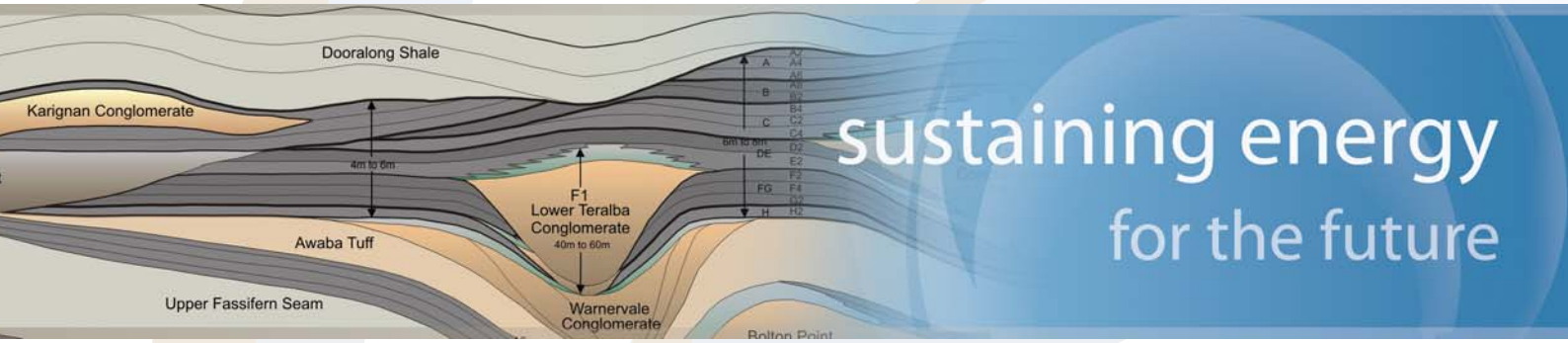
# WALLARAH 2 COAL PROJECT

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## PRELIMINARY ASSESSMENT REPORT
## NOVEMBER 2007

Wallarah 2
COAL PROJECT

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# 1. Introduction

## 1.1 Overview

The purpose of this report is to accompany a Part 3A application lodged with the Department of Planning for a proposed underground coal mine, referred to as the Wallarah 2 Coal Project as shown on **Figure 1**. This application simply seeks to obtain the requirements of the Director General of the Department of Planning in regard to a future Environmental Assessment to be undertaken for the project.

Project Approval is sought for the entire proposed mine area, as shown on **Figure 1**, with approval being sought for an initial duration of 28 years. Since the projected life of the mine is in the order 42 years, a further planning approval will be required for mining years 29 to 42. Because the current project application covers the entire proposed mine footprint, environmental assessment studies and impact predictions will encompass the entire mine area.

This report has been made public for the purposes of providing the local community with information regarding the project. The environmental issues to be assessed for the project have been identified and prioritised in this report. These issues and any additional matters listed in the Environmental Assessment Requirements (EARs) to be issued by the Director-General of the Department of Planning, will be the focus for the forthcoming environmental assessment and consultation work which is integral to the approval process. Key features of the project are:

- The underground extraction of coal by longwall methods at a depth of between approximately 350 m and 680 m below the surface within the area designated on **Figure 1**;
- Surface facilities on company owned and leasehold land between the Motorway Link Road and the F3 Freeway which will include rail loop, coal stockpiles, workshop and offices;
- Subdivision of land to allow a lease over a proposed rail loop easement;
- Main ventilation facilities on company owned land off Hue Hue Road between Sparks Road and the Buttonderry Waste Management Facility. This facility will include the main personnel access to the mine, offices and employee amenities;
- Construction of a second ventilation shaft within the Wyong State Forest as shown on **Figure 1**. This shaft will be an air intake only and will be constructed as mining moves to the west;
- Creation of 300 jobs directly and approximately 750 additional jobs created indirectly;
- Local economic benefits in the order of $60 million per annum;

- Average export earnings in excess of $200 million per annum; and

- Total revenue to Government of over $1 billion.

The proposed mine has been designed to minimise its impact on the environment, particularly the local community and water supply system. The proposed underground mining area has been significantly reduced in response to identified geological and environmental constraints and the views of the community. The proposed mine plan, shown on **Figure 4**, extends from deep beneath a portion of the Hue Hue rural residential area and continues at deeper levels below the Dooralong Valley before progressively mining beneath the Wyong State Forest area. Longwall mining will not take place directly beneath the Wyong River nor within the vast majority of the floodplain of the Yarramalong Valley.

The region's water supplies will be safeguarded. No mining will occur in or under the Mangrove Creek Dam catchment, or Mardi Dam, nor under the Wyong River, Wyong Weir, Ourimbah Creek, Porters Creek Wetland or related water facilities and infrastructure.

There have been a number of changes made to the project in response to community concerns and our risk review as part of project planning. These include:

- Reduced mine footprint within the floodplain area and removal of panels which previously extended under the Wyong River;

- Design of the mine plan to ensure that the existing permeability and behaviour of rock strata immediately below the shallow aquifers of the Dooralong and Yarramalong Valleys is retained. This will ensure that groundwater contributions to the water supply system will be safeguarded;

- Removal of coal washery and the associated reject disposal issues, significantly reducing water demand and environmental risks;

- Relocation of the surface infrastructure site to the eastern side of the F3 Freeway;

- Reduction in mine production levels to a maximum of 5 million tonnes per annum;

- Gas management initiatives; and

- Additional water supply initiatives to enable the project to become a nett water supplier to the region.

The project has incorporated a number of protection measures to safeguard against adverse impacts on the local community. The amount of coal to be extracted beneath the Hue Hue area has been significantly reduced to ensure that surface movement (referred to as subsidence), will readily comply with the levels

stipulated by the declared Subsidence District. Houses built in accordance with the Hue Hue Mine Subsidence District criteria should therefore not be damaged.

Similarly, when underground mining occurs deep beneath the Dooralong Valley floodplain, which is necessary to access coal reserves within the surrounding State Forest, less coal will be extracted to reduce the subsidence effects and to ensure that shallow aquifers are appropriately protected.

There are various methods used to reduce the amount of coal extracted. These include narrowing the panels of coal extracted, increasing the width of coal pillars between panels and extracting a smaller vertical section of coal. When these measures are considered necessary, the term "subsidence protection zone" is used. Subsidence protection zones have been included in both the Yarramalong and Dooralong Valleys as well as the Hue Hue rural residential area. There is also a range of other environmental initiatives designed to enhance the environment. These include:

- Treating any surplus saline water which may be encountered by underground workings to a standard so that it can be returned to either enhance the environmental flows of the surrounding waterways or directly to the water supply system or other industrial users. This water occurs at considerable depth, is naturally of poor quality and would otherwise be unavailable to either groundwater users or the catchment;

- The mine will encounter natural gas during the mining process. The gas is a by-product of the mining operation and needs to be managed for both safety and environmental purposes. The gas will be extracted from within the mine workings and piped to the pit top for processing. This is a vastly different and environmentally sound method of managing gas during the mining process compared with conventional methods of gas extraction using surface to seam bores. Collected gas will be available for beneficial uses including electricity generation or other commercial uses;

- Dedicating land for conservation purposes;

- Ongoing funding for local community projects;

- Carefully locating the main surface facilities within existing or future industrial lands and away from existing and planned residential areas.

## 1.2 Project Proponent

The Wyong Areas Coal Joint Venture (WACJV) was founded in 1995 at the invitation of the NSW Government to submit a competitive tender for the Wyong Coal Development Areas, as shown on **Figure 1**.

The majority partner in the successful tender was Coal Operations Australia Ltd, with minority partners including Kores Australia Pty Ltd ("Kores") and other

Korean and Japanese interests. BHP Billiton subsequently became a majority shareholder through the acquisition of Coal Operations Australia Ltd.

In 2005, Kores acquired the BHP Billiton interest in the WACJV, taking its equity in the venture to 82.25%. As a result, the ownership structure of WACJV now stands as follows:

| | |
|---|---|
| Kores Australia Pty Ltd | 82.25% |
| Catherine Hill Resources Pty Ltd | 5% |
| Kyungdong Australia Pty Ltd | 4.25% |
| SK Australia (Wyong) Pty Ltd | 4.25% |
| SK Networks Resources Pty Ltd | 4.25% |

The proponent, the WACJV, is proposing to develop the coal resource by a new project now referred to as the Wallarah 2 Coal Project (W2CP). WACJV is carrying out final studies for a mining option re-configured from that which had been pursued in the past.

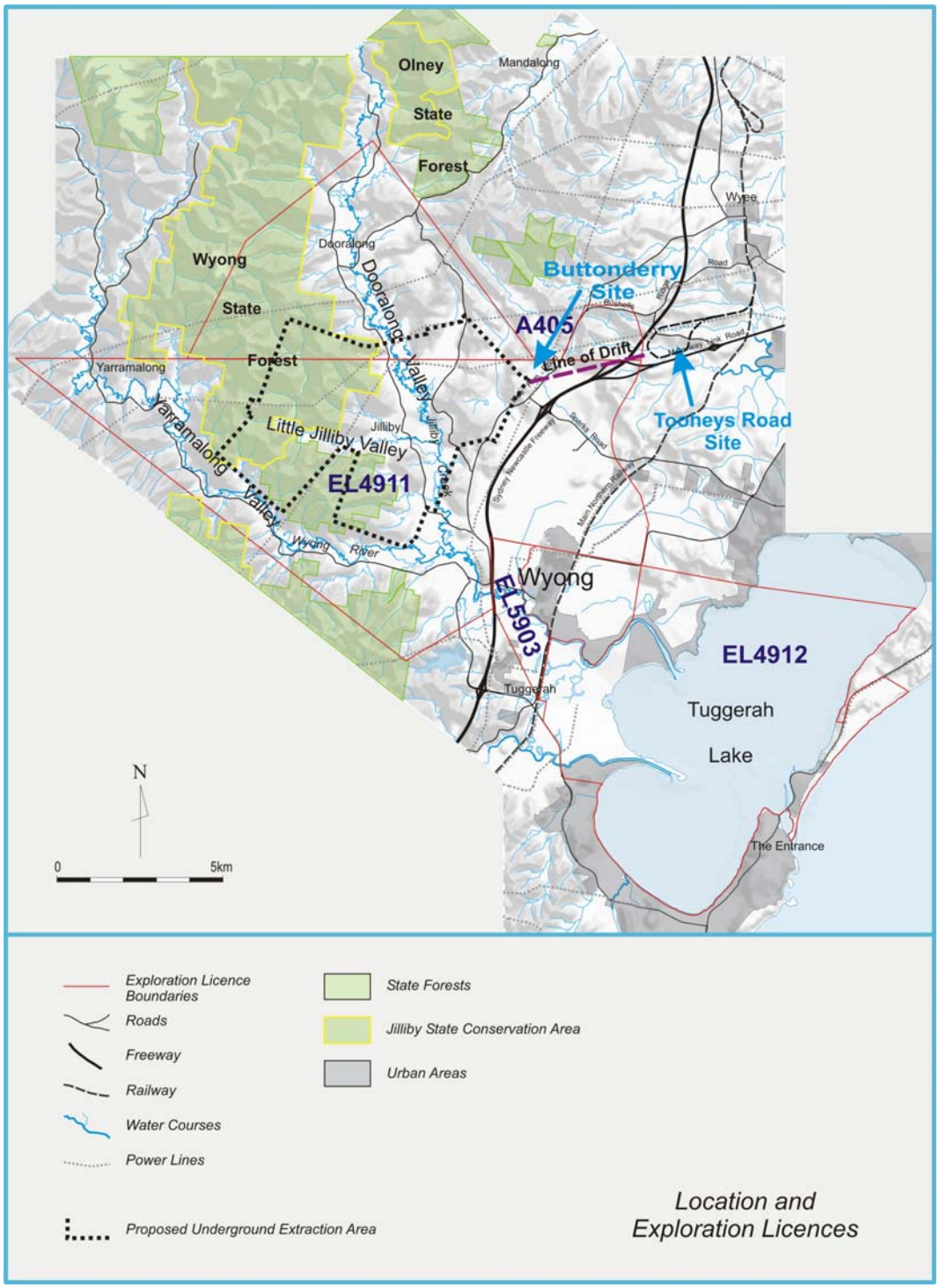



**Figure 1 – Location Plan**

## 1.3 Project Background

The original government tender involved two separate areas of the coal resource, referred to as the eastern and western areas. The eastern area covered the Tuggerah Lake and surrounding area. The western area included Yarramalong and Dooralong Valleys, Wyong and Olney State Forests and surrounding ranges.

Both resource areas were extensively explored in accordance with the original NSW government tender requirements. However as a result of this exploration, a small northern portion of the western resource was transferred to the tenement holding to the north (held by Centennial Coal) as it was found to be isolated by an igneous intrusion and therefore only accessible from the north. This resource has now been included in the Mandalong Mine tenements.

The Wallarah 2 Coal Project (W2CP) proposes to extract 151 million tonnes of coal from within the total western resource of approximately 878 million tonnes (representing 17% of the confirmed resource). Over half of the target area resource lies beneath the Wyong State Forest and surrounding ranges. A proportion however, lies beneath the Dooralong Valley and the Hue Hue area, and to a much lesser extent, the Yarramalong Valley.

In recognition of the high quality resource within the Hue Hue area, a Mine Subsidence District was proclaimed in 1988. An additional Mine Subsidence District was proclaimed in 1997 in recognition of the resource in the Wyong State Forest, the Dooralong Valley and the Yarramalong Valleys. The purpose of the Mine Subsidence Districts is to ensure that housing and other developments take into account the potential subsidence effects from future resource extraction.

The proposed mining operation has recognised that Dooralong and Yarramalong floodplains have a role in the region's water supply system. Investigations to date demonstrate that the proposed mine plan will not negatively impact on the important water supply functions in the catchment. Indeed, with its proposed water supply initiatives, the project will make a positive contribution to the Gosford-Wyong Water Supply Scheme.

Over the past 10 years, a number of environmental and engineering studies have been undertaken. These include:

- Detailed Flood Study covering both the Yarramalong and Dooralong Valleys. This work has been provided to Wyong Shire Council to assist in strategic planning for the area and has been exhibited to the community;

- Detailed environmental investigations covering climate, ecological, heritage and social issues;

- Engineering and geotechnical investigations, including subsidence and groundwater issues which have led to the formulation of the proposed mine plan for the target area;

- Extensive exploration work involving 352 drill holes representing 158,000 m of drill core being logged and analysed; and

- Detailed financial evaluation covering several development options. These options have included various mine plans, production rates, equipment alternatives, coal processing and handling, transportation options and marketing factors.

## 1.4 Project Timing

The Environmental Assessment documentation is expected to be available for public review in mid 2008. The government review and approval process, which may include a hearing of an Independent Panel of Experts will take place during 2008. Should Project Approval be obtained, Subsidence Management Plans will be prepared during 2009 prior to construction commencing. First longwall coal production is anticipated in late 2011.

## 1.5 Legislation and Planning

This section provides an outline of the legislative processes relevant to the W2CP.

### 1.5.1 Environmental Planning and Assessment Act 1979

The Project is a mining project as defined in Schedule 1 of *State Environmental Planning Policy (Major Projects) 2005*. As such, if the Minister for Planning is also satisfied that it meets this definition, it will be a project to which Part 3A of the EP&A Act applies. This means that the Project will be determined by the Minister for Planning.

The Part 3A approval is the most significant approval required for the Project. If this approval is obtained, it is expected that all other statutory approvals necessary for the Project will be able to be procured.

### 1.5.2 Other Approvals

In addition to approval under Part 3A, the project will also require approvals from the Department of Primary Industries – Mineral Resources (DPIMR) under the *Mining Act 1992* and *Coal Mines Regulation Act 1982*. These approvals form part of the grant of a Mining Lease and include preparation of a Subsidence Management Plan, Mining Operations Plan and approvals for secondary workings. Separate approvals may be required from DPI- Mineral Resources in relation to the project's gas management initiatives and Mine Subsidence Board in relation to construction requirements.

An Environment Protection Licence will be required from the Department of Environment and Conservation as well as other ancillary approvals from Council under the *Roads Act 1993* and WorkCover for the storage of fuels.

### 1.5.3 Wyong Shire LEP

The local environmental planning instrument governing land use in the Wyong local government area is the *Wyong Local Environmental Plan 1991 (LEP).* The Tooheys Road site, containing the rail loop and spur line and the coal handling facilities is primarily zoned 4(e) Regional Industrial & Employment Development, with a small area that will not form part of the development area zoned 7(g) Wetlands Management. Mining is permissible in the 4(e) zone but prohibited in the 7(g) area**.**

The Buttonderry site will provide the main ventilation fans, and access for personnel and services. This site is zoned 1(c) Rural Holdings where development ancillary to mining is permitted with development consent. This site is bordered to the north by 5(a) Waste Disposal, 10(a) Investigation Zone to the east (in the process of being zoned industrial), to the west by rural residential areas zoned 7(b) Scenic Protection, and to the south by areas zoned 6(a) Open Space Recreation, 7(a) Conservation and 7(c) Scenic Protection: Small Holdings.

There are several small areas within the underground extraction area where mining is prohibited. However, the project can be determined by the Minister for Planning under the provisions of Part 3A of the EP&A Act and State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007.

### 1.5.4 Draft Central Coast Regional Strategy

The Draft Central Coast Regional Strategy (DCCRS) was developed by the State government to assist in planning for an anticipated population growth in the region of 64,250 people by 2031. As a result of this, it is expected that more than 35,000 additional jobs will be required, to be met through the promotion of Gosford as a regional city and Tuggerah-Wyong as a major centre. The North Wyong Structure Plan Precinct will be the focus of new employment lands releases.

The Wyong Employment Zone (WEZ) has been identified in the Strategy as a major employment opportunity for the Central Coast Region. WEZ is currently being assessed by the State Government as a state significant project. Planning for this area will include investigation of land to the immediate west of the Sparks Road – F3 Freeway interchange for future employment opportunities that take advantage of this key transport interchange. The proposed Buttonderry site which includes ventilation facilities and access to the mine is also proposed for this Sparks Road area, and would be consistent with state government planning to utilise the area for employment opportunities.

The Tooheys Road site was zoned industrial more than 10 years ago by the NSW State Government as a significant regional employment precinct. The DCCRS retains and reinforces this site as key employment land, although with some constraints. These constraints include vegetation and surface drainage systems which have been identified by this project and protection measures have been incorporated into the design.

The proposed W2CP is consistent with the aim of the Strategy in providing additional employment in the region, as it will generate around 300 new jobs directly, and provide additional employment opportunities for around 750 people through increased expenditure in the local economy and normal flow on effects.

The Strategy also recognises that the region's employment growth is largely driven by the resource base attracting investment in agriculture, mining and energy sectors.

### 1.5.5 Rail Loop Subdivision

Part of the land proposed for the rail spur is owned by the Darkinjung Local Aboriginal Land Council. Negotiations are underway to lease any non-company owned land that is required for the proposed W2CP rail infrastructure.

Section 23F of the *Conveyancing Act* provides that a lease over part of an existing lot requires the subdivision of that lot into separate parcels to ensure that the leased land follows the boundary of an existing lot, if the lease is to cover a period greater than 5 years in duration. Consequently, it is proposed to subdivide the Darkinjung land for the purpose only of creating a free standing lot to contain the rail loop, and for no other purposes.

