

Wallarrah 2 Coal Project Review Report

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The Wallarah 2 Coal Project PAC Review Report©
State of New South Wales through the NSW Planning Assessment Commission, 4 June 2014.

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Executive Summary

The Wallarah 2 Coal Project is a greenfield mining proposal near Wyong on the Central Coast of NSW. The project is located within the Wyong LGA, but could also have water-related or transport-related impacts on Gosford and Lake Macquarie LGAs. The proposal seeks approval to construct and operate an underground coal mine and associated facilities with a view to extracting up to 5 million tpa of export quality thermal coal using longwall mining methods at depths between 350m and 690m. The project proposal is for 28 years (3 years construction and 25 years operation).

Although the current project application was lodged in October 2012, there is a long history to the proposal dating back to 2006. The earlier proposal was considered in multiple reviews, including a specific review by the Planning Assessment Commission in 2010. That review recommended approval of the project, but subject to over 40 recommendations. A former Minister for Planning refused the application in March 2011 immediately prior to the NSW State election. The current application differs from the previous application in a number of respects, with the main one being removal of the eleven western longwalls that were in steeper terrain under Jilliby State Conservation Area.

In February 2014 the then Minister for Planning & Infrastructure requested the Planning Assessment Commission to review the project and conduct public hearings. The Chair of the Planning Assessment Commission appointed Dr Neil Shepherd AM (Chair), Mr Joe Woodward PSM and Mr Garry West to constitute the Commission. The Minister's Terms of Reference require the Commission to consider a range of documents and other information, hold public hearings, assess the merits of the project as a whole and recommend any further measures required to avoid, mitigate or manage the potential impacts of the project.

The Commission has carefully considered all the information identified by the Minister as relevant to the review. It also held a public hearing at Wyong at which it received 36 verbal submissions, some of which required further investigation by the Commission. The Commission also visited the site and surrounds, met with government agencies and representatives of three local councils (Wyong, Gosford and Lake Macquarie), met with the Proponent and the Proponent's experts, and met with one of the submitters who made a submission at the public hearing.

The merits of the project as a whole have been considered within the relevant statutory context, with a close focus on the Mining SEPP and s.79C of the Environmental Planning & Assessment Act (the Act). The approach has been to examine critically the potential impacts of the project, determine whether these impacts can be avoided, mitigated or managed successfully within the scope of the draft conditions of consent recommended by the Department, or whether some further steps could avoid or lessen the impacts. The benefits claimed for the project have then been examined closely to determine whether they can provide an adequate basis for assessment.

In considering the merits of the project as a whole the Commission has found that the benefits claimed for the project by the Proponent (and largely adopted in the Department's Preliminary Assessment Report) are not credible. The reasons are set out in detail in the Commission's report. The Commission essentially had two options: reject the claims and recommend that a new economic assessment be undertaken (and that it be reviewed independently); or revise the claims to a level consistent with the Commission's findings and recommend that the revised level be utilised in any further assessment of the project.

In order to complete the review within the already-extended timeframe the Commission has chosen the latter option whilst recognising that it is open to the Department in preparing its final assessment report, or to the consent authority, to choose the former. However, the Commission considers in this case that there are sufficient benefits remaining (namely estimated royalty payments of \$100-200 million, direct employment of 300 staff and contractors in the operational phase and significant capital investment) to warrant further assessment of the project against the potential impacts without the need for a further economic analysis.

The potential impacts of the project have been examined in detail in this review. They can be divided broadly into those associated with subsidence (i.e. potential impacts on water supply, stream morphology, groundwater, flooding, biodiversity, built infrastructure, etc.), those associated with the proposed surface facilities (i.e. noise impacts, air impacts, water balance, etc.) and a miscellaneous group including rail transport, land development, etc.

The principal findings and recommendations of this review can be summarised as follows:

- (i) Whilst there is inevitable uncertainty concerning the subsidence predictions, they provide a basis for assessment of the potential subsidence-related impacts of the project. There is ample scope to revise the predictions based on site-specific experience and a rigorous adaptive management regime can be imposed to ensure impacts and consequences remain within the performance criteria in any consent.

The Commission has recommended two formal reviews be undertaken: one after the first 5 longwalls and another after the next 4. This will cover the major environmental issues likely to be encountered during this project. The Commission has also recommended that each Extraction Plan be based on subsidence predictions that have been revised utilising site-specific experience and that these revised subsidence predictions are consistent with achieving the performance criteria in the consent during mining of the longwall in question.

- (ii) As presented, the project predicts risk of reduced availability of water for the Central Coast Water Supply (CCWS) in some years if the subsidence impacts on the catchment coincide with adverse climatic conditions. The maximum predicted impact on catchment yield is 300 ML/y.

The Commission has recommended that there be no net impact on potential catchment yield from the mining operation and that the maximum predicted impact should be offset by return of suitably treated water to the catchment side of the CCWS system for the period during which subsidence may impact on the Project Area catchments.

- (iii) The project presents an array of water supply risks to landowners in the Project Area. The Commission has recommended a number of conditions to ensure that potential impacts are properly investigated and that landowners receive prompt compensatory supply in the event of problems.
- (iv) The project will have impacts on the morphology of streams within the Project Area. These impacts are predicted to be no greater than 'minor consequences', unless a flood event happens to coincide with a period of particular vulnerability for a section of stream undergoing subsidence changes.

The Commission considers that, as the impacts are likely to lie within expectations for normal variation for the Project Area streams, the performance criteria should be set at

‘minor consequences’, with a requirement to return impacted streams to an equivalent or better condition than their pre-subsidence condition.

- (v) The project will have some impact on flood levels and behaviour. With one exception these are considered to be manageable with standard approaches. The exception is increased delays for emergency access to some properties in major floods.

The Commission has recommended that individual emergency access and evacuation plans be prepared in consultation with the owners for each of these at-risk properties as well as Wyong Shire Council.

- (vi) The project will undermine or potentially cause subsidence impacts to a substantial number of residences (some 245) and an array of other public and private infrastructure. For most of these structures the subsidence impacts are predicted to be small, the strategies for managing the subsidence impacts are well developed and, within the statutory concept of the Mine Subsidence Districts and statutory compensation scheme, are well understood.

The Commission has recommended some improvements to the performance criteria for built infrastructure and that some other types of infrastructure need to be included in the relevant provisions.

- (vii) Impacts from the surface facilities on noise and air quality are expected to be both minor and manageable. Where necessary, recommendations have been included to address the residual impacts.
- (viii) Potential biodiversity and aquatic ecology impacts have been reduced by removal of the eleven western longwalls under the steeper terrain in the Jilliby SCA that were included in the previous version of this project. The Commission is satisfied that the draft consent conditions attached to the Department’s PAR deal adequately with impacts on biodiversity and aquatic ecology.

Turning to the merits of the project as a whole, the Commission considers that, if the recommendations concerning improved strategies to avoid, mitigate or manage the predicted impacts of the project are adopted, then there is merit in allowing the project to proceed. However, if the recommendations are either not adopted, or adopted only in part, then the Commission’s position would probably change in favour of a precautionary approach. This particularly applies to water-related impacts.

The Commission considers that commissioning a new economic assessment designed to increase the estimated benefits so as to create a new assessment playing field cannot substitute for reducing or managing the impacts as recommended. In this context it is worth noting that the courts have consistently held that the public interest is a much broader concept than the economic value of a mining project, particularly when this value is calculated using methodologies that cannot properly estimate the costs associated with non-market impacts. The Act specifically requires a consent authority to consider the public interest in s.79C(e).

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Glossary

AEIA	Aquatic Ecology Impact Assessment, Appendix P, Environmental Impact Statement, Hansen Bailey, April 2013
AEP	Annual Exceedence Probability
AIP	Aquifer Interference Policy
ARTC	Australian Rail Track Corporation
BMP	Biodiversity Management Plan
BOP	Biodiversity Offset Package
BOS	Biodiversity Offset Strategy
BSAL	Biophysical Strategic Agricultural Land
Commission	Planning Assessment Commission constituted for this review and public hearing, Dr Neil Shepherd (Chair), Mr Joe Woodward PSM and Mr Garry West
CCWS	Central Coast Water Supply
DGRs	Director-General's Requirements
DLALC	Darkinjung Local Aboriginal Land Council
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement prepared by Hansen Bailey Environmental Consultants, April 2013
EP&A (or the Act)	<i>Environmental Planning and Assessment Act 1979</i>
EPA	Environment Protection Authority
EPBC Act	Commonwealth Environmental Protection and Biodiversity Conservation Act 1999
FIA	Flood Impact Assessment, Appendix K, EIS April 2013
GDEs	Groundwater-Dependent Ecosystems
IESC	Commonwealth Independent Expert Scientific Committee
INP	NSW Industrial Noise Policy
IPM	Incremental Profile Method
LGA	Local Government Area
LW	longwall
Mtpa	Million tonnes per annum
Mining SEPP	<i>State Environmental Planning Policy – Mining, Petroleum, Production and Extractive Industries 2007</i>
MSB	Mine Subsidence Board
MSEC	MSEC Mine Subsidence Engineering Consultants, the proponent's consultant
NOW	NSW Office of Water
NPV	Net Present Value
OEH	Former Office of Environment and Heritage
PAC	Planning Assessment Commission
PAR	Department of Planning and Environment's Preliminary Assessment Report

PM ₁₀	Particulate matter with an aerodynamic diameter smaller than 10 micrometres
PM _{2.5}	Particulate matter with an aerodynamic diameter smaller than 2.5 micrometres
PMF	Probable Maximum Flood
PSNL	Project Specific Noise Level
PSMP	Property Subsidence Management Plan
RMS	Roads and Maritime Services
RMR	the Proponent's Residual Matters Report
ROM	run-of-mine coal
RO plant	reverse osmosis plant
RTS	Proponent's Response to Submissions
SCA	State Conservation Area
SMP	Subsidence Management Plan
SEWPac	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
SRLUP	Strategic Regional Land Use Policy, NSW
SSD	State Significant Development
the Department	Department of Planning and Environment (previously Planning and Infrastructure)
the Proponent	The applicant under Part 4 of the EP&A Act 1979, in this report being 'Proponent' includes the Proponent's EIS consultants.
the proposal	The subject of the application under Part 4 of the EP&A Act 1979, in this report being the Wallarah 2 Coal Project, mainly referred to as 'the project'.
TS	Threatened Species
TSP	Total suspended particulate
TSC Act	Threatened Species Conservation Act 1995
VPA	Voluntary Planning Agreement under the <i>Environmental Planning and Assessment Act 1979</i>
WACJV	Wyang Area Coal Joint Venture (the proponent)
WSC	Wyang Shire Council
WSP	Water Sharing Plan

1. INTRODUCTION

1.1 Background to the Current Application – Previous Reviews and Previous Application

1.1.1 Strategic Land Review 2007

In February 2007, an Independent Expert Panel was established by the NSW Government to conduct a strategic inquiry into potential coal mining impacts in the Wyong Local Government Area (Wyong LGA). The inquiry considered an earlier version of the Wallarah 2 proposal, as well as other sites not yet subject to a project application or exploration interest. The terms of reference for the Panel included the examination of “whether coal mining under the catchment of the Mardi Dam would compromise, in any significant way, the water supply of the Central Coast; and environmental impacts on surface and groundwater resources, especially on drinking water supply and flooding; and risks of subsidence impacts”. The Panel’s report, *Strategic Review of Impacts of Potential Underground Coal Mining in the Wyong LGA*, was published in July 2008.

The Panel report provided specific comments on the Wallarah 2 Project based on the limited information then available (the environmental assessment of the project had not yet been submitted for public exhibition). The report concluded, *inter alia*, that:

- because of the depth of the coal seams, subsidence is unlikely to compromise in any significant way the water supply of the Central Coast;
- the nature of the geology, geomorphology and depth of the coal seams make it unlikely that underground mining will result in a loss or contamination of surface water. Specifically, with appropriate mine planning, there is little likelihood for deterioration in the quality of surface waters or contamination from hard rock saline aquifers; and
- although there is a lack of information relating to groundwater in the Wyong LGA, on the data available any mining activity would not significantly impact on the existing groundwater levels or groundwater availability.

The report made 13 recommendations in relation to assessment process, community consultation, surface water and groundwater, flooding, Tuggerah Lake, wetlands, dust and social and economic impacts. The last recommendation was specific to the Wallarah 2 Coal Project. The Panel recommended that:

- the project be assessed under Part 3A of the Act;
- the final proposal be subjected to independent review;
- noise and dust be minimised, or the coal stockpile be reduced in size and relocated;
- best practice community consultation be applied; and
- Council and the community be encouraged to allow water monitoring stations to be installed and accessed for better collection of baseline and monitoring data.

The Department is satisfied that the current project application has adhered to the Panel’s recommendations.¹

1.1.2 The Previous Project Application (2006) and Planning Assessment Commission (PAC) Review (2010)

A project application for the Wallarah 2 Coal Project was lodged with the Department in late 2006 under the now-repealed Part 3A of the *Environmental Planning and Assessment Act 1979*.

¹ Department’s Preliminary Assessment Report on the Wallarah 2 Project, February 2014, (the PAR) at pp.10-11

In July 2010, the then Minister for Planning directed the Planning Assessment Commission (PAC) to review the project including the holding of a public hearing. The terms of reference for the review specifically directed the PAC to assess “the potential subsidence-related impacts of the project, paying particular attention to its ability to adversely affect the Central Coast’s drinking water supply; and any other potentially significant impacts of the project”.

The PAC review report was published in November 2010. The Commission expressed its view that “although sufficient information was provided to allow the Commission to complete its review and assessment, the Commission would not have had to recommend as many conditions on the approval of the project if more information had been provided in the EA.” In relation to potential groundwater, surface water and subsidence impacts, the Commission found:

- the predictions of conventional subsidence, primarily in the Dooralong valley, are adequate to assure that consequences for groundwater and surface water will be minimal and manageable, provided adaptive mining management is practiced and the Commission’s recommendations are implemented;
- only a small proportion of the Central Coast water supply comes from this catchment. There will be no significant adverse consequences for the Central Coast water supply, provided that no connectivity of surface water with the mining strata is caused by any major unidentified geological fault;
- although the mine water balance is unresolved, the demands of water for the operation will not place inappropriate demands on the Central Coast Water Supply (CCWS); and
- mine subsidence management should result in satisfactory outcomes for undermined houses and owners of structures using adaptive management, although a more wavy final landform may result if pillars do not collapse as predicted.

The Commission concluded that “the application may be approved subject to the imposition of a substantial number of conditions covering the full range of issues.”

