

Wallarah 2 Coal Project

Wyong, NSW, Australia

Review of 2013 EIS

Prepared for



By



EARTH SYSTEMS
Environment | Water | Sustainability

June 2013



DISTRIBUTION RECORD

Copy No.	Company / Position	Name
1	Wyong Shire Council	Lin Armstrong

DOCUMENT REVISION LIST

Revision Status / Number	Revision Date	Description of Revision	Approved By
RevDraft	June 2013	Draft	Nigel Murphy
Rev1	June 2013	FinalDraft	Nigel Murphy
Rev2	June 2013	Final	Nigel Murphy

Executive Summary

Earth Systems has undertaken a detailed review of the 2013 Wallarah 2 Environmental Impact Statement (EIS) for the Wyong Shire Council (WSC).

The Wyong Areas Coal Joint Venture (WACJV) proposes to develop an underground coal mine known as the Wallarah 2 Coal Project. This Project would extract coal using longwall mining techniques from under the Dooralong and Yarramalong Valleys in Wyong Shire, New South Wales.

In 2010, WACJV submitted an EIS which was refused by the NSW Government for the following reasons.

“The reasons for refusal of the project application are as follows:

- Uncertainty around the subsidence predictions for the project, particularly in the western portion of the site under Jilliby Conservation Area and the Wyong State Forest;*
- The project does not adequately address potential surface water quality impacts, resulting in uncertainty around the ability of the project to meet acceptable water quality outcomes;*
- Uncertainty around the ecological impacts of the project, particularly in the western portion of the site, as a result of a lack of ecological survey effort combined with uncertainty as to subsidence predictions in this area.*
- Uncertainty around the heritage impacts of the project, particularly in the western portion of the site, as a result of a lack of heritage survey effort combined with uncertainty as to subsidence predictions in this area.*
- In light of the above, the project is not considered consistent with the principles of ecologically sustainable development, including the precautionary principle, and as a consequence is not considered to be in the public interest.”*

A revised EIS was submitted by the proponent in 2013.

As a key stakeholder, WSC has a role to ensure that all relevant impacts and risks associated with the Project are professionally investigated and assessed to protect the interests of the Shire's residents and the environment. WSC engaged Earth Systems to independently review and evaluate the revised EIS and provide expert advice on the potential environmental and planning issues related to the Project. Earth Systems has been instructed to review all aspects of the EIS apart from subsidence, ground and surface water hydrology, and flooding which are being reviewed for WSC by another technical group.

The EIS documents have been reviewed for accuracy, technical competence, statutory compliance and conformance with Australian standards and guidelines and international best practice within the mining industry. A number of technical specialists and environmental impact assessment (EIA) experts from Earth Systems have contributed to the review.

Environmental Impact Assessment should be a thorough and consultative process involving specialist and multi-disciplinary inputs. Although many aspects and components of the Wallarah EIS appear to have been conducted competently, and are improved from the 2010 EIS, there are still some significant uncertainty and gaps in the EIS.

In general the EIS reaches the conclusion that there will be few significant adverse impacts (apart from subsidence and some flooding) as a result of Project development. This appears overly optimistic

considering the sensitivity of the project setting close to a significant population centre and in a catchment that supplies water to the Central Coast population.

Management, monitoring and risk mitigation measures are often poorly articulated. In particular, the assessment of water quality impacts and air quality impacts appears to be flawed or inadequate in some key areas.

The EIS details very few clear commitments regarding management, monitoring and risk mitigation providing key stakeholders with little confidence that their assets and values will be protected by the Project should it proceed.

Further specific findings of the EIS review are as follows:

Structure and Approach

1. The EIS should fully consider and assess the different phases of the mine. The EIS does not adequately assess construction impacts, focusing primarily on operations. Impacts and issues associated with air quality, water quality and transport are likely to be significantly different during construction. The EIS does not adequately consider closure planning and no assessment of potential closure impacts has been undertaken. The EIS does not demonstrate that the Project would be closed in a manner that safeguards the environment and community assets.
2. The Proponent's risk assessment and cost benefit analysis is based on the results of the EIS. The risks, benefits and costs associated with the Project need to be re-rated based on the knowledge gaps and uncertainties that remain and the findings of further recommended studies.
3. An Environmental Management System has not been developed for the Project, nor is there a commitment to develop such a system.
4. The project proponent has not committed to regular independent environmental audits throughout the project life cycle. However, the project proponent has committed to developing an Annual Review Report to systematically assess performance and identify areas for improvement.

Stakeholder Engagement

5. The Proponent has still failed to adequately engage with the community during the environmental assessment process and consequently limited consultation has been conducted. The EIS does not provide sufficient information on the concerns raised by the community during consultation.

Water

6. The EIS does not assess impacts on surface water quality associated with the construction phase of the Project, nor does it provide management and mitigation measures for any potential impacts. There is no contingency for the Project if development does impact on water quality or hydrology.
7. The mined materials and wallrock of the deposit have not been assessed in terms of their ability to leach acid and metalliferous drainage (AMD). This is a significant oversight as AMD / saline drainage can be one of the most long-lived environmental impacts from coal mining.
8. The surface water monitoring program does not include a sampling point immediately downstream of the proposed Wallarah Creek tributary discharge site
9. The EIS does not provide contingency for overflow of untreated mine water from the Mine Operations Dam (MOD) in the event that overflow may occur.
10. The baseline assessment for groundwater quality appears to have included measurement of only pH and TDS, neglecting other key analytical parameters and therefore not providing a suitable baseline.

11. Mitigation measures for groundwater impacts are limited to repairing damaged bores from subsidence and replacing water supply if groundwater drawdown exceeds expectations. Mitigation for groundwater quality is not directly articulated.
12. The EPBC Act 'Water Trigger' Amendment (2013) has not been considered.

Air Quality

13. The methodology for air quality impact assessment does not appear to have been undertaken in a manner consistent with applicable legislation (DECC, 2005). Some modelling appears to include only Project emissions rather than Project emissions with baseline conditions. This provides a misleading assessment of likely dust levels that will be experienced by surrounding communities. Construction impacts and impacts associated with certain climatic conditions are not clearly outlined.
14. Predicted Project-related emission concentrations from dispersion modelling assume Project implementation of best practices. These estimates are only relevant provided these controls are implemented. It is unclear whether the EIS commits the Project to these management and mitigation measures.

Greenhouse Gas

15. Greenhouse gas emission mitigation strategies are very brief and do not demonstrate a sufficient level of commitment by the Proponent to reduce emissions. As such the Greenhouse Assessment does not adequately address the terms listed in the Director-General's Environmental Assessment Requirements and the Supplementary Director-General's Requirements.

Noise and Vibration

16. It is unclear whether the control measures identified in the Noise and Vibration specialist study are Project commitments or recommended best practices. The results of noise modelling are only valid if the recommended attenuation measures are committed to and implemented.
17. While noise modelling indicates that construction and operational noise will not be a major issue for the Project, modelling predicted that there may be some exceedences of Project Specific Noise Criteria (PSNC). Additional mitigation measures are not identified to prevent these exceedences.

Ecology

18. In general, an adequate ecological baseline (terrestrial and aquatic) has been provided, however, it lacks detail in regard to threatened species population distribution and abundance estimates. Ecological surveys should have been conducted over a broader survey area to reflect impacts associated with all project components.
19. Offsets required under the EPBC Act threatened species identified within the Project Boundary were not calculated using the new EPBC Act Policy Guidelines of 2012.

Traffic and Transport

20. A Rail Study has been conducted as part of the 2013 EIS to address the gaps in information regarding transport impacts identified in the 2010 EIS. This is a more comprehensive assessment of the transport route of the coal.

Visual Amenity

21. The visual assessment conducted for the Project provides a good site analysis and identification of key viewpoints, assessment of potential visual impacts and recommendations for mitigation measures to minimise impacts of the Project.

Archaeology and Cultural Heritage

22. In general, a comprehensive survey and report of the Aboriginal cultural and historic heritage of the areas surveyed within the Project Boundary has been prepared apart from some areas with accessibility restrictions.

Community Health and Safety

23. Uncertainties and knowledge gaps identified in this report including air and water quality impacts indicate that the assessment of community health and safety impacts and risks and their necessary management and mitigation measures are unlikely to be sufficiently comprehensive.

Impacts beyond DGRs

24. Contingency plans for potential disasters, whether naturally occurring or human induced, have not been included in the EIS. This is an oversight.
25. The Buttonderry Waste Management Facility is mentioned in the EIS in respect to visual amenity, however, the potential environmental risks (gas and leachate leakage) associated with the proximity of this facility to the project are not discussed.

Management and Monitoring

26. The EIS is not accompanied by management and monitoring plans. It is understood that these have not yet been prepared. Good industry international practice and / or best practice requires an Environmental Management and Monitoring Plan to be prepared as part of the EIS process. Ideally this should be accompanied by a budget indicating that the Project is sufficiently resourced to undertake this work. It is not possible to fully assess the impacts of the Project without an adequately articulated management and monitoring plan.

Recommendations based on these key findings follow.

Recommendations

It is recommended that the EIS is revised to address the gaps and deficiencies identified by this Review.

Should the EIS be approved then the consent should be conditional on the following conditions:

Air Quality

- Air quality impacts are assessed utilising relevant methodologies to ensure that detailed impact assessments of project phases are conducted effectively.

Greenhouse Gas

- A more realistic assessment of greenhouse gas (GHG) impacts is provided by including Scope 2 and 3 emissions sources in the analysis of the GHG impacts and updating impacts of the Project on anthropogenic global warming.

Water Quality

- Surface water quality is investigated further to ensure that all sources of contaminants are identified and that water sources are effectively monitored for changes associated with the Project.
- A geochemical assessment for potential AMD / salinity is conducted, including development of contingency plans for the management and treatment of the Mine Operations Dam.

EPBC 'Water Trigger' Amendment (2013)

- The EPBC Act Water Trigger Amendment (2013) is considered by the Proponent.

Ecology

- Further detailed surveys for biodiversity are conducted, including extended flora survey to establish a robust flora baseline for the Subsidence Impact Limit.
- The Biodiversity Offset Strategy for threatened species is revised to ensure it addresses the current Policy and that currently proposed offsets for fauna habitats are reviewed for suitability.

Mine Design and Layout

- Internal haulage routes are confirmed to allow assessment of potential impacts of heavy vehicle movement.

Stakeholder Engagement

- A robust Stakeholder Engagement Plan is developed that is inclusive of commitments to ongoing consultation and a structured grievance procedure.

Rehabilitation and Closure

- A comprehensive Rehabilitation and Closure Plan is prepared.

Risk Assessment and Cost Benefit Analysis

- The Risk Assessment and Cost Benefit Analysis are reviewed and revised based on detailed findings of further recommended work.

Disaster Risk Management

- A Disaster Risk Management Plan is developed to cover natural and human-induced emergencies associated with the Project. This Plan should be inclusive of specific Contingency

Plans to manage particular events, including the management / treatment of the Mine Operations Dam (MOD) and spontaneous combustion.

Community Health and Safety

- The Community Health and Safety assessment is reviewed and revised based on the findings of the further work recommended.
- Potential impacts upon the Buttonderry Waste Management Facility associated with the development of the Project are fully considered.

Management, Monitoring and Reporting

- Management and Monitoring Plans are prepared for each aspect of assessment prior to commencement of the Construction phase to clearly outline how impacts will be mitigated and managed.
- An independent expert is commissioned by the Proponent to conduct Environmental Audits of the project on a regular basis throughout the project life cycle.
- An Environmental Management System based on ISO14001:2004 'Environmental management systems -- Requirements with guidance for use' is developed and implemented for the Project.

Additional specific recommendations are provided throughout the text.

Contents

Executive Summary	3
Recommendations	7
1 Introduction	13
1.1 Background	13
1.2 Objectives and Scope	14
1.2.1 Purpose	14
1.2.2 Aims and Objectives	14
1.3 Project Overview	14
1.3.1 Project Location	14
1.3.2 Project Setting	15
1.3.3 Project Description	16
1.3.4 Project Planning History	21
2 Review Method	23
2.1.1 Literature Review	23
2.1.2 Statutory Compliance	23
2.1.3 Australian Standards and Guidelines	23
2.1.4 International Standards and Guidelines	24
3 EIS Structure and Approach	25
3.1 Environmental Planning and Assessment Regulations	25
3.2 Project Description	25
3.3 Environmental Planning Instruments	26
3.4 Risk Assessment	29
3.4.1 2010 Risk Assessment	29
3.4.2 2013 Risk Assessment	29
3.5 Commonwealth Government Requirements	30
3.6 Plans and Documents	31
3.7 Potential Impacts Beyond Director General Requirements	32
3.8 Coal Alternatives and Markets	32
3.9 Project Design Alternatives	33
3.10 Project Schedule	33
3.11 Environmental Management System	34
3.12 Monitoring and Reporting	34
3.13 Regular Independent Environmental Auditing	34
4 Water Quality	36
4.1 Context	36
4.1.1 Reasons for Refusal 2010	36

4.1.2	New Director Generals Requirements	36
4.1.3	Earth Systems Recommendations 2010	37
4.1.4	New Regulatory Requirements	37
4.2	2013 EIS	39
4.3	Key Issues	39
4.4	Conclusions and Recommendations.....	41
5	Air Quality	43
5.1	Context.....	43
5.1.1	Reasons for Refusal 2010	44
5.1.2	New Director Generals Requirements	44
5.1.3	New Regulatory Requirements	45
5.2	2013 EIS	45
5.3	Key Issues	45
5.4	Conclusions and Recommendations.....	49
6	Greenhouse Gases	50
6.1	Context.....	50
6.1.1	Reasons for Refusal 2010	50
6.1.2	New Director General's Requirements	50
6.1.3	New Regulatory Requirements	51
6.2	2013 EIS	51
6.2.1	Quantification of Greenhouse Gas Emissions	51
6.2.2	Impact of Greenhouse Gas Emissions.....	51
6.2.3	Greenhouse Gas Mitigation and Management.....	52
6.3	Key Issues	52
6.4	Conclusions and Recommendations.....	53
7	Ecology	54
7.1	Context.....	54
7.1.1	Reasons for Refusal 2010	54
7.1.2	New Director General's Requirements	54
7.1.3	Earth Systems Recommendations 2010	56
7.1.4	New Regulatory Requirements	56
7.2	2013 EIS	57
7.2.1	Terrestrial Biodiversity	57
7.2.2	Aquatic Biodiversity	58
7.3	Key Issues	59
7.4	Conclusions and Recommendations.....	61
8	Noise and Vibration	63

8.1	Context.....	63
8.1.1	Reasons for Refusal 2010	63
8.1.2	New Director Generals Requirements	63
8.1.3	Earth Systems Review 2010.....	64
8.1.4	New Regulatory Requirements	64
8.2	2013 EIS	64
8.3	Key Issues	65
8.4	Conclusions and Recommendations.....	66
9	Visual Amenity	68
9.1	Context.....	68
9.1.1	Reasons for Refusal 2010	68
9.1.2	New Director General's Requirements.....	68
9.1.3	Earth Systems Recommendations 2010	68
9.1.4	New Regulatory Requirements	68
9.2	2013 EIS	68
9.3	Key Issues	69
9.4	Conclusions and Recommendations.....	70
10	Traffic and Transport	71
10.1	Context.....	71
10.1.1	Reasons for Refusal 2010	71
10.1.2	New Director General's Requirements.....	71
10.1.3	Earth Systems Recommendations 2010	71
10.1.4	New Regulatory Requirements	71
10.2	2013 EIS	72
10.2.1	Traffic and Transport.....	72
10.2.2	Rail Study.....	72
10.3	Key Issues	72
10.4	Conclusions and Recommendations.....	74
11	Archaeology and Heritage.....	76
11.1	Context.....	76
11.1.1	Reasons for Refusal 2010	76
11.1.2	New Director General's Requirements.....	76
11.1.3	Earth Systems Recommendations 2010	77
11.1.4	New Regulatory Requirements	77
11.2	2013 EIS	77
11.3	Key Issues	78
11.4	Conclusions and Recommendations.....	79

12	Socio-Economic Planning	80
12.1	Context.....	80
12.1.1	Reasons for Refusal 2010.....	80
12.1.2	New Director General's Requirements.....	80
12.1.3	New Regulatory Requirements	80
12.2	2013 EIS	80
12.3	Key Issues	81
12.4	Conclusions and Recommendations.....	82
13	Benefit Cost Analysis	83
13.1	Context.....	83
13.1.1	Reasons for Refusal 2010.....	83
13.1.2	New Director General's Requirements.....	83
13.1.3	Earth Systems Recommendations 2010	83
13.1.4	New Regulatory Requirements	83
13.2	2013 EIS	83
13.3	Key Issues	83
13.4	Conclusions and Recommendations.....	84
14	Stakeholder Engagement	86
14.1	Context.....	86
14.1.1	Reasons for Refusal 2010.....	86
14.1.2	New Director General's Requirements.....	86
14.1.3	Earth Systems Recommendations 2010	86
14.1.4	New Regulatory Requirements	86
14.2	2013 EIS	87
14.3	Key Issues	87
14.4	Conclusions and Recommendations.....	88
15	Prioritised Measures to Address Areas of Uncertainty	90
16	References.....	92

1 Introduction

1.1 Background

Earth Systems was commissioned in May 2013 by the Wyong Shire Council (WSC) to conduct an independent review of the Wallarah 2 Coal Project EIS (excluding ground and surface water hydrology, Flooding and Subsidence Impacts). The review is being conducted as part of the WSC's reviewing of the 2013 EIS.

The Wyong Areas Coal Joint Venture (WACJV) proposes to develop an underground coal mine known as the Wallarah 2 Coal Project (W2CP) (herein referred to as the Project), which would extract coal from beneath the Dooralong and Yarramalong Valleys in Wyong Shire, New South Wales using longwall mining techniques.

WACJV (the Proponent) prepared an Environmental Assessment (EA) for the Project in 2010 (referred to as the 2010 EIS), which was submitted to the Director-General of the NSW Department of Planning (DoP) for assessment and approval under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). As part of the assessment process, the EA was placed on public exhibition from 31 March to 2 June 2010. During the public exhibition period any person (including a public authority) may make a written submission to the Director-General concerning the Project.

The development application for the Project was refused on March 3rd, 2011 by the Minister for Planning. In November 2011, Wyong Areas Coal Joint Ventures lodged a new application for development consent of a mining lease.

In January 2012 the NSW Government issued new Director General's Requirements (DGRs) for the Project (referred to herein as the 'New DGRs') that outline key issues requiring comprehensive evaluation during the environmental assessment for Project approval. The New DGRs are supplementary requirements and do not rescind obligations set for in the original DGRs for the Project, (provided 10 August 2009).

An additional supplement to the DGRs was issued by the NSW Government on 11 July 2012 (Supplementary DGRs). The Supplementary DGRs focus on the assessment of potential Project-related impacts on biodiversity, reinforcing Project obligations under the Environmental Protection and Biodiversity Conservation Act 1999 and the Environmental Protection and Biodiversity Conservation Regulations 2000. These include provisions that are summarised as follows:

- Descriptions of the controlled action;
- Descriptions of the existing environment;
- Descriptions of relevant impacts of the controlled action;
- Proposed safeguards and mitigation measures;
- Offsets; and
- Other approvals and conditions.

The Project Proponent has prepared a second Draft EIS, completed in April 2013 (herein the 2013 EIS). This report was prepared to meet the regulatory and legislative requirements of EIS in NSW, address the issues identified in the 2010 EIS refusal and to meet the original and supplementary Director General Requirements.

WSC has engaged Earth Systems to independently review and evaluate the 2013 EIS and to provide recommendations to assist the Council in ensuring Project fulfilment of environmental and planning obligations. The findings of this report will be forwarded to the Director-General as part of WSC's overall submission to the EIS.

1.2 Objectives and Scope

1.2.1 Purpose

This Report intends to provide an independent and objective review of the 2013 EIS to identify whether the relevant environmental, mining and planning issues have been appropriately investigated and assessed; whether all of the Director General Requirements have been met; and whether the shortcomings of the 2010 EIS, identified by the Minister for Planning, have been adequately addressed.

1.2.2 Aims and Objectives

The aims and objectives of the Report are to:

- Determine if the EIS achieves statutory compliance with all relevant legislation, policies and plans;
- Confirm that the EIS adequately addresses the Director-General's Environmental Assessment Requirements;
- Confirm that the EIS adequately addresses key issues identified by the Minister for Planning in the Project Refusal dated March 3rd 2011.
- Determine if the EIS has been prepared in a manner consistent with Australian and International standards and best practice guidelines.
- Confirm whether the EIS provides a comprehensive and technically robust assessment of potential impacts from the Project;
- Identify any potential important aspects or issues that have not been fully and adequately investigated and assessed; and
- Identify areas of uncertainty and further investigations and assessments required prior to Project determination and/or during the construction, operation and closure stages of the Project.

1.3 Project Overview

1.3.1 Project Location

The Project is located approximately 9 km to the northwest of Wyong township in New South Wales (refer to Figure 1-1). The proposed mining area is located wholly within the declared Wyong Mine Subsidence District and the Hue Hue Mine Subsidence District which together extend west of the F3 (Sydney – Newcastle) Freeway.



Figure 1-1 Project Location (Source: Hansen Bailey, 2013)

Two primary surface facilities are proposed for the Project. The main coal handling and rail loading facility is referred to as the Tooheys Road Site and would be located adjacent the northeast corner of the F3 Freeway and the Motorway Link Road intersection. The Buttonderry Site would include ventilation shafts, office and employee facilities and be located to the south of the Buttonderry Waste Disposal Facility off Hue Hue Road. The majority of the underground extraction area lies beneath the Yarramalong and Dooralong Valleys and Wyong State Forest.

1.3.2 Project Setting

Key land uses within the Project Application Area range from light industrial, commercial and housing developments to small townships and small farms. The western area features heavily timbered hills, most

of which are in State Forests. Agricultural land uses in the proposed subsidence area include horticultural activities concentrated in the floodplains such as turf farming, market gardens, nurseries and orchards on the foot slopes. Further up the valleys extensive grazing predominates in the narrowing floodplain.

The Tooheys Road Site is located between the F3 Freeway and an active clay quarry and tile factory. The Buttonderry Site is situated adjacent to the Wyong Employment Zone (WEZ) and the Buttonderry Waste Management Facility. The Warner Industrial Park and Warnervale Aerodrome are located southeast of the Buttonderry Site. The proposed Warnervale Town Centre (WTC) is located southeast of the Project sites. Blue Haven residential area is located approximately 3 km to the north east of the Tooheys Road Site. A sewage treatment plant is located approximately 2 km to the south east of the Tooheys Road Site. Figure 1-2 shows the two surface facilities and the surrounding land uses.