The implications of this for the W2CP are that the rail loop, and associated sub-division, are development for the purposes of "coal mining" and pursuant to the *State Environmental Planning Policy (Major Projects) 2005* are a "project" that requires approval under Part 3A of the *Environmental Planning and Assessment Act 1979*. Accordingly, this sub-division is to be included in our proposed Part 3A application and can not be the subject of a separate development application under Part 4 of the *Environmental Planning and Assessment Act 1979*.

# 2. Wallarah 2 Coal Project

*This section describes the key elements of the Wallarah 2 Coal Project.*

## 2.1 Overview

The Wallarah 2 Coal Project (W2CP) will involve the underground extraction of export quality thermal coal with associated surface facilities and infrastructure. The project is comprised of an underground longwall mine, a coal handling plant and storage facilities, rail loop and loading infrastructure, an underground drift entry, ventilation shafts, gas and water management facilities and administration buildings.

The mine will operate 24 hours per day, seven days per week.

## 2.2 Resource Description

The W2CP Target Area, shown on **Figure 1**, is a subset of the resources which lie in the Exploration Licence area. The target area is delineated to the north by a large north-west oriented dyke zone (a vertical geological feature involving igneous rock) which passes through the northern half of the original government tender area. This dyke zone was detected by airborne and ground-based magnetic surveys, and consists of several widely spaced but significantly thick dykes. The target area has been subject to detailed mine planning and resource evaluation.

The southern boundary of the W2CP Target Area is formed by a combination of Wyong Creek and a separate dyke system (which was also detected by air-borne and ground-based magnetic surveys). Additional coal resources lie between this dyke system and the southern boundary of the exploration licence area, however the short distance between the two, coupled with increased mining depth and large distance from surface facilities, reduces the economic viability of mining within this area.

The eastern boundary of the target area is where the coal seam splits into thinner units, however development roadways could still be driven in the coal seam within this area. The western split line forms the western boundary. Within the W2CP Target Area the Wallarah and Great Northern Coal Seams are fully coalesced, resulting in seam thickness ranging from 3.2 m to 6.8 m. Depth of cover over most of the area ranges from approximately 350 m to 550 m, increasing to a maximum of 680 m below some heavily-timbered, steep-sided hills separating the Yarramalong and Dooralong Valleys.

A working section of 4.5 m can be potentially maintained over virtually the entire W2CP Target Area except along the north-western margin where seam thickness reduces to 4 m. Working section raw ash increases from 12.5% (ad: air dry basis) in the north-east to greater than 20% towards the Western Split. Specific Energy of raw coal generally ranges from a calorific value of 8,100 to 8,200 kcal/kg (daf:

dry ash free basis) but decreases to 8,000 in areas of increased ash. Sulphur content of the coal is consistently low, at about 0.35% (ad).

Major features of the coal compared to other coals from the Newcastle and Hunter coalfields are the low moisture, low sulphur and low nitrogen contents. The coal quality characteristics provide environmental as well as energy benefits when using the thermal coal product.

### 2.3 Mining Constraints

There have been a number of constraints identified that have been taken into account in the proposed mine plan. These include:

- The need to safeguard water supply catchment functions and infrastructure;
- Houses located within the Hue Hue Mine Subsidence District;
- Houses located within the Dooralong and Yarramalong Valleys;
- Floodplains of both Dooralong and Yarramalong Valleys;
- Wyong River;
- Geological constraints including identified igneous intrusions, faults and coal quality; and
- Protection of public infrastructure such as roads, railways, power lines etc.

Other issues which have had a bearing on the mine plan include the location of the pit top and ventilation shaft sites which in turn have been located away from residential receptors but have the benefit of good access to the freeway and main rail line.

**Figure 2** shows the location of the target area, key mining constraints, the location of the Hue Hue Mine Subsidence District, the 1-in-100 year flood extents and existing buildings.

The major dyke trend is approximately north-west as shown in the portrayal of aeromagnetic-derived geological structures in **Figure 3**. The highest frequency of geological structural features occurs in the 140-145 degree range.

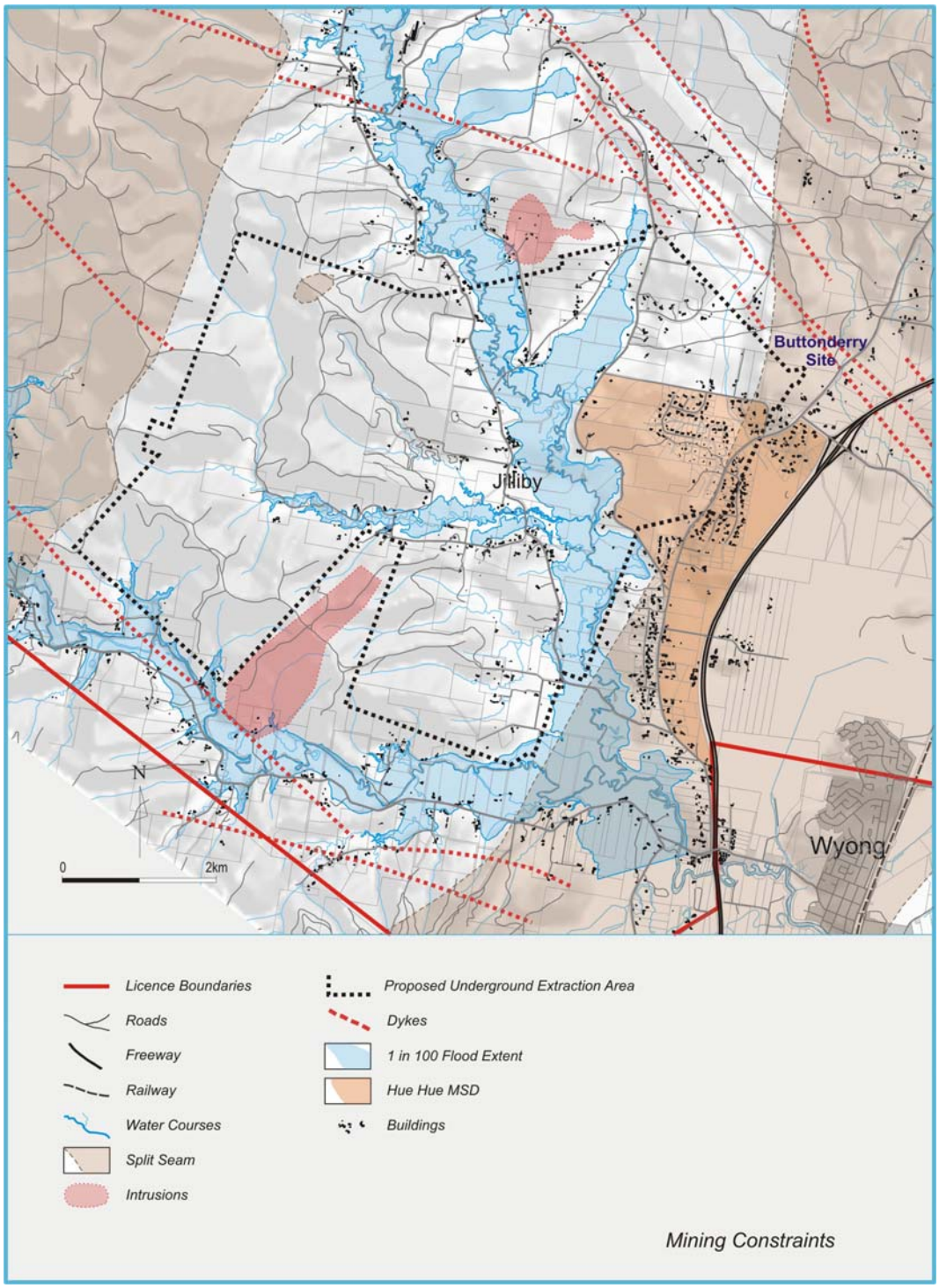



**Figure 2 - Mining Constraints Within the Wallarah 2 Target Area**

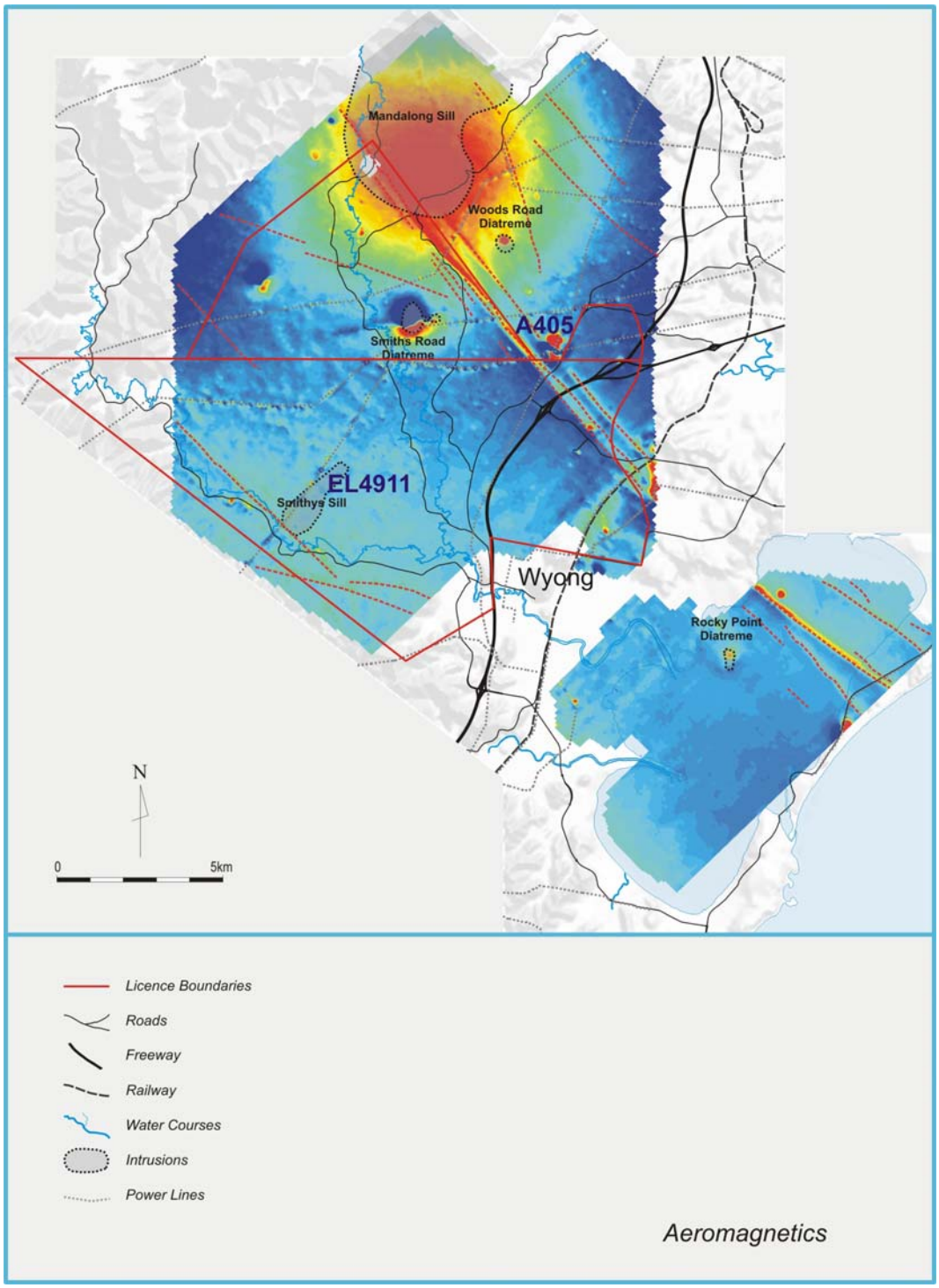



**Figure 3 – Aeromagnetic Appraisal of Geological Structures**

## 2.4 Selected Mining Method

Due to the size of the resource, the large depth of cover and the corresponding high cost of surface to underground access, a high production mining method is required. Analysis of the various options has concluded that longwall mining provides the best option in terms of workforce safety, financial viability, production capacity, environmental considerations and resource recovery.

Longwall mining is a term given to a particular type of underground coal extraction. All underground mines use mechanised coal extraction equipment and often in combination with hydraulic roof supports in order to safely remove the coal. In the case of longwall mining, blocks of coal are delineated by developing a series of parallel tunnels within the coal seam (referred to as roadways). These coal blocks are called panels. Once developed, a coal shearer is installed which progressively extracts the panel. The roof is supported by a series of hydraulic jacks known as chocks which move with the shearer in order to protect both the workers at the face and the extraction equipment.

The coal is removed from the mine by conveyor which runs along the face of the coal panel being extracted, then down one side of the panel to the main roadways leading out of the mine. The roadways are also used for equipment and personnel access and to draw fresh air into the mine to ventilate the workings.

## 2.5 Proposed Mine Layout and Extraction Sequence

The mining target area and proposed mine layout is shown in **Figure 4** while the proposed longwall panel extraction sequence is shown on **Figure 5**. Evaluation of alternative layouts indicates that the proposed mine plan is the preferred layout, although some minor adjustment to panel orientation and geometry may be made as a result of ongoing environmental and engineering studies. The mine layout incorporates a variety of longwall panel widths in order to optimise economic reserve recovery taking into account environmental and subsidence constraints:

- 120 m and 150 m wide panels below the north-eastern portion of the Hue Hue Mine Subsidence District;
- 150 m, 170 m or 200 m wide panels (depending on depth of cover) below the 1-in-100 year flood zone; and
- predominantly 250 m elsewhere.

Panel width varies along the length of one panel, as the panel moves from one zone to another zone of higher or lower permissible tilt levels. This process has achieved successful outcomes at other mines. The narrow sections of the variable width panel would have a three-heading gateroad on the tailgate side of the panel.

As shown in **Figure 5**, extraction commences in the north-eastern corner of the W2CP Target Area, adjacent to the pit bottom facilities. Due to surface subsidence restrictions, the initial longwall panels are relatively narrow. To commence longwall extraction as early as possible, the first eleven longwall panels are extracted from a set of northern main headings (MNW1), which run parallel and adjacent to the major dyke zone. A five-roadway configuration is used for these permanent main headings. A protection barrier of 120 m was applied against the dyke zone. The main headings terminate just east of the Smiths Road Diatreme.

While these first eleven longwall panels are being developed and extracted, an additional development unit drives the initial southern main headings, consisting of four headings (MSW1) in a south-south-west direction (east of and parallel to the first longwall panel), then five headings (MSW2) in a west-south-west direction that crosses deep under the valley to below the State forest. In contrast to the longwall panels, the main headings are not extracted by longwall mining but instead are mined using continuous miner equipment. These headings are permanent tunnels for access and services throughout the mine life and do not result in any subsidence.