In March 2011, a former Minister for Planning refused the application because of uncertainties in relation to the subsidence predictions, ability to meet acceptable water quality outcomes, and ecological and heritage impacts.

1.2 The Current Application (subject of this Commission’s Review)

Wyong Areas Coal Joint Venture (the Proponent) lodged a State Significant development application with the former Department of Planning and Infrastructure (the Department) in October 2012. It seeks approval to construct and operate an underground coal mine and associated facilities near Wyong in the Central Coast, about 100km north of Sydney. Although there are many similarities between the current project and the project reviewed by the PAC in 2010, there are also significant differences. These are discussed in section 1.3 below.

The proposal is to extract up to 5 million tonnes per annum (Mtpa) of export quality thermal coal using underground longwall mining methods for 28 years (3 years for construction and 25 years of mining operation). Coal mining will be undertaken at depths of between 350m and 690m below the surface within the underground extraction area. Mining and related activities are expected to occur 24 hours a day, seven days a week. Extracted coal would undergo minimal processing on site. Product coal will be transported by rail to the Newcastle port for export or to local domestic power stations. Surface facilities will be located across 3 sites; namely, the Tooheys Road site, Buttonderry site and West Shaft Site.

The Tooheys Road site will include the proposed rail loop and spur, raw coal and product coal stockpiles, decline tunnel, water and gas management facilities and offices. The Buttonderry site

will include administration offices, training rooms and bath house, the main personnel access to the mine, new intersection with Hue Hue Road, access road and car park, upcast and downcast ventilation shafts, and surface water treatment facilities. A downcast ventilation shaft will be located on the West Shaft site.

The project is expected to generate 450 construction jobs and 300 operational jobs with a capital investment value of \$805 million.

The mine is expected to result in a peak water surplus (from underground dewatering) of approximately 2.5 megalitres (ML) per day in Year 8 of operations. The water management system involves a 180 ML operational water dam, a 30ML portal dam, a 20 ML stockpile dam, a 20ML treated water storage, 9ML of brine storage, stormwater management system and potable water storage tanks at the Tooheys Road site and a 10ML entrance dam and stormwater management system at the Buttonderry site.

The conceptual mine plan for the subject application is for a total of 35 longwalls (19 in the northern part, 10 in the Southern part and 6 in the southwestern part. However, the EIS also outlined a 38 year project life with 46 longwalls, which has created confusion. (Figure 1) The 11 extra longwalls are in the far western extent of the Project Area. This area was identified as particularly sensitive to subsidence and environmental impacts in the 2010 PAC review. Although included for information in the EIS, these additional 11 longwalls are not part of the current application. The Commission wishes to make it clear that it has not considered these extra longwalls in the current review and the Commission's findings and recommendations in no way imply any endorsement in principle or otherwise for this proposed extension.

1.3 The differences between the current application and the 2006 application

The Commission met the Departmental staff for a briefing on Friday, 7 March 2014. One of the issues discussed was the differences between the current application and the 2006 application that were sufficient for the Department to change its recommendation from refusal to approval. Subsequent to the meeting, the Department, by email dated Monday, 7 April 2014, provided the Commission a written response to its questions. (Appendix 6)

The main reason advanced for the Department's change of view is the additional studies and information provided in the current EIS which, according to the Department, have addressed the inadequacies of the original EA. The additional studies and information include:

- revised subsidence model/predictions with peer review;
- additional geology report with peer review;
- revised groundwater and surface water impact assessments;
- additional boreholes and testing;
- development of performance measures;
- adaptive management approach in Extraction Plan process;
- additional ecological surveys; and
- additional heritage surveys.

A key difference between this application and the previous application is that the conceptual mine plan for this application involves a total of 35 longwalls (19 in the northern part, 10 in the southern part and 6 in the southwestern part). The 11 longwalls in the western part of the site, although indicated in the EIS, are not part of the current application. (Figure 2) The Department's Preliminary Assessment Report (PAR) makes it clear that future approval is required if mining is to occur in this part of the site.

Source: Figure 2.2, Vol 1 EIS, April 2013

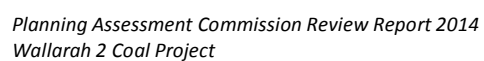
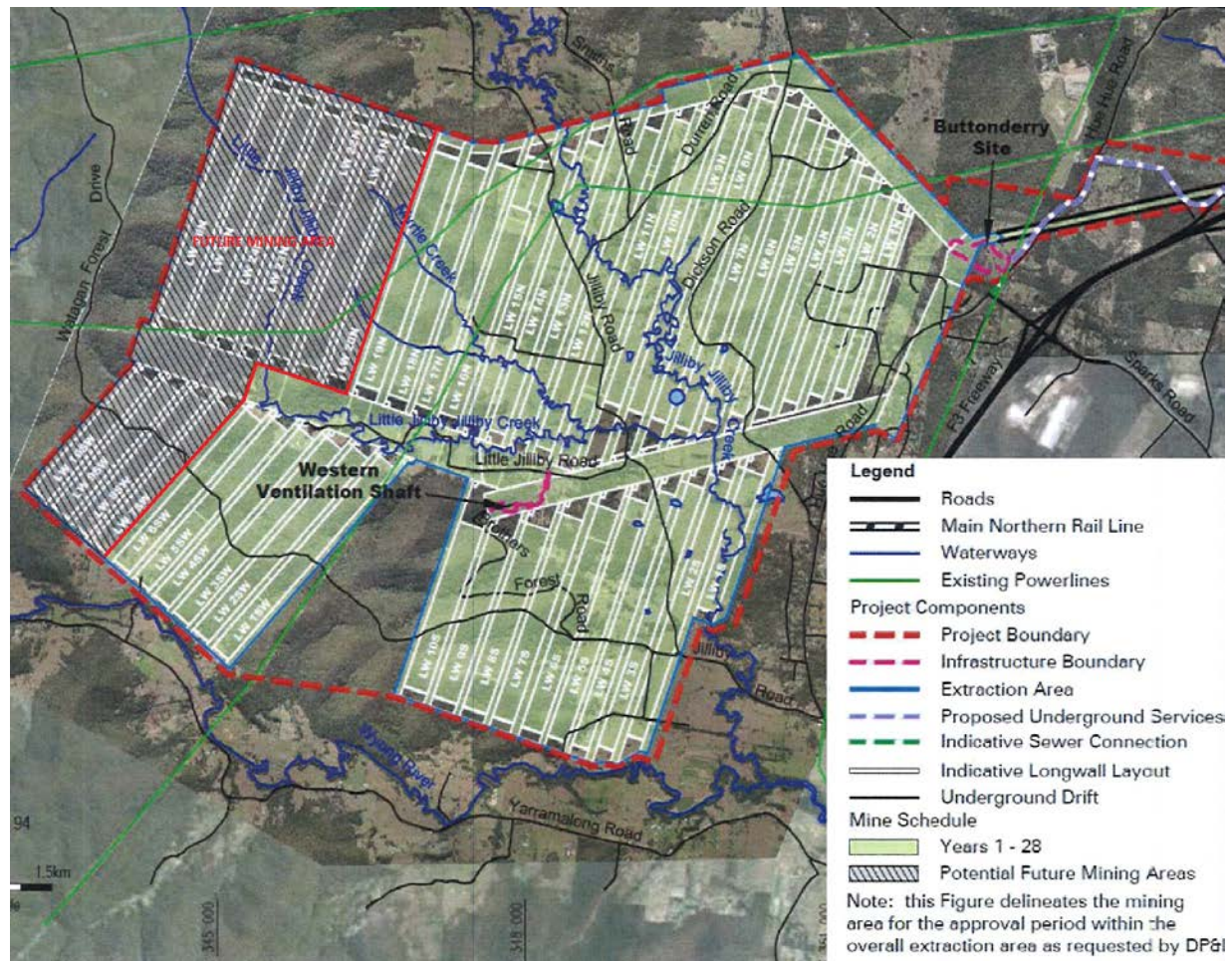


Figure 2 Year 1-28 Mine Plan



Source: Figure 1, Appendix 3, draft recommended conditions, PAR

1.4 The Department's Preliminary Assessment Report (PAR)

The Department has carried out a preliminary assessment of the proposal and its report has been submitted to the Commission for consideration as part of the review process.

The PAR considered the proposal, its strategic and statutory context, public and agency submissions, and the Proponent's responses to submissions and residual matters report. It identified the key issues relating to this application to be:

- predicted ponding and surface flow impacts in creeks;
- potential impacts on streams in the upland areas;
- subsidence induced impacts on built features, including flooding; and
- noise and air quality impacts, particularly in relation to the Tooheys Road site.

The report concluded that:

- amenity and health impacts are likely to be minor, and can be managed through the recommended conditions of consent, including appropriate noise and air quality performance criteria;
- impacts on creeks and rivers are likely to be minor, and there is a very low risk to groundwater resources; and
- Impacts to built features are likely to be minor and are covered by the Mine Subsidence Board (MSB) in respect of compensation for any mining-induced subsidence impacts.

The PAR has draft recommended conditions of consent attached. These include a range of checks and balances and a range of performance measures including for water, biodiversity, built features, heritage, noise and air quality to prevent/mitigate potential impacts. Two sets of management plans will also be required to address the areas of impact identified in the performance criteria. All reports, plans, reviews and audits are required to be made available on the project website. After weighing up the concerns in relation to subsidence and amenity impact against the socio-economic benefits of the project, the Department has concluded the project's benefits outweigh its potential impacts and has therefore considered it should be approved subject to conditions.

Provision of a PAR at the review stage is a recent development in the assessment process. The Commission considers that, with one exception, it is a very useful addition:

- It adds a significant layer of transparency to what has previously been a closed process. The Commission and the public now have access to the Department's considered position before they give 'final' advice to the consent authority;
- the report deals adequately with a multitude of issues that would otherwise need to be dealt with by the Commission *de novo*;
- it focuses attention on the major issues to be considered; and
- inclusion of draft consent conditions enables the Commission to check the proposed requirements against the discussion of the issue in the report and/or the Commission's own views.

The 'exception' noted above is inclusion in the PAR of the draft conditions in the form of a 'Recommended Development Consent', with the signature page for the consent authority (in this case the Commission) included. This gives the impression that the Commission has already determined that it will concur with the Department's position. This issue was raised multiple times at the public hearing: it clearly caused confusion and led to assertions that the Commission is a 'rubber stamp'.

The problem could simply be avoided by omitting the material relating to approval of the development consent and clearly marking the draft conditions as a draft. In any event, inclusion of the material relating to approval of the development consent is not relevant to the review process and has played no part in this Commission's review of this project.

Provision of the PAR at this stage is also not without risk for the Department. The Commission has been asked specifically to consider the report as part of the review and there will inevitably be differences in views on some matters. This may appear to imply wide-ranging criticism of the adequacy of the Department's report but, whilst some comments are indeed critical, these are a minority and need to be viewed in that context. Overall, the Commission regards the Department's PAR as a very useful contribution to the review process.

2. THE COMMISSION'S REVIEW TASK

2.1 Terms of Reference for the Review

Section 23D of the *Environmental Planning and Assessment Act 1979* (EP&A Act) provides for the Minister to request the Commission to conduct a review of a development application for a project and to hold a public hearing into the matter the subject of the review.

The Minister's terms of reference for this review are dated 16 January 2014 and are to:

1. *Carry out a review of the Wallarah 2 Coal Project, and:*
 - a) *consider the Department of Planning and Infrastructure's assessment report of the merits of the project;*
 - b) *consider the EIS for the project, the issues raised in submissions, the formal response to submissions and any other relevant information provided on the project during the course of the review;*
 - c) *assess the merits of the project as a whole, paying particular attention to potential water and biodiversity impacts of the project; and*
 - d) *recommend any further measures required to avoid, minimize, and/or manage the potential impacts of the project.*
2. *Conduct public hearings during the review as soon as practicable after the Department of Planning and Infrastructure provides a copy of its assessment report for the project to the Planning Assessment Commission.*
3. *Submit its final report on the review to the Department of Planning and Infrastructure within 6 weeks of the public hearings, unless the Director-General of the Department of Planning and Infrastructure agrees otherwise.*

The Department's PAR was received by the Commission on 20 February 2014. A public hearing was held in Wyong on 2 April 2014 and is discussed below. The Department of Planning and Infrastructure agreed to the Commission's request for an extension of time for completion of this report until 6 June 2014. This was sought as a result of the complexity of the issues to be considered, the need to obtain responses to a series of questions the Commission wished to put to the Proponent and agencies arising out of the public hearing, and the Commission's consideration of the submissions and the Environmental Impact Statement (EIS). The Commission's requests and the responses from Proponent and agencies are in Appendices 5 and 6 respectively

2.2 Public Hearing and Submissions

In accordance with the Minister's request, the Commission held a public hearing on 2 April 2014 at the Wyong Golf Club. A total of 36 verbal submissions were made to the Commission at the hearing including 9 special interest groups, Wyong Council, a Local MP and individual residents. All those seeking to be heard were heard. The Commission also received 30 written submissions. A summary of the issues raised at the public hearing is provided in Appendix 4 of this report. The submissions are publicly available and can be accessed from the Commission's website, along with written versions of any presentations that were provided to the Commission during the public hearing.

2.3 Documents, Meetings & Site Inspections

Through the course of the review the Commission accessed a wide range of documents including:

- The Proponent's Environmental Impact Statement (prepared by Hansen Bailey Environmental Consultants, April 2013);
- Submissions from government agencies, special interest groups and the public made to the Department on the EIS and the Proponent's Response to Submissions (RTS) and submissions made directly to the Commission;
- The Proponent's:
 - Response to Submissions (Hansen Bailey Environmental Consultants, September 2013);
 - Residual Matters Report (Hansen Bailey Environmental Consultants, October 2013); and
 - additional Information provided by the Proponent to the Department;

- The Impact of Potential Underground Coal Mining in the Wyong Local Government Area – Strategic Review, July 2008; and
- Wallarah 2 Coal Project PAC Report, NSW Planning Assessment Commission, November 2010.

During the review, the Commission met with representatives from the Department of Planning and Environment (Friday, 7 March 2014), Wyong Shire Council (Monday, 1 April 2014), Lake Macquarie City Council (Monday, 1 April 2014), the Proponent (Monday, 1 April 2014 and Tuesday, 29 April 2014), Central Coast Water Authority (Monday, 28 April 2014), NSW Office of Water (Tuesday, 29 April 2014) and Professor Philip Pells (Monday, 28 April 2014). Summaries of these meetings are provided in Appendix 4

The Commission visited the site on Monday, 1 April 2014 with the Proponent. The Commission also met on multiple occasions.