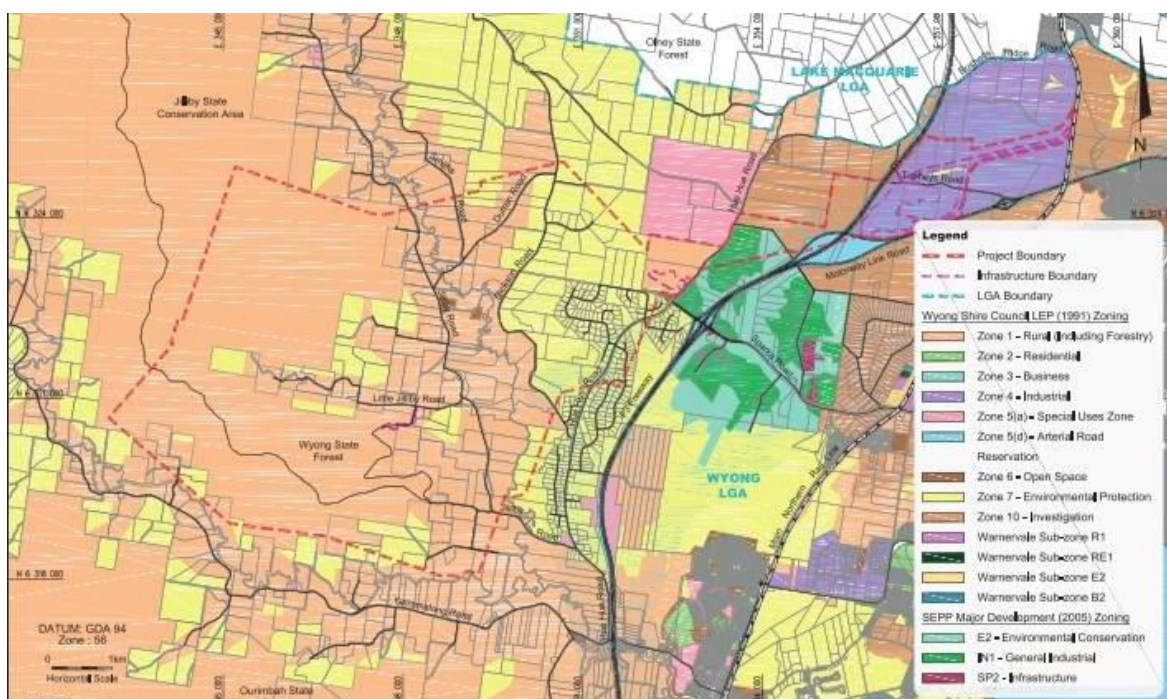


Figure 1-2 Surface Facilities and Surrounding Land Uses (Source: Hansen Bailey, 2013)

The Jilliby State Conservation Area and Wyong State Forest are located to the west of the Project area. Jilliby Creek flows south eastward to merge with the Wyong River which feeds Tuggerah Lake. Wallarah Creek flows through the Tooheys Road Site to Budgewoi Lake.

Major transport routes near the Project area include the F3 Freeway, Motorway Link Road and the Main Northern Railway Line.

1.3.3 Project Description

The Proponent proposes to extract of up to 5 million tonnes per annum of run-of-mine (ROM) coal from the Wallarah-Great Northern Coal Seam for a period of 42 years using longwall mining methods. The key components of the Project are summarised

Table 1.1 and depicted in Figure 1-3 and Figure 1-4. The Project is described in full in Chapter 3 of the EA.

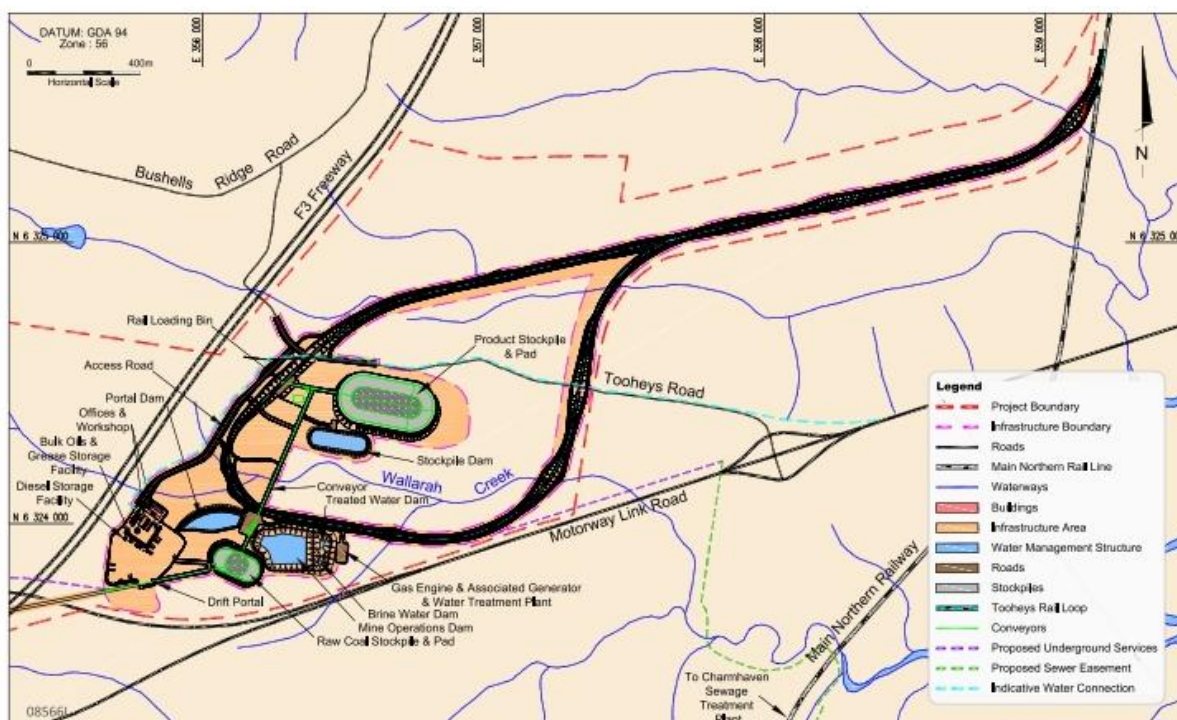


Figure 1-3 Tooheys Road Site (Source: Hansen Bailey, 2013)

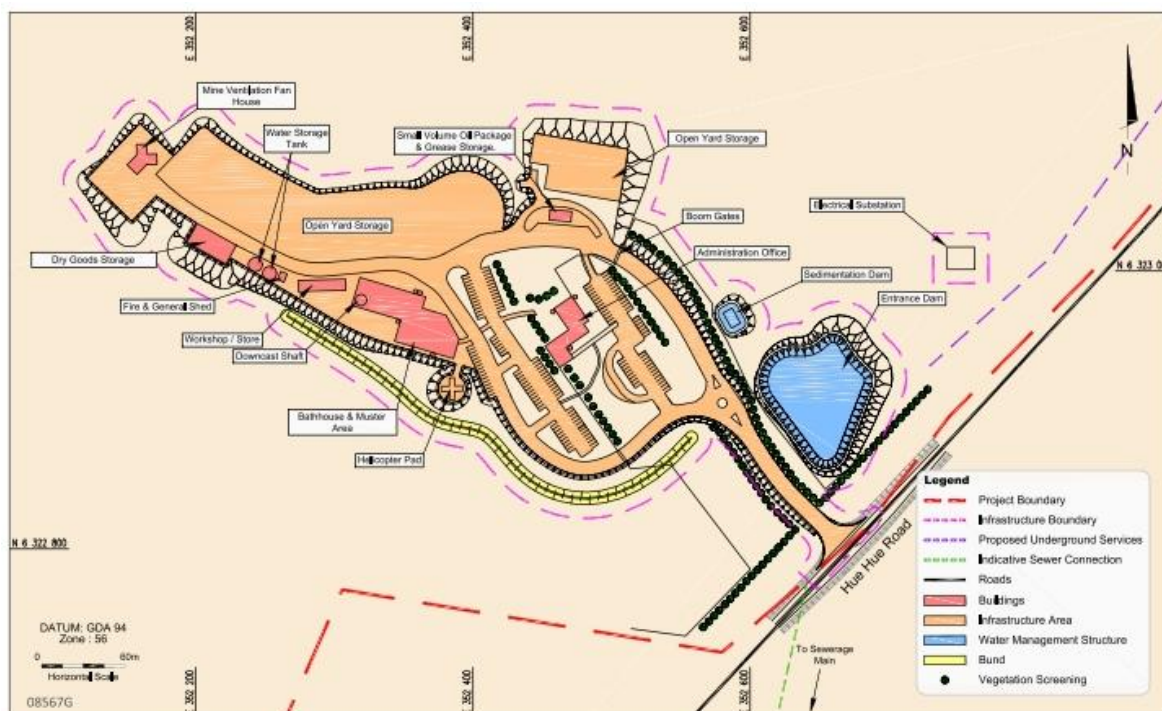


Figure 1-4 Buttonderry Site (Hansen Bailey, 2013)

Table 1.1 Key Components of the Project

Aspect	Description
Project Footprint	<p>Tooheys Road Site</p> <p>This site is on Proponent owned and leasehold land and would provide the main coal processing and handling facilities, coal stockpiling and</p>

	<p>train loading facilities and include:</p> <ul style="list-style-type: none"> o A 6 km long rail spur and loop with two rail overbridges over Tooheys Road and coal loading infrastructure to transport coal from mine to Newcastle; o A coal handling plant (CHP) providing crushing, screening and storage facilities and coal stockpiles; o Mine access drift and portal; o Gas extraction and treatment plant; o Mine operations pre-treatment water storage dam and surface runoff settling ponds; o Mine water treatment plant (saline water to be treated by a reverse osmosis desalination plant); o Surface water management systems and sewage treatment facilities; o Environmental monitoring station; o Administration offices for up to 40 staff (only 20 staff required on average day); and o Car parking facilities. <p>Buttonderry Site</p> <p>This site is on Proponent owned land and would be the main site for mine employees and include:</p> <ul style="list-style-type: none"> o Ventilation and employee/materials access shafts; o Administration offices for 40 staff; o Bathhouse for 140 people; o Car parking facilities for 150 cars; o Surface water management systems and sewage treatment facilities; o Emergency services helicopter landing area; o Environmental monitoring station; o Electrical switchyard, hardstand and pollution control facilities. <p>A second western shaft site would be required by Mining Year 10 and would be located in Wyong State Forest.</p>
Mining and Reserves	<ul style="list-style-type: none"> o The Project is based on a coal reserve of approximately 151 million tonnes of ROM export quality thermal coal from the Wallarah-Great Northern Coal Seam. o The underground mining operations would use longwall mining methods at a depth of between approximately 345 m and 690 m below the surface. Longwall panel widths vary from 120 m to 250 m and extraction height ranges from 3.5 m to 4.5 m.
Coal Processing	<ul style="list-style-type: none"> o Coal would undergo minimal processing with no traditional coal preparation plant or washery required. The coal would be sized by a crusher and screened in the CHP. o Depending on the presence of minor faulting with the seam or other geological conditions that may be encountered, deshaling (a dry screening process) may be required to remove non-coal materials (waste rock).
Project Life	42 years (initial planning approval sought for 28 years)

Hours of Operation	24 hours per day 7 days per week. Shut downs may occur from time to time to allow for major equipment upgrades, repairs and maintenance.
Direct Employment	<ul style="list-style-type: none"> ○ Approximately 3,000 jobs would be created on Central Coast over the life of the Project's three year construction phase. ○ In first year of operation, the Project would generate approximately 250 jobs on the Central Coast, which would increase to 300 jobs at full production.
Access Roads	<ul style="list-style-type: none"> ○ Buttonderry site accessed from Hue Hue Road via a sealed internal road. ○ Tooheys Road site accessed from Tooheys Road, which would be slightly realigned and upgraded.
Product Coal Transport	<ul style="list-style-type: none"> ○ The majority of the thermal product coal would be railed via the Main Northern Railway to Newcastle Port for export. ○ At peak production, an average of five to six trains would be loaded every 24 hours. ○ From time to time, domestic coal trains would deliver coal to local power stations on the Central Coast.
Water Demand and Supply	<p>Water demand would vary at the two surface facility sites.</p> <p>Buttonderry Site</p> <ul style="list-style-type: none"> ○ A 10 ML Entrance Road Dam and local area site stormwater drainage system would be built to ensure sufficient water is available for use during construction. ○ Once operational, water self-sufficiency will be achieved during normal climatic conditions by harvesting clean storm water from the site for storage in the Entrance Road Dam, or directly collected from the roofs of buildings into Potable Water Storage Tanks. ○ An on-site water treatment plant would draw water from the dam and provide potable quality water for domestic consumption during drier periods when roof storm water harvesting is insufficient to meet demand. ○ During a drought period exceeding two months, it is expected that potable quality water will have to be imported. <p>Tooheys Road Site</p> <ul style="list-style-type: none"> ○ Three dams (120 ML Operations Dam, 3 ML Stockpile Dam, 3 ML Portal Dam) and site stormwater drainage system would be built to retain all dirty water runoff and ensure sufficient water is available for use during construction and eventually for mining production operations. ○ Once operational, an onsite water treatment plant would draw water from the Mine Operations Dam and provide potable quality water for domestic consumption, dust suppression and underground longwall operating requirements. ○ The site would be in water deficit during the first production year due to water demand for underground mining operations. Potable water and sewage treatment plant recycled water would be sourced from external suppliers. ○ This deficit would progressively reduce over the next five production years as mine seepage water make from underground increases as

	<p>mining progresses.</p>
Coal Stockpiles	<ul style="list-style-type: none"> ○ Coal stockpiles would only be located at the Tooheys Road Site. ○ The main product coal stockpile would have a capacity of 250,000 t. The coal would be delivered by a 2,000 t/h overhead tripper conveyor. ○ The tunnel reclaim system under the product stockpile would feed a 4,500 t/h train loading system including a loading bin of approximately 250 tonnes. ○ Automated wind-activated watering systems for dust control.
Waste Products	<ul style="list-style-type: none"> ○ The Project has a zero coal rejects target. ○ Due to the absence of a washery, coal processing would not produce stony rejects or silty tailings; hence no tailings dams are required. ○ During the construction of the mine drift and shafts, approximately 180,000 m³ of excavated waste rock would be used at the two sites for perimeter bunding and landscaping. ○ Once operational, deshaling would produce approximately one truck load of waste rock per day which would be transported off site on an "as needs" basis to Buttonderry Waste Management Facility or another nearby licensed facility.
Gas Extraction and Utilisation	<ul style="list-style-type: none"> ○ Gas content is generally restricted to the coal seam and consists of greater than 95% methane. ○ Collected gas would be brought to the surface at the Tooheys Road Site for processing. ○ In the initial years of operation it is unlikely that sufficient quantities of gas would be produced to allow commercialisation of the resource. The collected gas would be flared during this time. ○ Future gas management and utilisation options would be evaluated in consultation with WSC and other stakeholders. One option could involve generating electricity on-site to power the desalinisation plant.
Site Rehabilitation and Vegetation Offsets	<ul style="list-style-type: none"> ○ Conceptual rehabilitation program outlines basic rehabilitation options and activities. ○ The primary objective of the rehabilitation program is to produce final stable landforms at each of the three Project infrastructure sites, consistent with surrounding topographic features and suitable for the proposed future land use: <ul style="list-style-type: none"> ○ The Tooheys Road Site would be rehabilitated to create a stable and non-polluting landform that is suitable for ongoing use as an industrial site. ○ The Buttonderry Site and Western Shaft Site would be rehabilitated to create a stable, non-polluting landform with self-sustaining vegetation to improve conservation values of the area. ○ Completion criteria for each stage of the rehabilitation program would be developed and refined through the Rehabilitation and Environmental Management Plan, which would be developed in consultation with key stakeholders after planning approval and a mining lease have been granted. ○ Rehabilitation activities to be undertaken in the mining area would be

	limited to works required to repair any subsidence related damage. o Ecological offset strategy proposed involves planting 50 ha of native vegetation on Proponent owned land to compensate for loss of approximately 22 ha of native vegetation as a result of the Project.
Economic Benefits	o \$600 million total potential expenditure in the Central Coast economy from the three years of the mine's construction o Ongoing direct expenditure and flow-on effects to the local economy in the order of \$200 million per annum. o Over \$1 billion in total revenue to Government over life of Project.
Community Contributions	o The Project would implement a Community Enhancement Program (CEP) funded by the Proponent comprising contributions in cash and in-kind. o Specific works and actions to benefit the local community directly would cover four main elements: <ul style="list-style-type: none"> o Community Trust Projects o Local Environment and Biodiversity Management o Work-Ready and Training Development o Community Infrastructure
Capital Value	\$1.4 billion (over life of Project)

1.3.4 Project Planning History

The Proponent has been exploring the Wyong Coal Development Areas under licence of the NSW Government since 1995. Exploration, mine planning, community consultation and environmental investigations have subsequently been ongoing for proposed Project development.

In November 2006, the Proponent lodged a Preliminary Assessment Report and Project Application with the Director-General of the Department of Planning (DoP). Accordingly, the DoP informed the Proponent of the Minister for Planning's confirmation that the Project is required to be assessed under Part 3A of the EP&A Act.

On 5 February 2007, prior to the issue of the Director-General's Environmental Assessment Requirements for the Project, the Minister for Planning announced an independent strategic inquiry into the *Impacts of Potential Underground Coal Mining in the Wyong Local Government Area* (referred to as the Wyong Inquiry). An Independent Expert Panel was appointed to conduct the inquiry which considered the issues related to potential coal mine developments in sensitive areas within the Wyong Local Government Area (LGA), including the Dooralong and Yarramalong Valleys.

Submissions were made to the Expert Panel from a host of potential stakeholders, including WSC and other Government agencies, interest groups and the coal mining industry. In addition, there were 66 individual submissions from the community and 237 form letters. The final report of the Inquiry was publicly released in December 2008.

An Independent Expert Panel was also appointed to conduct an independent *Strategic Inquiry into Underground Coal Mining in Southern Coalfield*. The final report of the Inquiry was publicly released in July 2008.

Following the two Inquiries, the Director-General issued the Environmental Assessment Requirements for the Project (DGRs) to the Proponent on 10 August 2009. The DGRs were prepared in accordance with the recommendations of the Inquiries; issues raised in public submissions and specific environmental

assessment requirements of relevant Government agencies, including WSC's requirements submitted to the DoP in June 2006. The Environmental Assessment Requirements only considered the findings from the Southern Coalfield Inquiry that were relevant to mining in the Wyong LGA.

The Proponent then prepared an EA (herein referred to as the 2010 EIS) and submitted it to the Director-General, who determined that the EIS adequately addressed the Environmental Assessment Requirements and made the submittal publicly available. Earth Systems was initially engaged to conduct an independent review of the 2010 EIS. The WSC subsequently provided written submission to the Director-General concerning the Project in the form of Earth Systems' 2010 Review of the EIS.

On the 3rd of March 2011, the Project application was refused by the Minister for Planning under Section 75J of the *Environmental Planning and Assessment Act 1979*. The Project Refusal provided the following reasoning:

"The reasons for refusal of the project application are as follows:

- Uncertainty around the subsidence predictions for the project, particularly in the western portion of the site under Jilliby Conservation Area and the Wyong State Forest;*
- The project does not adequately address potential surface water quality impacts, resulting in uncertainty around the ability of the project to meet acceptable water quality outcomes;*
- Uncertainty around the ecological impacts of the project, particularly in the western portion of the site, as a result of a lack of ecological survey effort combined with uncertainty as to subsidence predictions in this area.*
- Uncertainty around the heritage impacts of the project, particularly in the western portion of the site, as a result of a lack of heritage survey effort combined with uncertainty as to subsidence predictions in this area.*
- In light of the above, the project is not considered consistent with the principles of ecologically sustainable development, including the precautionary principle, and as a consequence is not considered to be in the public interest."*

2 Review Method

This Report was undertaken to review and evaluate the 2013 EIS and technical appendices for the proposed Wallarah 2 Coal Mining Project to determine whether the 2013 EIS fulfilled applicable regulatory and legislative requirements and to ascertain whether the Proponent had adequately addressed the shortcomings of the 2010 EIS. To ensure a comprehensive review, Earth Systems undertook the following steps:

1. Review of the 2013 EIS Main Report and Technical Appendices;
2. Review of the Project Refusal Document from the NSW Minister for Planning;
3. Review of 2013 EIS for compliance with each of the Director General Requirements (10 August, 2009), new DGR's (12 January, 2012) and supplementary DGRs (11 July, 2012);
4. Review of the EIS against *Department of Sustainability, Environment, Water, Population and Communities* (SEWPaC) requirements with consideration of relevant Australian standards and guidelines; and
5. Attend briefing meeting by the Proponent and WSC in June 2013.

2.1.1 Literature Review

The following key documents were reviewed during the preparation of this Report:

- *Walarah 2 Coal Project Environmental Assessment: Volumes 1 to 6 (2013)* and technical appendices;
- *Walarah 2 Coal Project Environmental Assessment: Volumes 1 to 4 (2010)* and technical appendices;
- *Director-General's Environmental Assessment Requirements (January 2012) and Supplement to the Director-General's Requirements (July 2012)* ;
- All relevant Federal and State legislation, policies and plans;
- Relevant environmental, sustainability and environmental impact assessment (EIA) standards and best practice guidelines; and
- Wyong Shire Council Brief and Correspondence.

2.1.2 Statutory Compliance

An important objective of this review is to ensure that the EIS clearly demonstrates that the Project complies with all relevant Federal and State legislative requirements with respect to mining, planning and environmental impact assessment. The review considers whether the EIS adequately addresses the relevant provisions of State, Regional and Local policies and plans and new or updated regulatory requirements that may now apply subsequent to the original submission of the EIS in 2010.

The review has been undertaken to confirm that the EIS adequately addresses the Director-General's Environmental Assessment Requirements, supplementary DGRs and SEWPaC environmental assessment requirements.

2.1.3 Australian Standards and Guidelines

The review assesses the EIS in accordance with current Australian environmental, sustainability and EIS standards and best practice guidelines. The review considers the methodologies, procedures and

requirements provided in *Coal Mines and Associated Infrastructure: EIS Guidelines* by NSW Department of Urban Affairs and Planning (DUAP, 2000).

The review of the EIS also considers the principles set out in *Enduring Value - the Australian Minerals Industry Framework for Sustainable Development* by the Mineral Council of Australia (MCA, 2005). The framework aligns with global industry initiatives and provides critical guidance on the International Council on Mining and Metals (ICMM) *Sustainable Development Framework Principles* and their progressive application and implementation at the operational level. It also builds on the Australian *Minerals Industry Code for Environmental Management* - the platform for industry's continual improvement in managing environmental issues following its introduction in 1996. The purpose of the framework is to assist the mining companies to operate in a manner that addresses expectations of the community and which seeks to maximise the long-term benefits to society that can be achieved through the effective management of Australia's natural resources.

Additional legislation or guidelines have been developed by NSW since the initial EIS submission to the Director General in 2010. As such the 2013 EIS is subject to the following additional State requirements:

- Nature Conservation Trust Amendment Act 2010
- Protection of the Environment Operations Amendment (Environmental Monitoring) Act 2010
- National Parks and Wildlife Amendment (Aboriginal Places and Aboriginal Objects) (2010)
- Threatened Species Conservation Amendment (Biodiversity Certification) Act 2010
- National Parks and Wildlife Amendment Regulation 2010
- Threatened Species Conservation Amendment Regulation 2010
- Protection of the Environment Operations (General) Amendment (Pollution Incident Response Management Plans) Regulation 2012
- NSW Guideline for the use of Cost Benefit Analysis in Mining and Coal Seam Gas Proposals (2012)

2.1.4 International Standards and Guidelines

The review also determines if the EIS has been conducted in a manner consistent with International environmental, sustainability and EIA standards and best practice guidelines. The aim of this aspect of the review is to establish whether the Project meets International standards and guidelines.

