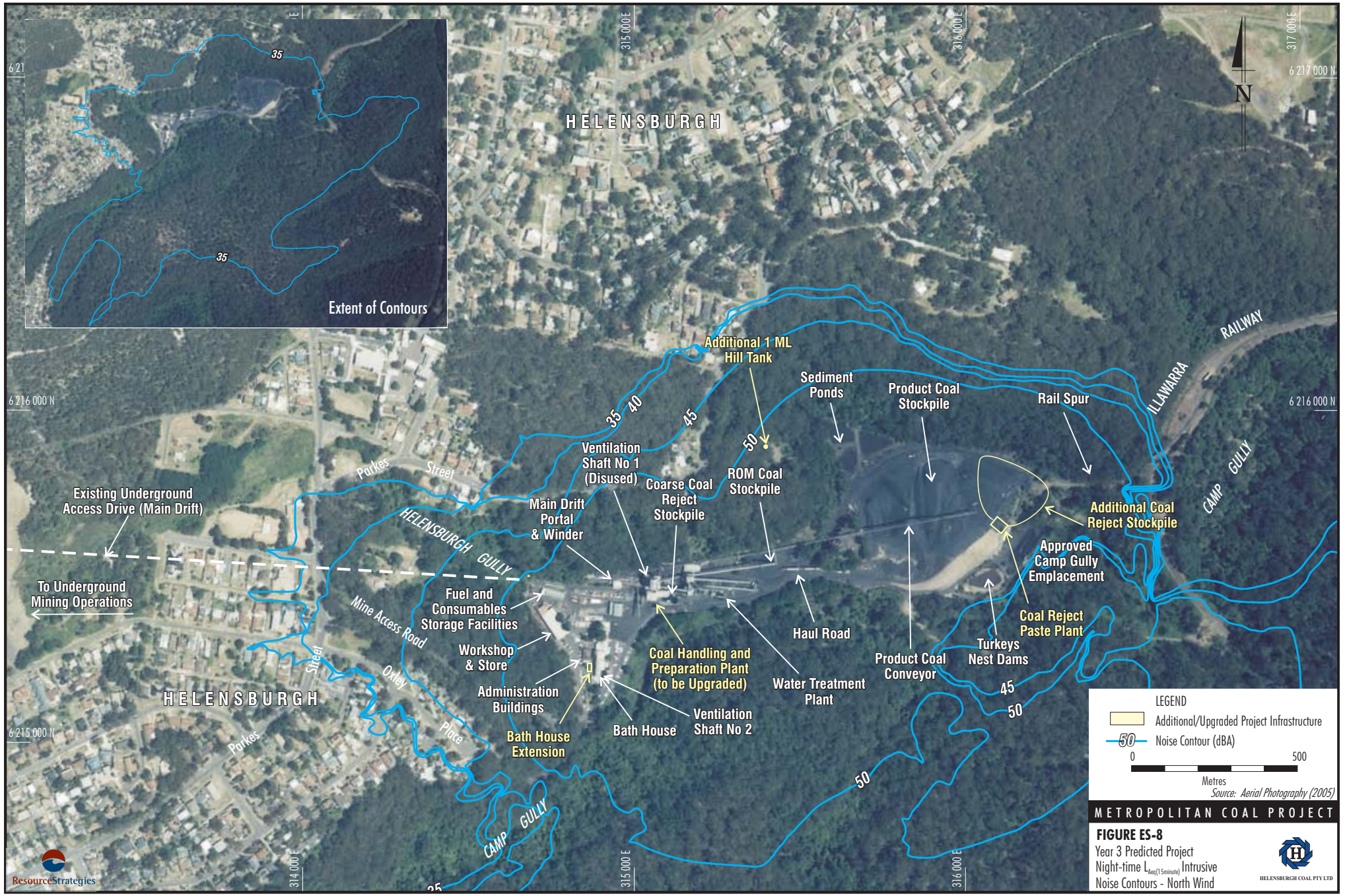

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Table ES-2
Project Specific Intrusive Noise Assessment Criteria

Street No.	Location Area	Intrusive $L_{Aeq(15minute)}$ Acceptable (dBA)		
		Day	Evening	Night
Near Project Boundary				
1-9, 2-18	Oxley Place	45	40	40
1-7	Wills Place			
40-46, 48-54, 53-59, 56-74, 65-69, 86-88	Parkes Street			
34, 36	Old Station Road			
48-54, 53	Hume Drive			
2A, 2B, 2	Robertson Street			
4	McMillan Street			
North and Beyond Project Boundary				
Any, except as noted above	All other residential	42	38	35

Note: Daytime 7.00 am to 6.00 pm, Evening 6.00 pm to 10.00 pm, Night-time 10.00 pm to 7.00 am.