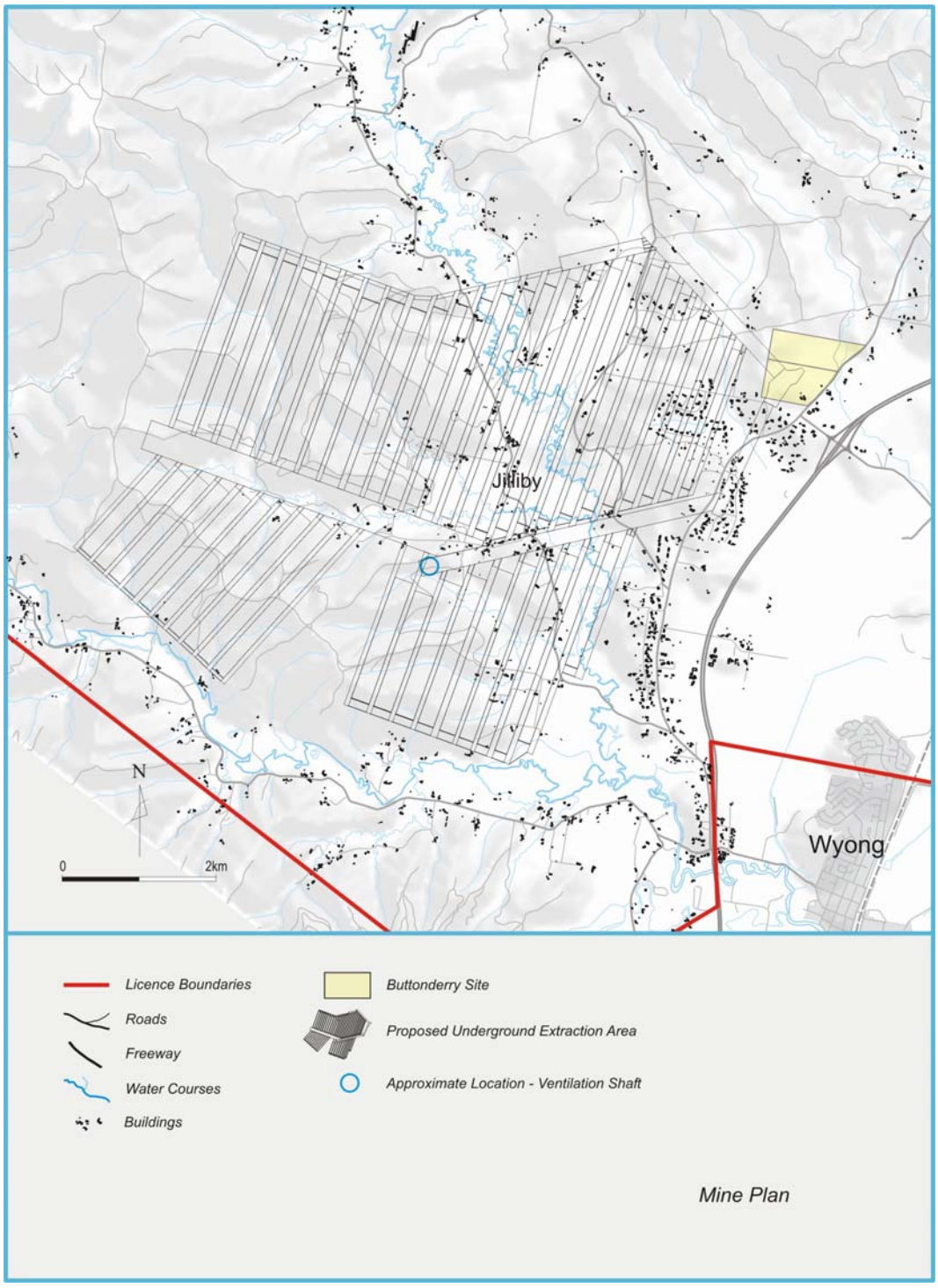



**Figure 4 - Proposed Mine Layout**

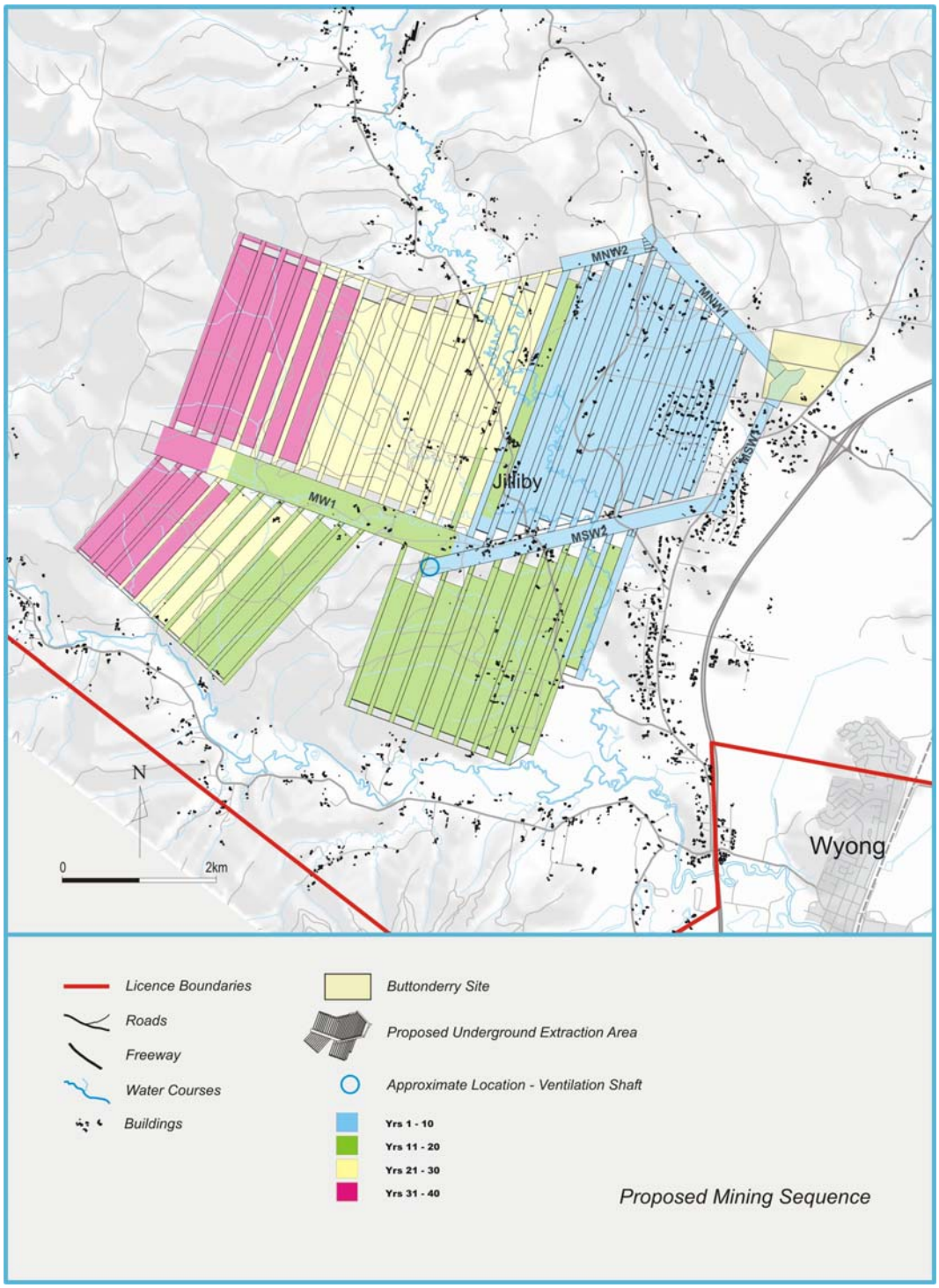



**Figure 5 – Proposed Mining Sequence**

The western extremity of the MSW2 main headings is the selected location for an additional downcast ventilation shaft. This shaft is required prior to longwall extraction from the southern mains.

Following extraction in the northeast area of the initial eleven longwall panels from the northern main headings, extraction of the southern panels commences in the southeast area. This sequence provides the following advantages:

- Better quality coal is extracted first, improving project economics; and

- Better mining conditions are anticipated, as entry into the Awaba Tuff floor areas is delayed.

The southeastern group of longwall panels are reduced in length to avoid Wyong Creek and a large number of flood affected properties within the Kidmans Lane area. Continuity of the southern longwall panels is interrupted by Smithys Sill to the west, a large igneous geological intrusion feature (as shown in **Figure 3**). This effectively splits the southern longwall panels into two discrete blocks. Extraction of the southern panels continues until LWS16 and involves extension of the southern main headings with eight headings (MW1) driven to the western edge of the W2CP Target Area. Again, the panels in the southwest area are designed to avoid the Wyong River system and any existing or future water supply scheme infrastructure.

After the initial eleven panels to be extracted in the northeast area (LWN1 to LWN11), mining shifts to the southern panels until a deterioration in coal quality in the south-west corner of the W2CP Target Area results in extraction moving back to the northwestern panels (LWN11 to LWN25). As this northwestern set of panels is to be extracted from the southern main headings, longwall retreat will be down-dip (as opposed to panels LWN1 to LWN11 which will be mined from the northern main headings). Thus, it is proposed that only these northwestern panels out of the entire W2CP will be mined in a southerly direction. All other longwall panels will be mined from south to north.

With an extraction height range of 3.5 m to 4.5 m, recoverable reserves are calculated to be 151 Mt (ROM). The overall longwall to development tonnage ratio is 11.0 : 1. **Figure 6** shows depth of cover for the mining area.

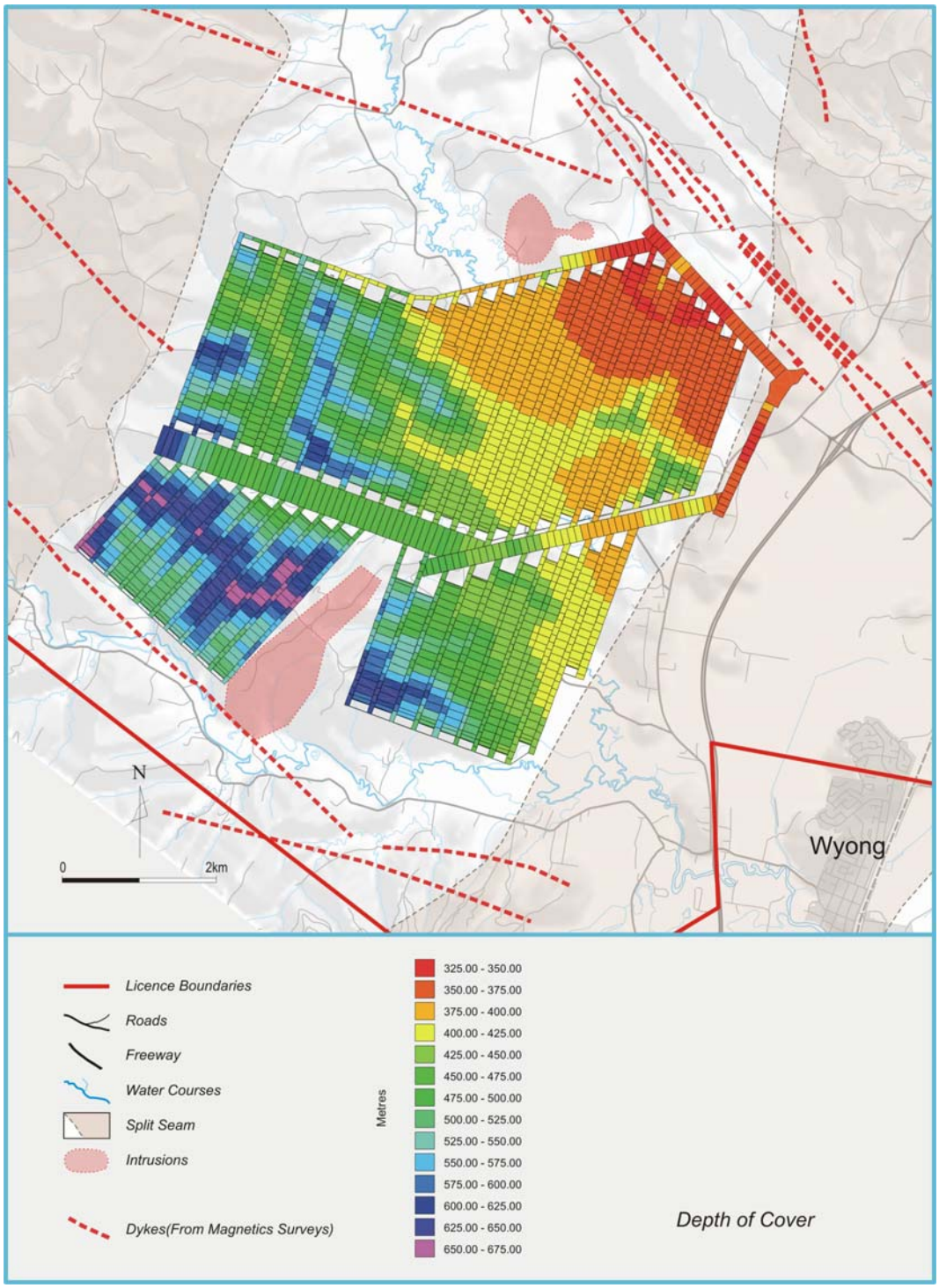



**Figure 6 - Depth of Cover Above the Coal Seam**

## 2.6 Coal Quality

The target area has been well explored with cored bore holes that have been extensively tested. Thus coal quality can be predicted and modelled with a high degree of confidence. A number of large diameter cores were also drilled to provide detailed sizing and quality information.

The W2CP coal will be an attractive coal to overseas and domestic power station operators and will have the following features:

- low moisture;
- high energy;
- low sulphur;
- medium to high volatile matter;
- low nitrogen; and
- benign ash chemistry.

## 2.7 Reject Disposal

The W2CP is targeting a policy of zero rejects by avoiding the need to include a Coal Washery as part of the project. By avoiding the need to have a Washery, the production of coarse (stony) or fine (silty tailings) will not be necessary. This in turn removes the need for coal reject disposal as well as significantly reduces the project's water consumption.

However, a small amount of rock that is separated from the Run-of-Mine (ROM) coal supply prior to the Coal Handling Plant will need to be disposed of offsite. This rock will be predominantly large flat pieces of roof stone that have passed through the crusher and this material will report to a storage bin. Trucks will transport the stone to nearby approved facilities on an "as needs" basis. Typically, this will involve around 1 truck load per day.

Clean excavated waste rock will also be created during the construction of the drift and shafts. This amounts to 156,000 $m^3$ for the Tooheys Road site and approximately 20,000 $m^3$ for the Buttonderry site. These figures assume a 25% swell factor for the recompacted material. It is intended to use this material for the creation of perimeter bunding and landscaping features on the two sites. For the Buttonderry site in particular, there is then no requirement to import fill material to fill the shafts at the completion of mining, as the material could be reclaimed from the bunding.

Cut and fill requirements of the railway construction will be subject to detailed design.

## 2.8 Water Management and Supply

The mine will require approximately 1 ML/day of water and, apart from the initial years of operation, can be expected to be not only self sufficient in water needs but may provide surplus water to the region.

Water which may be encountered by underground workings will be pumped from the mine for treatment. The water will be derived primarily from the coal seam as well as recycled water returned underground for the mining process. The collected water will require treatment prior to discharge or being directed offsite for most reuse options. The proposed treatment system at this stage will probably be a reverse osmosis process capable of producing potable water for reuse on site and other beneficial uses such as supply to the Wyong Water Supply Catchment. However, the final treatment option will depend on further negotiation with water stakeholders up to the actual design stage.

Preliminary engineering has been conducted by PB to produce a design for the purpose of establishing the likely footprint of the Mine Operations Dams and Reverse Osmosis (RO) Plant.

### 2.8.1 Mine Operations Waste Water Dam

It is anticipated that the mine will produce between 0.5 and 1.0 ML/day of water in the first year of coal extraction operations with a linear increase over the next 20 years up to 3 ML/day (~35 L/s). Out of the entire W2CP operations and facilities, the underground mine operations are expected to use 1 ML/day. Therefore in the early years there will be a water deficit, but a surplus will occur in later years. Pumping water from the base of the drift, the system would have a total static head of around 350 m. It is anticipated that pumps will be staged in three stages each with a balancing tank upstream. Water will be discharged to the Mine Operations Dam which is currently sized to accommodate at least up to 2 months supply of water.

The water supply for dust suppression of the raw coal stockpile will be supplied from the mine water dam. The product coal stockpile, contained within the rail loop, will be serviced by a smaller dam which would be supplied by local run-off and the main mine waste water dam (Mine Operations Dam).

The design phase is progressing to enable environmental studies to be completed. The next design stage will require development of water quality control measures and enhancement of the water balance as mining operations are refined.

Water for fire fighting can be supplied from the Mine Operations Dam. A pipe line from the dam to the base of the drift would be installed. A pump with a back-up diesel generator would be provided at the dam.

### 2.8.2 Reverse Osmosis Plant

It is estimated that the groundwater encountered by the mine workings would be moderately saline (5,000-7,000 mg/L) and will be treated at a desalination plant utilising the technique of reverse osmosis. A reverse osmosis (RO) plant would be capable of removing the high levels of Total Dissolved Solids (TDS). The process involves the passing of the flow through a membrane which will produce a brine which will be much higher in salt concentration than the feed water and a filtrate which will be much lower in salt concentration.

At this stage it is anticipated that the brine would be further refined for beneficial uses while the filtrate would be used first to satisfy the mines operational water demand. The treated remainder would be surplus water that could be available to supply other industries, direct to the Gosford Wyong Water Supply Scheme or for environmental flows within surrounding creeks.

The RO plant would be supplied as a containerised unit (packed in a standard 44 foot shipping container). For the ultimate volume predicted to be produced by the mine it is likely that two units capable of processing 1 ML/day each will be required.

Subject to further evaluation of gas management options, it would be possible to generate electricity using the gas from the mine to power the RO Plant (estimated at 56 kW per unit). Water from the Mine Operations Dam will be pumped to a disc screen and then through a micro filtration membrane before going through the RO process to allow for the efficient operation of the plant.

### 2.8.3 Pollution Control Dams

Pollution control dams will be located at both the Tooheys Road and Buttonderry Sites. The surface pollution control system has been designed to cater for the 1 in 100 year, 72 hour storm event. Contained water will be used preferentially on site for dust suppression and other raw water uses.

### 2.8.4 Sewage Treatment Plant

Appropriately sized sewage treatment systems are proposed to be constructed for both Buttonderry and Tooheys Road sites.

The tertiary sewage treatment plant produces effluent suitable for non human contact reuse. The system includes wet wells, duplex grinder pumps, and associated reticulation, below ground treatment modules, pump station and discharge to a transpiration pond.

Sewage and waste water from each of the infrastructure facilities and buildings at Buttonderry and Tooheys Road sites will be connected to their respective sewage treatment systems. The Buttonderry site system has been based on a load of 150 mine operations employees and 40 office staff per day. A consumption of 150 L/day per mine worker and 30 L/day for office staff has been estimated. The Tooheys Rd site system has been based on a load of 50 mine pit top operations personnel per day and a consumption of 100 L/day per worker has been estimated.

The systems will comprise the following elements:

- 10,000 L balance tank (each site);
- 20,000 L (Tooheys Road site) and 40,000 L (Buttonderry site) primary chamber;
- 20,000 L (Tooheys Road) and 40,000 L (Buttonderry) extended aeration chamber

- 20,000 L (Tooheys Road) and 40,000 L (Buttonderry) clarification chamber; and
- 2,500 L (Tooheys Road) and 5,000 L (Buttonderry) disinfection chamber.

Treated effluent will be discharged to a transpiration pond at each site and could be used as irrigation to sustain landscaping works around the site.

## 2.9 Power

A 132 kV/11 kV Switchyard Substation will supply power to the mine access, surface facilities and underground works at the Buttonderry site. The 132 kV supply will be provided by Energy Australia from their 132 kV feeder 957, near Hue Hue Road.

Power supply for the coal handling and surface infrastructure at Tooheys Road will be provided by a private electrical feeder from the 132 kV/11 kV Substation at the Buttonderry site. This feeder will be via an easement from Buttonderry to Tooheys Road.

## 2.10 Buildings and Facilities

A significant amount of work has been undertaken to determine the optimum sites for the surface facilities. Based on this work, the Tooheys Road site was selected for the mine and coal handling infrastructure.

The proposed general site layout is shown in **Figure 7** and this shows the rail loop and other surface facilities.

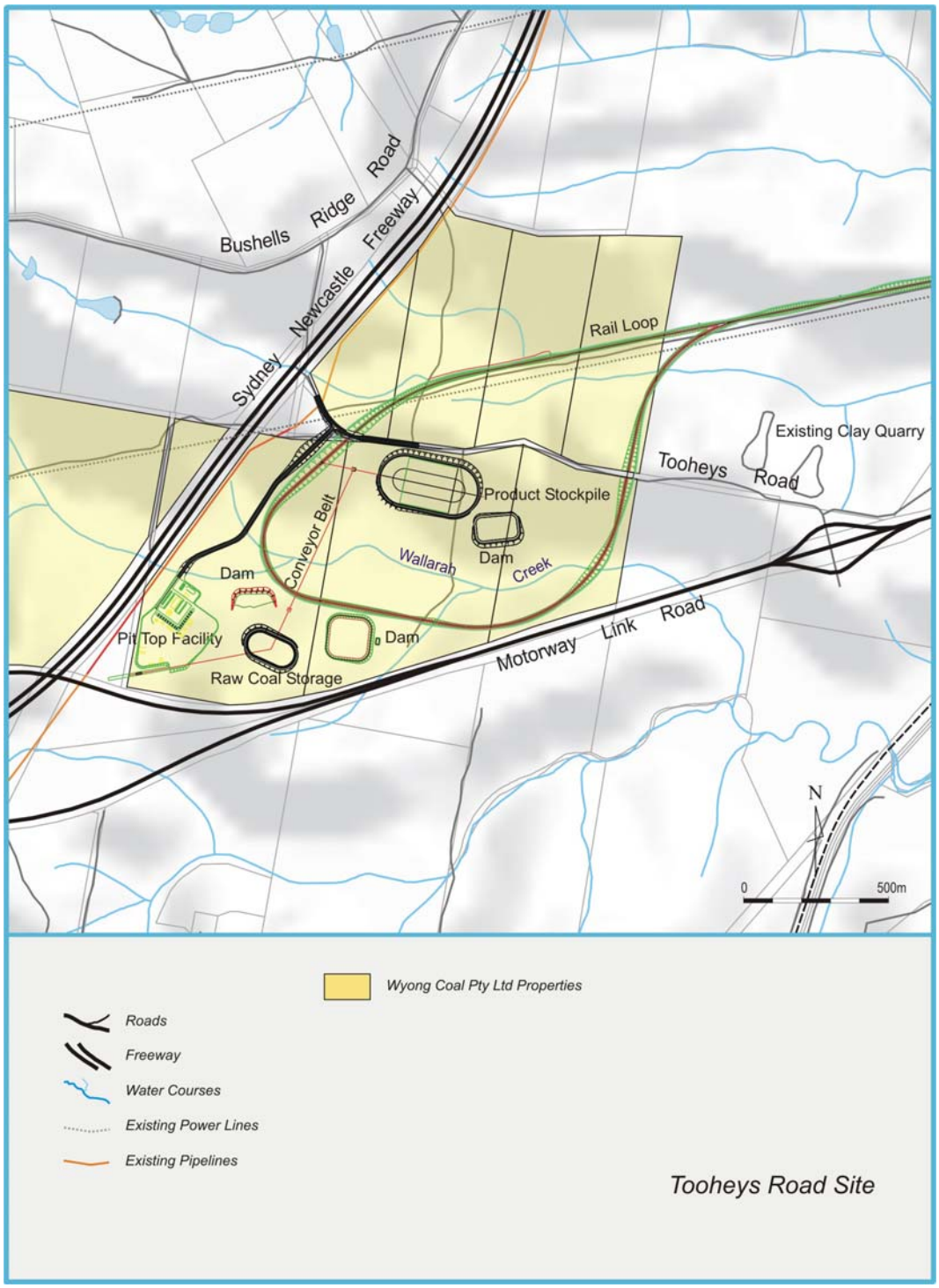



**Figure 7 - General Layout of Tooheys Road Site**

The proposed infrastructure for the Tooheys Road site includes:

- ❒ Rail spur and loop with coal loader and two rail overbridges along Tooheys Road;
- ❒ Office facility, inclusive of administration offices, bathrooms, training facilities;
- ❒ Site access roads including at least partial relocation of Tooheys Road;

- Mine access drift and portal;
- Gas extraction and treatment plant;
- Coal stockpiles and material handling facilities;
- Car parking facilities;
- Surface workshop and secure store;
- Bulk dry goods store;
- Open yard storage;
- Air compressor installation;
- Vehicle wash down bay, incorporating water treatment plant;
- Fuel, oil and flammable goods storage area;
- Fire fighting water storage tanks and surface fire station;
- Incoming electric power lines, switchyard and transformers;
- Sewage treatment facilities;
- Environmental monitoring station;
- Mine Operations waste water dam and surface runoff settling ponds; and
- Mine Water Treatment Plant.