The review of the EIS considers the principles, findings and recommendations outlined in the following guidelines, among others:

- *Principles of Environmental Impact Assessment Best Practice* by International Association for Impact Assessment (IAIA) (1999);
- *Environmental Impact Assessment Regulations and Strategic Environmental Assessment Requirements: Practices and Lessons Learned in East and Southeast Asia* by World Bank (2006); and
- *Sustainable Development Framework Principles* by ICMM (2003).

3 EIS Structure and Approach

3.1 Environmental Planning and Assessment Regulations

This section addresses the following Director General Environmental Assessment Requirement:

The Environmental Impact Statement (EIS) for the development must meet the form and content requirements in Clauses 6 and 7 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

Clause 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* are provided in Appendix A.

Key findings of the review, with respect to the above requirement, are summarised below:

- The form and content requirements of the EIS are in general met with respect to Clause 6, with the requirements of each sub-clause being specifically referred to in the EIS Main Report.
- The four principles of ecologically sustainable development have been addressed in Section 9.7 of the EIS Main Report (Clause 7, Sub-Clause 4).
- Clause 6, Sub-Clause 1 requires a full description of the “*likely impact on the environment*” and the “*measures proposed to mitigate any adverse effects of the development*”. For some aspects of the EIS this sub-clause has been met, however, the level of detail and extent to which impacts are assessed and mitigation measures are developed in the EIS is not considered sufficient in many instances, particularly with respect to development of management and mitigation measures. Specific examples of these deficiencies are detailed in this report.

3.2 Project Description

This section addresses the following Director General Environmental Assessment Requirement:

The EIS must include a detailed description of the development including:

- Need for the proposed development.
- Justification of the proposed mine plan, including efficiency of coal resource recovery, mine safety, and environmental protection.
- Likely staging of development, including construction, operational and rehabilitation stages.
- Likely interactions between the development and existing, approved and proposed mining operations in the vicinity of the site.
- Plans of any proposed building works.

Key findings of the review, with respect to the above requirement, are summarised below:

- A description of the Project is provided Section 3 and justification for the project in Section 9 of the EIS Main Report.
- The justification of the proposed mine and the efficiency of coal resource recovery are articulated in the Section 9 and the alternatives analysis of Section 3.
- Section 3 of the EIS provides a framework for the timing of construction, which is proposed for approximately three years for facilities and infrastructure, with underground construction occurring throughout the operational life of the mine. The construction and operations phases of the Project would occur for an estimated 28 years.

The framework for rehabilitation and closure is summarised in Section 7.25. A preliminary closure plan has not been developed. Section 7.25 provides principles and rehabilitation objectives. Some conceptual rehabilitation strategies are also provided in Appendices O, G, H and X. However, at this stage, there are few commitments provided. Many of the impact assessments do not specify measures undertaken for closure (e.g. surface water quality and groundwater quality and air quality, amongst others).

3.3 Environmental Planning Instruments

This section addresses the following Director General Environmental Assessment Requirement:

The EIS must include consideration of all relevant environmental planning instruments, including identification and justification of any inconsistencies with these instruments.

Environmental planning instruments include State Environmental Planning Policies (SEPPs) and Local Environmental Plans (LEPs) that regulate land use and development. For the purposes of this review, higher level federal and state regulatory requirements have also been considered.

Key findings of the review, with respect to the above requirement, are summarised below:

- In general, this aspect appears to be addressed reasonably well in the EIS Main Report Chapter 4.
- The following federal and state legislation relevant to the assessment and approval of mining projects have been referenced in the EIS:

Federal legislation

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act, administered by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities)
- *Native Title Act 1993* (administered through the Commonwealth Native Title Act 1993).

NSW State legislation

- *Environmental Planning and Assessment Act 1979* (administered by the NSW Department of Planning & Infrastructure) – *The EP&A Act is the principal piece of legislation regulating the assessment, approval and operation of mining projects. If approval is granted by the Minister, it is the primary approval instrument with which most other approvals must be consistent.*
- *Environmental Planning and Assessment Amendment Act 2008 No 36.*

- *Mining Act 1992 (administered by the Department of Trade & Investment) – Mining leases are granted by DTIRIS under the Mining Act.*
- *Protection of the Environment Operations Act 1997 (administered by the NSW Office of Environment & Heritage) – The main objectives of the POEO Act are to protect, restore and enhance the quality of the environment in NSW through pollution prevention and cleaner production, the reduction of harmful discharges and wastes, the reduction in the use of materials and improved re-use, recovery and recycling of materials.*
- *Threatened Species Conservation Act 1995 (Administered by the NSW Office of Environment & Heritage).*
- *National Parks and Wildlife Act 1974 (Administered by the NSW Office of Environment & Heritage).*
- *Heritage Act 1977 (Administered by the NSW Department of Planning & Infrastructure).*
- *Water Management Act 2000 and Water Act 1912 (Administered by the NSW Office of Water).*
- *Dams Safety Act 1978 (Administered by the Dams Safety Committee).*
- *Coal Mine Health and Safety Act 2002 (Administered by the Department of Trade & Investment).*
- *Pipelines Act 1967 (Administered by the Department of Trade & Investment).*
- *Native Vegetation Act 2003 (Administered by the NSW Office of Environment & Heritage).*

NSW State Environmental Planning Policies (SEPPs)

- *State Environmental Planning Policy No 33—Hazardous and Offensive Development (1992-129).*
- *State Environmental Planning Policy No 44—Koala Habitat Protection (1995-5).*
- *State Environmental Planning Policy No 55—Remediation of Land (1998-520).*
- *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (2007-65).*
- *State Environmental Planning Policy (State and Regional Development) 2011 (2011-511).*

Local Environmental Plans (LEPs)

- *Wyong Local Environmental Plan 1991 (Wyong LEP 1991)*
- *Draft Wyong Local Environmental Plan (LEP) 2012*

Other Relevant Policies

- *The Draft Aquifer Interference Policy (2012) – Stage 1 has also been released. This policy sets out the proposed regulation of aquifer interference activities, including those associated with coal and CSG mining and exploration.*
- While the main state and federal legislation involved in the regulation of mining project assessments is referred to in the EIS (as listed above) the following key documents were not cited or considered in the EIS:

EPBC Act 1999 - Environmental Offsets Policy

- *On 3rd October 2012 the Government released the national EPBC Act Environmental Offsets Policy, and this applies to any new referrals and variations to approval conditions*

from 2nd October 2012. It also applies to any projects currently under assessment for which a proposed decision has not yet been made.

- This is an important consideration for the Watermark Project, given the substantial offset areas expected to be required and significant changes introduced in the new policy (see Section 7).

EPBC Act Amendment Bill 2013 - 'Water Trigger' Amendment

- On 13 March 2013 this Bill was introduced into the House of Representatives to amend the EPBC Act 1999 to include 'water resources' as a new matter of national environmental significance (NES) for large coal mining and coal seam gas projects.
- The Bill passed the House of Representatives on 21st March 2013 and was referred (as of 15th April 2013) to the Senate Environment and Communications Legislative Committee. On the 19th June 2013, the Bill passed the Senate, meaning that the Commonwealth is now responsible for ensuring water systems are not impacted by major coal seam gas and coal mining projects. The Bill is awaiting assent by the Governor-General. The changes will commence the day after assent.
- Although the Amendment post-dates the Wallarah 2 Coal Project EIS submission, it would apply to any developments (such as this Project) that are currently referred for a decision that is in the approval process, where the Independent Expert Scientific Committee has not yet given advice.

Further information regarding this amendment is detailed in Section 4.1.4 of the Report.

Mining Regulation 2010 (under the Mining Act 1992)

- The amendments to the Mining Act 1992 and new Mining Regulation 2010 improve environmental regulation of the mining industry by:
 - Expanding the Government's powers to regulate mining activities, to ensure sound environmental and rehabilitation outcomes.
 - Introducing audit powers to promote compliance.
 - Requiring a rehabilitation cost estimate and disclosure of an applicant's environmental performance record in certain applications for authorisations.
 - Enabling consistency of approach with other environmental regulators.

Nature Conservation Trust Act 2001

- Nature Conservation Trust Amendment Act 2010.

Protection of the Environment Operations Act 1997

- Protection of the Environment Operations Amendment (Environmental Monitoring) Act 2010 No 85.
- Protection of the Environment Operations (General) Amendment (Pollution Incident Response Management Plans) Regulation 2012.
- A number of key regulatory requirements under the Exploration License EL 7223 were documented in Section 2.5.1 (Exploration) but omitted from Section 4 (Regulatory Framework). This includes a number of special conditions that were added to EL 7223 in January 2012. Of particular note is the requirement in EL 7223 that "any development approval sought by the licence holder within the initial term of the licence or during any extensions or renewals of the licence shall not include any of the following activities in the area covered by the licence: ... open

cut mining anywhere on the floodplain". The current Project design would involve open cut mining (Eastern Mining Area) on the Mooki River floodplain, as reported in the Surface Water Impact Assessment. Hence, this key requirement of EL 7223 has not been met.

3.4 Risk Assessment

3.4.1 2010 Risk Assessment

The Proponent commenced a risk assessment process for the Project in 1996, with the latest assessment conducted in October 2009 incorporating the Director-General's Environmental Assessment Requirements. The Director-General's requirements require a comprehensive risk assessment of the potential environmental impacts of the Project to be undertaken which identifies the key issues for further assessment.

A fair and reasonable risk assessment process identifies and prioritises potentially significant environmental risks and impacts be addressed in the EIS. However, the Proponent's risk assessment appeared to be based on the results of the EIS and some important risks have been discounted in light of the findings of the EIS. The risk assessment fails to adequately consider some potential key failures and public risks commonly associated with longwall mining (e.g. water loss, water quality impacts, gas release and landslides).

The risks associated with the Project needed to be re-rated based on the knowledge gaps and uncertainties that remain and the findings of further assessments.

It was noted that the Proponent should continue the risk assessment process through the approvals phase, detailed design, construction, operation and ultimately closure of the mine.

3.4.2 2013 Risk Assessment

This section addresses the following Director General Environmental Assessment Requirement:

The EIS must include a risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment.

Key findings of the review, with respect to the above requirement, are summarised below:

- A Risk Assessment is summarised in Chapter 6 of the EIS Main Report, based on the assessment provided in Appendix of the EIS.
- The risk assessment provided in Appendix F is broadly consistent with Australian and International standards and guidelines on risk assessment and management, although several deficiencies in the risk assessment process have been identified.
- There was insufficient explanation of the method used to conduct the assessment, including the criteria used and assumptions made to assess each risk. This is a particular concern given the qualitative nature of the assessment.
- The risk assessment report has been condensed into a single page and is therefore inadequately covered (over-simplified) in the EIS Main Report, Section 6. For example, the risk summary tables in the EIS Main Report (Section 6) represent broad 'issues' but do not correlate with individual 'impacts' as assessed in Appendix F.

- The Preliminary Risk Assessment identified six ‘high’ risk issues (*Subsidence, Groundwater, Surface Water Management, Flooding, Ecology and Aboriginal Cultural Heritage*). All other preliminary risk issues were classified as “medium” or “low” risk.
- Following stakeholder engagement, a revision of the Preliminary Risk Assessment was undertaken to ‘*incorporate additional requirements*’ (Chapter 6 – Risk Assessment) resulting in a Revised Risk Assessment. It is assumed from the Table in Appendix F that the Revised Risk Assessment also incorporates ‘*proposed management measures*’
- The ‘*proposed management measures*’ in Table 1 in Appendix F to address specific impacts are not articulated clearly. In most cases the measures refer generally to recommendations made in the technical appendices (many of which were not committed to in the EIS Main Report) and/or to management plans that are yet to be developed.
- PDF errors in Table 1 of Appendix F render the table unclear; categories are undefined and are difficult to interpret.
- Key risks to community health and safety such as spontaneous combustion are not adequately addressed.

3.5 Commonwealth Government Requirements

This section addresses the following Director General Environmental Assessment Requirement as per the Supplementary Director General’s Requirements of 11 July 2012:

The EIS must address the requirements of the Commonwealth Department of Sustainability, Environment, Water, Populations and Communities (SEWPaC).

For reference, SEWPaC requirements are provided in Appendix B of this document.

Key findings of the review, with respect to the above requirement, are summarised below:

- SEWPaC requirements are itemised in the Supplementary Director General’s Requirements (June 2012) with clear references to the most relevant EIS sections addressing each item. In many cases, however, the item is not adequately covered in the referenced section, and in some cases the item does not appear to have been considered at all. Specific examples are provided throughout this review.
- General information (SEWPaC Requirement 1):
 - This aspect appears to be adequately addressed in Chapter 1 and 3 of the EIS Main Report.
- Description of the controlled action (SEWPaC Requirement 2):
 - This aspect has been addressed in the EIS Main Report Chapter 3, with only minor limitations of data regarding some aspects of the project (i.e. internal haulage routes).
- Description of the existing environment (SEWPaC Requirement 3):
 - Some aspects of the ecological survey methods were consistent with this SEWPaC requirement, however, areas adjacent to the Project boundary have not been surveyed. These and other concerns relating to SEWPaC Requirement 3 are discussed in Section 7.3 of this report.
- Description of the relevant impacts of the controlled action (SEWPaC Requirements 4-6):

- The relevant impacts are discussed briefly in the EIS (and in more detail in Appendices O) however a number of concerns relating to the impact assessment have been identified as discussed in Section 7.3 of this report.
- Proposed safeguards and mitigation measures (SEWPaC Requirement 7):
 - The proposed safeguards and mitigation measures are discussed briefly in the EIS (and in more detail in Appendix O) however a number of concerns relating to the costing of these mitigation measures have been identified as discussed in Section 7.3 of this report.
- Offsets (SEWPaC Requirement 8):
 - Offset requirements have been assessed in the EIS however the assessment has not been undertaken in accordance with SEWPaC's new Environmental Offsets Policy (2012). This and other concerns relating to SEWPaC Requirement 8 are discussed in Section 7.3 of this report.
- Other approvals and conditions (SEWPaC Requirement 9):
 - This aspect appears to be adequately addressed in Table 14 in Chapter 4 of the EIS Main Report.
- Economic and social matters (SEWPaC Requirement 10):
 - These aspects have been addressed in the EIS Main Report Sections 7.17, and supporting document (Appendices V). A review of these aspects is provided in Section 6 of this report.
- Environmental record of person proposing to take the action (SEWPaC Requirements 11-12):
 - In Section 1.4 of the EIS Main Report, it is stated that "WACJV has not been the subject of any proceedings under Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources".
 - Whilst not explicitly required by SEWPaC, a description of the environmental record of the Proponent in relation to their existing international mining operations would be more relevant for the purposes of this assessment.
- Information sources (SEWPaC Requirement 13):
 - Information sources generally appear to be adequately addressed throughout the EIS. However, there is very limited discussion of "uncertainties" in the environmental information provided throughout the EIS Main Report.
- Consultation (SEWPaC Requirement 14-15):
 - This aspect has been addressed in the EIS Main Report Chapter 5. A review of this aspect is provided in Chapter 5 of this report.

3.6 Plans and Documents

This section addresses the following Director General Environmental Assessment Requirement:

The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the Environmental Planning and Assessment Regulation 2000. These documents should be included as part of the EIS rather than as separate documents.

Key findings of the review, with respect to the above requirement, are summarised below:

- Detailed engineering design drawings of project infrastructure / buildings are provided in Appendix E.
- A number of key Project design, baseline and impact assessment figures have been produced for the technical appendices but omitted from the EIS Main Report.

3.7 Potential Impacts Beyond Director General Requirements

The following potential impacts, beyond the Director General requirements, were identified but not considered or fully addressed in the EIS:

Buttonderry Waste Management Facility

The Buttonderry Waste Management Facility is an essential service infrastructure for the Wyong Council; servicing the waste management needs of the Wyong Shire community. The Buttonderry facility is considered a strategic regional facility for future processing and disposal of waste.

The primary concern is that should subsidence occur, leachate and landfill gas (methane) management systems could be compromised, with potential to lead to environmental and economic impacts. This has not been addressed as a potential impact within the EIS no management or mitigation measures have been developed to minimise the risk and mitigate potential impacts.

Disaster Risk Management

Disaster risk management for naturally occurring or human- induced events have been overlooked in the EIS. These include environmental emergencies such as uncontrolled discharge during high rainfall events, water storage dam wall failure, and bushfires. Other disasters could include those associated with spontaneous combustion or blasting accidents.

It is recommended that a comprehensive disaster risk management plan is developed, inclusive of detailed contingency plans to manage specific events, such as the development of contingency plan for management / treatment of the Mine Operations Dam (MOD) water that would be required should MOD water levels approach potential uncontrolled discharge stages to prevent untreated water from reaching Wallarah Creek.

3.8 Coal Alternatives and Markets

Chapter 9 of the EIS (Project Justification) provides a discussion on coal alternatives and makes a statement relating to the current lack of viability of alternative energy sources to replace coal according to international expert agencies such as the International Energy Agency. Section 9.2.1 states ‘...an alternative source to replace carbon based fuel as the primary source of energy for base load electricity supply has not yet been and is considered not likely to be sufficiently developed in the near future (IEA, 2011)’.

It is suggested that the mine will produce export quality coal with potential markets in Japan, China and India. It is stated that the Project seeks to assist Australia in meeting international and local demand for coal over the mine life.

3.9 Project Design Alternatives

The EIS provides three Project Design Alternatives, inclusive of the current proposed Project.

Option 1: Do Nothing

Option 2: Underground Operation (Bord and Pillar)

The bord and pillar underground mining method as suggested by Option 2 generally results in a lower level of surface subsidence above the mine extraction area. However, this alternative was deemed unviable due to safety implications and economic considerations (higher initial capital cost and higher operating costs). It is suggested that the use of this method would have resulted in the Project not being developed and the resource being sterilised.

Option 3: The Project

The option of conducting an underground longwall mining operation has been selected as the most appropriate after assessing a number of mine designs. It is suggested in the EIS that this method will maximise social and economic benefits while minimising environmental impacts associated with surface water, water supply, ecology, aboriginal archaeology and soils. *This option was also considered the best alternative in terms of meeting the principles of ESD and Objects of the EP& A Act.*

The design remains consistent with that of the 2010 EIS, excluding the following changes:

Mine Plan Layout

- The long wall panel widths within the extraction area have been increased from the original 2010 mine plan layout. Within the Hue Hue Mine Subsidence District (MSD) Area the originally proposed 120 m and 150 m wide long wall blocks have been increased to 125 m and 175 m respectively.
- In 2010 it was specified that within the Valley Area the long wall panels would be 150 m, 170 m or 200 m depending on depth of cover. In 2013 these lengths have been increased to a range of between 175 m to 205 m wide long walls depending on the cover.
- Within the Forest area the long wall panels have been stated as being less than 255 m which is an increase from the 250 m proposal in 2010.

Western Ventilation Shaft:

- The western ventilation shaft dimensions have been changed from 6 m in diameter and 490 m in depth to 5 m and 485 m respectively.

It is noted in Section 3.13.4 that a number of areas have been removed from the mine plan on environmental grounds, resulting in the sterilisation of an estimated 19.75 Mt of coal.

3.10 Project Schedule

As per Chapter 3 of the EIS, it is anticipated that construction will occur over a three year period. An indicative construction schedule is provided in Section 3.1.2, detailing a breakdown of quarterly

construction activities for the first five years of the Project in the form of a Gantt chart. This includes the phases of Procurement and Mobilisation, Construction and Underground Development and Longwall Extraction.

3.11 Environmental Management System

The Proponent has not developed an Environmental Management System.

It is recommended that the project develops and implements an Environmental Management System based on ISO14001:2004 'Environmental management systems -- Requirements with guidance for use' which is considered best practice.

3.12 Monitoring and Reporting

Monitoring and reporting processes are crucial to the success of adaptive management strategies required to be utilised. By producing regular reports, companies can gain a greater understanding of risks and opportunities, improve efficiency, benchmark environmental and social performance against laws, codes and best practices, as well as identify and mitigate environmental and social impacts.

The proponent has committed to developing Annual Reports (as per Chapter 8 of the Main EIS Report).

"WACJV will prepare an Annual Review Report (which summarises coal quantities, monitoring results and reviews performance against the predictions and commitments in this EIS) and distribute it to the relevant regulatory authorities and make available on the Project website."

An Environmental Monitoring Plan should be produced as a guide to environmental parameter monitoring processes and scheduling. Findings from regular monitoring of air and water quality etc. should be provided to interested stakeholders on a regular basis to ensure that transparency.

3.13 Regular Independent Environmental Auditing

At present, the Proponent has not committed to the conduct of regular environmental and social audits. Regular independent environmental and social audits will provide the Proponent and other stakeholders with an objective view of the Project's performance, and provide recommendations for continuous improvement.

It is recommended that the Proponent commissions an independent expert to conduct Environmental Audits of the project on a regular basis throughout the project life cycle. This audit should:

1. Be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Director-General;
2. Include consultation with the relevant agencies;
3. Assess the environmental performance of the project and whether it is complying with the requirements in this approval and any relevant EPL or Mining Lease (including any assessment, plan or program required under these approvals);
4. Review the adequacy of any approved strategies, plans or programs required under these approvals; and, if appropriate

5. Recommend measures or actions to improve the environmental performance of the project, and/or any strategy, plan or program required under these approvals.
6. Be provided to key stakeholders such as Wyong Shire Council.

4 Water Quality

4.1 Context

Construction and operation of the Wallarah 2 Coal Project has the potential to impact surface and groundwater quality in the Project area affecting downstream or down-gradient waters and potentially sensitive receptors. The Wallarah 2 Coal Project Area is primarily located within one of the catchments feeding the water supply for the Gosford City Council and Wyong Shire Council. The Project area and downstream habitats are of moderately high biodiversity value, with a number of EPBC listed species and communities utilising water from the catchment.

Potential subsidence related impacts from Wallarah 2 Coal Project longwall mining are recognised as being a key factor for consideration for the Project, particularly with respect to their potential effects on residential structures, water catchments and groundwater regimes. However, it is important to note that subsidence and groundwater hydrology issues are not part of this review.

This review evaluates the Project 2013 EIS assessment of potential impacts to surface and groundwater quality and associated management and mitigation measures reported therein.