Table ES-3
Project Specific Amenity Noise Assessment Criteria - Non-Residential Landuses

Non Residential Landuses	Amenity $L_{Aeq(period)}$ Acceptable to Maximum(dBA)		
	Day	Evening	Night
Church	External 50-55 when in use		
School	External 45-50 when in use		
Hospital	External 50-55 when in use		
Active Recreation Area	External 55-60 when in use		

Note: Daytime 7.00 am to 6.00 pm, Evening 6.00 pm to 10.00 pm, Night-time 10.00 pm to 7.00 am.

Table ES-4
Predicted Number of Dwellings in the Noise Affectation and Noise Management Zones
Existing Metropolitan Colliery and Project Years 3 and 15

Noise Exceedance Zone	Noise Exceedance[1]	Predicted Number of Residences		
		Existing	Year 3	Year 15
Noise Affectation Zone	>5 dBA above Project specific criteria	29	20	14
Moderate Noise Management Zone	3-5 dBA above Project specific criteria	5	9	6
Marginal Noise Management Zone	1-2 dBA above Project specific criteria	1	2	8

[1] Any noise period (i.e. in the Daytime, Evening or Night-time).

Predicted Noise Emissions Associated with Ventilation Shaft No. 4

The Noise Impact Assessment included consideration of the potential impacts of the development of Ventilation Shaft No. 4, later in the Project life. The assessment indicates compliance with applicable intrusive and amenity noise criteria at the nearest residences and the Garrawarra Centre.

Road Transport Noise

The potential for Project traffic to increase traffic noise has been quantified. The predicted results fall well below the 2 dBA increase limit that is advocated by the ECRTN.

Rail Transport Noise

RailCorp operates the South Coast rail network in NSW, of which the Illawarra Railway is a component. Noise emissions from the railway are regulated via RailCorp's EPL (12208).

A comparison of the existing rail noise levels with the future cumulative train noise including additional Project train movements indicates only a negligible noise increase (i.e. < 1 dBA) due to Project train movements at the nearest residential receivers to the rail line, as there is only a small number of additional train movements arising from the Project.

Blasting Noise and Vibration

Airblast emissions and blast induced ground vibration levels arising from underground blasting are predicted to meet the most stringent night-time criteria at the nearest residential dwellings.

Rail and Road Transport Vibration

As the Project would not result in significant increases in the total number of heavy vehicle movements on the public road network or total rail movements on the South Coast rail network, the existing road vibration effects of heavy vehicle movements on the public road network and rail vibration effects of trains on the South Coast rail network would be generally unchanged by the Project.

Mitigation Measures, Management and Monitoring

Project Operational Noise

PRPs under the existing EPL No. 767 provide an effective mechanism for progressive improvement of operational noise performance at the Metropolitan Colliery. The Project Noise Impact Assessment indicates significant operational noise reductions would occur as a result of the Project. If the Project is approved, it is anticipated that the PRP process would continue to provide the mechanism to identify and implement further operational noise management or improvement measures that may be practicable over the life of the Project.

The existing and future PRPs would inform the noise management measures for the Project.

The PRPs and associated noise monitoring would be used to optimise noise controls, validate the noise modelling predictions and results would be reported to relevant authorities via the Annual Environmental Management Report.

Road and Rail Transport Noise and Vibration

Notwithstanding the fact the Project is not predicted to significantly alter existing off-site transport noise or transport vibration effects on the public road or rail network, HCPL would prepare a Transport Management Plan for the Project.

ES3.11 AIR QUALITY

An Air Quality Impact Assessment for the Project has been undertaken by Holmes Air Sciences in accordance with the *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*.

Background

In recognition of the existing dust generation of the Metropolitan Colliery and the close proximity of neighbouring residential areas, the Department of Environment and Climate Change has initiated a number of PRPs for the Major Surface Facilities Area via EPL No. 767 that relate to on-site dust monitoring and dust reduction. As a result, HCPL established a dust monitoring network in the vicinity of the Major Surface Facilities Area and additional air quality management measures have been implemented at the Metropolitan Colliery over the last five years.

Existing Environment

The current air quality environment in Helensburgh includes the existing dust contributions associated with the operations at the Major Surface Facilities Area.

As a component of the Air Quality Impact Assessment, background air quality data was collected and reviewed. Background air quality data was collected from the current dust monitoring network which includes one high volume sampler and six dust deposition gauges. The existing air quality is detailed in the EA and indicates compliance with applicable air quality criteria.

Air Quality Criteria

The Department of Environment and Climate Change amenity criteria for dust deposition seek to limit the maximum increase in the mean annual rate of dust deposition from a new development to 2 grams per square metre per month (g/m^2/month) and total dust deposition (i.e. including background air quality) to 4 g/m^2/month.

Exposure to suspended particulate matter can be associated with health and amenity impacts.