**Plate 1 – View of Tooheys Road Site looking South**

The facilities for handling the ROM coal consist of:

- A 4,000 t/h receival system;
- A 50,000 t raw coal surge stockpile;
- A 2,000 t/h raw coal reclaim, crushing and stacking system;
- A 2,000 t/h overhead tripper to stack crushed coal on the 250,000 t product stockpile. Additional emergency stockpile capacity will be achieved using dozer pushout;
- A tunnel reclaim system under the product stockpile using coal valves;
- A 4,500 t/h train loading system including a loading bin of approximately 250 tonnes; and
- A balloon loop coming off the main railway line that will be able to hold three of the anticipated 3400 t trains.

The layout of the Buttonderry Site is shown on **Figure 8** and consists of:

- Upcast ventilation shaft and fan for mine ventilation;
- Downcast ventilation shaft for mine ventilation and man-riding;
- Main office facility for 40 staff, inclusive of administration offices and training rooms;
- Bathroom and showers for 120 men and 20 women with the ability to vary the numbers**;**
- Car parking facilities for 150 cars;
- Small fuel, oil and hazardous materials storage area;
- Explosives magazine;
- Fire fighting water storage tanks for surface fire;
- Sewage treatment facilities;
- Emergency services helicopter landing area;
- Air compressor installation;
- Environmental monitoring station;
- Ballast borehole; and
- Electrical switchyard, hardstand and pollution control facilities.

The Buttonderry site will be accessed off the Hue Hue Road via a sealed road. The road will have 3.5 m lane widths and 2 m shoulders. The width of the seal will be 9 m. Tree screening and landscaping is proposed either side of the road up to the main administration building and adjoining car park.

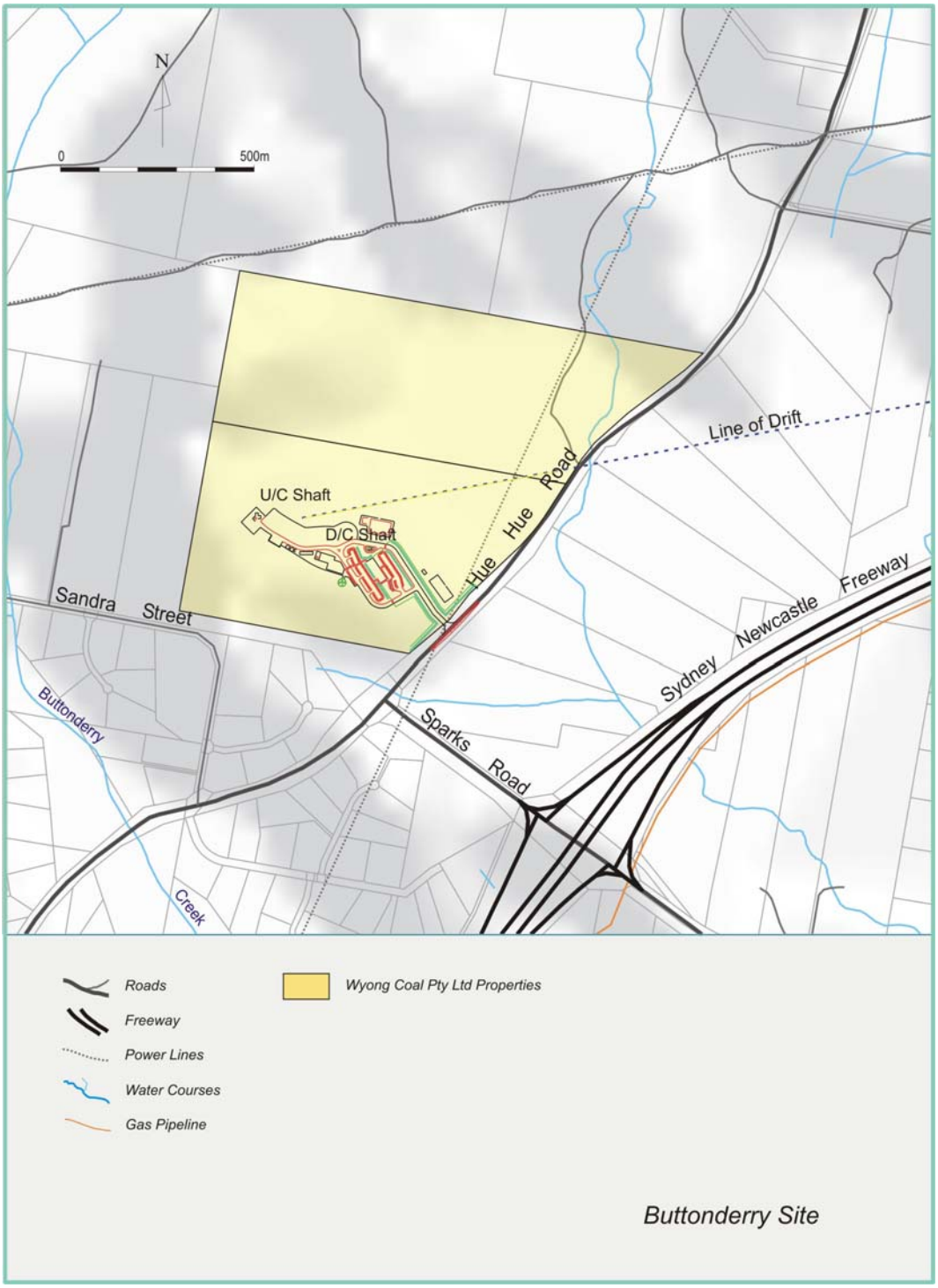



**Figure 8 - General Layout of Buttonderry Site**

**Plate 2 – View of Buttonderry Site**

A second (western) shaft site will be required by mining year 10 to be located in the Wyong State Forest as shown approximately on **Figure 4**.

This future western shaft facility will house a downcast shaft only (that is, air intake into the mine).

Only limited facilities will be required at this site however the site will also serve as a secondary emergency access point. The downcast ventilation shaft will be 6 m in diameter and sunk to about 490 m depth. Electricity supply to the site will be upgraded as necessary.

## 2.11 Rail Line Subdivision

This application also covers the necessary subdivision to accommodate the rail spur and a section of the loop leading from Main Northern Railway to the site. The purpose of the subdivision is to allow a long term lease to be established from the Darkinjung LALC and Crown Lands.

# 3. Environment

The Wallarah 2 Coal Project (W2CP) mining target area and facilities sites lie entirely to the west of the Main Northern Railway (Sydney to Newcastle), as shown in **Figure 1.** Two flood plains, the Dooralong and Yarramalong Valleys, traverse the western resource area. The Dooralong Valley is a broad, flat, low-lying region occupied by small farms and two villages (Jilliby and Dooralong). Yarramalong Valley is similar to Dooralong Valley, but much narrower, and includes the village of Yarramalong in the west. The land adjacent to both valleys rises steeply in the order of 150 m.

State forests occupy most of the land between these valleys and in the far north of the area. The north-east of the area is mostly undulating to steep, privately owned, rural land. A number of small-acreage semi-rural subdivisions have been developed immediately west of the Sydney-Newcastle Freeway, north of Wyong.

## 3.1 Priorities Determined by Environmental Studies and Consultations

Environmental and engineering studies have been undertaken concurrently in order to incorporate environmental controls from the outset. These studies are continuing and will be reported in full in the Environmental Assessment document.

In order to identify and prioritise issues relevant to the W2CP, a preliminary risk assessment was carried out which built on previous risk assessments undertaken as part of the earlier project studies. The methodology undertaken in the risk assessment and the findings are included in **Appendix A**.

Consultation with relevant government authorities has continued since the commencement of the exploration program and culminated in a Planning Focus Meeting held in May 2006. Similarly, consultation with the community has extended over several years and described in Section 3.6.

Information gained from both environmental studies and consultation has provided a firm foundation for the risk assessment process. The findings of the risk assessment have been used to determine the scope of work required to adequately address these issues within the Environmental Assessment.

Further risk assessment work will be carried out once the environmental studies have been completed to verify that the key issues have been adequately addressed and that appropriate impact mitigation initiatives and management strategies have been incorporated into the project.

The environmental issues associated with the project are discussed in this chapter, with those issues presenting the greatest potential risk to the environment (as determined through the risk assessment process) discussed first, namely, subsidence impacts on residences and related implications on surface water

supply systems, flooding regimes and groundwater. Other issues of lower residual risk ranking for this project include ecological and heritage impacts, greenhouse issues, noise, dust, visual and social implications.

### 3.2 Subsidence

The potential impacts of subsidence on the surface environment have been identified as a key environmental issue for the project. Both Strata Control Technology Pty Limited and Mine Subsidence Engineering Consultants Pty Limited are currently undertaking the subsidence assessment for the project. The combined use of these two leading consultants for the subsidence assessment for this project reflects WACJV's desire to ensure that this issue is comprehensively addressed during the finalisation of the mine plan design and accompanying environmental assessment.

The Hue Hue Mine Subsidence District, which overlies the initial mining zone of the W2CP target area, was proclaimed in 1988. This proclamation provides that mining induced ground movement should be limited to:

- Maximum ground strain 3 mm/m
- Maximum ground tilt 4 mm/m

The current mine plan has provided for restricted panel widths of 125-175 m within the Hue Hue Mine Subsidence District and immediately adjacent areas. Not only have the panel widths and geometries been carefully designed, the proposed extraction height beneath the Hue Hue area has been significantly reduced to ensure that the final surface subsidence effects will comply with the aforementioned limits so as to enable the effective management of subsidence impacts on structures.

Similarly, when mining beneath the Dooralong Valley floodplain, the mine design has been selected to reduce the effects of vertical subsidence. In the case of the Yarramalong Valley, this risk has been substantially mitigated by shortening the length of the longwall blocks so that it will not be significantly affected by mining. The risk has been avoided in the case of the Wyong River by excluding longwall panels under or in immediate proximity to the river.

The Wyong Mine Subsidence District was proclaimed in 1997. Initially, no specific ground movement limits applied, with single storey buildings less than 30 m in length on bearers and joists automatically approved, and longer structures or structures on slabs approved on their merits provided that they were designed to withstand tilt and strain predictions provided by the then Department of Mineral Resources. In 2000 the previous project owners indicated their intention to limit tilts to 4 mm/m, and a guideline, similar to that used for the Hue Hue area, was applied and a number of houses were built to that specification. Future houses will be required to meet the tilt and strain criteria provided by the Mine Subsidence Board based on information provided by W2CP which will be consistent with the extraction of longwall blocks up to 250 m wide and working heights of up to 4.5 m.

While construction that has, or will have, taken place after the proclamation of the Wyong Mine Subsidence District should permit effective extraction of the underlying coal reserves, a percentage of the buildings constructed prior to this would be at risk of suffering damage due to a lack of appropriate building design.

Detailed mine subsidence modelling and assessment has been undertaken at various stages over the last 10 years. Previous information is being reviewed and updated to specifically address the currently proposed W2CP mine plan and will be included in the Environmental Assessment document.

Subsidence will result in a range of impacts however, borehole data indicates that the overburden (material from the roof of the coal seam to the surface) is relatively fine grained, comprising mainly shales, mudstones, siltstones and sandstones with fewer massive conglomerate units than commonly exist in the Newcastle Coal Measures to the north. This geological setting reduces the risk of anomalous subsidence and enhances the accuracy of subsidence predictions.

### 3.2.1 Subsidence Effects on Structures

Table 3.1 gives an indication of the likely impacts of strains on building structures. It has been reproduced from Table C1 of Australian Standard 2870-1996, with the addition of Category 5 for the purposes of this study.

**Table 3.1 Categorisation of Damage with Reference to Strains**

| Category | Description of typical damage to walls and required repair |
|---|---|
| 0 | Hairline cracks (<0.1mm) |
| 1 | Fine cracks (0.1 mm to 1.0 mm) |
| 2 | Cracks noticeable but easily filled. Doors and windows stick slightly. |
| 3 | Cracks can be repaired and possibly a small amount of wall will need to be replaced. Doors and windows stick. Service pipes can fracture. Weather-tightness often impaired. |
| 4 | Extensive repair work involving breaking out and replacing sections of walls, especially over doors and windows. Window or door frames distort. Walls lean or bulge noticeably. Some loss of bearing in beams. Service pipes disrupted. |
| 5 | As above but worse, and requiring partial or complete rebuilding. Roof and floor beams lose bearing and need shoring up. Windows broken with distortion. If compressive damage, severe buckling and bulging of the roof and walls. |

Table 3.2 categorises damage to building structures from mining-induced subsidence, with particular reference to tilt.

**Table 3.2 Categorisation of Damage with Reference to Tilt**

| Category | Tilt (mm/m) | Description |
|---|---|---|
| A | <5 | Unlikely that remedial work will be required. |
| B | 5 to 7 | Adjustment to roof drainage may be required. |
| C | 7 to 10 | Adjustment to roof drainage will probably be required and remedial work to surface drainage might be necessary. |
| D | >10 | Considerable work might be required to rectify tilt. Jacking to level or rebuilding could be necessary in the worst cases. |

### 3.2.2 Subsidence Effects on Natural Features

The effect of mine subsidence is not only a key issue in relation to impacts on properties and residences, it also has other potential implications for the natural and built environments.

A key potential impact of subsidence is the effect on the surface drainage patterns in the area, particularly for a 1-in-100 year flood event. The effect of subsidence is likely to improve the existing flood hazard (determined from floodwater depth and velocity) in some areas, while other areas will be more adversely affected. Preliminary data suggests however, that there is an approximate balance between positive and negative changes registered at residences due to post mining flood behaviour.

The key issues that are currently being further investigated are:

- Implications for the regional water supply scheme;
- Effect on drainage and flooding potential;
- Mechanisms for impact mitigation and management;
- Effect on infrastructure and built environment features; and
- Ecological and other environmental impacts.

### 3.2.3 Methodology for Subsidence Assessment

An assessment of the impact of subsidence will involve detailed numerical modelling to develop enhanced empirical models, to provide a realistic predictive capability that is relevant to the geological environment in which the mining is proposed. The numerical model to be used can simulate both strata deformation and fluid flow within the rock mass, and can be configured to assess gas desorption and two phase flow within both the mined seam and surrounding seams.

The subsidence impact assessment will comprise two interrelated phases.

***Modelling of Extraction of the Longwall Panels***

The first phase is modelling the extraction geometry and assessing the impacts.

The numerical model utilises a two dimensional simulation to firstly assess the impact of the extraction of an individual panel, followed by the extraction of subsequent panels until a supercritical width is achieved. (*Supercritical* means that the width of the mine-out areas is greater than the depth from the surface to the mine workings).

Each panel will be extracted in sequence and the overall impacts determined. The outputs of the assessment will provide:

- Caving characteristics of the individual panels and the combined panels;
- Subsidence estimates of the individual panels and the combined panels;
- Overburden hydraulic conductivity estimates of the individual panels and the combined panels;
- Potential interactions of impacts of the individual panels and the combined panels;
- Potential areas of gas desorption and flow pathways; and
- Behaviour of chain pillars between panels.

The model will be quite large and detailed with one metre grid elements used to model the extraction areas. Chain pillar and panel widths will be varied to provide a robust sensitivity assessment of the impact of different longwall geometries on the resultant subsidence. Only a layout that produces a manageable subsidence impact will form the basis for the hydrological studies and ultimate application to government.

***Overburden Characterisation***

The second phase will focus on defining the hydrogeological character of the overburden and in particular that of the strata about the coal seams.

This will require a detailed review of the fracture geometry within the overburden coupled with the permeability data from the area. The aim is to confirm the nature of flow within the strata in terms of fracture flow networks and geological material flow. This will utilise the fracture data from the acoustic scanner, bore logs and existing packer test data. This work is necessary to:

- estimate the horizontal and vertical permeability within the overburden;

- ❒ assess the likely connectivity of the fracture systems; and

- ❒ to determine the most appropriate properties to model the in situ overburden hydraulic conductivity and the nature of flow within it.

If the hydrological impact of the subsidence is perceived to be unacceptable, the layout design will be revisited and another iteration of modelling will be undertaken.

### 3.2.4 Implications for the Project

The results of recent mine plan changes have been evaluated and indicate that the proposed mine plan will meet the guidelines associated with the Hue Hue and Wyong Mine Subsidence Districts.

This subsidence data will be used in other environmental studies such as the groundwater and surface water assessments, flooding and ecology.

## 3.3 Surface Water Supply System

The potential impact of proposed underground mining on the surface water supply system has been identified as a key area for detailed scientific assessment. A rigorous analysis of potential effects is considered important for the proposed mining area which represents just 4.7% of the local water supply catchment area.

Factors that govern the supply of water from a catchment are considered to include:

- ❒ Amount and distribution of rainfall and amount of evapotranspiration;
- ❒ Shape and size of the catchment;
- ❒ The geology of the catchment including the nature and distribution of lithologies, soils and alluvial deposits;
- ❒ Hydrological characteristics of the catchment;
- ❒ Prevailing hydrogeolgical conditions in the underlying rock formations and alluvial systems associated with the former and present creeks and rivers;
- ❒ Types and distribution of vegetation;
- ❒ Types and distribution of landuse; and
- ❒ The amount of water extracted from river sources for irrigation and municipal purposes, and from bores by registered users.

The water quality is also considered important because it can determine the usefulness of the supply for municipal and other purposes.

These issues will be fully addressed in the EA document. Given the importance of this issue however, the proponent has already made public its commitment that the only mine plan that Wallarah 2 Coal Project will submit to the NSW

Government will be one that safeguards the surface and underground water regimes. This commitment is addressed in Appendix 2 and Section 3.14.

### 3.3.1 Description of the Water Supply Scheme

In 1985, Gosford City Council, Wyong Shire Council and the NSW Government formed a joint water supply scheme to serve Gosford City and Wyong Shire. The agreement is managed by the Gosford-Wyong Councils Water Authority (GWCWA). This strategy was an expansion of the original joint water agreement executed in 1977.

The present Gosford-Wyong Water Supply Scheme is based on harvesting potable water from four coastal streams; Wyong River, Mangrove Creek, Mooney Mooney Creek and Ourimbah Creek. During times of insufficient flow to meet the demand, for example during a drought, security of supply is provided by the major water storage dam in the upper reach of Mangrove Creek (Mangrove Creek Dam) and two smaller dam storages at Mardi and Mooney Mooney.