4.1.1 Reasons for Refusal 2010

The Minister for Planning refused the project application, in-part, because:

“The project does not adequately address potential surface water quality impacts, resulting in uncertainty around the ability of the project to meet acceptable water quality outcomes”

4.1.2 New Director General's Requirements

The Director General's Requirements (DGRs) for the Wallarah 2 Coal Project EIS, dated January 12, 2012, included the following applicable language for water resources and applicable general requirements (supplementary requirements added to the original DGRs for the Project):

General Requirements Relevant to Water Quality

“The Environmental Impact Statement (EIS) for the development must meet the form and content requirements in Clauses 6 and 7 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

In addition, the EIS must include a:

- *detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment, which includes:*
 - *a description of the existing environment, using sufficient baseline data;*
 - *an assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and*
 - *a description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage any significant risks to the environment; and*

- *consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EIS."*

Key Issues Relevant to Water Quality

The EIS must address the following specific issues:

Water Resources – including:

- *detailed assessment of potential impacts on the quality and quantity of existing surface and ground water resources, including:*
 - *detailed modelling of potential groundwater impacts;*
 - *impacts on riparian, ecological, geo-morphological and hydrological values of watercourses, including environmental flows;*
- *a detailed site water balance, including a description of site water demands, water disposal methods (inclusive of volume and frequency of any water discharges), water supply infrastructure and water storage structures;*
- *identification of any licensing requirements or other approvals under the Water Act 1912 and / or Water Management Act 2000;*
- *demonstration that water for the construction and operation of the development can be obtained from an appropriately authorised and reliable supply in accordance with the operating rules of any relevant Water Sharing Plan (WSP) or water source embargo; - a description of the measures proposed to ensure the development can operate in accordance with the requirements of any relevant WSP; - a detailed description of the proposed water management system (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts"*

4.1.3 Earth Systems Recommendations 2010

The Earth Systems' review of the 2010 EIS concluded that the report did not contain an adequate assessment of the potential impacts of the Project on local and regional groundwater and surface water quality. Key issues identified in this review included:

Surface Water

The 2010 EIS failed to identify and describe sources of water pollution beyond salinity and does not assess potential water quality impacts from the construction, operation and closure of the Project. Sources of pollution could include increased turbidity and sedimentation due to erosion from construction, stockpiles, haul roads and other disturbed areas and workshops, vehicle wash facilities, plant and equipment and fuel storage.

Acid and Metalliferous Drainage (AMD)

The review of the 2010 EIS indicated that there had been no consideration of the potential impacts of AMD as a result of the construction and operation of the Project.

4.1.4 New Regulatory Requirements

- *Water Management Amendment Act 2010*
- *Water Management (General) Regulation 2011*
- *Protection of the Environment Operations Amendment (Environmental Monitoring) Act 2010*
- *Protection of the Environment Operations (General) Amendment (Pollution Incident Response Management Plans) Regulation 2012*

Of particular importance to the Project is the **EPBC Act Amendment Bill 2013 - 'Water Trigger' Amendment**, passed through the Senate on the 19th June 2013. The Bill is awaiting assent by the Governor-General. The changes will commence the day after the Bill is assented to.

The bill's passage now means the Commonwealth is responsible for ensuring water systems are not impacted by major coal seam gas and coal mining projects. Under the Bill, a person, a constitutional corporation or the Commonwealth (or agency) has committed an offence if they take an action involving coal seam gas development, or large coal mining development, and the action has, will have or is likely to have a significant impact on a water resource, unless they first obtain approval for the action for the Commonwealth environment minister under the EPBC Act.

The existing EPBC Act provides definitions of "coal seam gas development" and "large coal mining development" as any activity involving coal seam gas extraction or any coal mining activity (respectively) that has, or is likely to have, a significant impact on water resources. The definition of a water resource in this amendment is the same as currently used in the Water Act 2007. A water resource relates to ground water and surface water, and includes organisms and ecosystems that contribute to the physical state and environmental value of the water resource.

According to the Department of Sustainability, Environment, Water, Population and Communities guidelines on the definition of a "significant impact", a significant impact is an impact that is important, notable or of consequence, having regard to its context or intensity. A significant impact on water resources may be caused by one development action relating to coal seam gas or large coal mine, or the cumulative impact of such actions. Under the National Partnership Agreement, factors which may directly or indirectly bring about a significant impact on water resources could include those that:

- change in the quantity, quality or availability of surface or ground water;
- alter ground water pressure and/ or water table levels;
- alter the ecological character of a wetland;
- result in rivers or creeks diverted or impounded;
- alter drainage patterns;
- reduce biological diversity or change species composition;
- alter coastal processes, including sediment movement or accretion, or water circulation patterns;
- result in persistent organic chemicals, heavy metals, or other potentially harmful chemicals accumulating in the environment such that biodiversity, ecological integrity, human health or other community and economic use may be substantially adversely affected; or
- substantially increase demand for, or reduce the availability of water for the environment.

Although the Amendment post-dates the Wallarah 2 Coal Project EIS submission, it would apply to any developments (such as this Project) that are currently referred for a decision that is in the approval process, where the Independent Expert Scientific Committee has not yet given advice.

This means that the department will work closely with the proponent to identify what additional information is required to assess these impacts. The department will rely on information that has already been collected in the existing state and EPBC Act processes as much as possible, to ensure current assessments proceed efficiently.

The transitional arrangements provide that if the process of having a development assessed under the EPBC Act has already commenced, the Minister has 60 days (from the commencement of the Bill) to decide whether the project requires approval in relation to the new water trigger. The Minister then has to advise and consult with the individual proponents affected on the proposed decision for a period of 10 days before a final decision is made.

4.2 2013 EIS

Surface water quality sampling (initiated in 2006) for field water quality parameters and laboratory analysis continued through development of the 2013 EIS. Sampling has been undertaken monthly at thirteen (13) monitoring stations to determine baseline conditions for electrical conductivity (EC), pH, dissolved oxygen (DO), total suspended solids (TSS) and total dissolved solids (TDS) as well as a for number of total metal species and organic compounds, with results provided in Appendix J to the 2013 EIS.

Groundwater sampling for water quality appears to have been limited to measurement of TDS and pH.

- Concentrations of TDS ranged from 1,800 to 7,500 mg/L
- pH values ranged from 6.3 to 7.6.

Additional groundwater modelling was conducted for the 2013 EIS, with two models (W3 and W4) superseding previous models employed (W1 and W2). Models W3 and W4 incorporated some minor changes to the hydraulic conductivity distribution and the subsidence zone distributions.

A peer review of the groundwater modelling was undertaken by Kalf and Associates in accordance with the Murray Darling Basin Commission's "Australian Flow Modelling Guideline".

The water quality management plan operations phase management plan highlights four specific measures for managing surface water quality:

- (I) Diversion of water affected by the mine (stockpiled coal, disturbed areas, product of dewatering) into water holding facilities for re-use or treatment prior to discharge;
- (II) Implementation of appropriate erosion control measures at the discharge point (an energy dissipation device and channel bed protection);
- (III) Design of erosion and sediment control measures based on recommendations from the following guidelines: Managing Urban Stormwater, Soils and Construction, (Landcom, 2004) and Managing Urban Stormwater, Soils and Construction, Volume 2E Mines and Quarries (DECC, 2008).
- (IV) Implementation of a number of small sediment traps to treat runoff from the rail loop.

Mitigation measures for groundwater impacts include commitment to repairing damaged bores from subsidence and replacing sub-surface water supplies if groundwater drawdown exceeds expectations. Mitigation for groundwater quality is not directly articulated.

4.3 Key Issues

Surface Water

The 2013 EIS and Appendix J present a fairly thorough assessment of potential impacts to surface water quality during Project operations and identify a framework for managing water in the Project area. The strategy is based on the separation of runoff from undisturbed catchments from water potentially impacted by Project operations. The key objective of the mine water management system is to minimise the risk of untreated mine water being released to receiving waters. However, the impact assessment and the management measures to mitigate potential impacts are not articulated in a number of respects, including the following:

- The construction phase of the Project is not directly addressed in the 2013 EIS and Appendix J to the EIS. The Proponent does not provide an impact assessment, mitigation and management, or monitoring that specifically address potential water quality aspects during construction.

- Erosion of freshly disturbed land and sediment transport to watercourses is often the paramount water quality impact during construction. Management measures for preventing erosion and sediment during construction are not specified. Operations phase mitigation and monitoring is briefly summarised (refer to Mitigation and Management Planning, Section 12.2).
- The potential for generation of AMD as a result of oxidation waste rock and wallrock in the dewatered zone above the underground mining area was again not addressed. Geochemical data should be collected for the Project to identify the acid base accounting characteristics of the waste material and the rock in the unsaturated fractured wallrock zone.
- The surface water monitoring program does not yet include a sampling point immediately downstream of the proposed Wallarah Creek tributary discharge site (the controlled discharge point for the Project). The Surface Water Impact Assessment (Appendix J) mentions that a site will be set-up at the discharge location (monitoring station WTP), but does not provide a date for implementation. Potential impacts related to discharge will be difficult to interpret without an understanding of baseline at this location. Site W6 is downstream of the discharge point on Wallarah Creek, but exists below additional tributary input and does not provide a direct baseline.
- Turbidity data is not provided in the EIS or Appendix J. It is assumed that measurement for this parameter has not been included in the surface water monitoring program. It will be difficult to assess the level of sediment transport from construction and operations related erosion with measurement of TSS alone. WRM (Appendix J) indicate that erosion is significant in Jilliby Creek, "due to the highly dispersive nature of the bed/bank material" and that the flow of this channel may increase with subsidence of the channel.
- Runoff from the Buttonderry Site buildings, parking areas, paved and hardstand areas will be diverted to the Buttonderry Sediment Dam, which would then overflow to the Entrance Dam. The Entrance Dam overflow will discharge into Buttonderry Creek. Modelling indicates that overflow of the Buttonderry Sediment Dam will occur regularly (median of approximately 15 ML/a; 90th percentile discharge of approximately 40 ML/a; and 99th percentile uncontrolled discharge of approximately 67 ML/a). The EIS and Appendix J indicate that overflow will be "clean water". The model assumes that the sediment dam will sufficiently 'treat' the water passively by allowing sediment to settle out. The strategy does not take into account hydrocarbon input from parking facilities and sealed roads, nor that settling dams are often inefficient in containing suspended solids during high flow events.
- Wallarah Creek would be the receiver for storage overflows from the Mine Operations Dam (MOD), Portal Dam and Stockpile Dam, each of which will be comprised of untreated mine water. Sizing of the mine water storages has been based on achieving no uncontrolled discharge to the receiving environment. However, the EIS does not provide contingency for overflow in the event that it does occur.
- Specific management measures are generally not articulated. The 2013 EIS generally refers to management plans that will be subsequently generated to address potential impacts (e.g. Water Management Plan, Erosion and Sediment Plan, etc.).

Groundwater

The baseline assessment for groundwater quality appears to have included measurement of only pH and TDS. The 2013 EIS indicates that the WACJV will develop a Water Management Plan that will include sampling for the following groundwater quality elements:

- *"Quarterly monitoring of pH and EC in selected piezometers and pumped mine water. Such monitoring may provide early indication of the potential mixing of shallow groundwater within deeper strata groundwaters. Whilst this process is expected within the subsidence zone, it may not be evident*

within the wider piezometer network at the leakage levels predicted by groundwater monitoring:

- *Six month measurement of TDS and speciation of water samples in selected piezometers to support identification of mixing of groundwater types. Speciation will include, as a minimum, major ions such as Ca, Mg, Na, K, CO₃, HCO₃, Cl, SO₄, and elements such as Al, As, B, Ba, F, Fe (total), Li, Mn, P, Se, Si, Sr, Zn, and*
- *Graphical plotting of basic water quality parameters and identification of trend lines and statistics including mean and standard deviation, calculated on a quarterly basis. Comparison of trends with rainfall and any other identifiable processes that may influence such trends.”*

The Proponent has not identified baseline water quality conditions for the parameters listed above that would provide the basis for comparison with results from construction and operations phase data collected.

Groundwater monitoring was also limited to the W2CP Honeysuckle Park and Buttonderry properties due to restricted access to other existing bores. The EIS specifies that WACJV will endeavour to re-instate monitoring at existing bore locations while the EIS is being reviewed.

Mitigation measures for groundwater impacts are limited to repairing damaged bores from subsidence and replacing water supply if groundwater drawdown exceeds expectations. Mitigation for groundwater quality is not directly articulated.

4.4 Conclusions and Recommendations

The water quality impact assessment for the W2CP 2013 EIS was not conducted according to conventional methodology (e.g. baseline assessment, impact assessment, management measures, residual impact, reporting). Each phase of construction and operations are not considered individually, with water quality impacts and associated management considered almost exclusively for operations. The 2013 EIS focuses on principal potential impacts: subsidence and hydrology (reviewed in a separate report), transference of saline groundwater to additional aquifers, and potentially sediment laden surface water during operations.

The management planning for avoiding or mitigating impacts to water quality is similarly focused on what are considered the most likely and important potential impacts. The 2013 EIS and applicable technical reports (Appendices I and J) provide a framework for water management during operations, whereby impacts to surface water will be avoided by diverting ‘clean’ surface water that is not affected by mine operations and containment of ‘mine’ water for reuse, treatment, or subsurface disposal. This analysis is fairly thorough and the water management infrastructure (dams, sediment traps and water conveyance) may prove effective in containing contaminated waters to within the confines of the Project’s area.

However, as specified above there are several gaps in the impact assessment for water quality and additional areas that are not comprehensively evaluated. The following measures are recommended to address these gaps:

- **Identify additional potential sources of contaminants and key water quality parameters** beyond potentially saline water abstracted during operations and potentially sediment laden that comes into contact with coal stockpiles (e.g. potential contaminants from equipment and fuel storage areas, workshops and vehicle wash down areas) and specify management plans for avoiding spillage and remediating contaminated areas.

- **Conduct geochemical assessment for potential AMD impact:** Acid base accounting characteristics of the waste rock should be undertaken to ensure adequate assessment of potential impacts of AMD and the identification of appropriate waste rock re-use and disposal strategies. This assessment should include material from the future wallrock in the dewatered zone.
- **Implement and immediately sample from monitoring station WTP** to provide a baseline for water quality conditions at the controlled discharge site.
- **Develop a construction phase erosion and sedimentation plan** that details erosion control measures and sediment control measures that are consider potential impacts from all potential sources during construction (e.g. specific areas of scheduled for vegetative clearance and major earthworks, stockpiles and haul roads. Specific best practices should be identified for each component of construction. Consideration should be given to the following:
 - Minimisation of vegetative clearance area, inclusion of vegetative buffer zones near surface water drainage and clearing vegetation during the dry season only;
 - Conducting major earthworks during the dry season;
 - Application of best practices to construction and maintenance of the unsealed road network (e.g. minimum road cross-fall to shed water; waterbars with discharge outlets and sediment control devices on steep slopes; and armouring of road surfaces);
 - Installation of sediment control measures downstream of construction works and disturbed land areas (e.g. silt fences, sediment basins, sediment traps, fibre rolls); and
 - Progressive revegetation of disturbed land areas, giving priority to high risk erosion areas such as steep slopes and sites close to rivers and creeks.
- **Include turbidity measurement** in all future surface water quality monitoring (pre-construction) to identify baseline conditions.
- **Regularly analyse Buttondery Sediment Dam and the Entrance Dam for hydrocarbons.** Develop a management plan avoiding input of hydrocarbons into the dam and for removal of hydrocarbons well in advance of the first uncontrolled discharge event;
- **Develop a proactive contingency plan for management / treatment of the Mine Operations Dam (MOD)** water that would be enacted should MOD water levels approach potential uncontrolled discharge stages to prevent untreated water from reaching Wallarah Creek.
- **Sample groundwater monitoring bores for applicable water quality parameters** (at the expanded network of existing bores, if possible) at least quarterly prior to construction to establish a baseline for groundwater quality;
- **Develop management plans** committed to in the EIS (e.g. Water Management Plan, Erosion and Sediment Plan, etc.) prior to the onset of construction.

5 Air Quality

5.1 Context

Mechanical disturbance of rock and soil materials from coal mining project construction and operations (e.g. bulldozing, blasting, and hauling on unsealed roads) and wind erosion of stockpiles and bare ground contribute the majority of particulate matter emitted from coal mining operations, the primary air pollutant emitted from coal mining and processing activities. Diesel powered equipment emit additional pollutants during construction and operations and methane flaring and equipment further emit potential pollutants into the atmosphere during coal mining operations.

The air emissions inventory for the Greater Metropolitan Region (GMR) of NSW (OEH, 2003) determined that the coal mining industry is the largest industrial emitter of Total Suspended Particles (TSP), particulate matter with an aerodynamic diameter of less than 10 microns (PM₁₀) and particulate matter with an aerodynamic diameter of less than 2.5 microns (PM_{2.5}) in the region. Other anthropogenic sources of particulate matter (e.g. farming, construction, travel on unpaved roads, etc.) and natural processes (e.g. high intensity wind, forest fires, etc.) contribute to the atmospheric load, therefore the cumulative input of coal mining, ambient conditions, and future development are of particular importance in assessing the potential impacts of Project implementation.

Impacts from particulate matter emission range from nuisance in surrounding communities from soiling or odour and reduced visual amenity to serious adverse health effects and mortality from high concentrations of particulate matter.

Particulate matter pollution is associated with underground and open-cut mining. The *NSW Coal Mining Benchmarking Study: International Best Proactive Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (Donnelly et al, 2011) identifies the components of underground coal mining most commonly associated with particulate emission to the atmosphere.

“The main activities that produce emissions of particulate matter at underground mines are:

- Transport of raw coal from the mine to the raw coal stockpile (run-of-mine (ROM) pad). Wind-blown particulate matter from conveyors or wheel generated particulate matter associated with haul trucks.*
- Stockpiling materials on the ROM pad associated with dumping coal from conveyors or trucks. Wind-blown particulate matter from stockpiled coal and emissions associated with transferring coal to the load-in hopper (ROM hopper) of the processing plant.*
- Emissions of particulate matter from the processing plant may occur from the dry processing operations such as crushing and screening. Emissions from wet processing operations tend to be minimal.*
- Washed or processed coal is then transferred to product stockpiles and subsequently to trucks or trains for transport to the end user. Particulate matter emissions can occur due to wind erosion of product stockpiles if they become sufficiently dry and as a result of loading materials from the stockpile (reclaim). Dumping coal into*

rail wagons and trucks will also produce emissions of particulate matter.”

In addition to fugitive dust emissions (or incorporated within fugitive dust), Project activities will contribute oxides of nitrogen, carbon monoxide, sulfur dioxide, and organic compounds from combustion of diesel in mining equipment and from flaring of coal seam methane, emissions associated with combustion of diesel from the ventilation shaft at the Buttonderry site, and greenhouse gasses (such as fugitive methane and carbon dioxide).

5.1.1 Reasons for Refusal 2010

The Minister for Planning did not cite air quality as one of the justifications for refusing the 2010 Project application.

5.1.2 New Director Generals Requirements

The Director General's environmental assessment requirements (DGRs) for the preparation of an EIS for the proposed Wallarah 2 Coal Project, data January 12, 2012, included the following applicable language for water resources and applicable general requirements, which are supplementary to initial DGRs provided for the 2010 EIS:

General Requirements Relevant to Air Quality

“The Environmental Impact Statement (EIS) for the development must meet the form and content requirements in Clauses 6 and 7 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

In addition, the EIS must include a:

- ***detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment, which includes:***
 - ***a description of the existing environment, using sufficient baseline data;***
 - ***an assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and***
 - ***a description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage any significant risks to the environment; and***
- ***consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EIS.”***

Key Issues Relevant to Air Quality

“The EIS must address the following specific issues:

Air Quality – including a quantitative assessment of potential:

- ***construction and operational impacts, with a particular focus on dust emissions including PM_{2.5} and PM₁₀ emissions and the dust generation from coal transport;***
- ***reasonable and feasible mitigation measures to minimise dust emissions, including evidence that there are no such measures available other than those proposed; and***
- ***monitoring and management measures, in particular real-time air quality monitoring”***

5.1.3 New Regulatory Requirements

Protection of the Environment Operations (Clean Air) Regulations 2010 (POEO (Clean Air) Regulation (POEO, 2010))

5.2 2013 EIS

PAE Holmes conducted an assessment for background concentrations of applicable air quality parameters, modelling for Project-related impacts to air quality during operations, and provided management measures that are consistent with the most up to date best practices for the industry in NSW (Appendix L to the 2013 EIS). The CALMET/CALPUFF modelling system was used to simulate the effects of meteorological conditions on pollutant transport, transformation and removal. PM₁₀, TSP and dust deposition have been directly measured and background NO₂ levels, collected as part of the Munmorah Rehabilitation EA, were used to estimate impacts for the W2CP. In the absence of PM_{2.5} data, an estimate was made using ratios of PM₁₀ / PM_{2.5} measured at the closest EPA monitoring sites.

Direct air quality measurement for the Project continued, with two high volume air samplers (HVAS) measuring PM₁₀ on a one day in six cycle, two HVAS measuring total suspended particles (TSP) on a one day in six cycle and six dust deposition gauges located near each of the Tooheys Road and Buttonderry Road Sites.

Local wind data was collected at the Tooheys Road site from 2007 – 2011. Local climatic data compilation also continued through 2011, provided by the Norah Head Automated Weather Station located approximately 10 km southeast of the Project.

For the impact assessment of air quality from Project operations (Appendix L), predicted ground level concentrations for 24-hour average and annual PM₁₀ concentrations, 24-hour average and annual PM_{2.5} concentrations, incremental annual average TSP concentration, incremental ground level dust deposition, incremental ground level odour concentration, ground level concentration of NO₂ from combustion of methane were modelled, with contour plots provided for each. Each considers the likely maximum daily or annual production scenarios from Project activities provided the implementation of best practice management measures listed in Table 7.7 of Appendix L.

5.3 Key Issues

The specialist study provides sound investigation of ambient baseline conditions for applicable parameters, analyses of potential Project-related emissions impacts according to maximum production scenarios, and provides management measures that consider up-to-date best practices for NSW.

However, it appears that the methodology for impact assessment (Section 8) was not undertaken in a manner consistent with applicable legislation (DECC, 2005) and therefore cannot be compared with the associated NSW impact assessment criteria for estimation of potential exceedences. The following gaps in the analyses appear to require attention:

- The modelling for predicted impacts (Sections 8.1 – 8.7) and associated contour plots consider emissions from Project-related operations alone (with exception of the abbreviated cumulative impact assessment discussed below). Predicted impacts from the Project must be summed with respective background concentrations to determine **total impact for each parameter and averaging period**. Instead, the impact assessment compares predicted emissions from Project operations alone against the impact criteria, giving the impression that concentrations of applicable parameters will be compliant with impact criteria, when this may not necessarily be the case.
- The cumulative impact assessment is provided in Section 8.8, which would be suitable for comparison with impact assessment criteria provided the assessment was conducted according to Sections 5 and 7 of the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DECC, 2005) (refer to below). However, the cumulative impact assessment does not provide all the required information as detailed below:

- Appendix L cumulative impacts (i.e. total impact) for annual concentrations sum average ambient conditions with predicted Project operational emissions (Table 8.2 of Appendix L). According to the approved methodology for this assessment (DECC, 2005), the maximum ambient (background) concentrations should be used. The outcome will likely effect whether predicted emissions exceed impact criteria.

For example, for receptor P11, located at the closest residence to the north of the Tooheys Road Site, the predicted annual average PM₁₀ concentration of 1.6 µg/m³ was added to the average of the HVAC annual PM₁₀ concentrations from 1999-2012 (18 µg/m³) for a total concentration of 19.6 µg/m³ (below the 30 µg/m³ impact criteria). However, the addition of the maximum concentration predicted for the parameter, in this case reported to be 22 µg/m³ for P11, should have been added. The total impact would be quantified as 40 µg/m³ (18 background + 22 predicted), well above the 30 µg/m³ impact criteria.