Such particles are typically less than 50 micrometres (μm) in size and can be as small as 0.1 μm. Fine particles less than 10 μm are referred to as PM_{10}. Suspended particulate matter criteria, standards and goals used in the assessment include:

- The Department of Environment and Climate Change 24-hour PM_{10} assessment criterion of 50 micrograms per cubic metre ($\mu g/m^3$)(for concentrations due to the Project alone).
- The Department of Environment and Climate Change annual assessment criterion for PM_{10} of 30 $\mu g/m^3$ as a concentration that should be met within the region (concentrations due to the Project and background air quality).
- The National Health and Medical Research Council's (NHMRC) annual goal for total suspended particulate (TSP) of 90 $\mu g/m^3$ (as the assessment criterion for TSP concentrations due to the Project and background air quality).

Potential Impacts

The majority of potential air quality related impacts due to the Project are related to the development/ expansion of materials handling at the Major Surface Facilities Area rather than the extension of the underground mining of coal.

The Air Quality Impact Assessment has considered the air quality emissions likely to be generated by the Project and the predicted impact of these emissions in combination with existing background air quality in the vicinity of the Project. As the measured background air quality includes the existing air quality contributions of the Metropolitan Colliery, this is inherently conservative, as an element of double counting of emissions would occur.

Project impacts were modelled for Years 3 and 15. Year 3 was selected as it includes Project construction activities and a marginal increase in production. Year 15 represents the anticipated peak year for Project production and materials handling and hence potential maximum air quality emissions.

Dust Deposition

Incremental increases in annual average dust deposition due to the Project only are not predicted to be above the applicable 2 g/m^2/month Department of Environment and Climate Change amenity criterion at any receiver. Annual average dust deposition due to the Project plus background was not predicted to be above the applicable 4 g/m^2/month Department of Environment and Climate Change amenity criterion at any receiver.

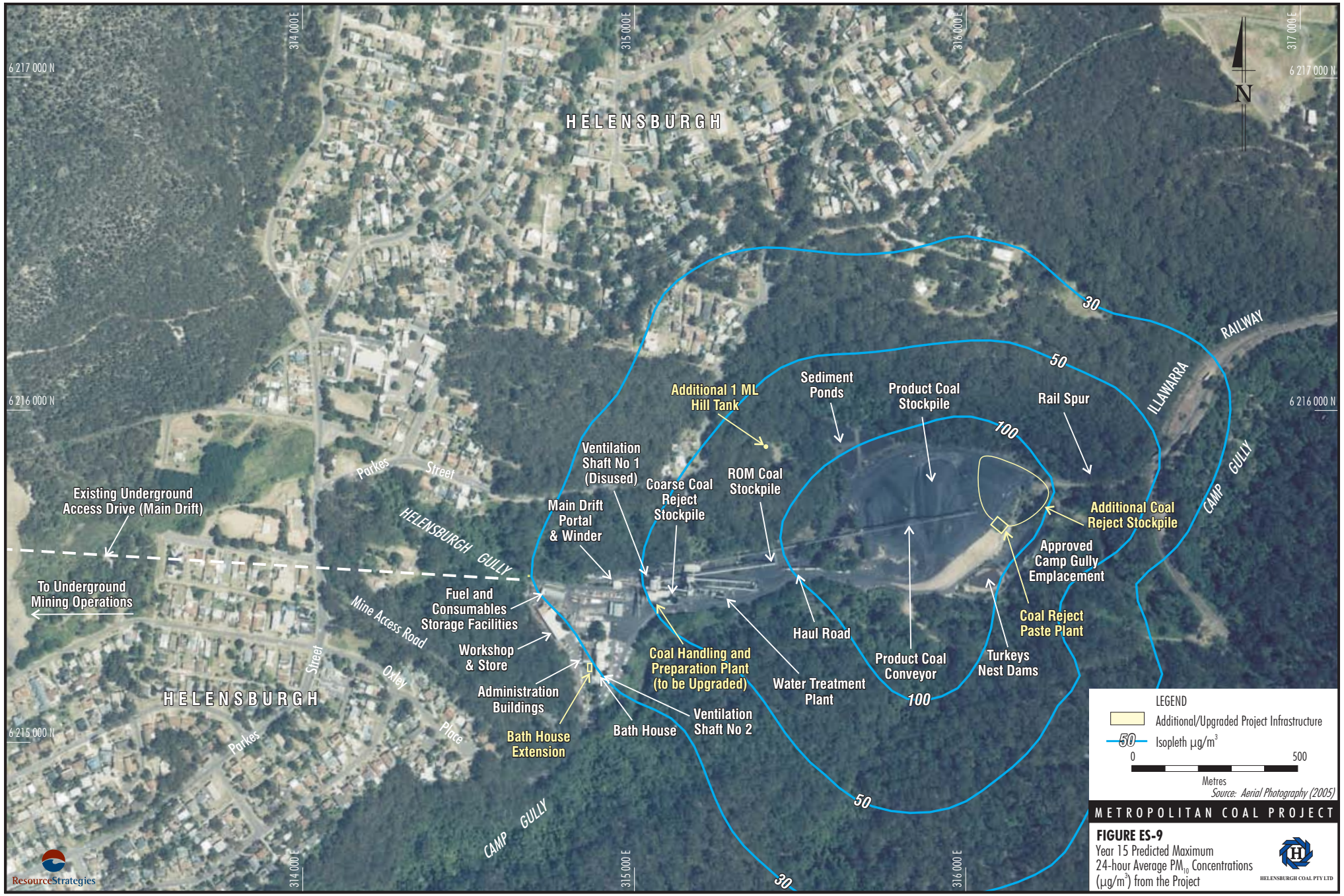
Suspended Particulate Matter

On the basis of baseline air quality monitoring data, the background annual average PM_{10} concentration for the Project site is 14 $\mu g/m^3$ and the inferred annual average TSP background level is 35 $\mu g/m^3$.