The scheme has the capacity to transfer water between the two local government areas. Water can be transferred from Wyong Shire to Gosford City using a coastal connection between Wamberal and Foresters Beach and from Gosford City to Wyong Shire via the western connection through Ourimbah and Tuggerah.

The existing water supply scheme incorporates three dams, three weirs, two water treatment plants, 40 reservoirs, and approximately1,900 km of pipelines. A new two-way transfer pipeline between the Hunter and Central Coast water supply systems has been recently constructed which initially supplies 20 ML/day. The major headworks components in the Gosford-Wyong Water Supply Scheme are shown in **Figure 9** and consist of the following:

**Mangrove Creek Dam - Stage 1**

This major rockfill dam is located on Mangrove Creek in the upper part of the Mangrove Creek Catchment approximately 4 km downstream of the Boomerang Creek confluence. The 81 m high dam is the key storage in the Gosford-Wyong Water Supply Scheme with a storage capacity of 190,000 ML and a catchment area of about 100 square kilometres.

**Mooney Mooney Dam**

This 28 m high concrete arch dam is located on Mooney Mooney Creek about 21 km upstream of the junction of Mooney Mooney Creek and the Hawkesbury River. The dam has a storage capacity of 4,600 ML and a catchment area of 39 square kilometres.

**Porters Creek Weir**

A minor weir enhancement at Porters Creek was recently constructed to provide a minor water supply supplement.


**Figure 9 – Gosford Wyong Water Supply Scheme**

### Mangrove Creek Weir

This small 3 m high concrete weir is located on Mangrove Creek immediately downstream of its confluence with Worleys Creek. The weir pool retains approximately 300 ML with a residual catchment area of approximately 140 square kilometres. During 'dry' periods the weir pool also accepts water released as required from Mangrove Creek Dam. These releases are presently daily and supplement run-of-river flows to the weir.

**Mangrove Creek Weir - Somersby Transfer System**

A pumping station at Mangrove Creek Weir extracts water from the weir pool with a 14 km transfer through a 900 mm main to a set of two balance tanks on the Somersby plateau. The balance tanks have a total capacity of 22 ML. The water is then transferred approximately 4 km via gravity flow to the Somersby Water Treatment Plant.

**Mooney Mooney Dam - Somersby Transfer System**

A pumping station immediately downstream of Mooney Mooney Dam transfers dam water some 1.6 km upgradient to the Somersby balance tanks. This 570 mm main is presently a one way transfer system. However, a retrofit is underway to render the system two way.

**Somersby Water Treatment Plant**

This is a conventional municipal water treatment plant located immediately west of the Somersby Industrial Estate. The plant was commissioned in 1985 and has a capacity of 140 ML/d based on 24 hours/day operation.

**Mardi Dam**

A 26 m high off stream earth-fill embankment storage dam located 4 km south-west of Wyong. Water is pumped from the 7,400 ML dam to the nearby Mardi Water Treatment Plant.

**Mangrove Creek Dam – Wyong River Transfer System**

As part of Stage A of the 1985 Gosford-Wyong Water Supply Scheme, the Boomerang Creek tunnel was constructed. This 11 km long inter-catchment tunnel directly transfers water by gravity as required from Mangrove Creek Dam to the upper reaches of Wyong River via Bunning Creek 1.5 km upstream of Yarramalong. The tunnel is used to supplement run-of-river flow to the Lower Wyong River Weir when Mardi Dam is drawn down. However, due to the continuing fall in dam water levels below the invert of the tunnel, the tunnel has not been used since mid October 2004.

**Lower Wyong River Weir**

This small 2 m high weir is located on Wyong River approximately 3 km downstream of the confluence with Jilliby Creek. The weir pool has a capacity of about 300 ML and a catchment area of almost 355 square kilometres.

**Lower Wyong River Weir - Mardi Dam Transfer System**

Water is pumped from the weir pool south to Mardi Dam via a 2 km long 600 mm pipeline.

**Ourimbah Creek Weir**

This 4 m high concrete weir is located on Ourimbah Creek immediately upstream of the junctions with Bangalow Creek and Canada Drop Down Creek. The weir has a storage capacity of approximately 100 ML and a catchment of about

88 square kilometres. The weir has an inbuilt open 200 mm pipe that allows continuous creek flow downstream.

**Ourimbah Creek Weir- Mardi Dam Transfer System**

Water is pumped from the weir pool through 5.6 km of 600 mm pipeline to Mardi Dam.

**Mardi Water Treatment Plant - Stage 1**

This is a direct filtration plant located immediately downstream of Mardi Dam with a 24 hrs/day capacity of 160 ML/d. The design provides for future augmentation in 80 ML/d stages.

**Transfer System between Gosford and Wyong LGAs**

A coastal connection provides a link between the Gosford and Wyong water distribution systems and comprises approximately 10 km of 450 mm main between Terrigal and Bateau Bay. Although this connection has the capacity to deliver about 20 ML/d in either direction, the actual supply is constrained by operational issues to about 10 ML/d.

**Transfer System between Wyong and Gosford LGAs**

The system comprises a total of 17 km of existing 1050, 900 and 750 mm mains and a two-way pumping station at Ourimbah. Gravitational transfers can be made from Gosford to Wyong when required and these supplies can be supplemented by boosting from the Ourimbah Pumping Station.

### 3.3.2 Potential Impacts on the Gosford-Wyong Water Supply Scheme Infrastructure

The proposed mining operations will not impact on the Gosford-Wyong Water Supply Scheme infrastructure. The proposed mine layout will however underlie, a small section of the Jilliby Jilliby Creek system albeit at significant depth. Implications of this intersection and a preliminary discussion of any potential impacts of the proposed mining on stream flow are discussed in the following section.

### 3.3.3 Potential Impacts on Stream Flow

The water extracted from the Lower Wyong River Weir and pumped 2 km to Mardi Dam constitutes approximately 30% of the combined Central Coast Water Supply. The average annual Central Coast usage in 2005 was approximately 28,000 ML with restrictions. The 10-year average is about 30,000 ML and the 2006 target is approximately 25,000 ML with restrictions.

The average river flow contribution from the Jilliby Jilliby Creek system to the Lower Wyong River Weir is approximately 37%. The remaining 63% contribution is from the Wyong River system. That is, the Jilliby Jilliby Creek contribution equates to about 11% of the total Central Coast Water Supply. This contribution primarily occurs during periods of wet weather. At other times the

creek is characterised by a series of ponds with low to nil flow. A combination of its low flow characteristics and catchment land uses has resulted in frequently degraded water quality within Jilliby Jilliby Creek, in terms of elevated fecal coliforms and nutrients particularly at low flows.

**Plate 3 - Jilliby Jilliby Creek**

**Plate 4 – Jilliby Jilliby Creek**

Baseline drilling and permeability testing in the Jilliby Jilliby Creek catchment and in similar coastal catchments and geological settings on the central coast

indicates that the valley-fill alluvial system is generally composed of stacked layers of sand, gravel, silt and clay. However, the sequence is dominated by low permeability, fine grained sediments. Although localised layers and lenses of more permeable granular materials may exist in the sequence some of which constitute aquifers, the vertical hydraulic connection is inhibited by the ubiquitous layered fine grained, less permeable sediments that result in confined or semi-confined hydrogeological conditions.

Good quality (low salinity) water is hosted by shallow, near-surface alluvial aquifers within about 5 to 10 m beneath the valley floor. This contrasts with the moderately to locally highly saline alluvial aquifers found in the deeper parts of the alluvial system some 20 to 40 m below surface.

Current data suggests that recharge in the alluvial system is slow and provides limited contribution to surface stream flows. This characteristic is supported by the results of recent age dating of groundwater in alluvial and hard rock aquifers in a similar coastal valley setting on the Central Coast.

The depth of alluvial cover and overburden lithologies associated with the Jilliby Jilliby Creek alluvial system indicates that the potential for any vertical drainage of the near surface alluvial aquifer is also very low.

### 3.3.4 Implications for the Project

The W2CP is committed to safeguarding the regional water supply and will potentially be a nett provider of water to the supply system in the long term. The Environmental Assessment will review the project's implications on the Jilliby water source and other issues related to water resource management and fluvial environment.

## 3.4 Groundwater

### 3.4.1 Hydrogeological Considerations

Within the proposed mining area, groundwater is contained in a range of hydrogeological environments. These are:

- Hard rock aquifers within the Permian and Triassic rocks, which form the upland areas and underlie the study area; and

- Alluvial and colluvial aquifers associated with the unconsolidated sediments which occupy the drainage lines dissecting the area of investigation.

Coal seams within the W2CP target area are at depths of at least 330 m and up to 680 m and the overlying material is moderately strong to strong in geotechnical terms. The likelihood of fracturing expressed at the surface caused by longwall mining was initially assessed by Coffey International Pty Limited to be low. This conclusion is currently being thoroughly investigated by Strata Control Technology Pty Limited as part of current studies.

The major valleys within the area are composed of alluvial sediments up to 40 m thick, which contain a significant fine grained fraction. In this situation, should cracking in the underlying hardrock basement occur they are likely to be infilled with these "plastic" sediments, which will act as a relatively low permeability seal. Examination of the hydraulic connectivity between bedrock and the overlying alluvium forms part of the comprehensive groundwater assessment which will be included in the Environmental Assessment document.

The strata above the coal seams are tight, with low potential for significant groundwater movements. The coal seams are considered to have the greatest aquifer potential within the hardrock sequence. Sudden high groundwater inrush is not expected to be a serious issue.

Water pumped from the mine will consist of collected groundwater seepage into the mine as well as recycled water returned underground for the mining process. The collected water will require treatment prior to discharge or being directed offsite for most reuse options. The proposed treatment system at this stage will be a reverse osmosis process capable of producing potable water for reuse on site and other beneficial uses such as supply to the Gosford-Wyong Water Supply Scheme.

The entire W2CP target area of mining represents only 4.7% of the catchment area of the Gosford-Wyong Water Supply Scheme and avoids all the important surface features and the water scheme infrastructure. Only a fraction of this 4.7% of catchment area (about 1% of the catchment) involves lands relating to alluvial valley systems. In addition, the small project area that will be subject to mining has been carefully designed to ensure that mining can proceed while safeguarding catchment functions. As longwall panel geometry (particularly width) and mining depth are major mine planning factors in determining surface subsidence impacts from mining, the impact on surface water flow has been an important consideration at the design stage, and has been taken into account in preparing the W2CP mine plans.

### 3.4.2 Groundwater Investigations

A hydrogeological investigation was begun in 1997 which investigated groundwater in Yarramalong and Dooralong Valleys. The study investigated groundwater extracted from monitoring wells and registered bores located within the area.

While groundwater is an important issue to the communities within the Project area, investigations indicate groundwater is not an extensively utilised resource in the proposed mine area. The Joint Water Authority's own investigations did not identify these valleys as containing prospective groundwater resources for extraction to augment water supplies during the drought. Nevertheless underground mining, particularly where depth of cover is shallow, has the potential to affect shallow groundwater resources. Groundwater management was also regarded by the community to be an important factor in recent gas exploration activities in the locality.

WACJV has commissioned Mackie Environmental Research to undertake further groundwater investigations, particularly relating to the assessment of potential impacts on alluvial groundwater systems.

The studies will involve consolidation and assimilation of regional aquifer information including aquifer test and monitoring data generated as part of previous regional investigations, numerical computer simulation of the proposed mine development, and prediction of mine water seepage and depressurisation/dewatering impacts on hardrock and alluvial lands.

### 3.4.3 Hydrogeological Assessment Methodology

Computer based aquifer simulations of proposed mining operations will be conducted in order to understand the many complex groundwater flow processes that could evolve during extraction of longwall panels. The model most likely to be invoked will be a finite element scheme that will incorporate hardrock and alluvial strata over an area of more than 300 square kilometres (to allow for regional depressurisation of the strata).

Aquifer and aquitard hydraulic properties will be assigned within the model on the basis of average measured values (eg. seam and interburden permeabilities) determined from core tests and in situ borehole tests to ensure the model has a sound physical basis. Measurements undertaken to date confirm very low permeabilities for interburden and overburden strata and moderately low permeabilities for the coal seam.

Geographic and geologic parameters like bed elevations of the Wyong River, Jilliby Jilliby Creek and other smaller drainages, coal seam geometry, alluvial lands extent etc., will also be assigned within the model on the basis of available exploration and survey data.

Panel extraction will be simulated incrementally over the mine life. Examination of model responses over this period will facilitate an understanding of the evolving pressure loss regime and quantification of the potential leakage associated with the alluvial lands. Impacts on existing bores and wells will be assessed.

Mine water influx will also be generated from the model assuming goaf is maintained in a generally dewatered state. This influx will be included in mine water management system assessments.

Model simulations will be conducted for the post mining scenario for a period possibly as long as 100 years in order to develop an understanding of the long term recovery of water levels/pressures and the equilibrated water table. It is expected that there will be a pressure loss envelope at the completion of mining which will be at depth below the Wyong River and Jilliby Jilliby Creek alluvial lands. The potential for any leakage to be induced from the alluvium is expected to be extremely low to negligible and would only extend until groundwater levels recover within the mine panels over time. This issue will be thoroughly examined in the groundwater assessment.

Subsidence over longwall panels could be expected to cause a transient (temporary) change in the groundwater storage component in the shallow alluvial aquifer systems. The change may occur through either filling of temporary shallow crack storage in hardrock immediately beneath the alluvial aquifers, or re-adjustment of groundwater levels to changed surface water levels brought about by subsidence. Temporary filling of shallow crack storage is likely to lead to very localised short term depletion of alluvial groundwater storage followed by rapid recovery. Subsidence is likely to induce a more widespread transient impact due to expected localised and temporary reductions in water table elevation as a part of a panel is subsided relative to an adjacent unsubsided area. The process will be a continuum as mining progresses that will include ongoing rebound of the subsided water table. The duration of the rebound-recovery process will depend largely upon local unconsolidated aquifer properties (permeability and storage characteristics), the recharge capacity of local drainages, and the prevailing climate.

The impacts of subsidence on aquifer storage will be assessed though development of a second aquifer model at a scale more appropriate for this type of analysis. This modelling would include assessment of subsidence impacts on the groundwater system under wide ranging climatic conditions including extreme dry and drought periods extracted from the historical record.

### 3.4.4 Water Management and Mine Water Disposal

Studies to date indicate that the mine will "make" up to 2 ML per day. In the early years there is likely to be a slight water deficit, but a surplus will occur in later years. It is expected that underground water will be moderately saline and will therefore require treatment prior to reuse or discharge. It is currently proposed to construct a desalination plant using Reverse Osmosis (RO) technology to treat mine water. Treated water can then be used in the mine for cooling, dust suppression and underground equipment purposes. Surplus water will be treated to an appropriate standard that could provide the option of discharging into the Wyong Water Supply Catchment as a useful supplement to water supplies of the region. Other water treatment or management options may be considered depending on the balance of environmental and socio-economic priorities.

It is envisaged that potable water for drinking and amenities would at first be trucked on-site during construction before eventually connecting the site to town supply.

### 3.4.5 Implications on Groundwater Regimes

The hydrogeological study will continue and focus on addressing the following issues for the EA:

- potential mining impacts on groundwater condition and usage;
- potential groundwater make;

- potential impacts of subsidence;
- potential impacts and opportunities for saline water management; and
- potential regional impacts.

Investigations to date suggest that potential groundwater risks are dominated by localised and temporary effects and can be satisfactorily managed. Groundwater that will be affected by the mine is well below that which is used for farming and domestic water supplies. The groundwater system will readjust to a new equilibrium over the long term. Water in the mine will be pumped to the pit top at the surface. It is saline and unusable for any domestic or rural purpose without treatment.

## 3.5 Flooding

The effect on flooding and surface drainage as a result of subsidence from the mine has been identified as an important environmental issue to be assessed.

Two flood studies of major catchments within the subsidence area have been previously prepared for the Project. These flood studies are described in the following sections. However, additional modelling will be undertaken as part of the Environmental Assessment report which will confirm the results of previous modelling and assess the impacts of the current mine plan. The extent of the 1 in 100 year flood is shown on **Figure 2**.

### 3.5.1 Yarramalong and Dooralong Valleys Flood Study

The Yarramalong and Dooralong Valleys are located to the west of Wyong. The Wyong River drains Yarramalong Valley, and Dooralong Valley is drained by Jilliby Jilliby Creek. The flood study focused on the 350 square kilometre catchment above the junction of the Wyong River and Jilliby Jilliby Creek. Although flooding is an important issue for the local community, no detailed flood study had previously been prepared for this area.

The hydraulic model of the Upper Wyong River extended from Woodburys Bridge on Yarramalong Road to its junction with Bunning Creek, upstream of the township of Yarramalong. Jilliby Jilliby Creek and its tributaries were modelled from the junction with Wyong River to the locality of Lemon Tree.

The study found that the topography of the valley is very well defined with steep valley walls and a relatively flat floodplain. As water depth increases with the magnitude of each flood, the submerged area increases only marginally. Therefore, there is little difference between the area submerged by a 1% AEP flood and that covered by a 20% AEP flood (commonly, but erroneously, referred to as 1 in 100 years and 1 in 5 year floods, respectively).

The following conclusions about existing flood behaviour were drawn from the study:

- the rivers and creeks have little capacity and most of the flood flows break out of the main channel and inundate the floodplain;
- the 1% AEP flood is approximately 1.1 m higher than a 20% AEP flood and 0.5 m higher than a 5% AEP flood;
- flood widths range from 500 m in the upper valleys to in excess of one kilometre in the lower sections of the valley;
- average velocities are low due to the width of the floodplain;
- higher localised flow velocities occur near bridges in the upper reaches of the valleys;
- the local community has a good understanding of flood behaviour in the valleys due to the frequency and extent of flooding;
- this intuitive knowledge of flood behaviour is demonstrated by the fact that most residences are located either outside the floodplain or on the flood fringe;
- some bridges for private access roads are overtopped by floodwaters in small floods, and during major events they are overtopped early in the storm event; and
- bridges on public roads generally have greater capacity than those serving private properties, but several public bridges are also overtopped in frequent flood events.

### 3.5.2 Hue Hue Creek

Hue Hue catchment, located at Jilliby on the NSW Central Coast, is drained by an unnamed creek that discharges into Porters Creek Swamp. The study area was the 8.2 square kilometre catchment upstream of the freeway. There have been no previous flood studies of this creek. Five kilometres of Hue Hue Creek were included in the hydraulic model. The model extended from Porters Creek Swamp to just upstream of Cottesloe Road.

Hydrologic and hydraulic models were created and used to predict flood flows, levels and velocities for a range of design storms. It was found that flood levels in the catchment were generally controlled by bridges and culverts and were relatively insensitive to changes in key parameters.

The following conclusions about the existing flood behaviour can be drawn from the study:

- bridges and culverts have a limited capacity and are overtopped in smaller floods, except for the freeway;
- the structures have a significant influence on flood profiles causing backwater effects for a considerable distance upstream;
- there are only small changes in flood levels between storm events as flood levels are generally controlled by the weir created as floodwaters flow over the roadways that traverse the creek;
- a large flood storage is created in the area upstream of the freeway due to the limited capacity of the culverts under the freeway and high tailwater level;
- flow velocities are relatively low generally less than 1.0 m/s; and
- flows are sub-critical except in the area immediately downstream of the Parry Jones Bridge.

This study established baseline flood conditions for the Hue Hue Catchment. It is being used in subsequent studies to assess the effects of mine subsidence on flood behaviour.