3 COMMENTS, FINDINGS AND RECOMMENDATIONS RELATING TO THE TERMS OF REFERENCE

3.1 Subsidence

3.1.1 Conventional Subsidence

There are numerous descriptions available of the mechanisms involved in conventional subsidence generally, and in relation to this project specifically. General references can be found in the PAC review reports on the Metropolitan Coal Project (May 2009) and Bulli Seam Operations Project (July 2010), in Appendix F of the first PAC Review report on the Wallarah 2 Coal Project (Nov 2010) and in the Department's PAR for this project. There is no need to repeat this material in this review report.

3.1.1.1 Subsidence Predictions

The first important issue for this project is how subsidence predictions are made. There are two basic approaches, empirical and analytical. The first relies on using a large amount of subsidence data from sites with similar conditions (geological and topographical) and the second uses mathematical modelling to predict rock mass behaviour. The first method is commonly used in NSW coalfields.

The problem with the Wallarah 2 site is that the key variables of depth of cover, mining height and geology are different to all other mining areas in NSW. The empirical method therefore has significant limitations: there is no substantial database from comparable areas on which to draw, and extrapolations from dissimilar areas must be used instead.

The Proponent has therefore used a hybrid method. This involved developing a mathematical model that was validated using existing examples of subsidence and then applying it to a number of cross-sections through the Study Area. This was then used to calibrate the empirical method (MSEC's Incremental Profile Method (IPM) in this case) and the IPM method was then used to develop subsidence predictions across the whole site.

This hybrid approach was considered to be ‘best practice’ by the peer reviewer. The first PAC Review (Nov 2010) also accepted the predictions as being adequate for assessment. However, not all experts take this positive view of the hybrid model.²

The Proponent’s Response to Submissions on the EIS (RTS) deals with the issue of conventional subsidence prediction in some detail at pp6-9. It argues that the modelling techniques have been subjected to exhaustive validation protocols and that there is a high degree of conservatism built into the prediction of conventional subsidence effects.

However, the Commission notes the cautionary warning by the peer reviewer³: *‘it will be absolutely essential that a comprehensive Wallarah site-based validation of the predictions and hence the prediction methodologies is carried out, once data is collected from subsidence associated with the initial longwall panels, to provide an even better level of confidence in the prediction techniques and the underlying assumptions and findings’.*

Opponents of the project argue that there is such a level of uncertainty about the conventional subsidence predictions for this Project Area that the project should not be allowed to proceed. The reasons given are that the potential consequences for built infrastructure (houses, other buildings, farm dams, etc.), stream morphology, catchment yield, agricultural businesses such as the turf farm, and public infrastructure (roads, bridges, etc.) are, in fact, unknown.

However, if this position were accepted then no greenfield site could be developed for underground mining. Always there will be some uncertainty. The issue is whether three things can be satisfied:

- (i) what are the consequences of a serious under-estimate of the subsidence impacts, or of subsidence impacts that vary significantly and in a non-uniform manner from the predictions;
- (ii) on the basis of what we do know, are the predictions for this project sufficiently robust as a starting point and could they be used as a basis for prescribing robust performance measures; and
- (iii) if a worst-case scenario eventuated, are there options to limit further impacts and remediate and/or compensate for those which have occurred.

3.1.1.2 Assessment of Risk of Underestimating Subsidence

Assessing the risks of serious under-estimation of impacts or of non-uniform impacts requires an understanding of the potential consequences for the natural or built features likely to be impacted coupled with an understanding of the proposed mine plan.

Potential consequences for features for this project are dealt with in a series of sections in the rest of this report (e.g. groundwater, surface water, biodiversity, built infrastructure, etc.). These consequences are based on current subsidence predictions.

However, the relationship between subsidence predictions, subsidence effects, subsidence impacts, and environmental consequences becomes less well defined as we move along this continuum. This is particularly true for natural features. By the time we get to consequences there is a relatively poor understanding of the likely responses of natural features to predicted subsidence effects. This is logical enough in that there are many variables involved in maintaining the integrity of a feature and subsidence may affect these variables in many different ways, to different extents and over different

² For example, see Wyong Shire Council Submission on the EIS containing the expert report by Prof. Philip Pells. See also comment on p.20 of Department’s PAR.

³ RTS, p.9

timescales. Alterations in the variables are also likely to drive changed relationships between the variables themselves. These interactions add another layer of complexity to an already complex situation.

Possibly the simplest example of these uncertain relationships for this proposed project is the potential for subsidence to cause adverse changes to the morphology of Jilliby Jilliby Creek or Little Jilliby Jilliby Creek. The risk of changed morphology (an environmental consequence) is known and the subsidence impacts that might contribute to that consequence are known (e.g. changes in stream gradient, locally depressed areas, etc.). There is also information on which to base concerns about areas of heightened risk (e.g. predicted subsidence effects over particular longwalls that will cause more significant changes in stream gradient than will be caused by other longwalls).

However, it is not known in advance what the rainfall event pattern will be over the period when the subsidence impacts are likely to be greatest in a particular location (the impacts will vary over time as successive longwalls alter the gradient between adjoining stream sections) and therefore it is not actually known what will happen to stream morphology at any particular point on the streams during the mining process.

The performance criteria in a consent are designed to set the upper bounds of acceptable consequences. Because the consequences may take time to develop and therefore may not be detectable, either fully or at all, during the extraction of the relevant longwall (or even during the life of the mine), reliance is often placed on earlier stages in the subsidence spectrum for evidence that problems may develop subsequently (e.g. the subsidence impacts, deviations from subsidence predictions, etc.).

Under these circumstances the first task is to determine the level of acceptable risk to the feature (i.e. can any damage be allowed, if so, what kind of damage, how much of it, over what period, can it be repaired, etc.). Depending on the answers to these questions any damage may be unacceptable, or some limited amount may be acceptable up to total destruction. The response must be consistent with the level of risk determined to be acceptable and may range from avoiding subsidence impacts on the feature altogether, to setting performance outcomes allowing some degree of damage and then monitoring responses as the mine approaches the feature with a view to ensuring that the performance outcomes are met.

The risk management approach is commonly used in mining consents in NSW and is discussed in much more detail in the PAC Review Reports on the Metropolitan Coal Project (May 2009), and the Bulli Seam Operations Project (July 2010) which followed on from the Southern Highlands Strategic Review (July 2008).⁴

The mine plan is developed based on the trade-off between maximising resource extraction and managing risks around mine safety and potential impacts on natural and built features.⁵ The mine plan is a progression of longwalls, each of which takes approximately 12 months to complete. Detailed information is required to be collected about subsidence impacts arising from each of these longwalls and the prediction models are then recalibrated based on actual data from the Project Area.

The RTS argues at p.11 that the predictions in the EIS represent a worst-case scenario and that use of the IPM model on its own would have produced subsidence predictions some 50-75% of those

⁴ Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield – Strategic Review, July 2008

⁵ See separate sections on surface water, groundwater, built infrastructure etc. in this report.

predicted by the hybrid model.⁶ (The IPM model is generally accepted as the benchmark for prediction of subsidence impacts from underground coal mines in NSW.) However, even if the Commission accepts that the predictions may be overestimated, this doesn't address what happens if there is substantial variation in accuracy between predictions of subsidence impacts at either the within-longwall or Project Area scales.

Such variation could arise from a number of sources, but one obvious one is the use of the 'yielding pillar' design for the mine. The concept of a 'yielding pillar' design is that relatively narrow pillars are left between the longwalls and these pillars subside when isolated between two extracted longwalls to give a more uniform final landform. The objective is to prevent the catastrophic collapse of conventional (i.e. broader) pillars at some later date as has happened in nearby locations such as Chain Valley Bay. These conventional chain pillars were designed to be sufficiently strong to support the surface between them (i.e. over the extracted area of the longwall) but they failed some time after mining was completed. The geological feature responsible for these collapses is the Awaba Tuff strata which can display poor strength properties. It is also a feature of this Project Area.

This 'yielding pillar' design has not previously been used in NSW and, although it appears to be conceptually attractive, it does create further uncertainty about subsidence effects and possible impacts. The principal concern is what happens if the pillars either do not yield as predicted or yield only partially. The earlier PAC Review (Nov 2010) notes the concern and states that the result could be 'a more irregular (or 'wavy') final surface profile. This, in turn, could result in larger final tilts or strains, albeit that vertical displacement is less.'⁷ However, that review did not appear to pursue the issue further.

The Commission for the current review raised concerns about this uncertainty with the Proponent at the site meeting on 2 April 2014. The concerns included the likelihood of partial or total failure of the pillars to yield, the consequences for built infrastructure, flood behaviour, etc. if they don't yield as expected, and what could be done about it. To this can be added the consequences of uncontrolled collapse of pillars at a later date of the kind that were identified at the public hearing.⁸

The Commission put these residual concerns to the Proponent formally by letter dated 14 April 2014 (Appendix 5). The matter was also discussed at the meeting with the Proponent and the Proponent's experts on 29 April 2014. The Proponent provided a formal response by way of letter dated 2 May 2014 (Appendix 6).

The response is comprehensive and deals adequately with both failure of all pillars to yield and failure of a small number to yield.⁹ The key points are:

- that it is highly unlikely that one (or a few) pillars would be able to remain intact if the nearby pillars yielded as predicted; and
- if all pillars failed to yield, the amount of subsidence would reduce across the mining area, but the maximum tilts and strains would not increase above those predicted.

The Proponent was specifically asked to provide advice as to the consequences for flooding, stream morphology and built features if the pillars did not yield as predicted. Again, the response is comprehensive. It indicates that the risk from flooding would not increase significantly (Appendix 6, Proponent's Response to the Commission's Questions dated 2 May 2014, p.29); that there could be

⁶ See also email to PAC from MSEC Director, D. Kay, dated 5 March 2014

⁷ PAC Review, Nov 2010, Appendix F

⁸ Note that that RTS at p.10 in response to similar issues provides arguments as to why this mine design would be preferable for this Project Area, rather than providing any evidence that it will actually work.

⁹ Proponent's Response to Commission's Questions dated 2 May 2014 (Appendix 6)

increased short-term impacts on stream morphology in proximity to a non-yielding pillar, but that these would be expected to be resolved within the scope of existing natural variation in the creek systems due to rainfall events (Appendix 6, Proponent's Response to the Commission's Questions dated 2 May 2014, pp.43-44); and that there could be increased damage to a built feature that happened to be located on the edge of the non-yielding pillar which could both increase the extent and alter the nature of repairs (Appendix 6, Proponent's Response to the Commission's Questions dated 2 May 2014, p.39). For the last of these possibilities, the strains and tilts would still remain within the maximum predictions for the project, but the Mine Subsidence Board (MSB) repair category would change for the feature in question.

Based on this information from the Proponent, the Commission is now satisfied that the pillars will yield. Some uncertainty remains as to whether they will all yield within the predicted timeframes, but the consequences of variation in timing are not likely to have significant consequences for any surface features.

3.1.1.3 Do the Subsidence Predictions Provide an Acceptable Basis for Assessment?

The Commission accepts that the predictions provide a sufficient basis for initial assessment. However, the Commission considers that at least two formal reviews will be required: one after the first five longwalls have been completed and the other after longwalls 6N to 9N have been completed. The first of these proposed reviews is consistent with the recommendation from the November 2010 PAC Review which was designed to not allow the restricted mining parameters applied to longwalls 1N-5N to be exceeded until a review of subsidence predictions indicated that performance criteria would not be exceeded in the longwalls most likely to affect Jilliby Jilliby Creek (i.e. LW 6N and above). The restricted mining parameters (narrower longwalls and reduced seam height) were designed to keep subsidence impacts within the limits set for the Hue Hue Mine Subsidence District (MSD). The second formal review is to ensure that the subsidence impacts on the alluvial lands are not exceeding the performance criteria for the undermined streams before undermining of those streams progresses very far along the catchment.

3.1.1.4 Options to Limit Further Impact - Adaptive Management

The Proponent's response to the various uncertainties outlined above relies on 'adaptive management'. In practice this means that the experience with the first few longwalls will allow the subsidence prediction models to be recalibrated using site-specific data. Any necessary adjustments can then be made to the project. Some examples of 'adjustments' are given in the Department's PAR ('changing the height of seam extraction or reducing panel width' at p.26, 'narrowing of the proposed longwalls' at p.30, 'appropriate alterations to mining operations' at p.54). In the Proponent's RTS there are numerous references to 'adaptive management', but no comprehensive description of what this may entail.

The Department's PAR summarises the position on 'adaptive management' at pp.53-54:

'Overall, the Department has recommended a robust set of conditions of consent based on an adaptive management approach, which accepts that knowledge and understanding of underground mining in this 'greenfields' area would substantially increase over the life of the project, and allows for appropriate alterations to mining operations to reflect this improved knowledge. The recommended conditions incorporate a range of checks and balances as the project develops and progresses, and provides various safeguards to prevent and/or mitigate potential impacts. These conditions are broadly based on three key features: a strict set of performance criteria; a requirement for various management plans to monitor and mitigate potential impacts; and stringent reporting and auditing requirements.'

But examination of the draft conditions relating to performance criteria indicates that at least some of the critical ones are anything but 'strict'. For example, the Commission considers that requiring impacts on a significant watercourse to be 'negligible' for 80% of its length and 'minor' for the other 20% is unenforceable: which is the 20% and how is water quality to be considered under such a regime?

'Adaptive management' has been considered by the Land and Environment Court on several occasions and a summary of the key cases is included in the PAC Review Report on Bulli Seam Operations (July 2010).¹⁰ The Court defined 'adaptive management' in the following terms:

*'Adaptive management is a concept which is frequently invoked but less often implemented in practice. Adaptive management is not a "suck it and see", trial and error approach to management, but is an iterative approach involving explicit testing of the achievement of defined goals. Through feedback to the management process, the management procedures are changed in steps until monitoring shows that the desired outcome is obtained. The monitoring program has to be designed so that there is statistical confidence in the outcome. In adaptive management the goal to be achieved is set, so there is no uncertainty as to the outcome and the conditions requiring adaptive management do not lack certainty, but rather they establish a regime which would permit changes, within defined parameters, to the way the outcome is achieved.'*¹¹

The Commission considers that there are substantial differences between the generalised statements in the PAR and RTS on the one hand and the specificity required by the Court on the other. The Commission considers that, given the uncertainty associated with the subsidence impact predictions, there needs to be a much 'tighter' specification of the performance criteria for some features and not-negotiable milestones at which assessment must demonstrate that the project is meeting the performance criteria.