Maximum 24-hour average PM_{10} concentrations modelled were not predicted to exceed the Department of Environment and Climate Change assessment criterion (Project only) of 50 $\mu g/m^3$ at any receiver. Figure ES-9 shows the predicted maximum 24-hour average PM_{10} concentrations resulting from the Project in Year 15.

Predicted annual average PM_{10} (Project plus background) concentrations modelled were not predicted to be above the 30 $\mu g/m^3$ Department of Environment and Climate Change assessment criterion at any receiver.

Annual average TSP (Project plus background) concentrations modelled were not predicted to be above the NHMRC goal of 90 $\mu g/m^3$ at any receiver.



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Greenhouse Gases

An assessment of Project greenhouse gas emissions is provided in the EA.

Odour

Odour modelling was carried out in accordance with *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*. Odour emissions from the ventilation shafts were not predicted to be above the Department of Environment and Climate Change odour assessment criterion at any receiver.

Mitigation Measures, Management and Monitoring

During the development of the dispersion modelling undertaken by Holmes Air Sciences, a number of air quality mitigation measures were incorporated for Project air quality modelling.

A range of controls would continue to be employed by HCPL to reduce air quality emissions from the Major Surface Facilities Area. The dust controls that would be implemented for the Project can be summarised as engineering controls, and operational controls which vary operations when adverse meteorological conditions occur. Engineering controls involve measures such as covering/enclosing conveyors and enclosing transfer points. Air quality control measures that are currently used and would continue to be used at the Project are described in the EA.

Air Quality Monitoring

The Project air quality monitoring programme would incorporate a real-time dust monitoring system, which would enable site operators to modify activities, as required to minimise dust emissions and off-site impacts during adverse conditions.

The results of the air quality monitoring would be used to optimise air quality controls, validate the air quality modelling predictions and would be reported to relevant authorities via the Annual Environmental Management Report and site PRPs, where relevant.

Greenhouse Gas

Project measures for energy efficiency are described in the EA.

Odour

While no odour impacts are predicted from the Project ventilation shafts, in the event of an issue or complaint arising with respect odour, suitable complaint response and monitoring measures would be developed.

ES3.12 TRANSPORT

A Traffic Assessment for the Project was prepared by Masson Wilson Twiney.

Existing Environment

The South Coast Rail network provides a passenger and freight rail link along the coast between Kiama and Sydney via Wollongong. Metropolitan Colliery is connected to the main line via a siding on the Illawarra Railway (between Helensburgh Station and Otford Station) (Figure ES-3).

The existing Metropolitan Colliery haulage of coal reject to the Glenlee Washery located to the west of Campbelltown and product coal haulage to the Corrimal and Coalcliff Coke Works south-east of Helensburgh (Figure ES-1) contributes to existing heavy vehicle movements on the public road network.

The traffic assessment analysis of existing traffic flows indicates that the Metropolitan Colliery makes only a minor contribution to total traffic volumes on the existing coal and coal reject haulage routes.

A review of accident data in the Helensburgh area has been undertaken. Analysis of the accident data identified no particular accident patterns or causation factors.

Potential Impacts

Project Traffic Generation

Project surface construction works would be undertaken intermittently over a period of up to five years and would be undertaken generally during daytime hours up to seven days per week. Predicted traffic generation during construction would comprise both light vehicles and small truck/heavy vehicle movements associated with employee transport and deliveries/services, respectively.

Project construction would (at peak) increase traffic flows to the Metropolitan Colliery by approximately 10%, and outside of Helensburgh the contribution to total traffic would be negligible.

As stated in Section ES1, the Project would not involve any significant changes to the annual tonnage of product coal trucked to the Corrimal Coke Works and Coalcliff Coke Works or coal reject to Glenlee Washery, or the hours of trucking.

The Traffic Assessment concluded that with the additional Project traffic, the Metropolitan Colliery would continue to make only a small contribution to total traffic volumes on the existing haulage routes.

Intersection Performance

The peak hour performance with predicted background traffic growth was assessed for the six key intersections.

The additional traffic expected to be generated by the Project during the on-street peak hours would be sufficiently low that potential impacts on the operation of the surrounding intersections are considered to be negligible.

Road Safety

As the Project would not significantly alter traffic flows, or the type of vehicles on the key haulage routes, the Project is considered unlikely to have any adverse affects on road safety.