- For predicted daily maximum PM₁₀ concentrations, a statistical approach (Monte Carlo Simulation) was used to randomly select background daily PM₁₀ concentrations from those measured to be added to predicted operational emissions. While there may be merit in selecting this methodology, *The Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DECC, 2005) specifies the use of maximum measured volumes in cases where measurements were not taken often enough to include them in the model (i.e. PM₁₀ concentrations were measured every sixth day). The results, provided in Figure 8.12 of Appendix L, are not very clear given the unit selection of the Y-axis. According to Figure 8.12, daily PM₁₀ concentrations would exceed impact criteria on approximately 20 – 25 days per year.

The Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DECC, 2005) advises that for use of an approach other than those outline in Section 5 of that report, the Air Technical Advisory Services Unit of the DEC should be consulted.

- A single value was provided for each parameter (average of the two HVAC values) for background concentration, regardless of the location of the receptor. Data recorded at the nearest HVAC would be more applicable. For receptor P11, HVAC-E data for PM₁₀ averaged 21 µg/m³. In averaging the Tooheys Road HVAC data (HVAC-E) with the Buttonderry HVAC data (HVAC-C), the concentration was reduced to 18 µg/m³.
- The cumulative impact assessment (i.e. impact assessment) was conducted for only a subset of the parameters analysed (i.e. 24 hour PM₁₀ and annual PM₁₀, PM_{2.5}, TSP and dust deposition), with the assessment for cumulative NO₂ not assessed quantitatively. Cumulative impacts are not considered for 24-hour PM_{2.5}.

A cumulative impact assessment should capture total impacts (background concentration summed with predicted Project-related inputs) combined with anticipated future development. The cumulative impact assessment, as identified in Appendix L and the EIS, should be renamed the 'Impact Assessment', with a cumulative assessment undertaken that considers planned construction or industry in the region.

- According to Figure 5.2 of Appendix L, 24-hour PM₁₀ concentration (background conditions from HVAC-E) exceeded the 24-hour average goal criteria of 50 µg/m³ on more than 16% of the measurement days. This assumes of the 2,047 days between the 1 October 2006 and 30 April 2012, PM₁₀ was measured on 341 days (i.e. 1 day in 6 measuring cycle). Figure 5.2 identifies 55 days that exceeded 50 µg/m³ for 24-hour PM₁₀ (approximately 16%) at HVAC-E. In Section 5.2.1 of the specialist study, it is noted that the HVAC-E data is 90-93% complete, therefore more than 16% of the measurement days may have exceeded 50 µg/m³ for average 24-hour PM₁₀ as PM₁₀ was measured for less than 341 days..
- Data provided in Table 5.3 is considerably different for HVAC-E measured days above the 24-hour PM₁₀ goal criteria of 50 µg/m³ for 2006 – 2012 (12 days, or ~4% of measurement days). This discrepancy (as compared to Figure 5.2) is fairly significant and should be clarified.
- The dispersion model was not run for impacts during construction. The justification provided is that because construction related air quality impacts are estimated to be less than 35% of the emissions estimated to occur during operations, compliance with impact criteria during operations would necessarily translate to compliance during construction. Provided the uncertainty regarding compliance with impact criteria during operations, this assumption may not be justified. For example, given that ambient conditions for PM₁₀ exceed criteria on occasion, air quality impact criteria during construction and operations will both exceed 50 µg/m³ for an undetermined number of days per year.

Determination of Total Impacts

The Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (DECC, 2005) provides the criteria for application of impact assessment in Section 7.1.2 of the plan. The assessment criteria (e.g. 50 µg/m³ average PM₁₀ for 24 hours) "must be applied as follows:

1. *At the nearest existing or likely future off-site receptor*
2. *The incremental impact (predicted impacts due to the pollutant source alone) for each pollutant must be reported in units and averaging periods consistent with the impact assessment criteria.*
3. **Background concentration must be included using the procedures specified in Section 5.**
4. *Total impact (Incremental plus background) must be reported at the 100th percentile in concentration or deposition units consistent with the impact assessment criteria and compared with the relevant impact assessment criteria."*

Section 5.1.1 Accounting for background concentrations (referred to in item number 3, above) provides the following:

"For impact assessments of sulfur dioxide (SO₂), nitrogen dioxide (NO₂), ozone (O₃), PM₁₀, total suspended particulates (TSP), deposited dust, lead (Pb), carbon monoxide (CO) and hydrogen fluoride (HF), the existing background concentrations of the pollutant in the vicinity of the proposal should be included in the assessment as follows:

Level 1 Assessment

- Obtain ambient monitoring data that includes at least one year of continuous measurements.
- **Determine the maximum background concentrations of the pollutant being assessed for each relevant averaging period.**
- At the maximum exposed off-site receptor, add the **maximum background concentration** and the 100th percentile dispersion model prediction to obtain the total impact for each averaging period.

The Level 2 assessment criteria (DECC, 2005) do not apply as HVAC measurements need to have been conducted daily to add daily measured averages to the daily modelled averages.

Exceedences in the EPA's impact assessment criteria

Where impact assessment criteria will likely be exceeded (e.g. for PM₁₀), DECC (2005) specifies the following:

If the EPA's impact assessment criteria are exceeded, the dispersion modelling must be revised to include various pollution control strategies until compliance is achieved. To determine incremental increases in the cost of air pollution abatement, a sensitivity analysis can be carried out by varying:

- source release parameters
- separation distance
- efficiency of pollution control equipment
- level of management practice.

The results can be used to select the most cost-effective and environmentally effective control strategy.

For circumstances where background concentrations regularly exceed impact assessment criteria, the EPA should be consulted.

2013 EIS, Air Quality Impact Assessment

The 2013 EIS provides a summary of baseline conditions, impact assessment and mitigation and management measures provided in Appendix L. For some aspects, the EIS does not clearly convey the results of the impact assessment or the management measures provided in Appendix L. For example:

- In Section 7.5.3, the EIS summarises results of the cumulative assessment, indicating that the Project is unlikely to result in additional exceedences of relevant impact assessment criteria at the neighbouring receivers. As background concentrations of PM₁₀, for example, commonly exceed impact criteria and the Project is predicted to add as much as 27 µg/m³ at the nearest receptor, the accuracy of this determination requires consideration.
- The EIS provides a summary of recommended management and mitigation measures, but the list is slightly less comprehensive than that described in Appendix L.
- Predicted emission concentrations from dispersion modelling assume Project implementation of best practices listed in Table 7.7 of Appendix L. Therefore, these estimates are only relevant provided Project implementation of these controls.
- It is difficult to determine whether the EIS is committed to management and mitigation measures provided in Appendix L, or whether these are considered recommended best practices.

5.4 Conclusions and Recommendations

The assessment of ambient conditions (background concentrations) of applicable parameters, modelling for impacts during Project operations for these parameters, and recommendations for applicable best practices were thorough and conducted according to approved guidelines and current best practices. However, the impact assessment should be conducted according to the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (DECC, 2005), with predicted emissions added to maximum background concentrations measured at the applicable monitoring station. Contour plots and comparison to applicable impact criteria should address total impacts instead of emissions from Project operations alone. Modelling should be conducted for the construction phase of project implementation, with total impacts determined as above. Cumulative impacts should address potential near-term development in the Project area (if applicable).

As dispersion modelling for each parameter was conducted under the assumption of Project implementation of mitigation and management measures provided in Table 7.7 of Appendix L, the Proponent should clearly demonstrate commitment to these measures. The management and mitigation measures should be further developed in the Air Quality Management Plan for the Project. Some of the measures identified should be described in detail (e.g. specific speed limits, progressive rehabilitation plans for disturbed areas, etc.) according to *Coal Mining Benchmarking Study: International Best Proactive Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (Donnelly et al, 2011).

SO₂ was not measured for this assessment. The inclusion of this parameter during construction and operations phase monitoring should be considered.

Further details regarding reactive management strategies for exceedences (particularly PM₁₀) and provision for investigations in response to complaints should also be provided in the Project's Air Quality Management Plan. A robust report reporting strategy will be needed, to enable reactive management to exceedences of impact criteria for applicable parameters measured for hourly or daily concentrations.

6 Greenhouse Gases

6.1 Context

6.1.1 Reasons for Refusal 2010

The Minister for Planning did not cite greenhouse gas emissions as one of the reasons for refusing the 2010 Project application.

6.1.2 New Director General's Requirements

The Director General's Requirements issued to the Proponent in 2012 require the EIS to include the following:

Greenhouse Gases – including:

- ***A quantitative assessment of potential Scope 1, 2, and 3 greenhouse gas emissions;***
- ***A qualitative assessment of the potential impacts of these emissions on the environment;***
and
- ***An assessment of reasonable and feasible measures to minimise greenhouse gas emissions and ensure energy efficiency***

In addition, the Supplementary Director General's Requirements was also issued in July 2012 in accordance with section 78A (8A) of the *Environmental Planning and Assessment Act 1979*. In relation to greenhouse gases, the EIS must also include the following (summarised extract) as stated in the Supplementary Director General's Requirements (full reference can be found in Appendix B):

Proposed safeguards and mitigation measures

7. A description of feasible mitigation measures, changes to the action or procedures, which have been proposed by the proponent or suggested in public submissions and which are intended to prevent or minimise impacts. Information must include:

- a. Description of the mitigation measures, these measures should be justified and based on best available practices;**
- b. An assessment of the expected or predicted effectiveness of the mitigation measures;**
- c. Any statutory or policy basis for the mitigation measures;**
- d. The cost of the mitigation measures;**
- e. An environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs (including any relevant thresholds for corrective actions). Include the person or agency responsible for implementing these programs and any provision for independent environmental monitoring;**
- f. The name of the agency responsible for endorsing or approving each mitigation measure or monitoring program;**
- g. Identification of mitigation measures proposed to be undertaken by State or local governments or the proponent.**
- h. Any changes to the action which prevent or minimise relevant impacts on listed threatened species or communities.**

6.1.3 New Regulatory Requirements

Carbon Pricing Mechanism (Carbon Tax)

The carbon pricing mechanism started on 1 July 2012. It applies to Australia's biggest polluters who have to report on, and pay a price for, their carbon pollution. This creates incentives to reduce emissions.

The price is fixed each year for the first three years, starting at \$23/tCO₂e in 2012 – 2013. The price will then be set by the market in 2015 – 2016.

Clean Energy Act 2011

The Clean Energy Act 2011 sets up the carbon pricing mechanism and contains rules for who is covered by the carbon pricing mechanism, what sources of carbon pollution are included, the surrender of emissions units, caps on the amount of carbon pollution from 1 July 2015, international linking, monitoring, enforcement, and appeal and review provisions.

6.2 2013 EIS

6.2.1 Quantification of Greenhouse Gas Emissions

Greenhouse gas emissions calculations have been updated to include more thorough analysis on each of the activity producing Scope 1, 2, and 3 emissions compared to the 2010 EIS (Scope 1: direct emissions, Scope 2: indirect emissions with respect to purchased electricity, and Scope 3: general indirect emissions).

In relation to estimating fugitive methane emissions (Scope 1), a site specific emission factor has been determined based on a gas content testing by Geogas in 2011. Separate calculations have been made to distinguish between the emissions of the methane gas due to flaring and the emissions of the methane gas due to venting (via Mine Ventilation Air).

The end-of-use coal emissions (emissions from the combustion of product coal) has been also been updated to include the total mass of the coal and multiplied by the emission factor from NGA Factors.

6.2.2 Impact of Greenhouse Gas Emissions

The EIS estimates the Project's greenhouse gas emissions impact by drawing comparison between the Project's Scope 1 emissions and estimates for the total global (2005 data) and national anthropogenic total emissions (2009 data). The Project's Scope 1 emissions would represent 0.04% of Australia's allowance under the first Kyoto Protocol commitment and a very small portion of global emissions.

An attempt to quantify the temperature increase associated with various global warming scenarios has also been carried out for towns/cities closest to the Project. This has been derived from studies conducted by CSIRO (2007). It is noted that the Project's contribution to projected climate change, and the associated impacts, would be in proportion with its contribution to global GHG emissions.

The 2013 EIS has also included an analysis on the impact carbon tax has on the Project. A benefit cost analysis and sensitivity analysis has been conducted and are shown in Appendix W: Economic Impact Assessment.

6.2.3 Greenhouse Gas Mitigation and Management

Due to the proposed flaring activities during operations of the Project, it is claimed in the EIS that when compared with 100% fugitive emissions of methane venting only, the flaring scenario results in GHG saving of approximately 54% of Scope 1 emissions over the Project life.

6.3 Key Issues

Quantification of Greenhouse Gas Emissions

- Assumptions and methodology (with references) need to be more clearly stated in estimating the greenhouse gas emissions. Due to uncertainties in the methodology used, it cannot be determined whether the figures presented are accurate. Earth Systems' internal calculations did not produce the same results as stated in the report. It is possible that the 2013 EIS has underestimated the emissions from fugitive methane flaring and venting;
- The use of NSW stationary power plant emission factors to represent end-use of coal in another part of the world requires justification; and
- Emissions from the shipping of the product coal have been excluded due to the difficulties in emission estimates. To understand the potential magnitude of such emissions, a conservative scenario should have been assumed and modelled. Emission factors for shipping of bulk commodities are available (e.g. from IPCC reports) and could be applied. It is likely that this Scope 3 emission source will be significant.

Impact of Greenhouse Gas Emissions

- The impact assessment is largely based on the Project's Scope 1 direct emissions only. When considering the impact in national and global context, all three scopes of emissions should be included to reflect the overall impact (direct and indirect) of the Project's construction, operation, and closure activities. Limited attention has been given to the most significant GHG emission activity – the 'energy production' emissions (emissions from the use and combustion of the product coal) – although it is the largest source of total Project emissions (representing ~98% of total Project emissions);
- The Project's total emissions impact in the national and global context has not considered recent scientific literature regarding greenhouse gas emissions and impacts, such as:
 - The Global Carbon Budget of 750 GtCO₂e should be used as a basis for assessing the Project's total emissions (including Scope 1, 2 and 3) contribution. The Project would represent 0.05% of total international greenhouse gas emissions under the Global Carbon Budget approach.
 - No consideration has been given to the implications of recent International Energy Agency (IEA) analysis regarding remaining Global Carbon Budget and what proportion of existing known fossil fuel reserves must not be combusted. The IEA in the World Energy Outlook report (2012) indicated that to "*no more than one-third of proven reserves of fossil fuels can be consumed prior to 2050 if the world is to achieve the 2 °C goal*".
 - There is no mention of the internationally agreed threshold of limiting anthropogenic global warming to 2 degrees above pre-industrial levels, nor is there analysis conducted on long term impacts at 2100, which is a standard scientific reporting timeframe. Discussion of global warming impacts at projected temperature increases of 4 to 6 degrees in 2100 would have been more appropriate.

- The local impact of the Project's emissions will be better perceived by the public if the emissions associated with operations are compared to the WSC region's baseline emissions.

Greenhouse Gas Mitigation and Management

- The limited list of possible greenhouse gas emission reduction strategies stated in 2013 EIS does not meet the 2013 Director-General's Environmental Assessment Requirements and the Supplementary Director General's Requirements. There are many more significant greenhouse gas emission reduction measures that could be undertaken than those mentioned. A comprehensive review of international best practice mining energy efficiency should be conducted by the Proponent, with particular emphasis on reductions to the major extraction emissions; and
- As part of managing carbon tax liability, it may be worth considering carbon offset mechanisms (e.g. actual purchase of carbon credits for offsetting purposes or co-investment in local renewable energy projects). The latter would represent a long term tangible emission reduction measure, for example through funding a local renewable energy plant to offset a certain percentage of the Project's annual emissions.

6.4 Conclusions and Recommendations

Calculations carried out in estimating greenhouse gas emissions are generally well conducted and are in accordance with the National Greenhouse and Energy Reporting (Measurement) Determination (DCCEE, 2008) and the National Greenhouse Accounts Factors July 2012 (DCCEE, 2012) methodology. The calculations have included the majority of emission activities and Scopes 1, 2, and 3.

However, the greenhouse gas emission mitigation strategies are very brief, do not demonstrate a sufficient level of commitment by the Proponent to reduce emissions, and do not adequately address the terms listed in the Director-General's Environmental Assessment Requirements and the Supplementary Director-General's Requirements (as mentioned in Section 6.1.2).

In order to fully address these requirements and to achieve emissions reduction during construction and operation, the following key actions are considered necessary:

- Develop more detailed approaches for implementing the proposed greenhouse gas reduction measures. For example, conduct feasibility assessments of each proposed measure including establishment of best practice, document planning and management of measures to be implemented, list goals to be achieved and develop a monitoring framework, as well as conducting financial assessments).
- Provide a more realistic assessment of greenhouse gas (GHG) impacts by including Scope 2 and 3 emissions sources in the analysis of the GHG impacts and updating impacts of the Project on anthropogenic global warming, such as using a Global Carbon Budget approach as defined in the scientific literature.

7 Ecology

7.1 Context

7.1.1 Reasons for Refusal 2010

The Minister for Planning cited the following reasons for the refusal of the 2010 Project application in relation to ecological issues:

- *Uncertainty around the ecological impacts of the project, particularly in the western portion of the site, as a result of a lack of ecological survey effort combined with uncertainty as to subsidence predictions in this area;*
- *Uncertainty around the subsidence predictions for the project, particularly in the western portion of the site under Jilliby Conservation Area and the Wyong State Forest.*

7.1.2 New Director General's Requirements

In relation to ecological issues, the 2012 DGRs state that the EIS must address the following:

Biodiversity

- ***Measures taken to avoid, reduce or mitigate impacts on biodiversity;***
- ***Accurate estimates of proposed vegetation clearing;***
- ***A detailed assessment of potential impacts of the development on any:***
 - ***Terrestrial or aquatic threatened species or populations and their habitats, endangered ecological communities and groundwater dependent ecosystems (including the following threatened species: Angophora inopina, Cryptostylis hunteriana, the Giant Barred Frog (Mixophyes iterates), the Stuttering Frog (Mixophyes balbus), the Littlejohns Tree Frog (Litoria littlejohnni);***
 - ***Migratory bird species listed under CAMBA, JAMBA and/or ROKAMBA; and***
 - ***Regionally significant remnant vegetation, or vegetation corridors;***
- ***Impacts on Jilliby State Conservation Area, including impacts on the conservation and recreational values of the reserve and landowner consent issues; and***
- ***A comprehensive offset strategy to ensure the development maintains or improves the terrestrial and aquatic biodiversity values of the region in the medium to long term.***

The Supplementary DGRs aim to ensure that sufficient information is provided to assess the potential impacts to State biodiversity and Commonwealth Matters of National Environmental Significance (MNES). A summary of the Supplementary DGRs in relation to ecological issues is provided below (refer Appendix B for the full document):

Description of the existing environment**3. A description of the existing environment of the proposed location and the surrounding areas that may be affected by the action, including but not limited to:**

- a. Surveys using accepted methodology for targeting EPBC listed threatened species and their respective habitat, including but not limited to OEHS (2009) and DSEWPaC (2013) guidelines;**
- b. A description of the distribution and abundance of threatened species, as well as suitable habitat (e.g. breeding, foraging) within the site and in surrounding areas that may be impacted by the proposal. Specifically, this must include but not be limited to the Charmhaven Apple (*Angophora inopina*), Black-eyed Susan (*Tetraheca juncea*), Spotted-tail Quoll (*Dasyurus maculatus maculatus*) and Giant Barred Frog (*Mixophyes iterates*);**
- c. The regional distribution and abundance of suitable and potential habitat for EPBC listed threatened species surrounding the site.**

Description of the relevant impacts of the controlled action**4. An assessment of all relevant impacts with reference to the EPBC Act Policy Statement 1.1 Significant Impact Guidelines Matters of National Environmental Significance (2009) that the controlled action has, will have or is likely to have on relevant threatened species and/or ecological communities. This includes impacts such as vegetation removal, ground subsidence and alteration of hydrological processes on species including but not limited to Charmhaven Apple, Black-eyed Susan, Spotted-tail Quoll and Giant Barred Frog. Information must include:**

- a. A description of the relevant impacts of the action on MNES;**
- b. Detailed assessment of the nature and extent of the likely short term and long term relevant impacts;**
- c. A statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible;**
- d. Analysis of the significance of the relevant impacts;**
- e. Any technical data and other information used or needed to make a detailed assessment of relevant impacts.**

5 & 6. A description of the relevant impacts on the Charmhaven Apple and the Giant Barred Frog should include an analysis of the current distribution and/or potential habitat on the site. It should also include direct, indirect, cumulative and facilitative impacts on the:

- a. Extent of the population, including connectivity to populations on the site and in the surrounding area;**
- b. Quality or integrity of the populations;**
- c. Abiotic factors necessary for the survival of the species, particularly impacts associated with ground subsidence and alteration to ground and surface hydrology.**
- d. These impacts should be described for both the construction and operational phases of the controlled action.**

Proposed safeguards and mitigation measures**7. A description of feasible mitigation measures, changes to the action or procedures, which have been proposed by the proponent or suggested in public submissions and which are intended to prevent or minimise impacts. Information must include:**

- a. Description of the mitigation measures, these measures should be justified and based on best available practices;**

- b. An assessment of the expected or predicted effectiveness of the mitigation measures;**
- c. Any statutory or policy basis for the mitigation measures;**
- d. The cost of the mitigation measures;**
- e. An environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs (including any relevant thresholds for corrective actions). Include the person or agency responsible for implementing these programs and any provision for independent environmental monitoring;**
- f. The name of the agency responsible for endorsing or approving each mitigation measure or monitoring program;**
- g. Identification of mitigation measures proposed to be undertaken by State or local governments or the proponent.**
- h. Any changes to the action which prevent or minimise relevant impacts on listed threatened species or communities.**

Offsets

- 8. Any residual impacts should be offset to ensure protection of MNES. Reference should be made to the department's draft policy statement, including any revisions to this statement, and:**
 - a. Description of any offset package including how the offset compensates for the residual impacts, when the offset will be delivered and how the offset will be managed;**
 - b. An assessment of the impact of the offsets on other matters of environmental, economic or social significance; and**
 - c. Analysis of cost, both financial and other, related to offsets.**

7.1.3 Earth Systems Recommendations 2010

In relation to ecological issues, Earth Systems' 2010 EIS Review recommended:

- Further ecological surveys and assessment, including comprehensive Commonwealth threatened species and aquatic fauna surveys.

Key issues identified with the 2010 EIS included:

- The ecological assessment had been undertaken without the establishment of an adequate baseline.
- Only limited field surveys were conducted for the proposed mining area, which is particularly significant given the potential presence of Commonwealth threatened species in the area. Detailed field information on these species was not able to be provided in the EA.
- No current field baseline had been established for aquatic fauna.