### 3.5.3 Implications for the Project

The baseline flood studies demonstrated that both the Yarramalong and Dooralong Valleys are currently significantly floodprone. The floodplain is subject to regular inundation to significant depths. Bridges and culverts are cut off regularly and for long periods during relatively small floods. Large sections of the main roads into both valleys are flood affected and many of the access roads pass through the floodplain.

The Hue Hue Creek floodplain is different as flood depths are significantly less. The majority of flood prone land is located in rural or public open space areas of the catchment rather than in rural residential area.

The next phase of the study is to undertake an assessment of subsidence impacts on the flooding regime and flood liable structures. The key issues to be addressed in future investigations of the flood impact assessment in the EA report include:

- flood affected dwellings and structures;
- flood liability;
- flood hazard assessment;
- property access;
- channel stability issues;
- time of ponding; and

- proposed flood mitigation measures.

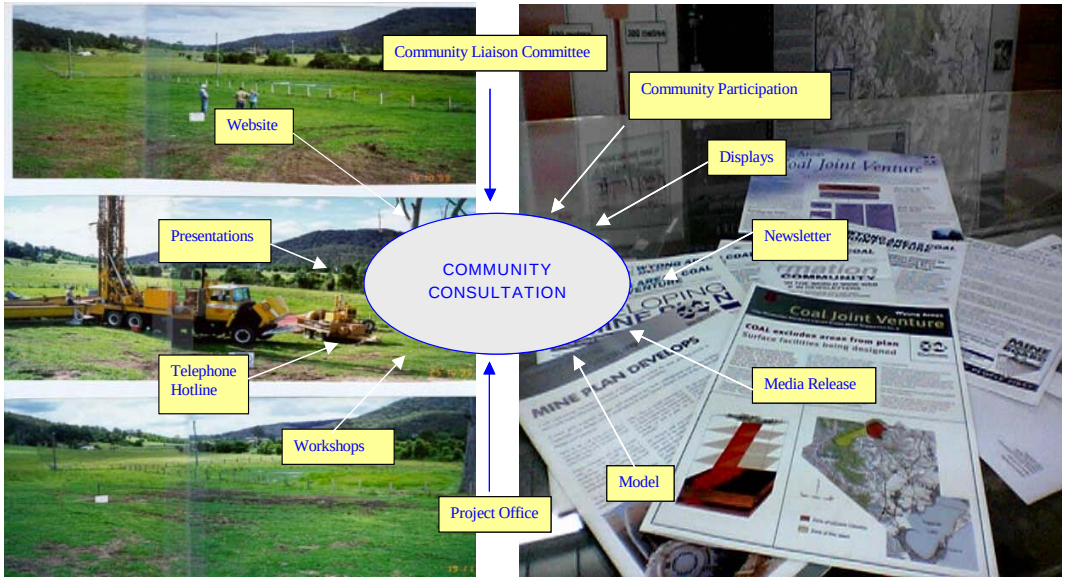
Work has begun on assessing the existing dwellings which are flood affected. There are 57 dwellings in the Yarramalong and Dooralong Valleys and 5 in the Hue Hue Creek floodplain, which are currently considered flood prone. Flood prone land is defined as land which experiences a one in a hundred year flood, as shown on **Figure 2**. The majority of flood prone houses are located outside the proposed mine plan.

## 3.6 Community and Social Issues

### 3.6.1 Consultation

WACJV is committed to effective and transparent consultation with the community throughout the project development and approval process. Key government agencies have also been involved in the consultation process and have received regular updates on community issues. There have been several beneficial outcomes from the consultation process which have led to modifications to the project design in order to further reduce the impacts of the project on the community and so develop a project that reflects community expectations. A summary of the key consultation activities to date are as follows:

- Nine newsletters with factsheets distributed to the community that provided information on development of the project and key environmental studies;
- public displays providing information and an opportunity for the community to provide feedback. The displays were held at several public libraries and shopping centres;
- a telephone information line to provide an avenue for the public to seek information or provide comment;
- a dedicated website that provides information on the project and an opportunity for the public to seek information or provide comment. The website can now be found at www.wallarah.com.au;
- presentations of environmental studies to groups such as the Community Liaison Committee, Progress Associations and Precinct Committees;
- community surveys that were distributed during community presentations and targeted surveys to obtain important information about the local community; and random telephone surveys of local businesses and residents;
- liaison with key stakeholder groups including government departments, Non Government Organisations (NGOs), local government and local community groups; and
- monitoring public comment, submissions and media coverage.




A Community Liaison Committee was established by Government upon issue of the original exploration licences. It was, and continues to be, independently chaired by the Hon Milton Morris AO. Members of the committee included elected and officer members of Wyong Council, representatives from the Mine Subsidence Board, the DMR, United Mineworkers Federation and representatives from community groups such as the Tuggerah Lakes Catchment Management Committee, Tuggerah Lakes Estuary Management Committee and Central Coast Minestop. The Committee met on a monthly basis during the initial stages of the project development.

With the project now centring on the western development area and progressing through the approval phase, and with various organisations having been restructured, membership of the Community Liaison Committee has been revised and continues to be subject to review. The CLC continues to meet on a regular basis.

Community Consultation and feedback focussed on a number of matters important to the local community and in October 2006 the company announced its *Commitment to the Community*. That commitment says:

- The only mine plan that Wallarah 2 Coal Project will submit to the NSW Government will be one that safeguards the surface and underground water regimes;

- The company will conduct its business in a manner that at all times respects the people of the Wyong community;

- The company considers the protection of the environment as an important part of its normal business activities;

- The company will conduct its business in a way that maintains a safe and healthy workplace for employees, visitors and the local community; and

- The company will develop sustainable practices that contribute to the interests of the wider community.

### 3.6.2 Economic Activity

Benefits to the community will include the provision of around 300 direct jobs, around 70% of which could be recruited locally. In addition, a substantial annual allowance has been made for activities such as youth employment, health workshops and recreational support facilities.

Total revenue to Government is estimated to be in the order of $1Billion over the project life and substantial indirect economic benefits will arise from ongoing expenditure on services, maintenance, plant and equipment and flow-on employment effects. Some 750 new jobs could be expected to be supported in the local and regional economy stemming from the indirect effects of the new project.

### 3.6.3 Landuse

The subregion containing the project area accommodates several significant types of landuse ranging from light industrial, commercial and housing developments to small townships and small acre farms. Major transport routes traverse the area near the W2CP including the F3 Freeway, Motorway Link Road and the Main Northern Railway Line. The western area features heavily timbered hills most of which are included in State Forests.

Ninety percent of urban development in the Shire is consolidated into 56 square kilometres of low density residential development around Tuggerah Lake (Wyong Shire Council, 1998). The four major suburban clusters in the Shire are east of the F3 freeway. They are:

- The Entrance/Southern Lakes;
- Tuggerah/Wyong;
- Central Lakes; and
- Northern Lakes (Munmorah-Lake Macquarie).

The Shire supports three main industrial/commercial centres. Enterprise Drive (Tuggerah Business Park) straddles Ourimbah Creek and links the southern lake areas with Tuggerah. The Tuggerah Strait commercial area is also close to Tuggerah, whilst the North Wyong Industrial Area links Watanobbi to the newly developing Warnervale area. Council is focussing on expanding industrial and commercial development in the Warnervale/Sparks Road area, and the Tooheys Road area. The Tooheys Road area is currently designated for large industrial enterprises and has been zoned accordingly. The Tooheys Road site for project which will house the main surface infrastructure is located within the Bushells Ridge Precinct.

Available natural resources have lead to the establishment of a number of extractive industries in the north of the region with coal mining being a major source of local income. The eleven underground mines currently or recently operating are:

- Mandalong Colliery;
- Cooranbong Colliery;
- Newstan Colliery;
- Chain Valley Bay Colliery;
- Moonee Colliery;
- Wallarah Colliery;
- Endeavour Colliery;
- Myuna Colliery;
- Awaba Colliery;
- Munmorah Coal Mine; and
- Wyee Colliery (Mannering).

The proposed mining area is somewhat remote from other settlement. Scattered rural dwellings follow the river flats and the small localities of Yarramalong and Dooralong are at the head of their respective valleys. State Forests dominate this area known as 'the valleys'. The connected Wyong and Olney State Forests, parts of which have been transferred into a State Conservation Area, continues north into the forested Watagan Mountains, which stretch towards Wollombi and the Hunter region. To the west of the valleys, the steep upland country continues through Dharug and Wollemi National Parks to merge with the Great Dividing Range. Ourimbah State Forest is south of the Yarramalong Valley, this area merges with the more gentle slopes of the Somersby Plateau.

The dominant agricultural activity in the valleys is intensive grazing, although turf farming also occurs in the more fertile areas near the Wyong River and Jilliby Jilliby Creek. Over the last 20 years large holdings have been fragmented and converted to hobby farms, rural weekend retreats, market gardens, nurseries, horse studs and turf farms. As a result the character is rural rather than agricultural.

The towns of Tuggerah and Wyong lie east of the Main Northern Railway and/or the F3 Freeway and are some distance from the W2CP and well outside the proposed lease area. Tuggerah includes several large, regional, commercial centres including the Westfield Tuggerah Shoppingtown and the Tuggerah SuperCenta.

The project will have no direct impact on residential or industrial land in the main Wyong centre. The project will have significant indirect and beneficial impacts on the local economy from increased employment and economic flow on effects.

### 3.6.4 Social and Economic Impact Assessment

The Social Impact Assessment will be prepared by Martin and Associates while economic data will be provided separately by Hunter Valley Research

Foundation, a specialised group who deal specifically in economic evaluation and modelling. The combined assessment will cover the following key issues:

- Effects on primary social indicators such as house and land values, community expectations and perceived implications;
- Effects on social and community infrastructure and services including education, health and safety;
- Effects on employment and determination of flow on economic costs and benefits; and
- Identification of community issues and the development of specific mitigation and offsets for the project.

Although it is considered that the overall economic and social benefits of the project will be substantially positive, the aim of the study will be to determine any specific local negative implications that can then be used to develop an appropriate compensation package for the project. This process will represent a continuation of, and build on the community consultation that has already resulted in a number of significant changes to the project design to mitigate and limit the impacts of the W2CP on the community, as previously outlined in Section 1.1.

### 3.7 Flora and Fauna

Several studies of flora and fauna have been undertaken for the Project, including ecological and biodiversity issues associated with the surface facilities. Other recent environmental assessment reports associated with major infrastructure projects (Munmorah Gas Turbine Facility and Morisset to Warnervale Water Trunk Main) impacting land owned by the company have also been reviewed. A gap analysis has been undertaken to identify areas that now require further assessment. Using the results of this analysis, additional studies are currently being undertaken by OzArk Environmental & Heritage Management Pty Ltd (OzArk EHM) to augment the data already compiled.

Seven broad vegetation communities were identified within the study area. These are: Scribbly Gum/Red Bloodwood Woodland; Scribbly Gum/Red Bloodwood Open Woodland; Scribbly Gum/Smooth-barked Apple/Red Bloodwood Open Forest; Blackbutt/Brown Stringybark Tall Open Forest; Swamp Mahogany/Red Mahogany Open Forest; Melaleuca Low Open Forest; and Heathland. Potential threatened flora species are listed below.

**Table 3.3 – Potential Threatened Flora Species**

| Scientific Name | Status | Habitat Requirements | Likelihood of Occurrence Precinct 15 |
|---|---|---|---|
| *Angophora inopina* | E | Open dry sclerophyll woodland of *Eucalyptus haemastoma* and *Corymbia gummifera* on deep white sandy soils over sandstone, often with some gravelly laterite. | Habitat available. Species detected |
| *Callistemon linearifolius* | V | Shale ridges, in moist Eucalyptus Forests and rain forest gullies, occasionally on river banks. | No habitat available. Unlikely to occur. |
| *Eucalyptus pumila* | V | Sclerophyll shrubland, skeletal soil on sloping sandstone, Pokolbin area. | No habitat available. Unlikely to occur |
| *Eucalyptus camfieldii* | V | Rare and localised, in coastal shrub heath on sandy soils on sandstone, often of restricted drainage. | Habitat not available. Not detected. |
| *Caladenia tessellata* | V | Clay loam or sandy soils, south from Swansea | Habitat available. Previous record |
| *Caladenia alata* | E | Dry sclerophyll forests and woodland in moist sites, often at edge of sandstone outcrops, but also in swamps near lakes. | Habitat available. Not detected. |
| *Cryptostylis hunteriana* | V | Grows in swamp-heath on sandy soils, chiefly in coastal districts. | Habitat available. Not detected. |
| *Melaleuca biconvexa* | V | Grows in damp places, often near streams | Habitat available. Previous record |
| *Tetratheca juncea* | V | Sandy and swampy heath and open forest | Habitat available. Species detected. |

*Note: Information on habitat requirements and distribution obtained from Harden (1990, 91, 92 & 93)*

*E = Listed as endangered on Schedule 1 of the Threatened Species Conservation Act 1995.*

*V = Listed as vulnerable on Schedule 2 of the Threatened Species Conservation Act 1995.*

There are three broad habitat types including: Dry Sclerophyll Woodland, Wet Sclerophyll Forest, and Heathland. These habitats show minor disturbance from past and present activities, however, provide good habitat for a number of flora and fauna species.

The proposed mining area, covering an area of approximately 37 $km^2$, contains a wide variety of habitats with relatively high biodiversity. Habitats include forest, woodland and heathland communities, upland streams, lowland rivers and wetlands. Approximately 61 per cent of the study area remains forested.

The western portion of the study area comprises a large block of upland forest contained within Jilliby State Conservation Area and Wyong State Forest. Although logged, the forest habitats are extensive and in relatively good condition. The valley floors of the Wyong River and Jilliby Jilliby Creek represent more suitable land for agriculture and have been extensively cleared. As a consequence, the majority of the remnant vegetation occurs along the watercourses.

### 3.7.1 Wetlands / Ponds

Wetlands and ponds within the study area generally occur in the lowlands and floodplains of the Wyong River and Jilliby Jilliby Creek. The potentially affected

wetlands and ponds within these floodplains have been identified. Almost all of these ponds are farm dams or used for agricultural purposes.

Although the wetlands and ponds within these floodplains occur on private lands that are used for agricultural production and thus exhibit significant variation in conditions, a number of threatened fauna species are likely to utilise these areas.

Surface water from the Buttonderry Site flows into Buttonderry Creek, which flows into Porters Creek Wetland and drains into Wyong River before it flows into Tuggerah Lake. Porters Creek Wetland is a wetland listed under State Environmental Planning Policy No.14 (SEPP 14). The Wetland is well outside the mining area and will not be affected by coal extraction.

### 3.7.2 Terrestrial Habitats

Considered to represent only low to medium risk, changes to flora and fauna assemblages in upland forest habitats are highly unlikely to occur given the lack of surface expression (cracking and increase permeability of near surface strata) as a result of the proposed mine plan.

### 3.7.3 Flora Assessment Methodology

The majority of significant subsidence in the mining area (i.e. between 1 to 2 m) is predicted to occur in the forested slopes of Wyong State Forest and adjacent State Conservation Area. Vegetation communities within these areas include Coastal Foothills Spotted Gum-Ironbark Forest, Coastal Narrabeen Moist Forest, Coastal Ranges Open Forest and Coastal Wet Gully Forest.

In locations where mining will occur deep below surface streams, more detailed studies will be undertaken which can then be used in the ongoing monitoring program required for the project. Vegetation communities that will require more detailed and ongoing studies include:

- riparian Alluvial Tall Moist Forest, particularly where it is present in narrow strips along the floodplains of Wyong River and Jilliby Jilliby Creek;
- pockets of Coastal Warm Temperate-Subtropical Rainforest in Wyong State Forest, which are of high conservation value; and
- other riparian and wetland vegetation communities that support threatened species.

Once these communities are identified and their structure and floristics determined, they will be assessed in a manner consistent with the most recently available vegetation mapping information. Input from subsidence modelling will be used to determine potential impacts. This data will then be used as part of a Vegetation Management Plan which will include regular monitoring before, during and after extraction. This will form an ongoing commitment by WACJV as part of the project.

### 3.7.4 Fauna

Fauna assemblages that require detailed assessment for the project are those species that utilise aquatic and/or riparian habitats and that may be rare, occur in fragmented or scattered populations, less mobile, or highly sensitive to small changes in hydrology. These include threatened arboreal mammals, amphibians and wetland birds.

These species may be affected through both direct and indirect impacts. Direct impacts may include loss or alteration of habitat, and the displacement/loss of individuals or populations through direct impact of breeding, foraging and sheltering sites particularly for threatened arboreal mammal and terrestrial frog species. Indirect impacts may include any longer-term changes to habitat requirements or alterations to food sources/prey dynamics.

### 3.7.5 Fauna Assessment Methodology

A number of threatened species and endangered ecological communities, as listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and nationally threatened and migratory species, as listed under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act**)**, are known or likely to occur within the study area.

A preliminary assessment of the likelihood of significant impacts on threatened species and endangered ecological communities has been prepared. This ecological assessment builds upon site specific information for the direct impact areas gathered by ERM (1999), Parsons Brinkerhoff (2005) Patterson Britton & Partners (2006) and OzArk EHM (2006). Threatened species known to occur in the vicinity of the Buttonderry and Tooheys Rd sites include:

- Squirrel glider (*Petaurus norfolkensis*);
- Little bent-wing bat *(Miniopterus australis);*
- Yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*);
- Large-footed mytosis *(Mytosis adversus);*
- Greater broad-nosed bat (*Scoteanax rueppellii*) / Eastern false pipistrelle (*Falsistrellus tasmaniensis*)[1];
- Wallum froglet (*Crinia tinnula*);
- Powerful owl (*Ninox strenua*); and
- Masked owl (*Tyto novaehollandiae*).

[1] Calls of these microbats are very similar such that it is wise to consider the call being from either threatened species.

Analysis of amphibian calls is currently being undertaken which may increase the number of threatened frogs known to occur within the Tooheys Rd direct impact area. Additional species were noted as having the potential to occur but were not recorded within the boundaries of the direct impact areas.

In relation to the direct impact areas, preliminary results indicate that hollow dependant species will be the most affected where direct loss of habitat occurs, although these impacts are unlikely to place any of the microbat, frog or owl species at risk of local extinction. To determine significance of this potential impact, all hollow bearing trees in the direct impact areas have been recorded, marked in the field and notes made in relation to what threatened species they are likely to support.

The most likely complex issue will be determining impact on a potential Squirrel Glider population recorded by ERM in 1999 at the Tooheys Road site. This potential population is susceptible to habitat loss and fragmentation through clearing associated activities. Although likely to remain extant, its presence was not reconfirmed during the September 2006 survey. The current nature and extent of this potential population is therefore unknown however, ERM (1999) notes that the Tooheys Road site is large enough to support a viable local population. Further assessment will be undertaken in the near future to assess the current status of this population.

Application of results to date has indicated that some species will require more detailed assessment to determine the potential impacts of subsidence in the mining area.

These additional assessments will be undertaken throughout 2006 by OzArk EHM, which will specifically focus on areas to be most affected by changed flood regimes or mine subsidence resulting from the project. A sustainability package will also be developed to offset direct and indirect impacts resulting from the project.

## 3.8 Archaeology

### 3.8.1 Indigenous

The closest known site to the project area, an open artefact scatter (NPWS 45-3-1312) is located approximately 1 km south west of the Buttonderry site on Hue Hue Road.