Cumulative Traffic Increases

Other developments in the vicinity of the Project site have the potential to add additional traffic flows that may result in cumulative impacts on the local road network. General traffic growth expected to be generated over the life of the Project was included in the Traffic Assessment.

Rail Transport

The majority of product coal is transported by train to the Port Kembla Coal Terminal. The increase in coal production and the requirements of train scheduling indicate that the Project would require 24 hour train loading up to seven days per week.

It is anticipated that the number of trains would increase from 1.5 trains per day to three trains per day on average over the year.

Mitigation Measures, Management and Monitoring

HCPL recognises that off-site traffic movements associated with the Metropolitan Colliery are a concern for a number of residents and businesses located on Parkes Street in Helensburgh and rail movements are also potentially of concern to residents located in close proximity to the Illawarra Railway.

Notwithstanding the fact the Project is not predicted to significantly alter existing off-site road transport on the public road network or off-site rail movements on the South Coast Rail network, HCPL would prepare a Transport Management Plan for the Project.

ES3.13 SOCIO-ECONOMICS

A Socio-Economic Assessment (including a regional economic assessment and employment, population and community infrastructure assessment) was prepared for the Project by Gillespie Economics.

The Metropolitan Colliery is located within the Illawarra Statistical Division of NSW. The Illawarra Statistical Division comprises the Statistical Local Areas of Wollongong, Wingecarribee, Shellharbour, Kiama and Shoalhaven.

Regional Economic Assessment

The regional economic assessment considered the potential impact of the Project at a regional scale and at the NSW level.

Existing Metropolitan Colliery

Using input-output analysis, it was estimated that the existing operation of the Metropolitan Colliery contributes the following to the regional economy:

- $253 million (M) in annual direct and indirect regional output or business turnover;
- $110M in annual direct and indirect regional value added;
- $46M in annual household income; and
- 549 direct and indirect jobs.

Project Impacts

The Project is predicted to have the following impacts on the Illawarra and NSW economies.

Illawarra Economy

- $372M in annual direct and indirect regional output or business turnover;
- $136M in annual direct and indirect regional value added;
- $56M in annual household income; and
- 700 direct and indirect jobs.

The Project would provide continued direct employment in the region for 320 people (HCPL staff and on-site contractors).

NSW Economy

- $687M in annual direct and indirect regional output or business turnover;
- $301M in annual direct and indirect regional value added;
- $154M in annual household income; and
- 1,951 direct and indirect jobs.

The potential impacts of the Project on the NSW economy are substantially greater than for the Illawarra economy alone, as more mine expenditure is captured and there is a greater level of inter-sectoral linkages in the larger NSW economy.

Project Cessation

The Project would stimulate demand in the Illawarra and NSW economies leading to increased business turnover in a range of sectors and increased employment opportunities. Cessation of the Project would, however, lead to a reduction in regional economic activity.

HCPL would develop a Mine Closure Plan before Project closure. The plan would be prepared in consultation with Wollongong City Council, Department of Planning and the Helensburgh community and would include consideration of amelioration of potential adverse socio-economic effects due to the reduction in employment at Project closure.

Employment, Population and Community Infrastructure

The primary potential impact of the Project on community infrastructure relates to population growth and related effects on housing and community facilities.

Project Construction

During construction of the Project, an additional workforce of up to 50 people would be required during peak periods of construction. The various construction activities would be spread over a period of approximately five years and hence little if any population change as a result of the additional construction workforce is envisaged.

No community infrastructure impacts are envisaged as a result of the Project construction.

Project Operation

The existing Metropolitan Colliery workforce would be maintained by the Project with increases in efficiency allowing for the proposed increases in coal production. Therefore compared to current levels, no additional direct workforce or population is predicted as a consequence of the Project.

Some additional flow-on workforce is expected as a result of greater flow-on employment associated with the Project compared to the current operation. This greater flow-on employment arises because the Project involves greater levels of operational expenditure in the region than the current operation.

The population associated with additional flow-on employment is small in the context of annual population growth of the region and no requirement for additional investment in community services and facilities infrastructure would be anticipated.

As described in ES3.12.1, HCPL would develop a Mine Closure Plan before Project closure.

ES3.14 HAZARD AND RISK

A Preliminary Hazard Analysis was conducted to evaluate the hazards associated with the Project. The Preliminary Hazard Analysis was conducted in accordance with the general principles of risk evaluation and assessment provided in the Department of Urban Affairs and Planning *Multi-Level Risk Assessment Guidelines*.

Following identification of the potential hazards associated with the Project, a qualitative assessment of the risks to the public, property and the environment associated with the development and operation of the Project was undertaken. Incremental risks were also assessed by comparing the Project risks with those at the existing Metropolitan Colliery.

Given the in-place or proposed mitigation measures, no incremental risks posing significant off-site impacts were identified for the Project.