Wyong Shire Council (and other presenters at the public hearing) were adamant that if performance criteria were not met the mine should cease operating until it could demonstrate that the problem had been rectified and compliance with the performance criteria could be achieved. This is in sharp contrast to the approach to addressing operational problems evident in the PAR and RTS, where a number of possible operational responses are suggested without specificity or clear commitment as to when and how these might be triggered.

Perhaps the more worrying aspect is the suggestion in the PAR at p.26 to the effect that if significant changes to the mine layout are required to 'reduce subsidence effects to an acceptable level' then a modified consent 'may be required before longwall extraction could continue'. It is not entirely clear what the purpose of this 'modified consent' might be particularly in the context of 'reduce to an acceptable level' [emphasis added]. Either the intent is to relax the performance criteria, or the mine plan changes are so significant that a new assessment of potential subsidence effects, impacts and consequences is required. In the latter case the subsidence predictions on which significant reliance has been placed in the current assessment would no longer be relevant.

The Commission also notes the statements on p.20 of the PAR to the effect that the adaptive management approach proposed for the project is consistent with the approach applied to all other recent development consents for underground mines in NSW and that the Extraction Plan process can appropriately manage the adaptive management requirements. The Commission received

¹⁰ PAC, Bulli Seam Operations Review Report, July 2010 at pp.124-131

¹¹ Newcastle and Hunter Valley Speleological Society Inc. v Upper Hunter Shire Council and Stoneco Pty Limited [2010] NSW LEC 48

multiple submissions at the public hearing that strongly disputed this position. The main points raised were:

- public scrutiny of the Extraction Plan process is very limited, yet major decisions are deferred to it;
- there is no evidence that corrective action is taken (or in some cases can be taken) before negative environmental consequences occur or to prevent the continuation of such consequences; and
- there is a close relationship between the Department and the mining industry that inhibits effective regulatory action to stop further impacts.

The Commission considers that the first two points have some validity and has no information on which to base any comment on the third. The first point requires the consent authority to ensure that robust performance measures are included in the consent so that the boundaries for decision-making in the Extraction Plan process are clear. The second point requires clear evidence that the Extraction Plan process can be made to work and that adaptive management is effective in stopping unpredicted negative consequences when they commence and ensuring that mining cannot continue until rectification occurs. This is a task for the Department. Until there is clear evidence that the process works there will be no public confidence in it.

Despite the concerns outlined above, the project does have some positive attributes when it comes to considering whether 'adaptive management' could be made to work. One important point for this project is that the mine is progressing up the catchment, so the consequences for stream morphology and water catchment yield can be assessed before impact has occurred over a significant length of the streams. Another important point is that the initial 5 longwalls have the shallowest depth of cover and are narrower in order to limit impacts to the residences in the Hue Hue MSD.¹² This will also enable recalibration of the predicted impacts before widespread impacts beyond those predicted can occur.

3.1.1.5 Far-Field Horizontal Movements

The other aspect of conventional subsidence is the prediction of far-field horizontal movements. These can occur well beyond the boundary of the Extraction Area and are a possible impact from this project (PAR p.41). The principal risks are associated with major infrastructure such as bridges on the M1 motorway that may be sensitive to differential horizontal movement. The RTS discussed far-field effects at pp.14-15, but only in relation to water supply infrastructure.

The EIS (Appendix H 5.12 at p.94) suggests that the subsidence predictions be provided to the RMS so that a structural assessment of the bridges can be undertaken to determine whether any action is required to prepare the bridges for the predicted subsidence effects. There are several concerns with this based on the proximity of the M1 to the early longwall panels (i.e. limited or no opportunity to recalibrate predictions based on operational experience before impacts could occur). The Commission's concerns are:

- (i) has the reference to RMS occurred?
- (ii) if so, what was the outcome of the assessment?
- (iii) what is the level of tolerance built into the assessment or proposed action plan in case current predictions turn out to be under-estimates?

The draft consent conditions refer to the performance measure for the M1 as 'always safe and serviceable' (condition 3, Schedule 3). This applies the standard regulatory requirement to potential

¹² The Hue Hue MSD operates on the basis that residential construction must be able to withstand a particular level of subsidence impact and the mine design must deliver a subsidence impact below that level.

impacts for the M1 from the project. However, the Commission considers that a consent authority would want to be sure that an assessment had been done by the RMS before longwall extraction commenced. This should be incorporated into the consent conditions.

3.1.1.6 Commission's Findings – Conventional Subsidence

The Commission's findings in relation to conventional subsidence are:

- although there are uncertainties arising from the greenfield nature of the proposed mining area, the subsidence predictions provide an adequate basis for assessment of the project;
- at least two formal reviews should be required: one after the first 5 longwalls have been completed (LW 1N-5N) and one after the next four have been completed (LW 6N-9N);
- the 'yielding pillar' design appears sound and the risks of one or a few pillars not yielding are low. In any event the consequences of non-yielding pillar(s) do not appear to be so significant as to prevent the project proceeding;
- the uncertainties require that a rigorous set of performance measures be included in any consent. Rigorous in this context means able to be measured or assessed in a scientifically and legally sound manner and be capable of enforcement. These performance measures must be supported by:
 - (i) a requirement that the Extraction Plan for each longwall contains revised subsidence predictions based on experience from previous mining on the site and that these revised predictions will not allow the performance criteria to be exceeded;
 - (ii) a requirement that the Extraction Plan for each longwall contains:
 - (a) appropriate triggers to warn of the development of an increasing risk of exceedance of the performance criteria (e.g. the subsidence predictions themselves and/or other relevant subsidence-related measurements);
 - (b) specific action plans to respond to increased risk of exceedance that will ensure the criteria are not exceeded (e.g. cessation of mining, narrowing the longwall, altering seam height, etc.); and
 - (c) an assessment of remediation measures that may be required if exceedance does occur and the capacity to implement the measures.
- although the risks to the significant public infrastructure such as the M1 Motorway and the Buttonderry Waste Management Facility appear small, the necessary steps to prevent impacts should be included in any consent and the consent authority should be satisfied that these steps will in fact, ensure the safety and/or integrity of the infrastructure.

The Commission notes that the draft conditions of consent attached to the Department's PAR go a long way towards meeting the requirements outlined in the above dot points (Specifically Schedule 3). However, the Commission considers that some of the performance measures in Table 1 are unenforceable, that the two suggested reviews should be provided for explicitly and that the Extraction Plan provisions could be strengthened by inclusion of stronger links to non-exceedance of the performance criteria and by requiring specific assessment of remediation options and the capacity to implement them in the event of exceedance.

3.1.1.7 Commission's Recommendations – Conventional Subsidence

The Commission recommends:

- that a rigorous set of performance measures be included in any consent. Rigorous in this context means able to be measured or assessed in a scientifically and legally sound manner and be capable of enforcement. These performance measures must be supported by:
 - (i) a requirement that the Extraction Plan for each longwall contains revised subsidence predictions based on experience from previous mining on the site and that these revised predictions will not allow the performance criteria to be exceeded;

- (ii) a requirement that the Extraction Plan for each longwall contains:
 - (a) appropriate triggers to warn of the development of an increasing risk of exceedance of the performance criteria (e.g. the subsidence predictions themselves and/or other relevant subsidence-related measurements);
 - (b) specific action plans to respond to increased risk of exceedance that will ensure the criteria are not exceeded (e.g. cessation of mining, narrowing the longwall, altering seam height, etc.); and
 - (c) an assessment of remediation measures that may be required if exceedance does occur and the capacity to implement the measures;
- although the risks to the significant public infrastructure such as the M1 Motorway and the Buttonderry Waste Management Facility appear small, the necessary steps to prevent impacts should be included in any consent and the consent authority should be satisfied that these steps will in fact, ensure the safety and/or integrity of the infrastructure; and
- that at least two formal reviews of the predicted subsidence impacts should be required: one after the first 5 longwalls have been completed (LW 1N-5N) and one after the next four have been completed (LW 6N-9N).

3.1.2 Non-Conventional Subsidence

3.1.2.1 Introduction

This is usually associated with steeply incised terrain. Essentially the subsidence-induced changes cause the valley walls to move inward and the valley floor to buckle upward (hence the name 'upsidence'). Detailed descriptions of non-conventional subsidence can be found in the PAC Review report on Bulli Seam Operations (July 2010), the first PAC review of Wallarah 2 Project (Nov 2010) and the EIS for this Project (Appendix H 3.7 pp.48-51 and 3.12 pp.54-55).

There were concerns expressed about the potential for non-conventional subsidence effects in the first PAC Review for this project (Nov 2010). Primarily these related to longwalls 23N and above (i.e. the far western longwalls in the steeper terrain under Jilliby SCA). Removal of eleven of the original western longwalls from consideration in this project has reduced that concern, but not eliminated it entirely.

There are still predicted impacts from non-conventional subsidence on some surface waters, but these are relatively small. The nature of the terrain and the structure of the bed of these streams makes it unlikely that significant cracking and associated water loss will occur. This type of impact is generally associated with streams underlain by sandstone and controlled by rockbars, not with streams underlain by alluvium. However, given the imprecision associated with the non-conventional subsidence predictions, it will be critical to monitor non-conventional subsidence impacts closely until it can be demonstrated conclusively that the mining parameters are producing impacts consistent with, or below, those predicted.

3.1.2.2 Commission's Recommendations – Non-Conventional Subsidence

The Commission recommends:

- that appropriate monitoring of non-conventional subsidence effects be included as a requirement in any consent and that the relevant Extraction Plan be required to contain appropriate measures to control the risks from non-conventional subsidence so as to ensure that the environmental performance criteria are not exceeded.

3.2 Groundwater

3.2.1 Introduction

The Department's PAR summarises the issues associated with predicted subsidence impacts on groundwater at pp.25-26. This summary is generally consistent with the material presented in Appendix I of the EIS and Appendix G of the November 2010 PAC Review Report on the Wallarah 2 Coal Project.¹³ The issues of relevance to this Commission are:

- (i) is there a direct subsidence-induced impact on shallow groundwater systems that may cause decreases in baseflow to streams or impacts to Groundwater-Dependent Ecosystems (GDEs)? If so, what is the likely magnitude, when will it commence and what is the likely duration?
- (ii) Is there a possibility of loss of water from the surface to the mine? If so, how much and over what period?
- (iii) Is there a subsidence-induced impact on deep aquifer systems? If so, what is the likely magnitude, when will it commence and what is the duration?
- (iv) Is there a subsidence-induced impact on current or proposed use of the deep groundwater aquifers?

3.2.2 Shallow Groundwater Systems

3.2.2.1 Impacts on Baseflow

The PAR acknowledges that there will be subsidence-induced impacts on shallow groundwater systems that will affect baseflow to streams. There are at least four potential mechanisms that could cause loss of baseflow. The first is movement of water in the alluvium from unsubsidised areas to subsidised areas as the longwalls pass beneath or adjacent to the alluvium. This is dealt with in detail under surface waters in section 3.3.1, but an outline is included in 3.2.2.1.1 below. The second is movement of water into cracks in the near-surface strata underlying the alluvium. This is dealt with in 3.2.2.1.2 below. The third is movement of water from the shallow groundwater aquifers to the zone of depressurisation created by voids in the goaves following extraction of the coal (see 3.2.2.1.3 below). The fourth is other possible connectivity between the alluvium and the mine (see 3.2.2.1.4 below).

3.2.2.1.1 Movement of Water from Non-subsided Areas to Subsidised Areas

When longwalls cause subsidence in the vicinity of the alluvium, water will flow into the subsidised area from the surrounding unsubsidised areas. Assuming for a moment that this water cannot escape downward or laterally, this effectively increases the total amount of water that can be stored in the alluvium. The impact will obviously vary over the mining period as the relationship between the positions of the longwall(s) and the alluvium changes.

The Proponent considers that this should be considered as a temporary movement of water into increased storage capacity created by the subsidence impact of a small number of adjacent longwalls and that this water will be returned to the system once the next adjacent set of longwalls are extracted. The argument is that the water is not 'lost' to the shallow groundwater system permanently and therefore does not affect water supply. However, the Proponent conceded that 'borrowing' water in this way could have a negative effect on baseflow in times of low flow and the Commission's view is that it must be considered in the context of the potential impacts on water supply.

¹³ The introductory section of Appendix G of the November 2010 PAC Review Report contains an excellent 'layman's guide' to groundwater, potential impacts of mining on groundwater and modelling used to predict groundwater behavior in response to mining.

3.2.2.1.2 *Movement of Water from the Alluvium into Near-Surface Subsidence-induced Cracks*

This arises from cracking of the bedrock beneath the alluvium and movement of water into the cracks. The PAR argues that this will be temporary based on:

- predictions that the cracking will be limited to the near-surface rock strata and will not extend far either vertically or horizontally;
- prediction that the alluvium will plug any gaps in the bedrock and form an effective seal; and
- predictions that rainfall will recharge the alluvium in a short period.¹⁴

The two main streams that will be undermined are Jilliby Jilliby Creek and, to a lesser extent, Little Jilliby Jilliby Creek. The predicted impact varies throughout the 28 years of mining depending on the location of longwalls relative to the creeks. Very little impact is predicted beyond the end of mining based on the assumption that the fracture networks are finite, that the alluvium will act as a seal and that recharge will rapidly fill any remaining voids to capacity. All of these assumptions have been challenged.

The PAR acknowledges that there is a possibility that the fracture networks are not finite, but the view taken is that any ongoing water loss into these networks would be small and of little consequence.

The assumption concerning the alluvium filling the cracks is untested and the Commission therefore sought formal advice from NOW on the issue.¹⁵ The matter was also discussed at a meeting with NOW on 29 April 2014. The advice from NOW is contained in their undated letter to the Department in response to the Commission's letter to NOW dated 11 April 2014 (Appendices 6 and 5 respectively). Essentially the advice questions the validity of the assumptions concerning the limited nature of the superficial fracture networks and the extent of the alluvial sealing of the cracks.¹⁶ However, NOW advised at the meeting of 29 April 2014 that the magnitude of the loss is not considered at this stage to be significant and could be addressed by monitoring and mitigation if required. NOW has not provided specific advice as to how mitigation could be achieved.

The assumption concerning recharge is based on average flow conditions. In times of drought recharge will be less and the time taken to fill cracks will be greater. Whether the cracks are in fact terminal may also affect this. Not all experts accept that cracks will be terminal.