On the basis of the known archaeological record of the Wyong area, the expected site types likely to occur over the entire project area are:

- open artefact scatters (surface artefact concentrations which also may be associated with sub-surface archaeological deposits) on gently sloping ground usually found in the vicinity of drainage lines or on ridge tops;

- camp sites (artefact scatters which are associated with other archaeological features such as hearths and food debris [bone and shell remains]). These are

usually located in the vicinity of a water course on flat or gently sloping ground, but can occur within rock shelters and on ridgelines;

- rockart, engraving or occupation sites may be found in association with suitable sandstone overhangs / shelters;
- scarred trees may be found anywhere, but are generally more frequent in proximity to waterways;
- isolated finds (single artefacts) may be scattered across the landscape; and
- axe grinding grooves may also be present in and around drainage line banks where sandstone outcropping is present. Axe grinding grooves are produced by the sharpening of stone axes, spears and other tools and are usually 30-40 cm in length.

**Direct impact areas**

A preliminary impact assessment of the surface infrastructure sites at Tooheys Rd has been undertaken by ERM Australia to establish the likely possibilities and constraints to the development of the site in terms of Indigenous archaeological potential. This work will be further advanced by OzArk EHM.

The first area targeted for full pedestrian survey is that of the proposed rail easement over land owned by Darkinjung LALC. This site inspection was undertaken in partnership with the Darkinjung LALC Sites Officer and did not identify any surface Indigenous archaeological or cultural sites over any of the low slopes, ridge top and drainage lines inspected.

Further systematic survey is to be undertaken in early November to assess the remaining direct impact areas of Tooheys Road, Buttonderry and the western air ventilation shaft as well as the potential conservation areas. Desktop overview and review of previous reports indicates that some landforms within these areas are archaeologically sensitive and may yield artefact scatters/campsites, isolated finds and / or grinding grooves. These are primarily the immediate areas surrounding Wallarah Creek and its associated tributaries to the south of the site.

The entire Indigenous heritage assessment is being undertaken in accordance with the DEC guidelines *Interim Community Consultation Requirements for Applicants.*

### 3.8.2 Non-Indigenous

A preliminary assessment of non-indigenous heritage issues has been undertaken for the Project and 23 features were identified of potential value (see **Table 3.4**). Only one of the sites listed in the Wyong Shire Council Heritage Report was identified from the road during the preliminary survey, and this is included in the list below Site 6/NI (Community Hall). The other items listed in the Wyong Shire Council Heritage Study were not identified during the preliminary survey due to their location on private property.

**Table 3.4 - Summary of Sites of Potential Significance Identified During the Preliminary Survey**

| ID Number | Site Type | Location |
|---|---|---|
| 1/NI | Residential property | 1136 Yarramalong Road |
| 2/NI | Residential property | 1150 Yarramalong Road |
| 3/NI | Residential property | 1152 Yarramalong Road |
| 4/NI | Bridge | Yarramalong Road |
| 5/NI | Residential property | 1163 Yarramalong Road |
| 6/NI | Community Hall | Yarramalong Road |
| 7/NI | House with associated dairy and cattle run | 1182 Yarramalong Road |
| 8/NI | Residential property | Jilliby Road |
| 9/NI | Residential property | 50 Jilliby Road |
| 10/NI | Residential property | 686 Jilliby Road |
| 11/NI | Residential property | Jilliby Road |
| 12/NI | Residential property | Jilliby Road |
| 13/NI | Residential property | Little Jilliby Road |
| 14/NI | Residential property | Little Jilliby Road |
| 15/NI | Residential property | Little Jilliby Road |
| 16/NI | Residential property | Little Jilliby Road |
| 17/NI | Bridge | Little Jilliby Road |
| 18/NI | Bunya Pine | Little Jilliby Road |
| 19/NI | Farm buildings and silos | Durren Road |
| 20/NI | Picket fencing | 724 Durren Road |
| 21/NI | Residential property | Durren Road |
| 22/NI | Farm buildings and silos | Dickson Road |
| 23/NI | Pottery sheds | Kiar Ridge site |

Several issues were raised during the preliminary survey that could be useful for further survey and investigation:

- two cemeteries were noted during the survey, both of which were outside the subsidence area. The earliest grave noted was that of Hannah Preston who died in 1899. It is possible that individual properties have family gravesites on them;

- consultation with local history groups to ascertain any other issues which should be investigated, and to gain further information on issues already identified; and

- later survey stages as part of the Property Subsidence Management Plans will require the presence of a structural engineer to pinpoint specific issues and to suggest mitigation and management measures.

### 3.8.3 Implications for the Project

It is likely that some Indigenous heritage sites will be located within the surface infrastructure area. Preliminary results from the studies to date indicate that there

are no sites of heritage conservation value however this will need to be confirmed during subsurface testing.

As is current best practice, all identified sites are fully investigated to determine potential significance prior to disturbance by the development. This investigation process often involves subsurface testing in the presence of Indigenous representatives. All cultural material found is recovered, catalogued and then managed in accordance with traditional landowners requirements. This can include management in-situ, recovery and relocation to the care and control of a nominated group or relocated on site to areas outside the disturbance zone.

## 3.9 Noise

A preliminary noise assessment report was prepared by Wilkinson Murray Pty Limited to assess the potential noise generated and resulting impact on the receiving environment as part of the initial feasibility studies for the Project.

A technical review of the Wilkinson Murray report and further noise assessment will be carried out by Atkins Acoustics Pty Limited and included in the EA document. The Noise Impact Assessment will follow the procedures recommended in the Industrial Noise Policy (INP). This will include additional background noise survey to establish the Rating Background Level (RBL) from which the anticipated noise levels generated by the proposed activities on each site will be assessed. In accordance with the procedures of the INP, adverse meteorological conditions (wind and temperature inversion) will be taken into account as required based on historic meteorological data.

Work undertaken to date suggests that with the implementation of standard noise control systems, the surface infrastructure will meet the necessary noise assessment goals at the nearest residential receptors.

## 3.10 Greenhouse

### 3.10.1 Gas Regimes

Results from gas testing were compiled by GeoGAS Pty Ltd (1997) and a comprehensive assessment was undertaken. The following conclusions were made and are being incorporated in mine planning:

- Gas content is generally restricted to the coal seam and consists of greater than 95% methane;
- Gas content for areas not affected by intrusions can be predicted confidently from depth, ash content, and volatile matter;
- The regional gas content gradient is determined by depth below sea level, with gas contents in-seam ranging from 6.0 to 8.9 $m^3/t$;

- Outburst potential is low but may need to be assessed around igneous structures; and

- Some form of gas drainage or gas capture will be required to achieve satisfactory gas levels in the mine with high production rates and acceptable ventilation levels.

To assist mine planning and ventilation studies, the gas content relationship has been used to develop a three dimensional gas content model. This model extends from 30 m above the potential working section (includes all overlying coal) to 70 m below the potential working section.

Calculations for this model utilised all existing quality and structural information, using model estimates where possible and default values for deeper unnamed and not-modelled seams. The final model takes into account coal left in the roof and floor above and below the working section.

Mine planning and scheduling has taken place on the assumption that gas drainage will be implemented.

### 3.10.2 Greenhouse Strategies

There are several opportunities available for the mitigation of greenhouse gases for the Project. Work is well advanced on developing opportunities to beneficially utilise this methane gas resource. The collected gas could be fed directly into the existing gas distribution systems for use by others. Alternatively, if any electricity was to be generated from the captured methane, it could be fed into the State's high voltage distribution system.

These options, along with other initiatives to offset the emission of greenhouse gases, will be included in an overall Sustainability Package for the project. This will cover other offsets and measures such as ecological, social and economic.

## 3.11 Air Quality and Dust

The construction and operation of the surface facilities of the Project may generate some air quality issues that will require further investigation. The main dust sources from the surface facilities are likely to be:

- dust generated from loading and unloading of materials or product;

- truck movements (particularly if over unsealed roads);

- coal stockpiles; and

- transport of coal on conveyors, transfer stations and locomotives proposed for product transport.

Local meteorology (which includes the wind speed and direction and stability classes to some extent) also has a role in determining the amount of dust generated from the site and transported to surrounding residences or landowners.

The impacts on air quality will depend on the amount of dust generated from the site which in turn depends on factors such as the volume and size of stockpiles, moisture content, vehicle movements, local meteorology and dust mitigation measures.

To assess the air quality effects of the Project, predicted dust deposition and concentration levels (that will be generated at the surface facilities) will be compared with recognised air quality criteria.

### 3.11.1 Air Quality Monitoring

Monitoring of air quality in the project area began in 1996. Two types of monitoring have been undertaken; static dust deposition and high volume air sampling. Two types of High Volume Air Samplers (HVAS) were included in the monitoring network; TSP which measures total suspended particulates and $PM_{10}$ which measures particles smaller than 10 microns. The air quality monitoring network was regularly updated to focus on collecting information surrounding the proposed surface facilities. HVAS monitoring included sampling up to six locations and up to 20 static dust gauges were measured for the project area. However, the air quality monitoring program has been further refined to focus on the priority areas relevant to the current W2CP.

Information collected from the monitoring network will provide existing dust levels for the area. Subsequently, the permitted increase in dust levels resulting from the project can be calculated. Data collected to date indicates that suspended and deposited dust levels are well within compliance limits.

Further assessment will be carried out by Holmes Air Sciences on the likely impact on the existing air quality for inclusion in the Environmental Assessment document. This study will include assessment of both dust and gas emissions from all site operations.

## 3.12 Transportation

Parsons Brinckerhoff has been commissioned to undertake a traffic and transportation study for the project. The project will primarily generate road traffic movements from the construction and operation of surface mine facilities. It is anticipated that the duration of construction of the mine facilities at each of the sites will be approximately 1.5 to 2 years. All coal produced will be transported to the north by rail either to the Port of Newcastle or Power Stations along the route.

Transportation issues that require assessment and will be reported in the EA document include the following:

- Site Access Requirements – each of the surface sites will require appropriate vehicular access for road transport of project personnel and materials;

- Adequacy of Existing Road Network – a detailed assessment of the existing road network and traffic usage levels has been undertaken to assess its suitability to accommodate additional traffic generated by the mine proposal;

- Construction Stage Traffic Impacts - The potential traffic impacts during the construction stage of the project, which may involve significant heavy vehicle traffic, are identified and assessed including the need for appropriate short term road capacity improvements or mitigation measures giving due consideration to the duration of the relevant construction traffic activity;

- Operational Stage Traffic Impacts - The main potential traffic impacts which would occur during the 20 year operational stage of the project will also be identified and assessed including any need for road improvements or mitigation measures for roads or intersections on the area road network;

- Road Safety - A review of recorded traffic accident data will be undertaken in the vicinity of each of the surface facilities to identify current and potential future road safety concerns in each locality which may be affected by the project;

- Road Maintenance - Where the project is likely to result in additional heavy vehicle traffic usage of the Council maintained road network on a sustained basis, the potential road maintenance implications of this traffic will be assessed;

- Effects of Subsidence on Roads / Flood Free Access - The potential effects of future mining subsidence on the local road networks of the Yarramalong and Dooralong valleys will be assessed, including bridge crossings and the potential effects of differential settlement on the road surface;

- Rail System Capacity - The existing rail system capacity has been documented and assessed for the various types of trains which currently use the system including express and all stations passenger services, export coal, domestic coal and general freight train operations. The assessment also documents existing usage levels of the system and current spare capacity;

- Assessment of Future Increased Usage - This assessment will be based on the current spare capacity of the rail system but also considers how existing coal train demand through the area may increase in addition to the W2CP transport requirements and how these increases may be accommodated by any potential increases in the capacity of the rail system from general network upgrading; and

- Rail Transport Noise/Vibration and Air Quality Issues – These issues will be assessed under the relevant sections of the EA document in reference to the contribution made by rail transport.

### 3.13 Visual

The surface facilities for the Project are likely to be visible from some public accessible vantage points and isolated residential locations. Possible infrastructure locations have been constrained by the increased development pressure in the local area and land acquisition issues. Also, the Wyong local community (as opposed to the region) has no traditional ties with the mining industry and the Central Coast is considered to be a tourist destination.

Most of the prominent surface facilities are to be sited on the Tooheys Road site. The rail line will be located on an elevated ridge but will be afforded some visual screening. This location will be visible to some nearby residents as well as people travelling along the Sydney-Newcastle Freeway. This is a main road and part of the National Road Network.

The main ventilation facility will be situated on the Buttonderry site, opposite a former rural residential area which has now been designated for future industrial development. The intervening natural topography will screen the ventilation and building facilities from any residential areas, however, it is likely that it will still be apparent from some public roadside and other viewpoints.

W2CP will carefully consider the design, placement, materials and screening while further developing the proposal. However, given the local topography, it will be difficult to minimise visual impacts entirely through screening. Also, an innovative landscaping plan, which enhances the long term visual environment, will be considered integral to the proposal.

### 3.14 Draft Statement of Commitments

The Environmental Assessment document will provide a detailed Statement of Commitments based on the outcomes of the various environmental and engineering studies. The purpose of the Statement of Commitments is to provide certainty of the impact predictions made as well as the main project components.

The proponent has already published its commitment to the community based on the key issues that have been raised in the public consultation program. Based on these issues, the Wallarah 2 Coal Project has made the following commitments.

- The only mine plan that Wallarah 2 Coal Project will submit to the NSW Government will be one that safeguards the surface and underground water regimes;

- The company will conduct its business in a manner that at all times respects the people of the Wyong community;

- The company considers the protection of the environment as an important part of its normal business activities;

- The company will conduct its business in a way that maintains a safe and healthy workplace for employees, visitors and the local community; and

- The company will develop sustainable practices that contribute to the interests of the wider community.

These core commitments are currently being expanded and will be reported in full in the Environmental Assessment document. Key additional areas that will be included in the final Statement of Commitments include:

- Specific commitments regarding protection and enhancement of the Gosford Wyong Water Supply system;

- Specific commitments regarding ecological impact mitigation measures and offsets;

- Ongoing expenditure and social infrastructure initiatives designed to enhance both the local environment and the community's socio-economic amenity; and

- Specific pollution control and environmental protection initiatives.

A copy of the publicised announcement is attached as **Appendix B**.

# 4. Conclusion

This Preliminary Assessment Report has been prepared to describe the project and to provide a preliminary overview of the likely impacts and potential mitigation measures that have been identified through initial studies.

This Preliminary Assessment Report accompanies a Project Application to the Director General of the Department of Planning. It is anticipated that the Director General for the Department of Planning will use the documentation to confirm that the project is to be assessed under Part 3A of the Environmental Planning and Assessment Act, and as a basis for issuing the environmental assessment requirements for the project.

# Appendix A – Risk Assessment

## A.1 Identification and Prioritisation of Issues

A risk management culture has been adopted by the Wallarah 2 Coal Project to effectively manage all adverse effects whether to the environment and community, health and safety of its employees or its investment.

In order to identify and prioritise issues relevant to the W2CP, a risk assessment was carried out using a transparent process as described in the following sections. The assessment process commenced at the project inception in 1996 and will continue through the approval process, final design, construction, operation and ultimately closure of the mine.

## A.2 Risk Assessment Methodology

A flow diagram of the steps taken in the risk assessment is shown in **Diagram 1.1**, and further defined in the following sections.

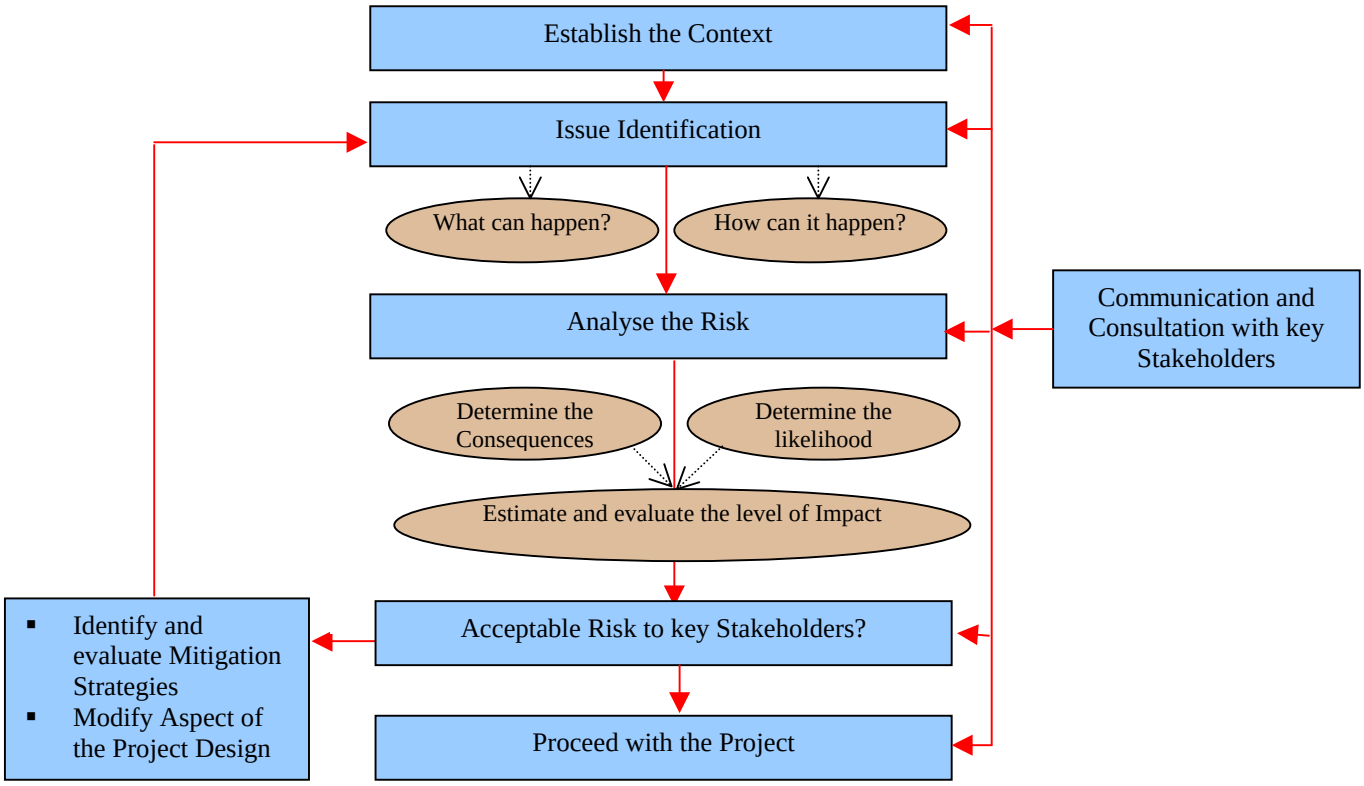



**Diagram 1.1 - Risk Management Process**

The W2CP risk assessment procedure has been adapted from the AS/NZS 4360: 1999, which includes the following steps:

- ❒ Hazard identification (referred to as Environmental Issues);
- ❒ Risk Analysis;
- ❒ Risk Evaluation; and
- ❒ Treating Risk.

### 1.2.1 Establish the Context

This initial step in the risk assessment involved identifying the relationship of the proposed W2CP to the external environment including operational, political, social, cultural, regulatory and legal aspects and public perception. This process was facilitated by the identification of, and communication with, stakeholders to the project, which have been described previously in the PAR.

Establishing this strategic context was an important preliminary step because the objectives and perceptions of some of the external stakeholders were not always consistent with those of the project team, and have highlighted aspects of the project that required additional investigation through the planning and assessment processes.