ES3.15 VISUAL CHARACTER

Potential impacts to the visual character of the Major Surface Facilities Area include the construction and operation of additional infrastructure items. Given the existing mass and scale of the Major Surface Facilities Area buildings, structures (e.g. conveyors) and stockpiles, the Project alterations are considered minor and are expected to have negligible impact on the visual character of the Major Surface Facilities Area and surrounds.

Potential impacts on the visual character of the Project Underground Mining Area include the construction of Ventilation Shaft No. 4, on-going minor surface works and the aesthetic effects of subsidence related impacts on surface features. Detailed design of the additional infrastructure would include consideration of the visibility of the infrastructure and the potential to incorporate colouring, visual vegetation screening or bunding to reduce potential views from the surrounding public road network. HCPL has completed a stream restoration trial at the WRS4 rock bar (Section ES-4) and HCPL is currently investigating the potential use of cosmetic treatments (in the form of coloured grout or similar) to restore aesthetic values along Waratah Rivulet.

ES4 ADAPTIVE MANAGEMENT AND REHABILITATION

ES4.1 STREAM RESTORATION AT THE METROPOLITAN COLLIERY

Mine subsidence at the Metropolitan Colliery has affected some rock bars and associated pools along Waratah Rivulet.

These effects have included shallow cracking of rock bars and a consequent increase in the hydraulic conductivity of the rock bar leading to some reductions in the persistence of pools.

HCPL conducted a restoration trial at a rock bar known as WRS4 on the Waratah Rivulet. The objective of the trial was to investigate the effectiveness of polyurethane grouting products and associated injection methods in reducing the hydraulic conductivity of the fractured rock mass. Successful restoration of the WRS4 rock bar has been completed.

Successful restoration of the WRS4 rock bar was confirmed through measurement of a significant decrease in hydraulic conductivity and further evidenced by the return of water flowing over the rock bar and pool water level responses.

The outcomes of the WRS4 restoration trial were peer reviewed by Gilbert and Associates and Dr Walter Boughton. The peer reviews supported HCPL's assessment of restoration success.

ES4.2 WARATAH RIVULET ADAPTIVE MANAGEMENT

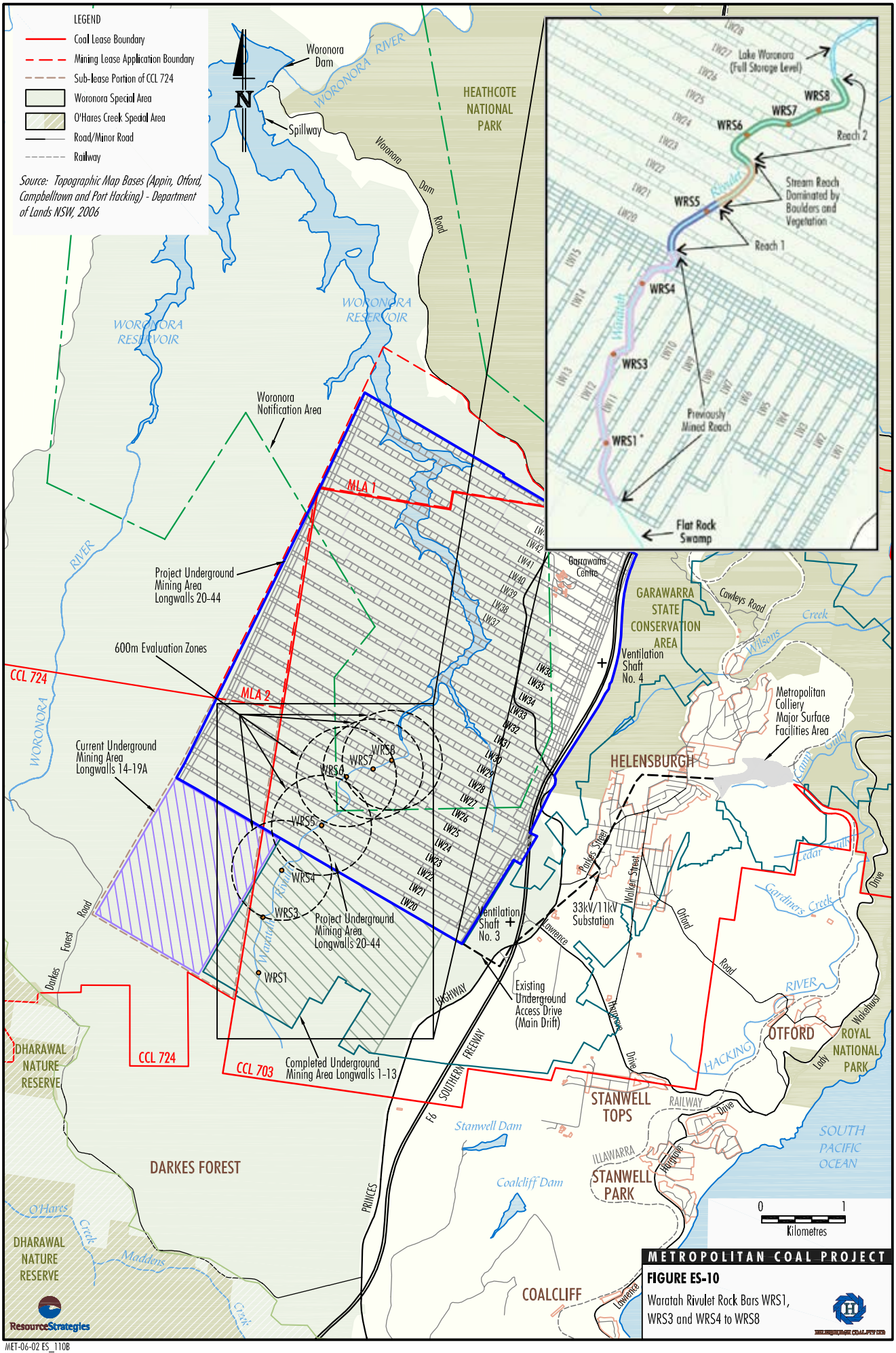
HCPL proposes an adaptive management approach for rock bars WRS5, 6, 7 and 8 on the Waratah Rivulet (Figure ES-10), consistent with the Southern Coalfield Panel Report and a risk based management approach.