However, overall the weight of opinion is that the loss of water from the alluvium to near-surface fracture networks will be limited both in amount and duration. The Commission accepts that this is the most plausible proposition. But in response to the inevitable uncertainty the Commission favours the approach suggested by NOW, which is to require monitoring capable of detecting losses from this source and to have a strategy (or strategies) in place for mitigating any significant losses. The Commission suggests that the possible mitigation options be identified prior to submission of the project for determination.

3.2.2.1.3 *Movement of Water from the Alluvium to the Zone of Depressurisation*

There are essentially three ways that water can get from surface waters (including alluvial aquifers) to the mine. The first is by subsidence-induced connective cracking from the bedrock through the various strata to the mine itself. The second is by vertical movement through intact strata via the existing permeability capacity of these strata. The third is via a pre-existing geological fault or dyke.

¹⁴ Department's PAR at pp.25-26

¹⁵ Letter from Commission to NOW dated 11 April 2014, Appendix 5

¹⁶ NOW Response to the Commission's Questions (undated), Appendix 6, pp.1-2

- **Connective Cracking**

Connective cracking is influenced by multiple factors including mining parameters (seam height and panel width), depth of cover and characteristics of the strata between the surface and the mine. The key issues for this mining project are that there is a substantial depth of cover, the predictions are that at least 100m of this cover would remain intact and that there is very little vertical movement of water through this intact layer (i.e. cracking is not currently a significant issue in this layer).

The conclusion in the various reports and reviews cited in Section 3.1 is that connective cracking is not likely to be a source of significant movement of water from the surface to the mine. The reports leave open the possibility of very slow movement of water through very fine 'tortuous path' fracture networks. However, the timeframe for movement of water via these mechanisms is multiple decades (or more) and the conclusion is that any such movement would not be detectable within the natural flow variation in response to rainfall.

- **Existing Vertical Permeability**

The reports acknowledge that the intact strata in the constrained zone above the goaves have some vertical permeability (albeit very slight). This means that a limited amount of water will move from the surface to the zone of depressurisation via this mechanism. But it is a very slow process estimated to take over 500 years to reach pre-mining equilibrium and the maximum annual contribution from the alluvial groundwater in the Project Area is estimated as 7.3 ML/y.

Opponents of the view that there is very limited connectivity between the surface waters and the mine take the approach that the predicted 2.5 ML/d inflow to the mine must come from somewhere and the only ultimate source of that 'somewhere' is rainfall that would otherwise become baseflow in streams.

The Commission met with Professor Pells on 28 April 2014 and with the Proponent's expert, Dr Mackie, on 29 April 2014, in order to explore these opposing views concerning movement of water from the surface to the zone of depressurisation. The areas of agreement can be summarised as:

- the zone of depressurisation will cause some water to move from the alluvial aquifers to the goaves;
- that process will take a long time to commence (i.e. until the zone of depressurisation moves through the various strata to exert negative pressure on the alluvial aquifers); and
- that the changes in pressure in the strata below the alluvium will exert some downward vertical pressure on water in the alluvium.

The areas of disagreement can be summarised as:

- the permeability of the rock strata in the constrained zone (Prof. Pells argues that water will move through this strata via existing fracture networks at a much higher rate than used by Dr Mackie in his modelling which was based on permeability of the rocks themselves); and
- the quantity of water that may move from the alluvium to the goaves (Prof. Pells argues that it will be more than 7.3 ML/y).

At its simplest the disagreement can be characterised as strongly divergent views on two things:

- the 'permeability' of the constrained zone and consequently the rate at which water can move to the goaves once the zone of depressurisation extends to the strata beneath the alluvium; and

- The surface area from which recharge might be drawn to the zone of depressurisation.

Most of the 2.5 ML/d predicted inflow to the mine comes from the coal seam and water stored in the adjacent strata. Water moves in response to the depressurisation from the areas adjacent to the mine void to the mine void itself (this was predicted to account for 25 out of 26.5 GL of water flow to the mine in the first EIS – see Nov 2010 Review Report, Appendix G, p.25). This movement may be from substantial distances away depending on pathways available for water movement.¹⁷

In effect this means that, while the opponents may be correct in asserting that the replacement of the minewater make must ultimately come from recharge of the surface aquifers, the timescale over which the 26,500 ML is replaced is very long and the annual impact is therefore small. It should also be noted that the recharge contribution may be drawn from the whole of the area of influence of the zone of depressurisation, not just those areas providing baseflow to the streams feeding into the CCWS.

If Dr Mackie is correct then the constrained zone acts as an effective barrier to significant vertical movement of water from the surface to the goaves. However, if Professor Pells is correct, then more water will move more rapidly to the goaves than is predicted in the EIS.

The weight of expert opinion available to the Commission supports Dr Mackie's view (including expert's advice on the 2010 PAC Review for the Wallarah 2 Project, advice to this Commission from NOW, and the two peer reviews by Professor Hebbelwhite and Dr Kalf). However, the matter cannot finally be resolved until some longwalls are extracted. Under-prediction of the impact will potentially affect the mining process itself (too much water has safety and operational risks and involves cost to pump it out) and possibly reduce baseflow to the streams (but this will depend on flow conditions at the time).

- **Other Potential Pathways for Water Movement from the Alluvium**

The most obvious 'other' pathways are geological faults or dykes. While encountering a significant fault or dyke could theoretically provide connectivity between the mine and surface waters, there are a number of factors that make this occurrence unlikely. They include the depth of the mine, the thickness of the alluvium and the drainage characteristics of the alluvium and shallow aquifer systems.¹⁸ In addition, the RTS includes information on geological surveys which indicates that faulting is minor within the Project Area and that the Project Area is a well-defined area located between faults and dykes on all four sides.¹⁹

3.2.2.2 Commissions Findings Concerning Potential Losses of Baseflow from Groundwater Impacts

The Commission's findings are that:

- The EIS gives figures for the combined maximum impacts of subsidence on baseflow of 300 ML/y (i.e. 270 ML/y from the Jilliby Jilliby Creek system and 30 ML/y from the Wyong River system). The majority of this loss is attributed to storage increases associated with subsidence of sections of the alluvium causing temporary movement of water into the subsided area. The Commission agrees that the majority of this water will be returned to the system at a later date, but considers that in dry years the increased storage capacity in

¹⁷ NOW advised the Commission at the meeting on 29 April 2014 that, given the predicted extent of the zone of depressurisation, this could even extend to movement of groundwater from under the sea.

¹⁸ PAC Review Report, Wallarah 2 Coal Project, November 2010, Appendix G, p.21

¹⁹ RTS, pp.179-181

the alluvium could decrease baseflow and must therefore be treated as a potential impact on the Central Coast Water Supply (CCWS). The Proponent²⁰ and NOW²¹ concede this point even if there is debate about the magnitude of the impact;

- Connective cracking is unlikely to provide a mechanism for transfer of anything more than very small amounts of water from the surface to the mine and any such movement will be over long time scales;
- There will be very slow movement of water over a very long period from the surface to the mine through the intact hard rock strata until groundwater pressure equilibrium is restored;
- Geological features (e.g. faults and dykes) are unlikely to cause surface waters to flow to the mine.
- Because undermining of the alluvium only occurs in some years, there will be substantial variation between years in the amount of water potentially lost from baseflow in dry years;
- The impacts on baseflow post-mining are likely to be small (estimated at 36.5 ML/y), but this issue will not be resolved until mining occurs and appropriate monitoring confirms the outcome;
- The potential impacts on baseflow need to be included in the performance criteria in Schedule 3 of the conditions of consent. As it stands there is no requirement not to exceed the predicted impacts; and
- Appropriate monitoring satisfactory to NOW will be required as a condition of any consent. Although there are specific monitoring requirements in relation to impacts on bores, GDEs and inflow to the mine, in the case of baseflow loss there is no linkage between monitoring requirements and any particular performance criteria.

3.2.2.3 Commission's Recommendations Concerning Potential Losses of Baseflow from Impacts on Groundwater

Some of the potential impacts on shallow groundwater systems are directly relevant to the supply of water to the CCWS and will be dealt with under the section on surface waters in 3.3 below.

Recommendations specific to groundwater systems are dealt with here. They are:

- Before submission of the project for determination the consent authority be provided with revised estimates by year for:
 - increased storage in the alluvium as a result of subsidence
 - losses to the alluvium from near-surface cracking of bedrock and movement of water into fracture zones
 - losses to the alluvium from leakage through the constrained zone to the zone of depressurisation
 - losses to baseflow from any changes to catchment flows (i.e. loss of catchment area) for streams potentially supplying the CCWS
 - any other potential sources of loss of water from subsidence-induced changes to either the streams or the alluvial aquifers.

These estimates must indicate whether the losses are expected to be temporary or extend beyond the life of the mine. The estimates should also have been reviewed by NOW.²²

- Given the sensitivity of the CCWS to drought, both temporary and permanent potential losses of baseflow are to be treated as potential impacts on the CCWS.²³

²⁰ Proponent's Response to the Commission's Questions, dated 2 May 2014, Appendix 6, p.15

²¹ NOW Response to the Commission's Questions (undated), Appendix 6, pp.1-6

²² The objective is for the consent authority to have a clear picture of the potential impacts so that potential mitigation options can be assessed quantitatively. As it stands it is very difficult to be sure about the estimates presented in the various project-related documents.

²³ Note that NOW in its response to the Commission's questions (Appendix 6, NOW Response to the Commission's Questions (undated), p.1) suggests that the CCWS is not as sensitive to drought as it was in earlier years. But this is

- Potential impacts on shallow groundwater systems be included in the performance criteria in Schedule 3 of any consent, particularly in relation to potential losses that could contribute to decreases in baseflow to streams supplying CCWS. The maximum predicted impacts of 300 ML/y should not be allowed to be exceeded unless the environmental impacts remain within existing predictions and any loss can be compensated (see 3.3.1.4 for additional detail on compensation requirements).
- Appropriate monitoring arrangements, satisfactory to NOW, be incorporated into the conditions of any consent to ensure that all potential losses of baseflow be accounted for.

3.2.2.4 Impacts on Groundwater-Dependent Ecosystems (GDEs)

The Department's PAR assesses this issue under 'Aquatic Ecology Impacts' at pp.39-40. However, for the purposes of this review report it is dealt with here. The Department's analysis responds to concerns raised by OEH in their response to the Proponent's RTS.²⁴ The Department's analysis is adequate and the Commission considers the conclusions and the proposed approach to managing potential impacts on the GDEs in the draft conditions of consent are sound.²⁵

3.2.3 **Subsidence Impacts on Deep Aquifers**

The main impact on the deep aquifers during mining is the movement of water from storage in the coal seam and the adjacent strata into the mine void and then extraction of this water via pumps to the surface. This is estimated to be a maximum of 2.5 ML/d. This water is saline.

As noted earlier, there is a very slow process of recharge of the deep aquifer system post-mining to fill the mining void and eventually reach pre-mining pressure equilibrium. The Commission is not aware of any current or planned future use of the saline deep aquifers.

The zone of depressurisation can also theoretically cause significant increases in drawdown of water in bores and wells. The extent of this potential impact is again disputed territory. The material provided to the Commission by Professor Pells at the public hearing (including the diagrams) was put formally to both the Proponent and NOW. There appears to be agreement that the potential impacts suggested by Professor Pells are entirely plausible at depths below the Patonga Claystone strata.²⁶ However, the argument put by both the Proponent and NOW is that the current registered bores and wells do not intercept aquifers that would be subject to these drawdown pressures and that there is no impact beyond level one in the NSW Aquifer Interference Policy.

The Commission considers that the weight of evidence in this case favours the view that drawdown will be limited. However, in the event that impacts are greater than predicted, there are strong monitoring and compensatory mechanisms in the Department's draft recommended conditions attached to the PAR (see condition 13 of Schedule 4 and condition 5 of Schedule 3).

disputed by the Water Authority and also does not take account of the severity of historical droughts or the projected increase in population required to be serviced by the CCWS.

²⁴ See Proponent's Residual Matters Report, pp.33-41. This provides a comprehensive response to OEH's concerns about impacts on the GDEs.

²⁵ See condition 1 of Schedule 3, condition 5(h) and 5(i) of Schedule 3, condition 16 of Schedule 4 and Table 8 of condition 17 of Schedule 4.

²⁶ Proponent's Response to the Commission's Questions, dated 2 May 2014, Appendix 6, pp.25-26; NOW Response to the Commission's Questions (undated), Appendix 6, pp.4-5

3.2.4 Subsidence on Bores and Wells

Apart from the potential impacts from the zone of depressurisation noted in 3.2.3 above, impacts on bores and wells will occur as a result of the fall in water table associated with the initial subsidence impact. The Proponent asserts that this fall will substantially recover within 6 months under low rainfall conditions and more rapidly under high rainfall conditions.²⁷

There is also a possibility that subsidence could cause damage to these structures and they would then need to be repaired or re-drilled at the Proponent's expense. As noted above, there are 'standard' conditions in the draft recommended conditions of consent to cover impacts on both the water supply and integrity of privately owned bores and wells. The only additions that the Commission recommends are a requirement to do a pre-mining test of private bores within the zone of potential impact and a requirement that the Proponent bear both the costs of independent assessment of any loss and the burden of proof that any loss is not due to the effect of mining.

3.2.5 The Commission's Findings and Recommendations Concerning Subsidence Impacts on Deep Aquifers and Bores and Wells

3.2.5.1 Findings

The Commission's findings are:

- there is no planned use for the deep saline aquifers that would be impacted by this project;
- while there would be substantial impacts on bore yield for any bores intercepting aquifers below the Patonga Claystone that were within the appropriate drawdown contour, no such bores are currently registered by NOW; and
- the Department's draft conditions of consent in relation to potential impacts on bores and wells are comprehensive. However, some minor amendments are recommended.

3.2.5.2 Recommendations

The Commission's recommendations are that:

- pre-mining testing of privately owned registered bores and wells be required to establish their performance characteristics; and
- the burden of proof that any declines in performance were not due to mining impacts rest with the Proponent.

3.3 Surface Waters

3.3.1 Water Quantity

3.3.1.1 Introduction

The potential for the project to reduce the water available for supply to residential and business users on the Central Coast is considered by many to be the most significant issue with this project proposal. To this must be added possible reductions in supply for other licensed users in the catchment that may result from the mining operations.

There have been a number of studies and reviews of the potential for mining to affect water supplies on the Central Coast, ranging from the general (e.g. Strategic Review of Impacts of Potential Underground Coal Mining in the Wyong LGA, 2008) to the specific studies for this project either in its

²⁷ RTS, p.34

earlier form (e.g. Wyong Water Study SKM August 2010 and PAC Review of the Wallarah 2 Coal Project Nov 2010, Appendix H) or current form (EIS for Wallarah 2 Coal Project April 2013).