### 1.2.2 Issue Identification

An environmental issue, for this purpose, was defined as follows:

> "*an environmental issue is the intrinsic potential for an agent, activity or process to lead to an incident, or ongoing condition*".

An incident, or ongoing condition, was regarded as any occurrence that has the potential to result in adverse consequences to people, the environment, property, or a combination of these. Consequences can result from the development of an incident over time, either immediately after or over a period of time.

In carrying out the risk assessment for the project, it was recognised that a single hazard may be the cause of multiple incidents and in turn, any one incident can have multiple potential consequences.

Environmental Issue identification was the most important step in the risk assessment process for prioritisation of issues. Also important is identification of potential incidents that may result from the issue.

Once the environmental issues and potential incidents were identified, the assessment of the risks was carried out.

### 1.2.3 Impact Assessment

Impacts were defined as specific effects resulting from an incident and may be related to people, the environment, plant, or a combination of these.

Once the environmental issues and potential incidents were identified, the risk was assessed by determining:

- The severity of the potential consequences that could result from the potential incident; and
- The likelihood or probability of each consequence.

Based on these two inputs, the risk matrix shown in Table 1.1 was used to qualitatively rank those issues of greatest potential importance to the W2CP.

**Table 1.1 – Risk Matrix**

| Probability of Hazard Occurring | Consequence Severity | | | | |
|---|---|---|---|---|---|
| | **Low** | **Minor** | **Moderate** | **Major** | **Critical** |
| **Almost Certain** | High | High | Extreme | Extreme | Extreme |
| **Likely** | Moderate | High | High | Extreme | Extreme |
| **Possible** | Low | Moderate | High | Extreme | Extreme |
| **Unlikely** | Low | Low | Moderate | High | Extreme |
| **Rare** | Low | Low | Moderate | High | High |

Once the level of risk involved with each potential hazard was determined, the acceptability of that risk was assessed. In cases where the level of risk was assessed as being high or extreme, steps were taken in the design of the project to reduce the risk so the effect or impact would become as low as reasonably practicable. Therefore an essential part of the assessment process is the determination of risk reduction strategies and their potential effectiveness to control, reduce or eliminate the risk.

Given that the risk assessment process has been ongoing for 10 years, many of the issues have already been resolved. Mitigation strategies in some areas are well advanced and preliminary results available to be reviewed by the project team. This enables the risk assessments to be continually reviewed and modified accordingly.

This process will continue during the detailed environmental investigations currently underway for the EA.

## A.3 Application of the Risk Assessment to the W2CP

The proponent and its consultants applied the risk assessment methodology outlined above throughout the planning process for the W2CP. The results of the risk assessment undertaken are summarised in Table 1.2.

The order in which issues are presented in this PAR document generally reflects the level of risk determined, with the highest potential risks being related to subsidence, and the lowest potential risk being the visual impact. It is important to note however, that the risk assigned to an issue includes public perceptions, which often leads to a much higher grading of risk than would otherwise be assigned in the absence of community involvement.

The information that will be provided in the EA document will be based on the results of a *quantitative* assessment of the potential impacts associated with the project. The ranking may therefore change as the environmental studies progress.

As a result of the assessment of the risks, and an evaluation of the acceptability of the risk, the project was modified on a number of occasions. This has included alterations to the mine plan, deletion of the coal washery and rejects storage requirement, siting of surface facilities, changed surface facility layouts and infrastructure, the decision to focus only on the western resource, and various management plans and mitigation strategies developed to minimise the impact of a risk.

Through the detailed risk assessment process, the proponent and its consultants are confident that all of the relevant issues have been identified, and accurately assessed based on the most up to date scientific knowledge available by highly qualified and experienced specialists in the industry. Under this professional guidance, it is considered that all of the potential impacts will be maintained at a level that is as low as reasonably practicable.

**Table 1.2 – W2CP Risk Review**

| Environmental Issues | Initial Risk Level | | | Comment | Actions Taken to Date | Further Actions Required | Predicted Residual Risk Level |
|---|---|---|---|---|---|---|---|
| | P | C | R | | | | |
| Subsidence | AC | Mi | H | High level of community concern on this issue. Subsidence also has the potential to modify other hazards, and cannot be considered in isolation. Potential damage to property considered key issue to be satisfactorily addressed | ▪ Develop scientifically sound and defensible subsidence prediction model<br>▪ Calibrate model based on actual mining results from other operations<br>▪ Preliminary results show that required subsidence limits can be achieved. | ▪ Remodel subsidence predictions to confirm impact predictions.<br>▪ If necessary, redesign Mine Plan to meet required subsidence levels | Moderate |
| Surface Water Supply System | P | Mi | Mo | Public perception of a higher risk ranking is not supported by available data. A very small percentage of catchment (6%) will be subject to mining. | ▪ Preliminary assessment based on geological data and subsidence modelling gives high degree of confidence that water supply system will be protected.<br>▪ Community commitment given that water supply system will be safeguarded from any significant impacts<br>▪ Commitment given that surplus water will be treated and made available for potential reuse | ▪ Conduct detailed modelling to assess the impact of subsidence on surface water regime<br>▪ Develop mine plan to achieve acceptable impact level<br>▪ Deep underground water encountered by the mine will be treated and used to offset water demand within the district. | Moderate |
| Groundwater | P | Mi | Mo | Public perception of a higher risk ranking is not supported by available data. A very small percentage of alluvial areas within the catchment will be subject to mining. | ▪ Preliminary mine plan designed to safeguard near surface aquifers<br>▪ Preliminary assessments based on groundwater monitoring and modelling results show that the mine will make approximately 2 ML per day primarily from the coal seam.<br>▪ Measurements undertaken to date confirm very low permeabilities for interburden and overburden strata and moderately low permeabilities for the coal seam. | ▪ Conduct detailed modelling to assess the impact of subsidence on surface and sub-surface aquifers<br>▪ If necessary, make further adjustments to mine plan<br>▪ Mine water encountered to be treated and used to offset water demand within the district. | Moderate |

**Table 1.2 – W2CP Risk Review**

| Environmental Issues | Initial Risk Level | | | Comment | Actions Taken to Date | Further Actions Required | Predicted Residual Risk Level |
|---|---|---|---|---|---|---|---|
| | P | C | R | | | | |
| Flood Hazard | P | Mo | H | Is a genuine issue that requires detailed investigation. At least 57 houses are located in the flood zone of the Yarramalong and Dooralong Valleys, 19 of which these are within the proposed mining area. | ▪ Detailed flood study undertaken<br>▪ Revision of mine plan to ensure acceptable subsidence levels on flood-prone land. | ▪ Flood management and mitigation strategies will be included in the Subsidence Management Plan. | Moderate |
| Community Opposition | Ac | Mi | H | Vocal groups within the community. Must be kept in perspective, members of the community without an objection to the project generally remain silent. | ▪ Extensive community consultation including newsletters, website, community liaison committee<br>▪ Community views to be sought by independent organisation | ▪ Results of consultation activities to be reported in EA<br>▪ Consultation activities ongoing | Moderate |
| Social | L | L | Mo | Issues raised include lack of understanding of mining, loss of property values and other primary social indicators, community expectations and perceived implications. | ▪ Preliminary determination that the project has the potential to cause community unrest.<br>▪ Clear and concise information on the project has been released.<br>▪ The mine is underground with minimal surface facilities areas that are well located.<br>▪ Tooheys Road site is zoned industrial<br>▪ Consultation program underway and will continue | ▪ Identification of community issues and the development of specific mitigation and offsets for the project.<br>▪ Determine effects on primary social indicators such as house and land values, community expectations and perceived implications.<br>▪ Determine effects on employment and determination of flow on economic costs and benefits.<br>▪ Ongoing funding for local community projects. | Low |

**Table 1.2 – W2CP Risk Review**

| Environmental Issues | Initial Risk Level | | | Comment | Actions Taken to Date | Further Actions Required | Predicted Residual Risk Level |
|---|---|---|---|---|---|---|---|
| | P | C | R | | | | |
| Negative Economic impacts | U | L | L | Economic impacts of the project are considered to be positive | ▪ Determination of initial economic benefits | ▪ EA to determine full range of economic benefits on local, regional and State levels<br>▪ Ongoing funding for local community projects. | Low |
| Infrastructure | P | L | L | The mining area is crossed by two high voltage power lines as well as a number of lower voltage lines, roads, telecommunications and pipelines. | ▪ Public infrastructure occurring within the mining area has been identified and mapped.<br>▪ Preliminary results from subsidence modelling has indicated that existing infrastructure can be protected | ▪ The EA will document specific subsidence implications on public infrastructure and proposed management techniques | Low |
| Land Use | P | L | L | W2CP unlikely to have any impact on land use in the region. | ▪ Preliminary assessment showed that no existing landuses within the mining area will be changed or altered | ▪ EA will address overall land use implications | Low |
| Ecology | P | Mi | Mo | It has been demonstrated for many years that longwall mining can be carried out with minimal impact on flora and fauna. Surface facilities are primarily located on cleared land. | ▪ Careful siting of surface facilities to minimise vegetation clearing<br>▪ Initial ecology studies have identified a number of species of conservation significant but the development will not result in significant impacts<br>▪ Mine plan avoids key wetland areas | ▪ Offset package is being prepared to compensate for vegetation disturbance.<br>▪ Resulting development will be assessed within the bioregional planning context | Low |
| Indigenous Heritage and Archaeology | P | Mi | Mo | Potential impacts are low given the extensive landuse activities within the surface facilities area. Potential positive impacts and economic benefits. | ▪ Preliminary assessments indicate that no significant archaeology sites will be disturbed | ▪ Surveys being conducted and mitigation measures will be documented in the EA | Low |
| Heritage | U | L | L | Although no European heritage items will be directly affected by the surface facilities, a number of items are located within the mining area. | ▪ Heritage structures within the mining area have been identified | ▪ Assessment of heritage structures and features will be provided in EA.<br>▪ Post approval Subsidence Management Plans specifically address heritage items | Low |

**Table 1.2 – W2CP Risk Review**

| Environmental Issues | Initial Risk Level | | | Comment | Actions Taken to Date | Further Actions Required | Predicted Residual Risk Level |
|---|---|---|---|---|---|---|---|
| | P | C | R | | | | |
| Noise | P | Mi | Mo | Surface facilities well located from a noise perspective. | ▪ Various noise monitoring programs have been undertaken.<br>▪ Surface facilities have been appropriately sited and the design incorporated noise controls | ▪ Noise controls will be required to maintain acceptable limits for the both the Buttonderry site and Tooheys Road site. | Low |
| Air Quality | P | Mi | Mo | Underground mining provides limited potential for dust generation. Coal handling facilities will be main dust source to be controlled. Gas capture and re-use initiatives form part of the project | ▪ Preliminary assessment indicates that air quality goals will be comfortably met with normal air quality controls employed. | ▪ Detailed air quality modelling to be undertaken for EA | Low |
| Methane Capture and effects on the environment | L | Mo | H | Mine planning and scheduling has taken place on the assumption that gas drainage will be necessary and implemented.<br><br>The collected gas could be fed directly into the existing gas distribution systems for use by others.<br><br>Alternatively, if any electricity was to be generated from the captured methane, it could be fed into the State's high voltage distribution system. | ▪ Work is well advanced on identifying opportunities to beneficially utilise the methane gas resource. | ▪ The EA will detail the preferred gas management strategy including initiatives to offset the emission of greenhouse gases.<br>▪ These initiatives will form part of an overall Sustainability Package for the project. This will cover other offsets and measures such as ecological, social and economic. | Low |
| Greenhouse emission from W2CP coal | L | Mo | H | Greenhouse issues are recognised as important but the use of the coal does not part of the project. W2CP sourced coal for South Korean electricity generation will be accommodated within their obligations under the Kyoto Agreement. | ▪ Gas capture proposals represent a key initiative for the Wallarah 2 Coal Project.<br>▪ W2CP is proposing mitigation strategies to lower the GHG emissions per tonne of coal mined | ▪ The greenhouse gas implications for the project will be reported in the EA | Low |

**Table 1.2 – W2CP Risk Review**

| Environmental Issues | Initial Risk Level | | | Comment | Actions Taken to Date | Further Actions Required | Predicted Residual Risk Level |
|---|---|---|---|---|---|---|---|
| | P | C | R | | | | |
| Transport | U | L | L | W2CP production transported by rail. | ▪ Surface facilities have been ideally located close to regional road and rail transport arteries | ▪ EA will address local and regional road network impacts. Expected implications to be minimal | Low |
| Pollution Control | R | Mo | M | Surface facilities will incorporate modern pollution control technologies | ▪ Preliminary designs completed which incorporate best practice pollution controls as required by regulatory authorities.<br>▪ Surface pollution control system will be able to cater for the 1 in 100 year storm event | ▪ Details of all pollution control initiatives to be reported in EA | Low |
| Visual Amenity | P | L | L | Surface facilities are well located to limit views from public areas. Some views will be available from the freeway but are not considered significant given the surrounding area is zoned industrial | ▪ Landscaping incorporated into surface facility designs | ▪ A visual assessment will be included in the EA along with landscaping initiatives to reduce the residual visual impacts | Low |

Note:
P=Probability level; Categories AC=Almost Certain; L=Likely; P=Possible; U=Unlikely; R=Rare
C=Consequence Severity; Categories; L=Low; Mi=Minor; Mo=Moderate; Ma=Major; CR=Critical
R=Risk Level, Categories: L=Low; M=Moderate; H=High; E=Extreme

A number of other items and issues of low risk consequence have been included in some detail in earlier risk assessment phases undertaken by the Wyong Areas Coal Joint Venture. Although not specifically mentioned here, they will be reported in the EA. These include:

- Planning matters including local and regional planning issues.
- Implications for future residential and industrial development.
- Implications for future road development.
- Impacts on Warnervale Airport.
- Soil and erosion controls.
- Acid Sulphate soils.
- Implications and improvements on riverine and fluvial systems.
- Existing and future water quality expectations for surface facilities.
- Implications on migratory birds in the region.
- Impacts on aquatic ecosystems.
- Perceived impacts on water supply infrastructure.
- Land capability and loss of viable agricultural land.
- Weed control and land management issues for the surface facilities sites.
- Issues for the existing Boral quarry adjacent to the Tooheys Road site.
- Lighting.
- Existing and future services within the future industrial precincts.
- Rail freight and rail servicing.
- Waste controls and recycling.
- Impacts on community health, comfort and safety.
- Storage of fuels, oils and chemicals.
- Site landscaping and localised environmental improvements.
- Workforce and skills availability.

# Appendix B – Community Commitment

Wallarah 2
COAL PROJECT

# The Facts

about a future underground coal mine proposal

The Wallarah 2 Coal Project provides this information as a community service. It outlines the project's efforts to obtain the necessary data on the coal resource and the environment as well as the company's commitments to ensure that the region's water supplies are safeguarded.

## Where we started

- The company is required by the State Government to investigate the coal resource.
- The company is then required to advise the government if a mining operation is viable.
- If so the company is required to submit an Environmental Assessment Report.

## Where we are now

- Investigations have taken many paths as more and more information becomes available.
- The community will be aware that the company is charged with investigating the whole coal resource including a large area beneath Tuggerah Lake.
- We have recently announced that we do not intend to mine beneath the lake.
- We have also released an outline of a mine plan to indicate the areas identified as most likely for surface and underground facilities.
- Environmental impacts assessments are continuing.

## What happens next

This flow chart shows where we are up to in the comprehensive assessment processes, including ongoing community involvement.

Environmental investigations begin

↓

Community consultation begins (ongoing)

↓

**WE ARE HERE**

Development of mine plan concepts

↓

Lodgement of Project Application & Preliminary Assessment Report

↓

Prepare comprehensive Environment Assessment report (EA)

↓

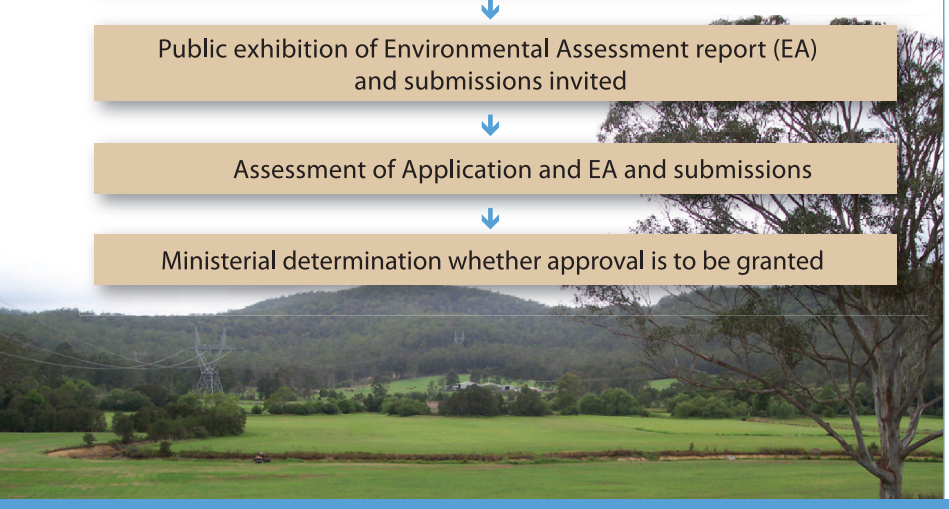
Public exhibition of Environmental Assessment report (EA) and submissions invited

↓

Assessment of Application and EA and submissions

↓

Ministerial determination whether approval is to be granted



## Statement of Commitment to the Community

- The only mine plan that Wallarah 2 Coal Project will submit to the NSW Government will be one that safeguards the surface and underground water regimes.
- This company will conduct its business in a manner that at all times respects the people of the Wyong community.
- This company considers the protection of the environment as an important part of its normal business activities.
- This company conducts its business in a way that maintains a safe and healthy workplace for employees, visitors and the local community.
- This company will implement stringent environmental management practices and will establish enduring programs that will contribute to the interests of the wider community both now and in the future.

## What we have discovered

- A viable mine is possible. (Viability is dependent on engineering, environmental and economic considerations.)
- This will not be the largest longwall mine in Australia. (There are at least five that are or will be larger)
- This mine would not have the largest rail loading facility. (There are at least 10 that are or will be larger.)
- The geology of the area, allied with sensitive mine planning, ensures a mine can be developed without adversely impacting on water supplies both surface and underground. (The local geology enables underground mining to be carried out so that the water catchment remains protected.)
- There is considerable work to be done to bring the project to the stage where an environmental assessment report can be presented.
- The mine will be designed to ensure that surface and groundwater resources are safeguarded. (A mine is viable only when it can become an integrated part of the local and regional infrastructure.)
- The region's water supplies will be safeguarded. No mining will occur in or under the Mangrove Creek Dam catchment or Mardi Dam, nor under the Wyong River, Wyong Weir, Ourimbah Creek, Porters Creek Wetland or related water facilities and infrastructure.
- The mine will be designed to ensure there is no impact from surface or ground water (The last thing an underground mine wants is additional water in the workings that can present a danger to employees or interfere with the efficient operation of coal extraction.)
- It is likely this mine will not only produce enough water from groundwater within its workings for use for dust suppression and other surface operations but surplus water that can be treated and made available to other industries and so reduce the take on region's water supplies.

## Contact Us

**We welcome your inquiries and comments that you can direct either by:**

**Telephone: 02 4352 7500 Email: info@wallarah.com.au**

**Interview: Our offices are at 25 Bryant Drive, Tuggerah. You are welcome to visit but it is advisable to telephone first to ensure the person who can best help is available.**

**Sustaining energy for the future**

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