HCPL has evaluated each rock bar in terms of its suitability for restoration activities. Based on these evaluations, HCPL considers that WRS5, 6, 7 and 8 would be amenable to restoration using the general injection methods, drilling techniques and environmental controls developed at the WRS4 rock bar.

A Waratah Rivulet Management Plan would be developed in consultation with the relevant authorities to reflect the adaptive management approach. The Waratah Rivulet Management Plan would be an operational document that would be reviewed and updated to reflect the status of longwall mining, revised subsidence predictions and any advances in stream restoration methods.

The Waratah Rivulet Management Plan would include:

- the identification of evaluation zones where the adaptive management approach would be implemented;
- specific incremental subsidence assessment;
- subsidence measurement for comparison with predictions,
- a Trigger and Response Plan with trigger mechanisms that initiate a range of responses (e.g. a higher intensity of monitoring and/or the implementation of response measures) and that identify personnel responsible for implementation of the response measures;
- iterative stream restoration phases at WRS5, 6, 7 and 8 and aesthetic measures that are planned prior to entering each evaluation zone;


LEGEND
Coal Lease Boundary
Mining Lease Application Boundary
Sub-lease Portion of CCL 724
Woronora Special Area
O'Hares Creek Special Area
Road/Minor Road
Railway
Source: Topographic Map Bases (Appin, Otford, Campbelltown and Port Hacking) - Department of Lands NSW, 2006
N
Woronora Dam
Spillway
Woronora Dam Road
WORONORA RIVER
HEATHCOTE NATIONAL PARK
WORONORA RESERVOIR
Woronora Notification Area
MLA 1
MLA 2
CCL 724
CCL 703
Project Underground Mining Area Longwalls 20-44
600m Evaluation Zones
Current Underground Mining Area Longwalls 14-19A
Completed Underground Mining Area Longwalls 1-13
Existing Underground Access Drive (Main Drift)
Ventilation Shaft No. 3
Ventilation Shaft No. 4
33kV/11kV Substation
Garrawarra Centre
GARAWARRA STATE CONSERVATION AREA
HELENSBURGH
Metropolitan Colliery Major Surface Facilities Area
OTFORD
ROYAL NATIONAL PARK
STANWELL TOPS
STANWELL PARK
DARKES FOREST
DHARAWAL NATURE RESERVE
COALCLIFF
SOUTH PACIFIC OCEAN
Stanwell Dam
Coalcliff Dam
Waratah Rivulet
Lake Woronora (Full Storage Level)
WRS8
WRS7
WRS6
WRS5
WRS4
WRS3
WRS1
Reach 2
Reach 1
Stream Reach Dominated by Boulders and Vegetation
Previously Mined Reach
Flat Rock Swamp
Kilometres
METROPOLITAN COAL PROJECT
FIGURE ES-10
Waratah Rivulet Rock Bars WRS1, WRS3 and WRS4 to WRS8
ResourceStrategies
MET-06-02 ES_110B

- environmental monitoring, environmental control measures and reporting for stream restoration works; and
- contingency measures in the event that observed subsidence effects are significantly greater than predicted or if the restoration performance criteria are not being achieved.

If subsidence effects are trending so as to potentially exceed that authorised by the Project Approval and/or the implementation of restoration commitments is not performing adequately (including the time scale within which they are undertaken), then the adaptive management approach would lead to various responses.

These include: further restoration works in the first instance; or in the case of the need for contingency measures a reduction in the causal subsidence magnitudes (achieved by options including reduced thickness of seam mined, narrowed longwall width, and/or longwall set-backs from the rivulet).