7.1.4 New Regulatory Requirements

Environment Protection and Biodiversity Conservation (EPBC) Environmental Offsets Policy 2012

The new policy outlines the Australian Government's commitment to the use of environmental offsets and replaces the draft policy statement *Use of environmental offsets under the EPBC Act (2007)*. The policy and associated offset calculation guidelines provide much more transparency about the suitability of offsets. The decision to approve a proposed action considers the suitability of proposed offsets. This new policy applies to "any new referrals and variations to approval conditions from 2 October 2012. It also applies to any projects currently under assessment for which a proposed decision has not yet been made" (DSEWPC 2012).

Forestry Act 2012

The new act repeals the *Forestry Act 1916* and the *Timber Marketing Act 1977* to provide for the dedicated management and use of state forests and crown timber land for forestry and other purposes. Additionally, the Act serves to constitute the Forestry Corporation of New South Wales as a statutory state owned corporation. The western portion of the proposed mining Project is within the Wyong State Forest.

7.2 2013 EIS

Catchments and State Forests in the vicinity of the Project are discussed in Chapter 2 of the main EIS Report by Hansen Bailey. Potential ecological impacts and proposed management/mitigation measures are discussed in Chapter 7 (Sections 7.9 and 7.10).

These sections are based on the specialist studies provided as appendices to the EIS as follows:

- Appendix O: Cumberland Ecology (2013) Wallarah 2 Coal Project Ecological Impact Assessment.
- Appendix P: Marine Pollution Research Pty Ltd (2013) Wallarah 2 Coal Aquatic Ecology Impact Assessment

Additional work conducted for the 2013 EIS in relation to terrestrial and aquatic biodiversity is summarised below.

7.2.1 Terrestrial Biodiversity

Additional terrestrial vegetation mapping, flora and fauna surveys were conducted within the eastern and western portions of the proposed mining Project area since the 2010 EIS submission (

Table 7.1). Vegetation mapping was conducted and vegetation condition assessed throughout the entire Project Boundary (except for in areas with logistic constraints, e.g. difficult terrain). Based on these field surveys and satellite imagery, an overall assessment of the vegetation within the Project Boundary was conducted.

Quadrats and transects within the eastern portion of the Project Boundary and two quadrats around the Western Ventilation Shaft were assessed for all vascular plants and targeted for threatened species and orchids. Fauna habitat surveys, particularly focused on the presence of tree hollows, was predominantly conducted in the eastern portion of the Project Boundary. All vertebrate species (except fish) were surveyed for throughout the entire site, using a variety of methods. These surveys were much more comprehensive (both spatially and taxonomically) than previous work conducted for the 2010 EIS.

Table 7.1 A summary of additional field biodiversity surveys conducted for the Wyong 2 Coal Project EIS

Year/s	Assessment conducted	Area/s assessed
2009-2012	<ul style="list-style-type: none"> • Vegetation mapping • Vegetation condition 	<ul style="list-style-type: none"> • Buttonderry • Tooheys Rd • Hue Hue Rd Offset • Western Project (Extraction) Area (mostly along public roads) • Western Ventilation Shaft • Honeysuckle Park
2009-2012	<ul style="list-style-type: none"> • Flora surveys (quadrats) 	<ul style="list-style-type: none"> • Buttonderry

	<ul style="list-style-type: none"> Targeted threatened flora species surveys Orchid surveys 	<ul style="list-style-type: none"> Tooheys Rd Hue Hue Rd Offset Western Ventilation Shaft
2012	<ul style="list-style-type: none"> Targeted <i>Angophora inopina</i> and <i>Melaleuca biconvexa</i> searches 	<ul style="list-style-type: none"> Buttonderry Tooheys Rd
2009-2012	<ul style="list-style-type: none"> Fauna habitat assessment Tree hollow assessments 	<ul style="list-style-type: none"> Buttonderry Tooheys Rd Hue Hue Rd Offset
2009-2012	<i>Fauna surveys</i> <ul style="list-style-type: none"> Ground and arboreal mammals Micro-bats Nocturnal mammals, birds and amphibians Diurnal birds Reptiles and amphibians 	<ul style="list-style-type: none"> Western Project (Extraction) Area Tooheys Rd Hue Hue Rd Offset Buttonderry

7.2.2 Aquatic Biodiversity

A new Aquatic Ecology Impact Assessment was commissioned for this EIS (Appendix P). The study involved a broad, catchment-wide literature and database review of the current aquatic ecology of the region and included an assessment of potential impacts from the Project on local and downstream ecology and aquifers (Table 7.2). The study also surveyed local rivers and tributaries for flora, fauna, ecological communities, water quality and stream health over three seasons. In addition, boreholes were assessed for the presence of stygofauna in aquifers near to the proposed mining operations in the western portion of the Project Boundary.

Table 7.2 Summary of the baseline aquatic ecology study undertaken for the Wyong 2 Coal Project EIS

Year/s	Assessment method	Area/s assessed
2011	<ul style="list-style-type: none"> Literature review 	<ul style="list-style-type: none"> Walarah Creek sub-catchment Wyong River sub-catchment
Autumn/Spring 2011 Autumn 2012	<ul style="list-style-type: none"> Macroinvertebrates AusRivAS sampling Fish and other vertebrates Stream condition Aquatic plants Water quality Aquatic groundwater dependent ecosystems 	<ul style="list-style-type: none"> Wyong River Jiliby Jiliby Creek Little Jiliby Jiliby Creek Spring Creek Walarah Creek Buttonderry Creek Hue Hue Creek
2010	<ul style="list-style-type: none"> Stygofauna (13 bores) 	<ul style="list-style-type: none"> Jiliby Jiliby Creek Little Jiliby Jiliby Creek Honeysuckle Park

7.3 Key Issues

Description of the existing environment

The additional aquatic surveys conducted have allowed the aquatic baseline of the Project to be described based on field surveys, which was not conducted in the previous EIS. The additional terrestrial ecology surveys conducted have also increased the robustness of the ecological baseline, although there are still some aspects not well covered as described below.

- The Study Area (defined as the Project Boundary) did not include a continuous buffer around the Project infrastructure and extraction zone. In some parts, the Infrastructure Boundary and Project Boundary shared the same “boundary line” or were very close to each other (e.g. along the Motorway Link Road). This is not consistent with the OEH’s *Survey and Assessment guidelines* (2009) which require fauna surveys to be conducted in a continuous buffer zone around the Project Boundary to allow for the consideration of potential impacts on highly mobile fauna, as well as indirect impacts on flora and fauna in the surrounding area.
- Confirmation of the results of the database searches of fauna occurring in the wider region was not adequately conducted. A search for existing records was conducted in a 10 km radius of the centre of the Project, but no confirmation of these results was conducted. An (on site) overview assessment of the surrounding region could have provided much more information about the species potentially (indirectly) impacted by the Project. This could have simply involved incidental records and vehicular inspection along roads.
- Detailed flora quadrat surveys (including surveys for threatened species) were not conducted throughout the Subsidence Impact Limit area. It was noted that incidental observations were taken when conducting other surveys, but no justification was provided as to why quadrats were not completed in other areas (especially in the Jilliby State Conservation Area and Wyong State Forest).

One of the 2012 DGRs is for the EIS to provide (3b) “a description of the distribution and abundance of threatened species”. A statement of abundance and distribution of threatened species has been included for surveyed sites in the eastern portion of the Project Boundary. However, no detailed threatened species population distribution and abundance estimates of the Project Boundary (as a whole) and surrounding area were provided based on available information.

Description of the relevant impacts of the controlled action

Descriptions of the relevant impacts of the Project are discussed briefly within the main text of the 2013 EIS and further detail is provided within two appendices (Appendices O and P). Main findings of the review regarding ecological impacts are as follows:

- The 2012 DGRs specifically require impacts on Jilliby State Conservation Area to be considered in relation to biodiversity. The potential impacts on this area are not specifically discussed in the main text of the EIS, although there is some discussion of likely impacts of subsidence in the conservation area within the relevant Appendices.
- The assessment of the likely extent of indirect impacts on fauna in the main text of the 2013 EIS is too general. For example, Section 7.9.3 indicates that indirect impacts may include “Lighting spillage effects as a result of infrastructure areas” but does not include an assessment of the potential magnitude or duration of this impact. The assessment of indirect impacts of issues such as lighting are also very general in the relevant Appendices and conclusions are largely unjustified. For example, Appendix O states that “*light pollution is unlikely to have a significant long term impact on any fauna species*” (Section 6.3.2). This statement implies that all fauna species are unlikely to be impacted in the long-term; however some disturbance-intolerant species may flee and not return. Some nocturnal species may also be attracted by an increase in

insect activity around the lights. These impacts may continue for the life of the Project and possibly beyond, and should be appropriately considered in the EIS.

- One of the Supplementary DGRs (4c) states that the EIS is required to include “a *statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible*”. Many of the potential ecological impacts listed in the 2013 EIS can be unpredictable and/or irreversible, yet these issues are not discussed in detail in either the main text of the EIS or the relevant appendices (O and P).
- There is limited evidence provided for the conclusion that the impact on species/communities resulting from subsidence “*are expected to be minor and temporary*” (section 6.2.5 of Appendix O) and the level of uncertainty of this conclusion has not been identified. Ecological systems are inherently complex and potential impacts are often unpredictable. Some impacts on ecological values from subsidence may be unpredictable, and it is possible that some impacts could be severe and long-lasting. Given that the NSW Scientific Committee have listed “Alteration of habitat following subsidence due to longwall mining” as a Key Threatening Process, a detailed assessment of these potential impacts and uncertainties should have been included in the 2013 EIS.
- Very limited detail was provided in the EIS main text regarding potential ecological impacts during the different phases of the mine (i.e. construction, operation, closure). There are expected to be markedly different potential impacts on flora and fauna in these three phases. Potential impacts associated with each phase should be clearly identified. The 2012 Supplementary DGRs state that “*impacts should be described for both the construction and operational phases of the controlled action*” for the Charmhaven Apple and Giant Barred Frog (Art. 5 & 6).

Proposed safeguards and mitigation measures

Key findings regarding the proposed safeguards and mitigation measures are:

- A costing of mitigation measures is required by the Supplementary DGRs (Art 7d) but this has not been provided in detail. Brief costing information is found within Appendix O however is not provided within the main EIS text.
- A detailed *environmental management plan* has not been included, which is required by the Supplementary DGRs (Art 7e). However, details regarding the contents of the management plan have been discussed.
- Details of rehabilitation/revegetation procedures to be implemented have not been provided (relevant procedures briefly discussed in Appendix O).

Biodiversity Offset Strategy

Key findings regarding the proposed offset strategy are:

- The Biodiversity Offset Strategy has been developed based on NSW State and 2007 Commonwealth policy guidelines. For the EPBC Act listed species identified within the Project Boundary the Biodiversity Offset Strategy should have been developed in accordance with SEWPac's new Environmental Offsets Policy (2012). As stated in DSEWPC (2012), this policy “*applies to any projects currently under assessment for which a proposed decision has not yet been made*”, which includes the current Project. In addition, the Supplementary DGRs (Art 8) specifically states that “*reference should be made to the department's draft policy statement, including any revisions to this statement*”.
- Some information on costs of the Biodiversity Offset Strategy has been provided. However limited detail is provided and this is unlikely to meet the requirement of the Supplementary DGRs (Art 8c) to provide “*an analysis of cost, both financial and other, related to offsets*”.

- The Biodiversity Offset Strategy has not appropriately taken into account the precautionary principle which is required in the absence of scientific certainty in accordance with SEWPaC's Environmental Offsets Policy (2012). Much of the Subsidence Impact Limit area could not be surveyed due to limited access and difficult terrain, however it is highly likely that EPBC and TSC Act species inhabit the area. Due to the likely impact of subsidence on these areas, appropriate offsets for the Subsidence Impact Limit area that were unable to be surveyed should be included in the Biodiversity Offset Strategy.
- Offset areas have been proposed for land beside the Project infrastructure. It is highly likely that these areas will be indirectly impacted by mining activities over the life of the Project. Although the Proponent has proposed a buffer (of unknown size) around the offsets to allow for greater protection, highly mobile fauna (especially species with large territories) are likely to avoid these areas. Disturbance tolerant species (e.g. Noisy Miner *Manorina melanocephala*) will probably use the offset areas, but sensitive species (especially threatened) may not use these areas near to the disturbance source (i.e. negating one of the purposes of the offset).
- No details have been provided as to how offsets for impacted vegetative and fauna species have been calculated.

7.4 Conclusions and Recommendations

In general, the 2013 EIS provides a much more comprehensive understanding of the ecological characteristics present within the Project Boundary than was previously presented in the 2010 EIS. Most of the 2012 DGRs and Supplementary DGRs have been addressed. However, there are several requirements that have not been adequately addressed, particularly in relation to the coverage of baseline surveys, assessment of indirect impacts and the approach to the Biodiversity Offset Strategy.

Clarification of the issues identified will be required to ensure that the potential impacts on flora and fauna are adequately assessed and an appropriate management and offset strategy are in place to address these impacts. Further survey work will also be required if these issues are unable to be addressed based on existing data.

One of the key 2012 DGRs is for the EIS to provide (3b) "*a description of the distribution and abundance of threatened species*", however this requirement has not been adequately met in the revised EIS. While a statement of abundance and distribution of threatened species has been included for the eastern portion of the Project Boundary, no detailed threatened species population distribution and abundance estimates of the Project Boundary (as a whole) and surrounding area were provided. Threatened species abundance estimates should be calculated for the entire Project Boundary, including estimates for the surrounding area (i.e. within a buffer zone).

The flora baseline surveys were found to have not adequately covered the Subsidence Impact Limit area. It is therefore recommended that further detailed surveys for flora be conducted to establish a robust flora baseline for the Subsidence Impact Limit (or justification provided as to why significant areas are not able to be surveyed within this zone, and particularly in Jilliby State Conservation Area and Wyong State Forest).

Very limited detail was provided regarding potential indirect impacts on flora and fauna in the area surrounding the Project Boundary. Furthermore, fauna surveys were not conducted in a continuous buffer zone around the Project Boundary to allow for the consideration of potential impacts on highly mobile fauna, as well as indirect impacts on flora and fauna as required by OEH's *Survey and Assessment guidelines* (2009). It is therefore recommended to conduct further baseline surveying within a continuous zone around the Project Boundary. Potential indirect impacts on flora and fauna should then be described in detail in EIS and management measures should be developed accordingly.

The Biodiversity Offset Strategy for flora and fauna species in the 2013 EIS does not take into account the new Environmental Offsets Policy released in October 2012. It is therefore recommended that the Biodiversity Offset Strategy for threatened species is revised based on the latest policy (or evidence be provided of approval from SEWPaC that assessment based on the State recommendations is acceptable). This should also include a much more comprehensive costing of the offsets, to ensure the Supplementary 2012 DGRs are met appropriately.

Considering much of the Subsidence Impact Limit area could not be surveyed due to difficult terrain or access limitations, the precautionary principle should be adopted. It is highly likely that EPBC and TSC Act species inhabit the area and due to the likely impact of subsidence, appropriate offsets for this area should be included in the Biodiversity Offset Strategy. DSEWPaC be consulted regarding the most suitable way to offset the impact on the threatened species potentially inhabiting this western portion of the Project Boundary.

Finally, it is recommended that the suitability of currently proposed offsets for fauna habitat should be reviewed as the proposed offset areas include land is located directly adjacent to the mine disturbance areas and therefore will not be appropriate offsets until the closure of the mine.

A detailed *environmental management plan* should be developed as required by the Supplementary DGRs (Art 7e). This should include specific sections covering terrestrial and aquatic biodiversity management and monitoring. It is hard to assess the impact on the ecology from the Project without an explicit ecological management and monitoring plan.

8 Noise and Vibration

8.1 Context

The impacts of exposure to noise emission from industrial activity (and associated activities, including construction, operations, and transport of personnel / product) range from nuisance levels to intensities that may degrade health and well-being. While there is variability in response to elevated noise according to individual receptors, decibel levels and the frequency and timing of disturbance; scientific evidence has demonstrated that impacts from construction and industrial operations can sufficiently compromise health and well-being for humans and animals to warrant diligent impact assessment and mitigation measures where required.

Similarly, vibrations resulting from construction or industrial operations may impact nearby receptor due to the nuisance of sustained vibration to potentially compromising the integrity of adjacent structures or geotechnical stability of landforms.

For their 2013 EIS, the Wallarah 2 Coal Project conducted assessments to determine whether noise and vibration from construction or operations may pose a threat to nearby receptors, and if so, to develop management and mitigation measures to avoid or mitigate for potential impacts.

8.1.1 Reasons for Refusal 2010

Noise and vibration were not identified as sources for refusal of the 2010 EIS.

8.1.2 New Director General's Requirements

The Director General's environmental assessment requirements (DGRs) for the preparation of an EIS for the proposed Wallarah 2 Coal Project, dated January 12, 2012, included the following applicable language for noise and vibration and applicable general requirements (supplementary requirements added to the original DGRs for the Project):

General Requirements Relevant to Noise and Vibration

"The Environmental Impact Statement (EIS) for the development must meet the form and content requirements in Clauses 6 and 7 of Schedule 2 of the Environmental Planning and Assessment Regulation 2000.

In addition, the EIS must include a:

- ***detailed assessment of the key issues specified below, and any other significant issues identified in this risk assessment, which includes:***
 - ***a description of the existing environment, using sufficient baseline data;***
 - ***an assessment of the potential impacts of all stages of the development, including any cumulative impacts, taking into consideration relevant guidelines, policies, plans and statutes; and***
 - ***a description of the measures that would be implemented to avoid, minimise and if necessary, offset the potential impacts of the development, including proposals for adaptive management and/or contingency plans to manage any significant risks to the environment; and***

- ***consolidated summary of all the proposed environmental management and monitoring measures, highlighting commitments included in the EIS.***

Key Issues Relevant to Noise and Vibration

“Noise - including a quantitative assessment of potential:

- ***construction, operational and transport noise impacts;***
- ***offsite road noise impacts; and***
- ***reasonable and feasible mitigation measures, including evidence that there are no such measures available other than those proposed; and***
- monitoring and management measures, in particular real-time and attended noise monitoring”

8.1.3 Earth Systems Review 2010

The Earth Systems’ review of the 2010 EIS indicated that the noise assessment does not adequately identify and assess the potential construction noise impacts from the surface facility works.

The noise assessment does not identify and consider future changes in land uses such as the proposed Warnervale Town Centre and the Wyong Employment Zone when determining the land zoning and noise amenity goals in accordance with the *NSW Industrial Noise Policy*. It is also noted that no reference measurement or assessment locations were established at the proposed Warnervale Town Centre.

8.1.4 New Regulatory Requirements

New regulatory requirements or updates to regulatory requirements following the submission of the 2010 EIS include:

- *NSW Road Noise Policy* (OEH 2011); and
- *Assessing Vibration: a Technical Guideline* (OEH, 2009).

8.2 2013 EIS

Noise

Additional ambient noise monitoring was undertaken for the 2013 EIS. Post 2007 noise monitoring was comprised of the measurement of ambient sound pressure levels at six locations, conducted for one week (24 hours/day) in March 2012. Measurements were recorded at five of the locations used for previous assessment and one new location, on Propan Way in Blue Haven, set-up to account for Warnervale Town Centre and the Wyong Employment Zone.

Results were then evaluated to establish (or confirm) Rating Background Levels (RBL) and to establish the Project Specific Noise Criteria (PSNC) for the Project. Quantitative and qualitative methods were used to evaluate whether noise from construction, blasting, road traffic and rail traffic during daytime, evening or night would exceed PSNC during varying meteorological conditions and whether sleep disturbance criteria may be exceeded.

Daily traffic estimates for construction personnel were elevated to a predicted level of 440 two-way car movements at Buttonderry Site, 800 two-way car movements at Tooheys Road Site and 90 at the Western Ventilation Shaft (modified from 290, 500 and 90, respectively).

Contour plots were generated that indicate the areas of exposure to noise levels above 40 and 45 dBA for daytime and evening operations. The proponent developed 'feasible and reasonable' noise control measures that will be incorporated into Project construction and operations.

As per the New DGRs, the 2013 EIS includes Proponent development of a leading practice noise monitoring network that will include quarterly attended noise monitoring during construction and operations, a network of real time noise monitors, a meteorological monitoring systems, and regular correlation of real time noise monitoring data with meteorological station data.

Vibration

Structural damage assessment criteria and human disturbance were assessed for the construction phase of the Project, with predictions of vibration levels from dynamic rollers and rock hammers (identified for their potential to create the highest levels of ground vibration during construction) included in the assessment.

Dozers and trucks were identified as key sources of vibration from mining related activity and were therefore assessed for their potential to impact private receptors.

Qualitative modelling was conducted for blasting during construction to determine whether air blast overpressure criteria and ground vibration criteria would be satisfied at the closest private receptors.

8.3 Key Issues

Noise

Ambient noise measurement was conducted at thirteen (13) potentially sensitive receptor locations. Modelling was utilised for estimates of: construction noise, construction vibration, and blasting; operational noise and vibration at the Tooheys Road Site and Buttonderry Site, road and rail traffic noise; and sleep disturbance assessing whether Project Specific Noise Criteria (PSNC) may be exceeded and/or structural or human comfort criteria from vibration or blasting would be exceeded.

While some data was provided for estimates of unmitigated noise generation, the noise modelling for conditions at sensitive receptors assumed the implementation of recommended noise attenuation components in Project development and operations. The exception to this was for predicted short term noise disturbance from train horn, wagon bunching, coal bin loading, and transfer chute plates, where the results of unmitigated and mitigated noise modelling is provided.

The following potentially excessive noise related issues are identified in the 2013 EIS:

- Noise modelling indicates that construction noise levels have the potential to exceed the PSNC at Amberwood Close (Project-owned residences). The predicted noise levels of 50 – 55 dBA exceed the daytime PSNC of 46 dBA.
- The specialist study (Appendix N) indicates that predicted noise levels may exceed the PSNC for more than 25% of a contiguous block of land for two privately owned properties in single land ownership in the Tooheys Road Site area, Receiver 57 (K.R. Drake) and Receiver 58 (K.L. Norman). Atkins Acoustics (Appendix N) identified two additional private receptors, Receiver 56 (The Commissioner for Main Roads) and Receiver 152 (Roads and Traffic Authority of NSW) where predicted noise levels exceed the PSNC for more than 25% of the land.
- Noise contributions would exceed recommended sleep disturbance criteria if unmitigated, including: train horn, wagon bunching, coal bin loading and transfer chute plates. The 2013 EIS

indicates that with implementation of noise controls described in Section 7.8.4 of the EIS, modelling has shown that noise levels are predicted to remain below sleep disturbance criteria.

The 2013 EIS defines daytime construction hours of 7am to 6pm on Saturday and 8am to 6pm on Sundays and Holidays. DECCW's recommended hours are 8am to 1pm on Saturday and no work (or blasting) on Sundays or public holidays.

Vibration

Assessment of construction and operations equipment indicated that the respective equipment that would create the greatest vibration will satisfy human comfort criteria and structural damage assessment criteria at all private receptors.

Qualitative modelling results indicate that air blast overpressure criteria and ground vibration criteria will be satisfied at the closest private receiver with the employment of Maximum Instantaneous Charge and 'detailed planning of any blasts needed to assist in construction of either surface facilities or underground activities' (2013 EIS, Section 7.8.3).

The management and mitigation for blasting has not been assessed to the level required during construction and operations. Specific management measures should be incorporated into the Noise Management Plan that addresses the procedure for implementing blasting.