While an overall summary of these studies and reviews could conclude that the risks to the Central Coast Water Supply (CCWS) from the project are small relative to the catchment capacity (essentially the position in the Department's PAR), that position is strongly disputed by some experts and by the Water Authority. There is considerable ongoing debate over the source(s), size and duration of potential impacts and whether they are significant or not.

For the Commission there appear to be four tasks in relation to the Central Coast Water Supply. The first is to determine whether the project will cause a loss of water to the CCWS and to characterise the nature and possible extent of that loss. The second is to determine whether any loss identified poses a threat to the capacity of the CCWS to maintain supply under all climatic conditions. The third is to determine whether there are options available to mitigate or offset any impacts arising from the previous two issues and the fourth is to determine the significance of any residual threat in the context of the value of the coal resource.

3.3.1.2 Potential Catchment Water Loss

As noted earlier in section 3.2 there is some debate over what should be described as "loss" in this context. The Proponent argues that the water which moves into temporary storage in the alluvium in response to longwalls impacting on a particular section of the streams will be returned once the next set of longwalls subsides to the adjacent area and should therefore not be classified as "lost" to the catchment.²⁸

However, the Commission is concerned with availability of water at all times and under all climatic conditions and the fact is that this "temporarily stored" water is "temporarily unavailable" to downstream users such as the CCWS. From the Commission's perspective this unavailability amounts to a potential impact and ought to be characterised as such. The Commission has already reached this conclusion in section 3.2.2.2 and has recommended accordingly in section 3.2.2.3. The size of the impact and its duration will be discussed below.

Summarised, the position appears to be:

- (i) there will be some loss of water estimated at 320ML/y maximum (0.7% of current catchment yield of 45,600 ML/y)²⁹;
- (ii) this is made up of 270 ML/y from the Jilliby Jilliby Creek Water Source Water Sharing Plan (WSP) and 30 ML/y from the Central Coast Unregulated Water Sources WSP (both from subsidence-induced losses from the alluvium)³⁰ and approx. 20 ML/y for operational purposes drawn either from the catchment under licence or purchased from the CCWS³¹;
- (iii) There are multiple components contributing to the potential decrease in water availability. They include: temporary storage in subsided alluvium, permanent losses from leakage from the alluvium at 7.3 ML/y, leakage from the shallow rock strata of up to 29.2 ML/y, and small permanent reductions in the catchment area of Jilliby Jilliby

²⁸ Proponent's Response to the Commission's Questions, dated 2 May 2014, at pp.10-23 (Appendix 6)

²⁹ PAR at p.33 – but see discussion at 3.3.1.3 below where current catchment yield accessible to CCWS is stated to be 36,750 ML

³⁰ EIS, Appendix I, p.31

³¹ But note that the EIS states that no water will be drawn directly from the catchment, EIS, Appendix J, p.60. This position was confirmed by the Proponent at the 29 April 2014 meeting with the Commission and in the Proponent's Response to the Commission's Questions dated 2 May 2014 (Appendix 6) at pp.3-4.

Creek. The total loss will vary from year to year as the impact from the different components either increases or decreases. For example, the predicted maximum 270 ML/y loss from Jilliby Jilliby Creek occurs in Year 10, but the losses vary considerably over the mining period depending on whether there is extraction occurring in the vicinity of the creek and how quickly the alluvium 're-seals' and recharges. Likewise, operational requirements vary across the mine life depending on the difference between operational needs and the amount of treated minewater available to meet the need;

- (iv) there is no connective cracking between the surface and the goaf, meaning that there is no subsidence-induced direct connection that can allow surface waters to flow to the zone of depressurisation either during the life of the mine or at some future date.³² No allowance has been made for a loss from this source in the 320 ML/y identified in (i) above;
- (v) the majority of the alluvial loss is temporary and will cease once the subsidence impacts are complete and the alluvium seals any subsidence-induced cracks in the underlying bedrock and rainfall recharges the alluvium. This is also contested and depends on a number of as-yet untested assumptions. The first is that cracking in the bedrock will not be significant in terms of opening up major fracture networks or encountering significant geological faults. The second is that the alluvium will form an effective seal by 'plugging' the gaps;³³
- (vi) there is a small permanent reduction in water availability of 36.5 ML/y made up of 7.3 ML/y leakage from the alluvium and 29.2 ML/y from the shallow rock strata; and
- (vii) not all the numbers provided by the Proponent in various documents add up to the same estimate of reduction in water availability. The Proponent's response to the Commission's questions³⁴ suggests that the maximum may be less than the 320 ML/y given in the EIS. A recommendation to address this is included in section 3.2.2.3 above.

The Commission's findings are that:

- for the purposes of assessment the losses to be accounted for can be estimated as:
 - (a) for the operation up to and including LW 4N – the predicted operational make-up requirements;
 - (b) for the operation from LW 5N until all mining having an impact on the alluvium is completed:
 - the predicted maximum potential decrease in availability arising from subsidence impacts, including decreases due to temporary storage and permanent losses calculated without the benefit of recharge. Based on predictions in the EIS this should be set at 300 ML/y. This may be subject to review after sufficient monitoring results become available to determine whether the maximum predicted losses should be revised (see 3.3.1.5 below); and
 - the predicted operational make-up requirement for the year in question;
 - (c) for the period after the impact in (b) has ceased until cessation of operations – the predicted operational make-up plus 36.5 ML/y ongoing losses;
- as recommended in 3.2.2.3 above, the Commission considers that the Proponent should be required to limit operations to ensure that the 300 ML/y is not exceeded unless the Proponent is in a position to provide a further additional compensatory supply acceptable to NOW and the Water Authority and there is no additional environmental impact; and

³² The Department's PAR p.25 leaves the door open on the possibility of some loss, but describes it as not being significant (although no quantification is provided).

³³ This is discussed in more detail in section 3.2.2.1.2 above

³⁴ Proponent's Response to the Commission's Questions, dated 2 May 2014 (Appendix 6)

- provided the alluvium is effectively sealed and there are no connections between the surface and the mine (either connective cracking or faults), the long-term loss should be limited to 36.5 ML/y. This is a very small proportion of the current licensed extraction limit for the CCWS of 36,750 ML (.1%). The questions are whether it should be compensated for (and, if so, how), and what provision needs to be made for the possibility that 36.5 ML/y is exceeded.

3.3.1.3 Threat to Central Coast Water Supply (CCWS)

The fact that there is a reduction of water available for catchment purposes does not necessarily translate directly into a threat to the CCWS. The issues are much more complex. They include:

- (i) CCWS does not 'own' all the water in the catchments from which it can draw water. It has a 'share' of the available water established by the various statutory water sharing plans (WSPs). The most comprehensive assessment of this appears to be found in the Nov 2010 PAC Review of the Wallarah 2 Coal Project, Appendix H, Section 4, pp.6-19. The key points are that:
 - the combined Central Coast catchments are relatively small compared to other NSW coastal catchments;
 - the water extracted comes from a number of catchments, not just those impacted by the project;
 - the long-term average total water resource of the catchments is 176,300 ML/y;
 - the total storage capacity of the CCWS is notionally 202,000 ML, but this is limited by a current 80% of capacity constraint on the Mangrove Creek Dam (which provides >90% of the system storage capacity);
 - the current WSPs limit the total water available to the Water Authority to 36,750 ML/y. Additional water entitlements will be required to allow the Authority to achieve a system harvest capacity of 45,600 ML/y;
 - the total entitlement provision is further complicated by 'carry-over- provisions' that allow the Water Authority to shift access to 30% of its entitlement to the Wyong River source between years; and
 - the future ability of the Water Authority to provide supply is governed primarily by the water licence access rules and the facilities available to the Authority to extract, store and distribute the water rather than the available water resource itself.
- (ii) there are other shares in the water resource controlled by access licences. There is a market in these shares (transferable licences). The Proponent has purchased some of these shares and, according to the PAR (p.33) would have access to others sufficient to account for all of its impacts on the water resource;
- (iii) there are complex rules for restricting access to entitlements under low flow conditions. This is important for understanding whether the proposed use of purchased entitlements to offset project impacts is, in fact, a sustainable proposition. This arises primarily because the project impacts caused by subsidence cannot be restricted by pumping rules: they will occur once subsidence occurs. The Commission discussed this issue with NOW. The conclusion was that, during periods of low flow, licences would not compensate for water lost as a result of subsidence-induced reductions in baseflow to streams supplying the CCWS³⁵;
- (iv) the question of priority for water supply to meet mine operational requirements was also raised in submissions and at the public hearing. The Proponent's advice is that any water required to supplement operational requirements would be drawn from the CCWS supply and not directly from the catchment. Priority would therefore be determined by the CCWS rules in times of restricted supply. The draft consent conditions

³⁵ See NOW Response to the Commission's Questions (undated) (Appendix 6) at p.2

- require the Proponent to adjust the scale of operations to match its available water supply (see condition 11 of Schedule 4);
- (v) there have been some improvements in CCWS supply infrastructure since 2007 that have increased the capacity for the system to harvest and store water³⁶; and
- (vi) there is a substantial increase in population proposed for the area supplied by the CCWS on the Central Coast as part of overall regional planning strategies. The figures provided to the Commission by Wyong Council indicate a population increase of some 33% over the 2011 figures for the 30 year period to 2041. This approximates the operational period for the mine. It also does not take account for any changes for the population to be supplied arising from proposed changes in boundaries between Wyong LGA and Lake Macquarie City Council.³⁷

The Commission's findings are that, despite the views of the Department (PAR, p.33) and the PAC Review, November 2010 at p.21, there is an equally tenable alternative position as to whether or not the project could pose a threat to the Central Coast Water Supply. It is based on:

- the water supply system is what it is: it currently has access to 36,750 ML/y and can only harvest this when there is flow in the system (i.e. it doesn't matter what the theoretical long-term catchment yield might be);
- the 'known' impacts from the project are estimated to be up to 320 ML/y and these impacts will occur in the next 30 years (i.e. most likely before further significant upgrades to supply infrastructure occur);
- 300 ML/y of this predicted maximum impact cannot be controlled by access restrictions in times of low flow;
- purchase of licences cannot compensate for this low flow impact; and
- the population to be supplied is expected to grow significantly in the next 30 years.

3.3.1.4 Is the Threat to Central Coast Water Supply Significant?

The Department's PAR concludes at p.33 that the 320 ML/y is 0.7% of the current system yield of 45,600 ML/y and that this is unlikely to have a significant impact on the CCWS catchment. However, the RTS uses the same licenced extraction figures for CCWS of 36,750 ML/y as was used in the Nov 2010 PAC Review. If the 36,750 ML/y is used in conjunction with the potential catchment impact of 300 ML/y the percentage is 0.81%.

The real issue is what can happen to the CCWS during drought and whether the uncontrollable impact from the project on the surface water availability will deny access for CCWS to water that it would otherwise have been able to harvest.

This is a strongly contested issue. The Proponent argues that its impact on flow regimes during low flow periods will be negligible (see RTS p.72) and that it will hold licence allocations to more than compensate for any residual impact. It also argues that its impact will be temporary. Opponents (including the Water Authority) argue that its impact on flow regimes during low flow periods may be significant and that the licences cannot compensate for any low flow losses.

The Commission's findings are:

- the threat is real and cannot be ignored;
- acquisition of licences will not solve the problem of low flow impacts nor compensate for them effectively;

³⁶ See NOW Response to the Commission's Questions (undated) (Appendix 6) at p.1. But see the Wyong Shire Council caveats on the position in their letter to the Commission dated 16 May 2014 (Appendix 6) at pp.2-5

³⁷ See Wyong Shire Council letter to the Commission dated 16 May 2014 (Appendix 6) at pp.1-2

- insufficient attention has been given to projected increases in the population to be supplied by the CCWS in the next 30 years;
- the Proponent should be required to deliver a no net impact result on water in the catchment potentially available for the CCWS supply system; and
- the most obvious way to meet this requirement is for the Proponent to provide a compensatory water supply to offset the potential impact.

The Commission's preliminary conclusion that the Proponent should be required to provide water to CCWS to offset the potential impact on catchment yield was discussed with the Proponent, NOW, Wyong Shire Council (representing the Water Authority), and the Department.

The Commission's position is that sufficient water from the minewater make could be treated to the required standard to be returned to the raw water side of the CCWS system rather than being discharged to Wallarah Creek. There was agreement in-principle by all agencies that this would be an appropriate way to offset the losses potentially caused by the project, although there are many matters of detail to be negotiated between the parties. NOW has provided formal in-principle endorsement of the proposal (See Appendix 6, NOW Response to the Commission's Questions (undated), p.6) as has Wyong Shire Council on behalf of the Water Authority (see Appendix 6, Wyong Shire Council Response to the Commission's Questions dated 16 May 2014, p.6). The Commission also notes that diverting some of the excess water away from Wallarah Creek should be an environmental benefit.

The Commission notes that there are likely to be competing views on how and where the raw water compensation might be delivered to the CCWS system. The two broad options appear to be to return water to the catchment at or above the zone of subsidence impact or return it close to the area where raw water offtake for the CCWS system could occur. While returning water to the catchment appeared initially attractive to the Commission, there are a number of reasons why this may not be a sound proposition. They include:

- it would require an extremely complex system to enable supply of water at multiple sites to coincide with subsidence impacts;
- supply of fixed quantities of water on a regular basis is not likely to mimic natural flows and may not be environmentally sound; and
- the intended purpose of compensatory supply is for the CCWS only. There should be minimal opportunities for further loss of this compensatory supply.

The likelihood is that there will still need to be some discharge to Wallarah Creek. The criteria governing this are set out in the Department's PAR and the Commission considers these are adequate.

The Commission considers that the principles that govern this process should include:

- any offset requirement should be considered in two separate parts: (a) subsidence-induced catchment losses; and (b) potable supply usage;
- subsidence-induced losses should be compensated from the commencement of impacts on the alluvial lands. This may be as early as LW 5N, but more likely LW 6N. Compensation should continue until after any potential mining impacts on catchment yields ceases. The amount to be compensated should be set at 300 ML/y, although a review step may be required to adjust this if revised predictions of potential losses change significantly (including the 36.5 ML/y 'permanent' loss).
- the review should not occur until there is sufficient monitoring data available on which to form a judgement as to whether the 300 ML/y maximum loss prediction is valid or not. The Commission considers that this is unlikely before completion of LW 9N. It could therefore logically form part of the formal review of subsidence predictions recommended at that

time. The results of the review would need to be assessed by the Water Authority and by NOW and any revision of the requirement for compensatory supply would need to be acceptable to both the Water Authority and NOW. The burden of proving any impact less than 300 ML/y rests with the Proponent;

- commencement at LW 5N or LW 6N will give more than adequate time to install and test the required infrastructure;
- the consent should require that no extraction be allowed beyond LW 5N unless the compensatory mechanisms are operational; and
- potable supply usage is more complex. The Proponent will be paying CCWS for access to potable water and therefore should not be required to compensate for this. However, it may be that in times of severe water restrictions an arrangement between the Water Authority and the Proponent could be of mutual benefit whereby continued potable supply to the mine was offset by a suitably enhanced volume of raw water supply from the mine.