ES4.3 REHABILITATION OF SURFACE DISTURBANCE AREAS

The Project rehabilitation programme would include the progressive rehabilitation of minor Project surface disturbance areas and the rehabilitation of surface disturbance areas remaining at the cessation of the Project (e.g. the Major Surface Facilities Area).

Rehabilitation would be subject to regulatory authority agreement and approval as part of the Mining, Rehabilitation and Environmental Management Process administered by the Department of Primary Industries.

Revegetation of the majority of the minor Project surface disturbance areas would be progressive over the life of the Project. Natural regeneration would be encouraged in the minor surface disturbance areas.

Monitoring of rehabilitation areas would be conducted on a regular basis to confirm that the rehabilitation objectives are being achieved and to identify the need for any maintenance and/or contingency measures.

The Mine Closure Plan to be developed for the Project would document the final mine closure process (refer Section ES4.5).

ES4.4 REHABILITATION OF MINE SUBSIDENCE EFFECTS

In addition to the adaptive management approach described for the Waratah Rivulet in Section ES4.2, rehabilitation may be undertaken to remediate mine subsidence effects (e.g. surface cracking and erosion) on other natural surface features.

ES4.5 MINE CLOSURE AND LEASE RELINQUISHMENT

Prior to the completion of mining operations, a Mine Closure Plan would be developed in consultation with the relevant authorities and stakeholders.

The Mine Closure Plan would document the final mine closure process, final rehabilitation works and post-closure maintenance and monitoring requirements appropriate to established completion criteria. The Mine Closure Plan would also address the long-term landuse for the Major Surface Facilities Area.

ES4.6 COMPENSATORY MEASURES AND ECOLOGICAL INITIATIVES

A range of mitigation, management and monitoring measures would be implemented for the Project to maintain or improve the biodiversity values of the surrounding region in the medium to long-term and are described in the EA.

ES5 STATEMENT OF COMMITMENTS

HCPL has prepared a Statement of Commitments for the Project which provides a summary of the environmental mitigation and management measures and environmental monitoring that the company proposes to incorporate in the Project. These commitments are described in the EA.

ES6 PROJECT JUSTIFICATION

ES6.1 CONSIDERATION OF PROJECT ALTERNATIVES

Alternatives were considered for the Project in relation to the mining method, mine plan and orientation, avoidance and minimisation options, coal reject management, road transport of coking coal to Corrimal and Coalcliff Coke Works and electricity supply.

In late 2007, HCPL conducted a detailed consideration of a selection of mine layout options for the Project based on the underground mining experience gained from over 100 years of mining, management of gas/ventilation and hauling of coal at the Metropolitan Colliery. Each layout case had several options of longwall panel arrangements. HCPL's comparative analysis of the options resulted in the selection of an East-West Orientation as suitable for further consideration in this EA.

The potential to minimise impacts to Waratah Rivulet was considered by an iterative process of applying 50 m incremental setbacks to determine the setback required to minimise rock bar leakage and associated effects on pools. MSEC concluded that a longwall setback of between 450 m and 500 m would be required.

The adoption of a 500 m setback would have a number of potential environmental benefits. However, a 500 m setback would still result in some subsidence effects to Waratah Rivulet. The adoption of such a 500 m setback to reduce effects on the Waratah Rivulet would also have significant economic costs.

Based on the evaluation described in the EA, Project Approval for full extraction is being sought for the Project.

ES6.2 ECOLOGICALLY SUSTAINABLE DEVELOPMENT ASSESSMENT

Project design, planning and assessment have been carried out applying the principles of Ecologically Sustainable Development, through:

- incorporation of risk assessment and analysis at various stages in the Project design and environmental assessment and within decision-making processes;
- adoption of high standards for environmental and occupational health and safety performance;
- consultation with regulatory and community stakeholders; and
- optimisation of the economic benefits to the community arising from the development of the Project.

Assessment of potential medium and long-term impacts of the Project was carried out during the preparation of this EA on aspects of surface water and groundwater, transport movements, air quality emissions (including greenhouse emissions), noise emissions, aquatic and terrestrial ecology, coal reject management, heritage and socio-economics.

The Project can be operated in accordance with Ecologically Sustainable Development principles through the application of mitigation and management measures to minimise environmental impacts of the Project.

ES6.3 CONSIDERATION OF POTENTIAL SOCIO-ECONOMIC BENEFITS

The Project would provide up to 50 construction jobs and would continue to provide employment for 320 existing Metropolitan Colliery staff and on-site contractors for the life of the Project.

Employment and expenditure associated with the Project is also predicted to have significant flow-on effects in the regional and NSW economy. The Socio-Economic Assessment indicates that the Project is predicted to generate up to 700 direct and indirect jobs in the Illawarra economy and up to 1,951 direct and indirect jobs in the wider NSW economy.

The Socio-Economic Assessment has indicated the development of the Project would provide a net production benefit of approximately $592M, and a net benefit of approximately $436M would be forgone if the Project is not implemented. These significant economic benefits to Australia (and the State of NSW) would be foregone if the Project does not proceed.