8.4 Conclusions and Recommendations

The impact assessment and management strategies for noise were conducted according to applicable guidelines, with identification of appropriate PSNC and few predictions of exceedences of PSNC. However, it is important to note that noise modelling estimates for operations for the Tooheys Road and Buttonderry Sites assume Project adoption of specific strategies for ameliorating noise from the site. The validity and applicability of predicted outcomes for Rating Background Levels and potential exceedences of PSNC should only be considered applicable if the Project implements all the 'feasible and reasonable noise control' mitigation and management measures listed in Section 7.8.4 of the EIS.

Potential exceedences of PSNC listed in Section 7.8.3 of the EIS should be considered 'best case scenario' residual impacts that would apply if each of the management measures listed in Section 7.8.4 of the 2013 EIS and Sections 3.1.1 and 3.2.1 of the *Noise and Vibration Impact Assessment Report* (Appendix N) are implemented.

The EIS specifies that the WACJV will develop a Noise Management Plan for construction and operation of the Project that will incorporate noise attenuation and management. The Noise Management Plan will also identify a noise monitoring network comprised of quarterly attended noise monitoring, correlation of real time noise monitoring results with meteorological station data, a network of real time noise monitors, and trigger levels developed to notify site supervisors of noisy operations.

Earth Systems recommends WACJV incorporation of the following measures, should the Project be granted approval:

- Construction of the preferred option (refer to Appendix N), with incorporation of all the Feasible and Reasonable Noise Control measures identified in Section 7.8.4 of the EIS. As the majority of management relies on design elements and equipment selection (and modelling assumed their implementation), anticipated noise levels are dependent on this commitment.
- Development of a Noise Management Plan that includes targeted actions that would be employed following exceedence of trigger values;

- Identification (and justification) of key sensitive receptors in the Noise Management Plan for incorporation into the monitoring program.
- Specific provisions for identifying and contacting applicable residents that would be impacted by construction that occurs outside of the recommended hours (e.g. after 6 p.m. Monday – Friday, after 1 p.m. on Saturday, and on Sunday);
- Provision for investigations and response to complaints.

Vibration

Equipment identified to pose the greatest risk regarding vibration during construction and operations are predicted to satisfy structural damage assessment criteria and human comfort criteria. Impacts from blasting, however, are expected to require the employment of Maximum Instantaneous Charge (MIC) and 'detailed planning of any blasts needed to assist in construction of either surface facilities or underground activities' (2013 EIS, Section 7.8.3).

Earth Systems recommends WCJV incorporation of the following measures, should the Project be granted approval:

- Inclusion of vibration management in the Noise Management Plan or development of a Vibration Management Plan prior to construction;
- The plan should require MIC for required blasting unless it can be conclusively demonstrated that it is not required for a specific blasting scheme;
- The plan should identify and develop specific management requirements for blasting to replace the ambiguous language that is currently applied; and
- The plan should identify provision for investigations and response to complaints.

9 Visual Amenity

9.1 Context

9.1.1 Reasons for Refusal 2010

No reasons associated with Visual Amenity were cited in the 2010 Project Refusal.

9.1.2 New Director General's Requirements

The Director General's Requirements have been updated in 2012 to include the following:

Visual - including:

- ***A detailed assessment of the:***
 - ***Changing landforms on site during the various stages of the project; and***
 - ***Potential visual impacts of the project on private landowners in the surrounding area as well as key vantage points in the public domain, and particularly the proposed Warnervale Town Centre, Wyong Employment Zone and the major elements of the public domain linking these two.***
- ***A detailed description of the measures that would be implemented to minimise the potential visual impacts of the project.***

9.1.3 Earth Systems Recommendations 2010

Earth Systems review of the EIS in 2010 found that the natural feature baseline for the project needed to be strengthened to provide a more accurate representation of the visual character of the site. It was further noted that no mitigation and management measures were presented

9.1.4 New Regulatory Requirements

There are no new regulatory requirements directly applicable to the visual amenity aspects of the EIS.

9.2 2013 EIS

Visual Impacts are discussed in Section 7.16 of Chapter 7 of the EIS Report by Hansen Bailey. This section was based on the specialist studies provided as appendices to the EIS as follows:

- Appendix U: The Design Partnership (2013) Wyong Areas Coal Joint Venture, Wallarah 2 Coal Project Visual Impact Assessment.

9.3 Key Issues

The specialist study conducted for the Project provides a description of the existing visual character of the proposed surface facility sites as well as key visual elements of the region. The study makes good use of topographic surveys and aerial photographs in its baseline assessment. Whilst a generally sound assessment from key viewpoints to the proposed surface facility sites has been made, our review notes the following limitations:

Director General's Requirements

The Director General's Requirements outline that the assessment should provide '*a detailed assessment of changing landforms on site during the various stages of the project*'. The EIS Report has not broken down the anticipated visual impacts by project phase and as such does not meet the DGR.

Warnervale Town Centre

In 2010 it was noted that the Warnervale Town Centre development was not adequately considered in respect to visual impacts. This was addressed in the 2013 EIS, with visual impacts upon the site considered in the Main EIS Report. The report suggests that it is unlikely to be visually impacted as a result of the ridgeline and existing vegetation.

A viewshed analysis for the Warnervale Town Centre has been deduced from that conducted for Bruce Crescent, which is closer to the proposed project site. The viewshed analysis in Appendix U indicates that the site will not be visible due to topography.

Visual Landscape Character Assessment Viewpoints

The 2013 EIS Report stated that a Visual Landscape Character Assessment was undertaken to determine key viewpoints for the project, all of which were for roads. This has mitigated the discrepancy noted in the methodology of the 2010 EIS Report, which stated that key viewpoints for the assessment will be from public spaces such as parks, roads and lookouts; however all the key viewpoints appeared to be from roads only.

Bushell's Road Residences

The 2010 EIS Review indicated that it was unclear whether the residential properties on Bushell's Ridge Road would have partial views of the Project Site. The 2013 EIS indicates in the Social Impact Assessment that the residents were unlikely to have views of the site, however, they would have views to the Buttonderry Site when using Hue Hue Road or the Freeway.

Surface Facility Infrastructure Exterior Palette

Appendix U indicates that surface facility infrastructure and buildings will be constructed in neutral colours as to blend into the natural vegetation. Heights and materials used for elevated structures are indicated in limited detail in Appendix U.

Photomontages

The photomontages of the Tooheys Road Site from the F3 Freeway and Motorway Link Road show that the coal stockpiles and gantry and conveyor are visually prominent. A proposed concept landscape design is provided in Appendix A of Appendix U, which is anticipated to mitigate these views.

Landscape Concept Designs

Landscape Concept Designs have been prepared for both sites which incorporate management and mitigation measures to minimise the potential visual impacts of the Project. Although the focus of the

mitigation measures proposed is on the continuation and enhancement of endemic vegetation to screen the surface facilities and stockpiles from major travel routes, the plans do not identify any of the endemic species proposed to be planted. The Landscape Concept Designs should list the proposed endemic flora as a palette to give an indication of the mature height, density and bulk of vegetation.

9.4 Conclusions and Recommendations

The visual assessment conducted for the Project provides a good site analysis and identification of key viewpoints, assessment of potential visual impacts and recommendations for mitigation measures to minimise impacts of the Project.

10 Traffic and Transport

10.1 Context

10.1.1 Reasons for Refusal 2010

No reasons associated with Traffic and Transport were cited in the 2010 Project Refusal.

10.1.2 New Director General's Requirements

The Director General's Requirements have been updated in 2012 to include the following:

Traffic and Transport- including:

- ***A detailed assessment of the project on the capacity, efficiency and safety of the:***
 - ***Rail network, having regard to the strategic objectives for passenger and freight rail network (such as Northern Sydney Freight Rail Corridor Project); and***
 - ***Local road network, with particular regard to the Wallarah interchange (F3 Freeway and Sparks Road), Motorway Link Road / Tooheys Road intersection, and the Sparks Road / Hue Hue Road intersection; and***
- ***A description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road and rail networks in the surrounding area over the life of the project.***

10.1.3 Earth Systems Recommendations 2010

Earth Systems' 2010 EIS Review recommended the development of a supplementary environmental assessment that included consideration of the findings of further traffic assessment investigations currently being undertaken by the Proponent.

Key issues identified included:

- Limited consideration of road safety aspects, and
- No evidence of a detailed study of the capacity, efficiency and safety of the rail network.

10.1.4 New Regulatory Requirements

Since submission of the 2010 EIS, no significant new regulatory requirements directly applicable to the Traffic and Transport assessment for the Wallarah 2 Coal Project.

10.2 2013 EIS

Traffic and Transport Impacts are discussed in Chapter 7 of the main EIS Report by Hansen Bailey. This section was based on the specialist studies provided as appendices to the EIS as follows:

- Appendix Q: Parsons Brinckerhoff Australia (2013) Wyong Areas Coal Joint Venture, Wallarah 2 Coal Project Traffic Impact Study.
- Appendix R: Rail Management Consultants Australia (2013) Wallarah 2 Coal Project Rail Study

10.2.1 Traffic and Transport

Traffic and Transport is discussed in Section 7.12 of Chapter 7 of the EIS. This section is a summarised version of the Traffic and Transport Assessment in Appendix by Parsons Brinckerhoff (PB). Issues considered in the 2013 assessment additional to those considered in 2010 included:

- A review of existing crash data and road safety deficiencies;
- A traffic impact analysis was performed for key intersections in the vicinity of the Project using intersection simulation software (SIDRA). The intersection analysis was applied to future scenarios with and without the proposed Project to account for background traffic growth as well as anticipated traffic generated by the Project. The analysis was performed on the following intersections:
 - *Walarah Interchange (F3 Freeway and Sparks Road);*
 - *Sparks Road - Hue Hue Road; and*
 - *Motorway Link - Tooheys Road interchange.*
- A cumulative assessment including surrounding developments and their impacts on the surrounding road network.
- Recommendations of potential mitigation measures and road safety improvements.

10.2.2 Rail Study

Section 7.13 of Chapter 7 of the EIS also details potential impacts upon the local and regional rail network. The relevant section is based upon a detailed Rail Study that was developed by Rail Management Consultants Australia (RMCA) as an Appendix to the 2013 EIS to address the Director's General Requirement relating to rail services. The study included:

- A description of the existing rail network and its capacity; and
- A discussion of the anticipated impacts of the Project upon the capacity of the rail system.

10.3 Key Issues

Director General's Requirements

The review of the traffic assessment found that it provided a detailed analysis of the forecast traffic and transport impacts (including rail) on the surrounding road network that are likely to arise as a result of the Project.

A traffic impact analysis was performed for key intersections in the vicinity of the Project using intersection simulation software (SIDRA), including:

- *Wallarrah Interchange (F3 Freeway and Sparks Road);*
- *Sparks Road - Hue Hue Road; and*
- *Motorway Link - Tooheys Road interchange.*

Cumulative Impacts

The 2010 EIS Review noted a lack of consideration of potential cumulative traffic impacts associated with traffic flows generated from new developments in the area. This has been addressed in the 2013 EIS, giving reference to the detailed cumulative assessment as undertaken in Section 1.4 of Appendix Q.

Consideration of new developments

The EIS states that a Traffic Management Plan would be required prior to construction, which would include any official revised traffic predictions covering new developments in the area. It was noted in 2010 that for the EIS to adequately assess the potential traffic impacts of the Project on the surrounding road network, the traffic assessment would require revision to take into account the traffic generated by the Warner Industrial Park (Precinct 14). As such, in 2010 WSC advised Earth Systems that the revised intersection analysis would need to re-evaluate the following intersections:

- Sparks Road / Hue Hue Road;
- Sparks Road / Precinct 14; and
- Hue Hue Road / Precinct 14.

These intersections have been evaluated in the 2013 EIS (Appendix Q), giving consideration for background traffic associated with Precinct 14 (Warner Industrial Park / Wyong Employment Zone) in scenario modelling for construction and operations phases, and 'no-project' scenarios.

Internal Haulage Route

As noted in the 2010 review of the EIS, the 2013 Report has not identified the internal haulage routes to be utilised for the movement of excavated material within the site.

Chapter 2 of the EIS Main Report notes that all excavated material from the Tooheys Road and Buttonderry sites will be re-used onsite for the creation of a perimeter bunding and landscaping features. However, Appendix Q of the EIS states that "*the construction traffic management plan should also be used to develop site-specific management measures once the construction methods and haulage routes are finalised*". This indicates that the route is at present unconfirmed, and as such, the potential environmental impacts of utilising such an internal route are unable to be identified.

Haulage of spoil offsite

The haulage route for excavated material to be moved offsite from the Western Ventilation Shaft has not yet been confirmed.

An estimated 5700 m³ of material from the excavation of the Western Ventilation Shaft is required to be taken offsite by road. It is quoted that "*at this stage the destination of this material has not been identified*", with a suggestion that upon confirmation of the route, efforts would be made to minimise impacts on the road network.

WSC expressed concerns during the 2010 Review about the potential adverse impacts on the road network due to the accelerated loss of pavement life caused by the additional truck movements during the construction of the Western Shaft. The anticipated number of truck movements are detailed in the 2013 EIS Report (Appendix Q), however, their impacts on pavement and drainage structures are not covered in

specific detail. Section 8 of Appendix Q addresses road dilapidation and recommends that heavily utilised roads are monitored, and for any impacts beyond reasonable wear and tear to be addressed immediately by WACJV or the road authority.

Traffic Management Plans

A Traffic Management Plan has not been developed as part of the 2013 EIS.

Appendix Q of the EIS indicates that Traffic Management Plans would be developed for the construction of rail bridges for the new rail spur line crossing over Tooheys Road, as well as Traffic Control Plans for road works to be undertaken. It is noted that a specific management plan for this issue is not mentioned in the Statement of Commitments or in Chapter 8 of the EIS (Table 103: Project Management and Monitoring Measures).

Temporary Road Closures of Brothers and Tooheys Roads

The traffic assessment indicates that both Brothers Road and Tooheys Road would be upgraded as part of the Project and will likely be closed temporarily. Whilst the assessment does indicate that a Traffic Management Plan would be developed in coordination with road authorities and landholders to manage traffic along Tooheys Road during construction, limited details are provided on the potential impacts on traffic flows.

Rail Impacts

Appendix R: Rail Study notes that the Wyong – Newcastle Rail System is almost wholly within RailCorp's network, with a small area of overlap with the Australian Railway Track Corporation (ARTC). A number of planned upgrades are being introduced to meet anticipated demand from a number of projects within the area, irrespective of the approval of the Wallarah 2 Coal Project.

It is anticipated that the project will require an average of 4.33 trains per day during operations for coal transport, with capacity for 6 trains per day 6 days per week. The additional services as a result of the project are anticipated to result in level crossing closures for an additional 56 minutes per day.

Three scenarios have been modelled in conjunction with RailCorp, the third option inclusive of the installation of new passing loops at Awaba North. This is the selected option anticipated to have the least impacts upon existing services, as well as catering for anticipated future growth in service requirements.

The installation of the Awaba North Passing Loops has been recommended as a mitigation and management measure for rail impacts. This is a measure to be considered by RailCorp and is outside the scope of WACJV's individual capacity to manage the capacity, efficiency and safety of the local and regional rail network.

10.4 Conclusions and Recommendations

In general, the 2013 EIS document addresses the major traffic and transport requirements of the Director General, as well as the issues noted by Earth Systems in the 2010 EIS Review. It is clear that further investigations and studies have been completed to meet these requirements and identified gaps.

Further investigation is required to confirm the haulage route and its potential environmental impacts, and to confirm the off-site disposal site for spoil from the excavation of the Western Ventilation Shaft and whether the transport of spoil would have an impact on existing road use to the site.

A Traffic Management Plan should be developed immediately to ensure all stakeholders have the opportunity to comment on the recommended management and mitigation measures and to understand any potential residual impacts. Specific Traffic Management Plans for the construction of rail bridges for

the new rail spur line crossing over Tooheys Road, as well as Traffic Control Plans for road works to be undertaken should also be developed as recommended by Parsons Brinckerhoff in Appendix Q.

An evaluation of potential mitigation measures for managing rail network capacity limitations outside the proposed ARTC rail network upgrades would support the Traffic and Transport assessment in comprehensively meeting the Director General's Requirements.

11 Archaeology and Heritage

11.1 Context

11.1.1 Reasons for Refusal 2010

The 2010 EIA prepared for the Wyong Areas Coal Joint Venture was rejected in 2011 because there was uncertainty around the heritage impacts of the Project. In particular, the refusal was issued because insufficient surveying was conducted within the western portion of the site (i.e. above the mine) and the impact of subsidence on the heritage characteristics of the site was not adequately addressed.

11.1.2 New Director General's Requirements

The Director General's Environmental Assessment Requirements and a Supplement to the Director General's Requirements were issued to the Proponent in 2012. The primary document detailing the Director General's requirements states that the EIS must address the following:

Heritage

- **An Aboriginal cultural heritage assessment (including both cultural and archaeological significance) which must:**
 - **Demonstrate effective consultation with Aboriginal communities in determining and assessing impacts, and developing and selecting mitigation options and measures;**
 - **Outline any proposed mitigation and management measures (including an evaluation of the effectiveness and reliability of the measures); and**
- **A Historic heritage assessment (including archaeology) which must:**
 - **Include a statement of heritage impact (including significance assessment) for any State significant or locally significant historic heritage items; and**
 - **Outline any proposed mitigation and management measures (including an evaluation of the effectiveness and reliability of the measures)**

The Supplementary Director General's Requirements state that:

Consultation

14. Any consultation about the action, including:

- a. **Any consultation that has already taken place;**
- b. **Proposed consultation about relevant impacts of the action;**
- c. **If there has been consultation about the proposed action – any documented response to, or result of, the consultation.**

15. Identification of affected parties, including a statement mentioning any communities that may be affected and describing their views.

11.1.3 Earth Systems Recommendations 2010

Generally, one of the limitations of the assessment for the Project included a lack of detail regarding the Chance Find Procedure and monitoring program. Further details regarding these aspects should have been provided.

11.1.4 New Regulatory Requirements

There are no new major regulatory requirements regarding cultural and historic heritage since the 2010 EIS submission. There are some minor amendments to acts that have or are still in the process of being incorporated. The current 2013 EIS has included a summary of all relevant legislation.

11.2 2013 EIS

Additional archaeological, cultural and historic surveys were conducted within the eastern and western portions of the proposed mining Project area since the 2010 EIS submission (Table 11.1). The main method to survey ridgelines and waterways in accessible areas was to walk transects that followed the topography, while surveying the ground for evidence. Similar to pre-2010 surveys, the locations of these transects were limited by accessibility to private property and difficult terrain. Additionally, only a small area could be searched due to dense ground cover, with test pits only being dug in one area.

Table 11.1 A summary of additional archaeological, cultural and historic heritage field sampling within the Project Boundary for the Wyong 2 Coal Joint Venture

Year	Project Boundary area surveyed	Area/s assessed	Methodology or description
2010	Eastern portion (Project footprint)	Tooheys Road site, banks of: <ul style="list-style-type: none"> • Wallarah Creek 	60 test pits measuring 1 x 1 m
2010	Western portion (Subsidence Impact limit)	Ridgelines in the Wyong State Forest/Jilliby SCA: <ul style="list-style-type: none"> • Whitemans Ridge; • Little Jilliby Ridge; • Harris Point; and • Ridgelines accessed on the Watagan Forest Road 	Restricted transects along ridgelines (i.e. did not follow arbitrary linear transects)
		Waterways: <ul style="list-style-type: none"> • Calmans Gully; • Myrtle Creek; • Little Jilliby Jilliby Creek; • Armstrongs Creek; and • Unnamed waterway to the east of Smithys Road West 	Restricted transects along creeks (vegetation and topography limited)
		Honeysuckle Park	Meandering transects (cleared land)
2011	Western portion	Ridgelines in the Wyong State	Restricted transects along

	(Subsidence Impact limit)	Forest/Jilliby SCA: <ul style="list-style-type: none"> • Spotted Gum Ridge; • Woodward's Ridge; • Pole Ridge; • Big Pole Ridge; • Daniels Ridge; • Calmans Ridge; • Coutts Ridge; • Goldsmiths Ridge; • Whitemans Ridge; and • Little Jilliby Ridge 	ridgelines (i.e. did not follow arbitrary linear transects)
		Waterways: <ul style="list-style-type: none"> • Myrtle Creek; and • Little Jilliby Creek 	Restricted transects along creeks (vegetation and topography limited)

11.3 Key Issues

- Much of the Project Boundary, particularly within the eastern part of the Subsidence Impact Limit area was not surveyed due to accessibility restrictions. It is understandable that access may be restricted by private land or difficult terrain. However, as Aboriginal cultural and historic heritage sites have been found elsewhere within the Project Boundary, it is highly likely that other sites exist in inaccessible areas. Although it may be currently impossible to survey these undiscovered sites, these potential sites should still be considered within mitigation and management measures (under the precautionary principle). Currently, mitigation measures are only applicable in areas where sites have been found and if sites are discovered during earthworks.
- Although most sites found were considered to have little archaeological, aesthetic or historic value, Aboriginal cultural significance has simply been considered as "high" for all sites. The NSW OEH (2010) guidelines state that *"when identifying values, it is not necessary to agree with or acknowledge the validity of each other's values but it is necessary to document the range of values identified."* The conclusion that all sites *"are held in high cultural value by the local Aboriginal community"* may be partly accurate, but it is more likely that this value ranges on a broad scale. There was limited discussion of how these cultural values were assigned/assessed, whether they were, for example, spiritual sites, and how did the Aboriginal representatives come to categorise all sites as "high".
- Since the 2010 EIS and the completion of field work in 2011, two new corporations became Registered Aboriginal Parties (RAPs). These two corporations feel that they have been inadequately consulted regarding the Project and were not asked to assess the significance of found sites. With the information collected, this could certainly have been done before the EIS was submitted (without necessarily a site visit). It appears that an assessment was only made by representatives that assisted with field surveys. However, it also is stated that every attempt has been made to organise meetings with these RAPs and have been largely unsuccessful. It is a difficult issue and probably requires the input of an independent third-party (i.e. not the heritage consultants or the Proponent).

- These new RAPs are also concerned that the Proponent has not adequately included their connection to the land within the Project Boundary, placing “*the Project Boundary within Darkinjung Country although in an area in close proximity to the Awabakal (to the north) and the Daruk to the south*” (section 4.1; Appendix S). It is understandably difficult to ascertain the exact boundaries of the different Aboriginal group’s pre-European settlement. However it would be a relatively minor change to the EIS and appendices to recognise that many RAPs and people have a connection to the land within the Project Boundary.
- The management plan has not been developed and details regarding its development and contents were not extensive. All interested stakeholders should also be consulted during this process.

11.4 Conclusions and Recommendations

In general, a comprehensive survey and report of the Aboriginal cultural and historic heritage of the areas surveyed within the Project Boundary has been prepared. The inaccessibility of the western portion of the Project Boundary and wide-spread low visibility of sites surveyed makes it particularly difficult to ascertain the number and type of cultural and historic sites that may be impacted by the Project. Since these issues are not due to a lack of survey effort on behalf of the Proponent, general mitigation measures and the (to be prepared) management plan should cover all areas within and surrounding the Project Boundary (i.e. not limited to areas where sites were found).