NOW was also prepared to consider a different approach to compensating for the potential losses through bringing forward augmentation of the water supply scheme headworks, with the cost of bringing the augmentation forward (not the whole cost of augmentation) transferred to the mine.³⁸ The Commission considers that this is much more difficult to structure properly in a consent and is therefore likely to be less certain. However, it may need to be explored in more detail if the more direct option of supplementation of supply cannot be implemented for some reason.

The Commission notes with some concern the Proponent's response to the Commission dated 27 May 2014 which followed from the Commission providing the letter from Wyong Shire Council of 16 May (Appendix 6) to the Proponent for comment. The Proponent appears to take the position that compensatory water supply may not be required if a monitoring regime does not indicate that there are quantifiable losses attributable to the mining process.

The Commission does not consider this acceptable. The reasons are:

- (i) there will be endless debate over whether the monitoring system can detect quantifiable losses;
- (ii) there will be endless debate over whether any losses detected can be attributed to the mining operations;
- (iii) while these debates are occurring the Central Coast community may be deprived of water that may otherwise have been available to it; and
- (iv) there is a strong perception in the community that mining proponents will usually claim that serious environmental impacts most likely to have been caused by mining were in fact caused by some other factors for which they bear no responsibility.³⁹

The Commission's position is unequivocal. For this project to meet the public interest test in s79C of the Act there must be no net impact on water availability in the catchment under all climatic conditions. This cannot be determined and compensated for retrospectively. It must rely on up-front compensation for maximum predicted impacts. To be clear:

- the Proponent has predicted a maximum impact of 300 ML/y;
- that maximum impact is not to be exceeded unless there is no increase in environmental impact and compensatory supply is available;
- that maximum impact is to be compensated for during the period of subsidence-induced impacts in the Project Area catchments;

³⁸ See NOW Response to the Commission's Questions (undated) (Appendix 6) at p.6

³⁹ This has been drawn to the Commission's notice in multiple other mining project reviews and assessments and was also raised multiple times in the public hearing for this project.

- a monitoring system capable of confirming catchment losses from mine-related impacts is to be developed and implemented;
- that monitoring system must be acceptable to the Central Coast Water Supply Authority and NOW;
- it is only if results from that monitoring system indicate that maximum predicted water losses should be revised downward that any change in compensatory supply can be considered;
- a formal review step after LW 9N is recommended to consider the monitoring results; and
- the burden of proving that monitoring results show that a reduction in compensatory supply is warranted rests with the Proponent.

3.3.1.5 Commission's Recommendations Concerning Potential Impacts on the CCWS

The Commission recommends that:

- (i) the project be required to meet a no net impact performance outcome on catchment water resources during the life of the mine;
- (ii) consideration be given to augmentation of CCWS supply by return of sufficient minewater treated to the required standards for raw water supply to compensate for estimated losses during the life of the mine;
- (iii) the principles governing this augmentation of CCWS supply be as described in section 3.3.1.4 of this review report; and
- (iv) that mining beyond LW 5N not be permitted until the mechanism to compensate for potential impacts on water availability for CCWS is operational; and
- (v) that no compensation be required beyond mine closure for the predicted 36.5 ML/y loss provided that a review prior to mine closure confirms that the loss does not exceed 36.5 ML/y.

3.3.1.6 Impacts on Water Availability for Users other than CCWS

Potential impacts on availability of water for licenced users in the catchment other than CCWS may be different to potential impacts on the CCWS. CCWS draws water from a number of catchments and the project impacts are being considered against the total water available across all catchments. Impacts on other users will be dependent on where they are located relative to the subsidence-induced impacts on the streams, particularly Jilliby Jilliby Creek and Little Jilliby Jilliby Creek.

For these users there is a potential reduction in stream flow in dry times and a potential change in stream behaviour as a result of both temporary and permanent changes in stream gradient. There is also a risk that changes in stream morphology may make access difficult or force alterations in pumping locations and/or infrastructure. Very little attention is given to these other users by the Proponent or in the PAR.

The Proponent's position is that there will be very little impact on dry weather flows in Jilliby Jilliby Creek and Little Jilliby Jilliby Creek. This was strongly contested by presenters at the public hearing and in the submissions.

The Commission's conclusion is that the uncertainties identified with subsidence predictions coupled with the potential changes in stream behaviour make it virtually impossible to state what will or will not happen to individual water licence holders at this point in time. The only solution appears to be to require that the Proponent be required to monitor flows above and below extracted longwalls and to compensate licence holders if their access is affected either by a reduction in flow or a mechanical problem in accessing the flow.

The relevant part of Schedule 3 (condition 5h) does not contain anything directly relevant to impacts on individual landholders of the kind described above. Equally, condition 13 of Schedule 4

(compensable water supply) is non-specific as to how the loss would be determined and also does not deal with the issue of pumping infrastructure. The Commission considers that it needs to be very clear that the Proponent must have the capacity to determine the magnitude of the loss and must provide compensation for the loss. The Proponent should also bear the burden of proof in the event of any dispute.

Commission's Recommendations Concerning Potential Impacts on Water Availability for Users other than CCWS

The Commission recommends that:

- specific provision be made in the conditions of any consent to ensure that landholders whose access to surface waters is negatively affected by the project have compensatory supply provided within 24 hours and that the Proponent be responsible for restoring access as soon as practicable; and
- the Proponent bear the onus of proof in the event of a dispute over subsidence-induced impacts on surface water access.

3.3.1.7 The Value of the Coal Resource vs. the Significance of the Impact on Water Availability

The Department's PAR suggests that the value of the coal resource is significant and that it should not be sterilised unnecessarily by restricting mining in the catchment, and under Jilliby Jilliby Creek in particular. It notes that the market value of water is low in comparison to the value of coal.

The problem with this analysis is that it is simplistic. The potential impacts of the project on water availability become significant when water is scarce – not during periods of average or high rainfall. When water is scarce on the Central Coast it has very significant impacts on a wide range of activities including daily living (severe water restrictions), tourism, agriculture and business. It is the impact at these times that determines the value of the water resource and at these times the value of licence allocations is irrelevant.

This will be examined more closely under the economics section when the Mining SEPP requirements are considered, but at this point the Commission is inclined to the view water impacts in the context of acceptability or otherwise of the project under the provisions of s79C of the Act itself, and particularly under s.79C(e) (the public interest).

3.3.2 Stream Morphology

This is dealt with at pp.26-31 of the Department's PAR. The focus is on the three main streams in the Project Area, i.e. Wyong River (6th order stream), Jilliby Jilliby Creek (5th order stream) and Little Jilliby Jilliby Creek (3rd order stream).

3.3.2.1 Wyong River

The PAR adopts the position in the EIS that there will be minimal impact on this stream. The stream is not to be undermined and the closest longwalls (LW 3S-5S and LW 3SW-5SW) will not be mined for at least fifteen years, giving plenty of time to reassess the subsidence impact predictions before extraction of these longwalls occurs. The Department has also recommended 'negligible environmental consequences' and 'no connective cracking' be required in any consent (PAR p.28).

Examination of Table 1 in condition 1 of Schedule 3 of the draft conditions of consent shows that 'negligible environmental consequences' is included for 6th order streams but 'no connective cracking' is not included. There is potentially a difference (albeit probably minor in practice)

between the expression 'no connective cracking' and the definition of 'negligible' and 'environmental consequences' in the draft consent. As it stands the draft consent would allow 'small and unimportant' connective cracking rather than 'no connective cracking at all'.

The Department also notes that it would have the 'option of requiring the finishing line of the proposed longwalls to be further set back from the Wyong River in order to meet the negligible environmental consequence performance criteria, if considered necessary'.

The Commission considers that the predicted impacts on the Wyong River are probably acceptable. However the Commission considers that a more definitive approach to constraining subsequent decision-making is required in any consent. The consent should be explicit that no extraction of longwalls be permitted in areas potentially impacting on the Wyong River unless:

- (i) revised predictions of subsidence impacts on the Wyong River are available for consideration in the Extraction Planning process;
- (ii) the Director-General accepts that the revised predictions will not risk environmental consequences for the Wyong River beyond those identified in the consent; and
- (iii) the mine plan has been modified to ensure that no exceedance of the consent conditions will occur.

It is arguable that a combination of existing draft conditions would achieve the same result (i.e. condition 1 of Schedule 3, condition 5 of Schedule 3, and condition 3 of Schedule 6). However, there is no requirement for the Director-General to be satisfied that the consequences would be no greater than those allowed for in the consent before approving the Extraction Plan, and the onus is entirely on the Proponent to ensure that the performance measure is complied with.

While this division of accountability may be appropriate in other circumstances, the level of uncertainty in this project concerning the subsidence predictions, impacts and consequences is substantial and the Commission considers that additional safeguards are required. Indeed there were very strong submissions to the effect that the precautionary principle should apply and that the project should not be approved until the uncertainties were resolved. The first PAC review for Wallarah 2 (Nov 2010) also contained a recommendation that mining parameters be limited to those proposed for longwalls 1N to 5N until a reliable subsidence prediction methodology has been demonstrated to the satisfaction of the Director-General. The mining parameters for longwalls 1N to 5N involve narrower panels and smaller seam heights than those proposed for later longwalls.

3.3.2.2 Jiliby Jiliby Creek

This presents more complex problems than the predicted impacts on the Wyong River. Jiliby Jiliby Creek is directly undermined over most of its length within the Project Area. Impacts on Jiliby Jiliby Creek commence relatively early in the mine plan with the first major impact associated with LW6N. This creek makes an important contribution to catchment yield (approx. 10% of total Central Coast catchment yield⁴⁰).

The PAR adopts a position that the coal resource under Jiliby Jiliby Creek should not be 'unnecessarily sterilised' and that a balance must be struck between maximising extraction of the coal resource and minimising any environmental impacts on the creek.

This position is essentially based on the following points:

- Jiliby Jiliby Creek has a relatively slight gradient overall (1.3mm/m);
- there are historical changes in alignment from significant rainfall events;

⁴⁰ PAC Review Wallarah 2 Project, Nov 2010, Appendix H p.8

- the base of the stream is saturated alluvium up to 30m deep;
- any subsidence-induced changes will be well within the natural variation for this stream; and
- subsidence effects on the stream will be uniform based on the yielding pillar design.

The Department does note that some sections of the stream will be impacted more than other sections (particularly associated with LW 6N and LW 1S) and that it retains concerns in these areas.

The solution offered is to require negligible environmental consequences over 80% of the impacted length and minor environmental consequences over the remaining 20% of the impacted length, but with a caveat that it is not convinced that even 'minor environmental consequences' can be met in all places. Resolution of the concerns is left to the Extraction Plan process once more data are available on the accuracy of subsidence impact predictions.

The Commission's site inspection included inspection of some sections of Jilliby Jilliby Creek. This confirmed that the creek does meander across relatively flat terrain in the Project Area, is characterised by sandy sediments and has obviously undergone changes in alignment over time (oxbows and abandoned channels were common). Some of the changes in alignment appeared to be relatively recent.

The risks to the stream vary from limited ponding and scouring, to serious bank erosion, and then to head cuts and avulsion leading to major changes in alignment. The Department's draft consent conditions are clearly designed to limit any mining-induced impacts to the lower end of that scale. The PAR also makes the point at p.28 that the natural storm events will produce stream velocities an order of magnitude higher than those arising from any mining-induced change to stream gradient.

The Commission considers that the risks of subsidence-induced impacts on stream morphology for Jilliby Jilliby Creek arise from four sources:

- (i) the mine plan itself (e.g. the risk of increased ponding and scouring associated with LW 6N and LW 1S);
- (ii) predicted temporary changes in gradient along sections of the creek as mining progresses;
- (iii) failure of pillars to yield either fully or partially, causing long-term unplanned changes in gradient; and
- (iv) the interaction of significant rainfall events with one or more of the situations identified in (i) – (iii).

The PAR considers (i) and suggests that experience with the early longwalls will allow adjustments to be made to the mining parameters if the risks involve more than minor consequences for the two specified sections.⁴¹ The impact of predicted temporary changes in gradient also appears to have been considered by inclusion of the requirement for consequences to be no greater than minor for the whole length of the stream and negligible for 80% of it.

There does not appear to be any consideration of what might happen if the pillars don't yield uniformly. While the Commission has accepted the Proponent's position that the pillars will yield, there are still some uncertainties around the timeframes within which this will occur. This risk will require specific consideration by the consent authority.

The interaction of significant rainfall events with the other potential sources of risk does not appear to have been considered in the PAR. It seems likely to the Commission that changes in gradient

⁴¹ But note in this context that Appendix H of the PAC Review of Wallarah 2 (Nov 2010) at p.32 records that the EIS identifies more sections of the creek at risk of gradient-change impacts than the two identified in the PAR.

combined with flooding could turn an increased vulnerability to minor consequences into something much more serious if the relevant circumstances arose. It seems equally likely that it would be difficult to predict all areas where these increased major risks might occur, although some of the more obvious ones have been identified in the EIS.

The RTS (p.67) suggests that subsidence is ‘unlikely to significantly affect breakout locations or overbank inundation during low flow conditions and is unlikely to result in channel avulsions’. It also suggests that the risks will be ‘manageable through ongoing monitoring and remediation of identified problem areas with a focus on maintaining and enhancing riparian vegetation’.

The Commission considers these generalisations about risk management strategies are unconvincing and that they do not provide the level of detail required to satisfy the Commission that the risks have been properly identified or that a clear plan exists of prevention/mitigation/remediation strategies involving methodologies with a proven track record. The consent authority would need to be convinced that there were specific proposals to manage the risks and that these proposals would work. Some options for approaching these issues are discussed below.

The draft conditions in Schedule 3 of the Department’s recommended conditions propose that impacts on the stream be limited to negligible consequences over 80% of the subsided length and minor consequences over 20% . This split is unenforceable. The Commission recognises the intent behind the proposed condition and has accepted it in the past – albeit very reluctantly – but considers that a better solution must be found.