For the most part, it appears every effort has been made to consult with most (if not all) RAPs. As consultation with the community and RAPs is such a crucial component of the Aboriginal cultural and historic heritage assessment, the Proponent should continue attempts to consult any interested parties. However, it is difficult to independently ascertain the progress of consultations from the EIS and associated appendices. Perhaps an independent group could liaise with stakeholders and the consultants conducting the surveys and writing the management plan, since attempts by the heritage consultants to arrange meetings with all stakeholders have been unsuccessful.

12 Socio-Economic Planning

12.1 Context

12.1.1 Reasons for Refusal 2010

The 2010 Project Application refusal did not cite any reasons associated with Social Planning.

12.1.2 New Director General's Requirements

The Director General's Requirements have been updated in 2012 to include the following:

Social and Economic – including an assessment of the:

- ***Potential impacts on local and regional communities including:***
 - ***Increased demand for local and regional infrastructure and services (such as housing, childcare, health, education and emergency services); and***
 - ***Impacts on social amenity;***
- ***A detailed description of the measures that would be implemented to minimise the adverse social and economic impacts of the Project, including any infrastructure improvements or contributions and/or voluntary planning agreement or similar mechanism***
- ***Impacts on Jilliby State Conservation Area- including impacts on the...recreational values of the reserve and landowner consent issues.***

Supplementary Director General's Requirements include:

- ***A description of the short term and long term social and economic implications and/or impacts of the project.***

12.1.3 New Regulatory Requirements

No significant new regulatory requirements or updates to regulatory requirements relevant to social planning were identified following the submission of the 2010 EIS.

12.2 2013 EIS

Section 7.17 of the Main EIS Report discusses the findings of the Social Impact Assessment. This section is based upon the Social Impact Assessment provided as Appendix V – The Wallarah 2 Coal Project Social Impact Assessment (2012) Martin and Associates Pty Ltd.

Section 7.7 of the Main EIS Report discusses the finding of the Health Risk Assessment. This section is based upon the Health Risk Assessment provided as Appendix M – The Wallarah 2 Coal Project Health Risk Assessment (2012) PAE Holmes.

A Benefit Cost Analysis was undertaken for the Project as part of the broader Economic Impact Assessment and the findings of our review are discussed in Chapter 12 of this Report.

Key tasks undertaken for the Social Impact Assessment (Appendix V) included:

- An assessment of relevant government policy and guidelines;
- Characterisation of the existing community, current behaviour and interactions of residents;
- Characterisation and assessment of Project perceptions by those within the directly affected area;
- Assessment of potential Project impacts upon the population, temporary accommodation and housing;
- Identification of the present use of social infrastructure and observed or perceived gaps from a community perspective;
- Discussion of implications for the directly affected area, particularly the likely spatial distribution of any non-local operational and construction work forces and their impacts on the community;
- Discussion of implications for the broader Secondary Study Area in relation to employment and population impacts; and
- Preparation of a social management and monitoring program to mitigate potential and perceived impacts.

The study was undertaken utilising information from:

- The ABS 2001 and 2006 Census Data;
- WSC Social Planning Reports;
- Community Attitude Surveys of 400 residents within the Secondary Study Area in 2006 and 2012;
- A community baseline survey conducted in 2008 with the Directly Affected Area.

Consultation was also undertaken with key relevant Wyong Shire Council (WSC) and Lake Macquarie City Council (LMCC) staff.

12.3 Key Issues

Director General's Requirements

The report provides very little description of the long term social and economic implications and/or impacts of the project. Short term impacts are discussed in relation to the construction and operations phase impacts, however a discussion of impacts beyond the project life span (28 years) regarding social impacts of closure is not included in this assessment. Rehabilitation and Closure is discussed briefly in Section 7.25 of the Main EIS Report however

Flow-on Employment Opportunities

An overview of the regional and local economy was well presented and Project benefits to the local economy and surrounding region have been identified. It has been estimated that 504 flow-on jobs will be created as a result of the Project (Table 90, EIS Page 224) however there remains some

discrepancies in numbers between documents, including EIS Chapter 3, Project Description; EIS Chapter 7, Impacts Management; Appendix V, Social Impact Assessment and Appendix W, Economic Impacts.

Mitigation and Management Measures

Section 7.17 of the EIS refers to a Social Management and Mitigation Program, and outlines a number of mitigation and management strategies to address social impacts.

A Social Management and Monitoring Plan has not been developed.

Project Closure

It is noted that EIS Section 7.17 and Appendix V are broken down into impact assessment of the Construction and Operations Phases. The review of the EIS Section 7.17 and Appendix V indicates that the socio-economic impacts of mine closure have not been considered.

Cumulative Impacts

There is little discussion of the Project's cumulative socio-economic impacts in relation to other proposed projects within the region or Council area. Some discussion of the Warnervale Town Centre development is provided in regard to employment opportunities, however, impacts of cumulative developments in respect to housing and demand on resources have not been discussed.

Community Health and Safety

The EIS does not provide a comprehensive assessment of all potential impacts on community health and safety associated with the Project. The Health Risk Assessment considers impacts on human health and safety associated with water quality, air quality and noise and vibration impacts.

As a result of the identified knowledge gaps and uncertainties in the Air and Water Quality assessments, the potential health and safety impacts associated with the Project should be re-evaluated to ensure they accurately reflect the anticipated environmental scenario.

Monitoring and Reporting

Appendix V notes that the Community Reference Group (CRG) will assist in monitoring the progress of the project and report back to the community. It is unclear however how monitoring of Project progress will be undertaken.

12.4 Conclusions and Recommendations

The Social Impact Assessment and Economic Impact Assessment appear to adequately describe the baseline of the local and regional socio-economic setting, however, there are some gaps and limitations in these studies. The main failing of this assessment is derived from a lack of clarity regarding the physical impacts and risks associated with the Project that leads to underestimation of social and economic risks.

There is a lack of consideration of long-term impacts of the Project. This includes little to no consideration of socio-economic impacts of Project closure / mine cessation. A Mine Closure Plan should be developed which would consider the potential socio-economic impacts of closure.

Some Socio-economic mitigation and management measures have been outlined however it is recommended that these are presented in the form of a structured Social Management and Monitoring Plan.

13 Benefit Cost Analysis

13.1 Context

13.1.1 Reasons for Refusal 2010

No reasons associated with Benefit Cost Analysis were cited in the 2010 Project Refusal.

13.1.2 New Director General's Requirements

A detailed assessment of the costs and benefits of the development as a whole, and whether it would result in a net benefit for the NSW community.

13.1.3 Earth Systems Recommendations 2010

The review found that the BCA lacks sufficient detail. A number of key assumptions have been made in the quantification and valuation of costs and benefits. These decisions and assumptions need to be made more explicit in order for the reader to understand the limitations of the BCA tool. Similarly the report needed to provide more information on the calculations, techniques applied and sources of information used to quantify and value the Project's benefits and costs.

As such it was recommended that a revised benefit cost analysis be developed based on the findings of the supplementary EIS.

13.1.4 New Regulatory Requirements

Since submission of the 2010 EIS, a November 2012 *Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals* has been introduced.

13.2 2013 EIS

Section 7.18 of the Main EIS Report provides a summary of the economic impact assessment and benefit cost analysis as undertaken in Appendix W: Economic Impact Assessment conducted by Gillespie Economics in 2013.

The document is designed to evaluate the economic efficiency of the project, as well as the project's economic impacts.

13.3 Key Issues

Valuation of Monetary Impact upon affected Stakeholders

As per the NSW Government's 2012 Guideline (as above), a CBA must identify all groups in the community affected by a policy or project and values the effects on their welfare in monetary terms as the effects would be valued by the parties themselves. Neither the Main EIS Report nor Appendix W identifies all affected stakeholders and their valuation of impacts.

Identification of a Baseline Scenario

A baseline scenario has been identified for the Wallarah 2 Project, based on the performance of the Regional Economy from 2005 – 2006. The baseline scenario is mentioned in Section 7.18 of the Main EIS Report however the findings of the economic baseline assessment are not presented in a numerical form. As such, the Main EIS Report does not give a strong indication as to the numerical monetary difference between the 'with project' and 'without project' scenarios.

Further, the economic assessment is based on information provided from 2005 – 2006. Upon commencement of the Project, this data will be almost 10 years old. It is unlikely that information this old provides an accurate reflection of the current economic setting in the region, and as such, the net benefit calculated for the project is unlikely to be accurate.

Economic Valuation of Environmental and Social Impacts

To evaluate the economic value of environmental impacts, the effects of these impacts upon business (for example, on agricultural productivity) and on households (for example, on health) must be evaluated.

The economic assessment suggests that for Air Quality and Groundwater, no impacts are anticipated upon stakeholders within the area, and as such, no economic impacts can be attributed to these aspects. This EIS review has indicated that water impacts have not been adequately assessed and require further investigation, and that the determination of air quality impacts requires further modelling and assessment to ensure an accurate prediction.

Sensitivity Analysis

A sensitivity analysis was undertaken to evaluate whether the Project was sensitive to reasonable changes in assumptions regarding a number of variables. It was found that the results were '*most sensitive to decreases in the value of product coal*', yet it was found that in order for the project to be deemed economical unfeasible these would need to be substantial and sustained. The sensitivity test does not determine the anticipated price of coal during the operations phase and as such it is difficult to understand how the figures were calculated.

13.4 Conclusions and Recommendations

Whilst the Benefit Cost Analysis has been conducted using a systematic method of evaluation, this review has found some key limitations in its undertaking.

The economic baseline has not been calculated in a clear manner, and is not presented in the Main EIS.

Regional economic data utilised to determine the baseline provided in Appendix W utilises data from 2005-2006, which is unlikely to provide an accurate representation of the current regional economic standing.

The EIS Process is designed to identify the environmental and social impacts attributed to the development of the Project. To conduct an effective cost benefit analysis, monetary values must be attributed to these environmental and social impacts. This review has indicated that some environmental and social impacts have not been evaluated effectively, particularly those in regard to air quality and

water management. Consequently the monetary values attributed to environmental and social impacts are likely to be inadequate, and the overall Cost Benefit Analysis optimistic.

14 Stakeholder Engagement

14.1 Context

14.1.1 Reasons for Refusal 2010

The 2010 Project Application refusal did not cite any reasons associated with Stakeholder Engagement.

14.1.2 New Director General's Requirements

The Director General's Requirements have been updated in 2012 to include the following:

The EIS must:

- ***Describe the consultation process used and demonstrate that effective consultation has occurred.***
- ***Describe the issues raised by public authorities, service providers, community groups and landowners.***
- ***Identify where the design of the development has been amended in response to issues raised.***
- ***Otherwise demonstrate that issues have been appropriately addressed in the assessment.***

14.1.3 Earth Systems Recommendations 2010

The 2010 EIS Review found that the 2010 EIS Report did not meet the Director-General's Environmental Assessment Requirements, which specifically required the EIS to describe both the consultation process and the issues raised during this consultation process. The EIS was found to have described the consultation strategy implemented for the Project, but it did not adequately identify and describe the issues raised by the community during the consultation process. Therefore the Director-General's Environmental Assessment Requirements in relation to community consultation have not been met by the EIS.

As such, Earth Systems recommended that *an independent credible organisation should be engaged by the Proponent to facilitate open and transparent community consultation during the supplementary EIS process.*

14.1.4 New Regulatory Requirements

New regulatory requirements or updates to regulatory requirements following the submission of the 2010 EIS include:

- National Parks and Wildlife Amendment (Aboriginal Places and Aboriginal Objects) (DECCW 2010)

14.2 2013 EIS

Chapter 5 of the EIS Main Report details the stakeholder consultation process that was undertaken for the Wallarah 2 Project.

- Chapter 5 outlines the DGRs and where they are addressed in the report. It also provides tables indicating issues raised in consultation at both regulatory and community levels.
- During preparation of the Main EIS Report, consultation was conducted with the stakeholders identified in the DGRs, as well as other stakeholders such as service providers, local community groups and the Aboriginal community (detailed in Section 5.2 of the Main EIS Report).
- The Main EIS Report (Section 5.4.4) summarises the key concerns raised during regulatory and community consultation. These include potential air quality, noise, visual amenity, social economic, water management, transport, heritage, ecology, and subsidence impacts.
- Concerns regarding consultation with the community and understanding of the 2010 Refusal of the W2CP EIS are also noted in Table 19.
- Section 5.5 outlines the proponent's commitment to ongoing stakeholder engagement and details the mechanisms it intends to utilise to ensure effective ongoing engagement and communication with Project Stakeholders.
- Appendix D: Stakeholder Engagement provides newsletters dating from September 2011 through to 'Spring 2012', and a copy of a letter sent to residents providing information regarding the Project and how residents can contact the Proponent for further information.

14.3 Key Issues

Key findings of the review, with respect to the above requirements are summarised below:

Stakeholder Responses

An overview of the general issues raised by each stakeholder and how these are addressed in the EIS is provided in Section 5.4.4, Table 18 and 19. Table 19, however, does not indicate the level of concern attributed to each issue, or how many stakeholders indicated concern. As such it is difficult to understand the key issues of community concern.

Consultation Process

The 2007 NSW Government Guidelines for Major Project Community Consultation states that '*a project proponent [should choose] engagement techniques that offer opportunities to participate across all relevant groups*'. Whilst it appears that all major groups and special interest groups have been consulted, it appears that much of the consultation has been conducted in a passive manner, with an emphasis upon the distribution of newsletters.

Monitoring and Reporting

It is unclear how performance on community engagement will be monitored, however, it is stated that an annual report made available to the public will detail annual performance in consultation and other environmental and social concerns.

Ongoing Consultation

On behalf of the project proponent, the EIS makes a commitment to ongoing stakeholder engagement throughout the project life cycle. This does not, however, detail a proposed schedule of consultation within which mechanisms for engagement will be conducted.

A Stakeholder Engagement Plan has not been developed for the Project.

Grievance Procedure

The development of a grievance procedure / complaints-handling procedure is considered to be international best practice for a mine operation (IFC 2009). There is no evidence of the establishment of a grievance procedure or complaints-handling procedure to manage public complaints.

Director General's Requirements

The Director General's Requirements require that the report describes the issues raised by stakeholders during the consultation process. The Main EIS Report outlines a detailed list of stakeholder issues, however provides no detail to indicate the number of stakeholders who raised a particular issue or the subsequent level of concern. As such, the DGR is not adequately addressed.

Further, the DGRs detail that it must be identified where the design of the development has been amended in response to issues raised during consultation. The report gives an indication as to which sections outline relevant strategies to manage issues raised, however does not provide a detailed description of the community concern and how it will be managed. Mitigation and management measures were consistently found to be poorly articulated throughout the Main EIS Report. Specific management measures to be undertaken not adequately provided and as such it is likely that the mitigation of community issues is not adequately addressed.

Stakeholder comments such as those of the ATOAC who feel as if the Social Impact Assessment is not conducted to an adequate level (Appendix S) have not been considered by the Main EIS Report in great detail. Section 5.6.5 mentions that the ATAOC have expressed concern, however the specific concerns are not outlined in the Main EIS Report.

Regulatory Requirements

The National Parks and Wildlife Amendment (Aboriginal Places and Aboriginal Objects) revised in 2010 outlines that a specific process of community consultation with relevant aboriginal parties must be undertaken before a person makes an application for an Aboriginal heritage impact permit.

Whilst no evidence is provided, it is stated in Chapter 5 of the EIS Main Report that the requirements outlined in the updated legislation were followed for all Aboriginal Cultural Heritage consultation that occurred from 2011 onwards.

14.4 Conclusions and Recommendations

In general, community engagement and consultation has been conducted with a variety of stakeholders, ranging from community groups to regulatory institutions. The consultation conducted however is not described in great detail, and consultation appears to have been conducted utilising a primarily passive approach, with the distribution of Project newsletters a prominent method of engagement.

The issues raised during community consultation have been listed, however, the strength of the concern, or how vocal the community was about a particular issue is not provided. Key concerns are not noted in terms of their priority to the community.

Whilst the EIS states that the proponent is committed to continuing its stakeholder engagement program throughout the life of the project, a structured Stakeholder Engagement Plan has not been developed to

outline ongoing strategies for consultation and detailing solid commitments to consultation, including consultation schedules and grievance procedure / complaints handling procedures.

15 Prioritised Measures to Address Areas of Uncertainty

The following table outlines recommendations to address areas where information is unclear or uncertainty to fully assess impacts. The measures provided below are intended for consideration by approving authorities.

Table 15.1 Guidance for Further Assessment / Validation and Monitoring

ITEM / AREA OF UNCERTAINTY	IMPORTANCE (Low, Medium and High)	MEASURES
Air Quality	High	Air quality impacts are assessed utilising relevant methodologies to ensure that detailed impact assessments of project phases are conducted effectively.
Greenhouse Gas	Medium	A more realistic assessment of greenhouse gas (GHG) impacts is provided by including Scope 2 and 3 emissions sources in the analysis of the GHG impacts and updating impacts of the Project on anthropogenic global warming.
Water Quality	High	Surface water quality is investigated further to ensure that all sources of contaminants are identified and that water sources are effectively monitored for changes associated with the Project. A geochemical assessment for potential AMD / salinity is conducted, including development of contingency plans for the management and treatment of the Mine Operations Dam.
EPBC Water Amendment	High	The EPBC Act Water Trigger Amendment (2013) is considered by the Proponent.
Ecology	Medium	Further detailed surveys for biodiversity are conducted, including extended flora survey to establish a robust flora baseline for the Subsidence Impact Limit. The Biodiversity Offset Strategy for threatened species is revised to ensure it addresses the current Policy and that currently proposed offsets for fauna habitats are reviewed for suitability.
Mine Design and Layout	Medium	Internal haulage routes are confirmed to allow assessment of potential impacts of heavy vehicle movement.
Stakeholder Engagement	High	A robust Stakeholder Engagement Plan is developed that is inclusive of commitments to ongoing consultation and a structured grievance procedure.
Rehabilitation and Closure	High	A comprehensive Rehabilitation and Closure Plan is prepared.
Risk Assessment	Medium	The Risk Assessment and Cost Benefit Analysis are

ITEM / AREA OF UNCERTAINTY	IMPORTANCE (Low, Medium and High)	MEASURES
and Cost Benefit Analysis		reviewed and revised based on detailed findings of further recommended work.
Disaster Risk Management	High	A Disaster Risk Management Plan is developed to cover natural and human-induced emergencies associated with the Project. This Plan should be inclusive of specific Contingency Plans to manage particular events, including the management / treatment of the Mine Operations Dam (MOD) and spontaneous combustion.
Community Health and Safety	Medium	<p>The Community Health and Safety assessment is reviewed and revised based on the findings of the further work recommended.</p> <p>Potential impacts upon the Buttonderry Waste Management Facility associated with the development of the Project are fully considered.</p>
Management, Monitoring and Reporting	High	<p>Management and Monitoring Plans are prepared for each aspect of assessment prior to commencement of the Construction phase to clearly outline how impacts will be mitigated and managed.</p> <p>An independent expert is commissioned by the Proponent to conduct Environmental Audits of the project on a regular basis throughout the project life cycle.</p> <p>An Environmental Management System based on ISO14001:2004 'Environmental management systems -- Requirements with guidance for use' is developed and implemented for the Project.</p>

16 References

- Australian and New Zealand Minerals and Energy Council/Minerals Council of Australia (2000) *Strategic Framework for Mine Closure*.
- Australian Department of Climate Change (2009) *National Greenhouse Accounts (NGA) Factors*.
- Australian Government Department of Resources, Energy and Tourism (2009) *Leading Practice Sustainable Development Program for Mining Industry Handbook – Air Contaminants, Noise and Vibration*.
- Commonwealth Department of Industry, Tourism and Resources (2006) *Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry*.
- Commonwealth Department of Industry, Tourism and Resources (2006) *Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry*.
- Commonwealth of Australia (2006a) *Introduction to Cost-Benefit - Analysis and Alternative Evaluation Methodologies*, January 2006.
- DEC (2004) *Approved Methods for the Sampling and Analysis of Water Pollution in NSW*. Department of Environment and Conservation NSW, Sydney.
- DECC (2005) *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW*. Department of Environment and Conservation NSW, Sydney.
- DECC (2006) *Technical Framework for Odour Assessment*. Department of Environment and Conservation NSW, Sydney.
- DECC (2007) *Waste Avoidance and Resource Recovery Strategy 2007*. Department of Environment and Climate Change NSW.
- DECC (2009) *Waste Classification Guidelines*. Department of Environment and Climate Change NSW.
- DUAP (2000) *Coal Mines and Associated Infrastructure - EIS Guideline*. Department of Urban Affairs and Planning.
- EPA (1996) *Environmental Guidelines: Solid Waste Landfills*. Environment Protection Authority.
- IAIA (1999) *Principles of Environmental Impact Assessment Best Practice*. In cooperation with the Institute of Environment Assessment, UK.
- IAIA (2005) *Biodiversity in Impact Assessment*. International Association for Impact Assessment. Special Publications Series No. 3.
- ICMM (2003) *Sustainable Development Framework: ICMM Principles*. International Council on Mining and Metals.
- Institute of Ecology and Environmental Management (2006) *Guidelines for Ecological Impact Assessment in the United Kingdom* (version 7 July 2006). <http://www.ieem.org.uk/ecia/index.html>
- International Environmental Consultants Pty Ltd (2010) Wallarah 2 Coal Project - Environmental Assessment.
- James & Gillespie (2002) *Guidelines for Economic Effects and Evaluation of EIA (Draft)*, prepared by for Planning NSW, November 2002.

- Mineral Council of Australia (2005) *Enduring Value - the Australian Minerals Industry Framework for Sustainable Development*.
- NSW DECC (1994) *Environmental Noise Control Manual*. Department of Environment and Conservation NSW, Sydney.
- NSW DECC (1999) *Environmental Criteria for Road Traffic Noise*. Department of Environment and Conservation NSW, Sydney.
- NSW DECC (2006) *Assessing Vibration: A Technical Guideline*. Department of Environment and Conservation NSW, Sydney.
- NSW DECC (2009) *Interim Construction Noise Guideline*. Department of Environment and Conservation NSW, Sydney.
- NSW Department of Mineral Resources (2003) *Guidelines for Application for Subsidence Management Approvals*.
- NSW Department of Planning (2008) *Impacts of Potential Underground Coal Mining in the Wyong LGA- Strategic Review*.
- NSW Department of Planning (2008) *Impacts of Underground Coal Mining on Natural Features in the Southern Coalfields - Strategic Review*;
- NSW Minerals Council (1997) *Guidelines for Best Practice Community Consultation in the New South Wales Mining and Extractive Industries*.
- NSW Treasury (2007) *NSW Treasury Guidelines for Economic Appraisal*, NSW Treasury.
- Pacific Power International (1997) *Cooranbong Colliery Life Extension Project Overburden Strata Groundwater Study*, June 1997.
- World Bank (2006) *Environmental Impact Assessment Regulations and Strategic Environmental Assessment Requirements: Practices and Lessons Learned in East and Southeast Asia*. Environment and Social Development Department.