The two broad options appear to be:

- (i) require that sections of Jilliby Jilliby Creek predicted to experience minor consequences be identified in the consent and require all other sections to meet the negligible consequences criteria. Then, prior to extraction of the longwalls that will cause the subsidence impacts expected to lead to minor consequences require that:
 - (a) the subsidence predictions be reviewed based on experience and mining parameters be adjusted so that minor consequences will not be exceeded;
 - (b) subsidence predictions consistent with (a) be established in the Extraction Plan and these predictions not be allowed to be exceeded; and
 - (c) there are specific actions identified to remediate damage that causes minor alteration in stream performance and that will not be remediated by natural processes. Any additional pre- or post-impact monitoring requirements must also be expressly provided for; or
- (ii) specify minor consequences for Jilliby Jilliby Creek throughout the length subject to subsidence impacts. While this would be unacceptable in many (most?) situations, the characteristics of this creek with its naturally dynamic nature and capacity to reach a new equilibrium following flood events, may make this both a realistic and an acceptable outcome.

The Commission considers that the overall objective here is to prevent subsidence impacts from causing consequences beyond those likely to arise from naturally occurring events and, within that absolute constraint, to ensure that the stream morphology and behaviour post-mining is no worse than its pre-mining condition. With regard to the performance measures to be applied, it should be noted that differentiating negligible and minor consequences may be much more difficult for this type of stream than it is in the rock-bar controlled streams in the Southern Coalfield where the streams show very little morphological change in response to rainfall events and it is relatively simple to identify and classify subsidence-induced impacts.

The Commission is not suggesting that every impact on a stream requires immediate remediation. As the Proponent points out, many impacts will be within the natural variation in stream behaviour for the Project Area and physical intervention may do more harm than good. However, there needs to be a clear framework identified in any consent which sets out the performance measures to be achieved and outlines any areas of unacceptable risk or required management response. In this context the Commission accepts that the detailed action plan for addressing risk from a particular longwall will need to be part of the Extraction Plan for that longwall.

For this project the Commission considers the following requirements should be specified in any consent:

- pre-mining surveys of stream morphology and flow characteristics are to be conducted;
- no impact above 'minor consequences' is to be permitted in any part of the stream;
- post-subsidence characteristics of the stream are to be equivalent to, or better than, those identified in the pre-mining surveys;
- management options for avoiding, mitigating or remediating impacts are to be identified in the Water Management Plan in consultation with NOW; and
- for the Extraction Plan for each longwall, revised subsidence predictions based on previous experience in the Project Area are to be produced and these are to be utilised to ensure that impacts on stream morphology do not exceed 'minor consequences'. The specifics of proposals to meet the required post-subsidence performance criteria must also be included in the Extraction Plan.

One other matter that will need to be addressed is how any changes to the mine plan will affect the identified risk locations for stream morphology. The Commission considers that no changes to the mine plan that could affect streams should be allowed without a revised assessment of potential impacts on these streams and identification of the measures required to maintain impacts within the consent parameters.

The Commission has considered the Proponent's proposed 'Stream Stability Monitoring and Management Program' (EIS, Appendix J, p.108). The monitoring component as outlined may be adequate (although consideration is deferred until detailed plans are prepared in consultation with NOW etc. if consent is granted), but the proposals for preventing/mitigating/remediating impacts are too generalised to satisfy the Commission that any relevant action would be taken.

The Commission's concerns were put to the Proponent at the site meeting on 1 April 2014 and subsequently by letter dated 14 April 2014. The matter was further discussed at the meeting with the Proponent on 29 April 2014 and a written submission was received on 2 May 2014.

The Proponent's response covers much of the same ground as the discussion above and reaches a similar conclusion as to the performance measures to be applied. However, whereas the Proponent wishes to have 'no greater than minor impacts following the completion of all longwall panels with the potential to subside a section of the stream', the Commission is of the view that the 'minor impact' criterion should apply at all times.

The Commission considers that the four years over which impacts on a section of stream may occur under the Proponent's model is far too long a period in which to allow unremediated impacts above the 'minor' category and would make enforcement difficult. It also doesn't readily fit with the emphasis the Commission considers needs to be placed on rigorous conditions in the Extraction Plan for each longwall that are designed to prevent exceedance of the performance criteria in the consent.

The Commission agrees with the Proponent that post-subsidence stream characteristics should be consistent with undisturbed reaches and pre-subsidence conditions.

3.3.2.3 Little Jilliby Jilliby Creek

The Department's PAR divides the assessment of this creek into three parts (p.30). The lower section (4th order stream) joins Jilliby Jilliby Creek and is underlain by the same deep alluvium. This extends upstream for 1.3km where it becomes a 3rd order stream and travels east-west along the lower part of the Jilliby Jilliby Valley. This section is also underlain by alluvium. The upper section (also 3rd order) runs roughly north-south and is underlain in part by outcrops of Patonga Claystone. It is not undermined by longwalls in the current project application and will not be considered further.⁴²

The only part of Little Jilliby Jilliby Creek to be undermined is the middle section. There are three longwalls involved (LW 11N, LW 12N and LW 13N). These impact the upper part of the section and may cause increased ponding where the subsided section joins the unsubsided lower section (see Fig. 4.15 Appendix J EIS), but flow velocities should still approximate the pre-mining situation (see Figure 4.16 Appendix J EIS).

The Department has proposed that impacts on Little Jilliby Jilliby Creek be dealt with in the same way as Jilliby Jilliby Creek, i.e. 80% negligible consequences and 20% minor consequences for the length affected by subsidence. The Commission will not re-state its concerns with this approach, but simply confirms that those concerns also apply to Little Jilliby Jilliby Creek.

3.3.2.4 Other Watercourses

These are essentially tributaries of the three main streams already discussed and the issues are similar. The 3rd order sections of Armstrong and Myrtle Creeks are underlain by alluvium and this becomes shallower further upstream in those creeks.

3.3.2.5 Commission's Findings on Potential Impacts on Stream Morphology

The Commission's findings are:

- risks of subsidence-induced impacts on stream morphology arise from four sources:
 - the mine plan itself (e.g. the risk of increased ponding and scouring associated with LW 6N and LW 1S);
 - predicted temporary changes in gradient along sections of the creek as mining progresses;
 - failure of pillars to yield either fully or partially, causing long-term unplanned changes in gradient; and
 - the interaction of significant rainfall events with one or more of the situations identified in (i) – (iii).
- the risk of interaction between significant rainfall events and changes in gradient between subsided and unsubsided sections of creeks leading to much more than 'minor consequences' does not appear to have been addressed and there is no clear strategy evident for how this eventuality would be dealt with;
- the proposed performance criteria in Schedule 3 of the draft consent attached to the PAR requiring an 80:20 split between negligible and minor consequences is positive in its intent, but unenforceable in practice;

⁴² The Commission has already indicated that including material in the EIS and PAR relating to the western end of the Project Area where no longwalls are proposed for the current application creates confusion for the public. It also creates an impression that some assessment of this western area has occurred and, because there are no specific concerns identified, that mining this area may be acceptable at some future date. The Commission wishes to make it abundantly clear that no assessment of this western area has occurred and that consequently there has been no review undertaken within the meaning of section 23D of the Act.

- for the streams in the project area underlain by alluvium, the most appropriate performance criteria are no more than minor consequences at any time and to be returned post-mining to a condition consistent with the pre-existing morphological characteristics;
- rigorous conditions will be required in the Extraction Plan for each longwall to ensure that:
 - the previous experience in this project of impacts on stream morphology are incorporated,
 - there are appropriate triggers to warn of developing problems,
 - there is a clear response plan to prevent exceedance of the criteria,
 - clear strategies are identified to address any exceedance that might occur despite the adaptive management requirements.

3.3.2.6 Commission's Recommendations Concerning Potential Impacts on Stream Morphology

The Commission's recommendations are:

- Before the project is submitted to the consent authority, the risks to stream morphology of interaction between significant rainfall event(s) and the interface between subsided and unsubsidised sections of a stream be assessed with a view to properly describing the risk (and quantifying it if possible), and providing a detailed assessment of the options available to deal with any such eventuality and an assessment of the capacity to implement any such options on the Project Area streams.
- The performance criteria for stream morphology for streams in the Project Area underlain by alluvium be:
 - no more than minor consequences in any part of the stream at any time; and
 - post-subsidence, stream sections be returned to a condition equivalent or better than their pre-subsided condition.
- Rigorous conditions be included in the Extraction Plan for each longwall to ensure that:
 - the previous experience of impacts on stream morphology are incorporated;
 - there are appropriate triggers to warn of developing problems;
 - there is a clear response plan to prevent exceedance of the criteria; and
 - clear strategies are identified to address any exceedance that might occur despite the adaptive management requirements.

3.3.3 **Water Quality**

Multiple submissions on the EIS and to the Commission raised concerns about subsidence-induced impacts on water quality in streams. However, there is little of substance in response in either the RTS (p.69) or PAR and the EIS only mentions water quality impacts in a few sections without any comprehensive assessment of the risks, although some background data are provided. Reference is made in the RTS (p.69) to 'a detailed assessment of the potential impact of subsidence on stream geomorphology, including water quality in Jilliby Jilliby Creek' having been 'undertaken by International Environmental Consultants Pty Ltd (IEC 2009)' but this is not included in the reference list.

The background data indicate that water quality in the main streams (Wyong River and Jilliby Jilliby Creek) is variable over time and the Proponent's position appears to be that any subsidence impacts on water quality would be difficult to differentiate from the background variation. Removal of the western longwalls from the current project application should also limit the potential risks of iron staining and acidic groundwater infiltration to the streams.

However, the Commission considers that it is essential to be able to demonstrate conclusively whether the mine is or is not having an impact on water quality in these major catchment streams. The Commission considers that the focus should be on the undermined sections of Jilliby Jilliby Creek and Little Jilliby Jilliby Creek and that a program be developed that provides sampling above and below each longwall as the mining operation moves up the catchment. If impacts on water quality

are detected an assessment of their significance will need to be made and the relevant authorities will need to be engaged in this process (i.e. the Water Supply Authority, EPA, NOW and possibly NSW Health).

3.3.3.1 Commission's Recommendation Concerning Water Quality Monitoring in Response to Subsidence Impacts

The Commission recommends:

- that before extraction of longwall 6N commences a program of water quality monitoring that can differentiate subsidence-induced impacts from background variation be implemented. The program is to be developed in consultation with the Water Supply Authority, EPA and NOW and be approved by the Director-General before implementation; and
- that the program be subject to independent audit each year at least until the Director-General is satisfied that longer intervals can provide appropriate safeguards.

3.3.4 **Potential Impacts on Porters Creek Wetland**

Porters Creek Wetland has a catchment of approximately 55km² and is located on the eastern side of the M1 Motorway. The catchment includes much of the Hue Hue Creek catchment. The Porters Creek Wetland contains a number of threatened species and vegetation communities listed under the *Threatened Species Conservation Act 2001*. A number of these species are groundwater dependent and require a flow regime consisting of wetting and drying cycles.

Wyong Shire Council (WSC) in their response to the Commission's questions dated 16 May 2014 (Appendix 6) raised concerns regarding the potential impact to the Porters Creek Wetland., in particular, the potential ecological impact due to an alteration in flow regimes caused by subsidence within the Hue Hue Creek catchment. A change in flow regime, particularly during extended dry periods, is likely to have detrimental impacts on wetland vegetation, groundwater dependent ecosystems and aquatic fauna within the wetland. They also expressed concern that no baseline ecological assessment of the Porters Creek Wetland was undertaken by the Proponent.

The Commission provided a copy of these concerns to the Proponent and requested they respond. The Proponent's response dated 27 May 2014 (Appendix 6) reiterates their earlier position that there will be minimal impact to the Porters Creek Wetland as it is located more than 1km outside the Subsidence Impact Limit. The assessment concluded that, due to its location and no direct disturbance from the project, it was not necessary to undertake specific ecological surveys of Porters Creek Wetland.

The Proponent further reiterates that the predicted subsidence of the Hue Hue Creek stream gradient will be a maximum of 500mm vertical subsidence over a 500m distance. Such a small change in gradient will have minimal implications on stream morphology and erosion potential. In addition to this, the culverts under Hue Hue Road and the M1 Motorway are hydraulic controls. The prediction is there will be *"no change to the flood peak flows, flood levels, flood volume or hydrographs downstream of the M1 Motorway for any flood frequency or duration."*

Given the minimal subsidence impact within Hue Hue Creek, the prediction of no change in flood flow regimes downstream of the M1 Motorway, and the location of the Porters Creek Wetland outside of the predicted Subsidence Impact Limit, the Proponent is confident that there will be *"no material impact on aquatic organisms or groundwater dependent ecosystems associated with the wetland and therefore no requirement for extensive baseline surveys and impacts assessment of the wetland."*

Although the Commission finds the Proponent's response to Council's concerns reasonable, the wetland is important and should be protected by inclusion of a 'negligible environmental consequence' performance measure in Schedule 3 of the draft consent conditions. A monitoring regime should be in place to confirm this outcome (essentially a 'screening' regime to detect whether there are changes in flow regimes that may lead to concerns) and mitigation measures should be implemented if and when negative monitoring results occur.

3.3.4.1 Commission's Recommendation for Porters Creek Wetland

The Commission recommends that a performance measure of negligible consequences should be specified for Porters Creek Wetland in any consent and that this should be supported by a monitoring regime sufficient to alert the Proponent and regulators to any change that may cause greater than negligible consequences to the wetland.

3.4 Monitoring of Water-Related Matters

The Department's PAR contains a suite of monitoring requirements in Schedules 3 and 4 that relate to the matters discussed in sections 3.1. to 3.3 of this report. The Commission considers that it will be important to review these proposed requirements carefully to ensure that they will, in fact, provide the information necessary to assess performance of the project against the performance criteria in any consent and also provide the information necessary to support the adaptive management requirements that will need to be specified in detail in the Extraction Plans for individual longwalls.

3.4.1 Recommendation Concerning Water Monitoring Generally

The Commission recommends that the consent authority review water-related monitoring requirements carefully to ensure that they will provide (a) the information necessary to assess performance of the project against performance criteria in any consent and (b) also provide the information necessary to support the adaptive management requirements in Extraction Plans for individual longwalls.

3.5 Flooding

The topography of the catchments, which are typically small in area, are characterised by steep valley walls with relatively flat floodplains. The topography of the catchment means that the rivers and creeks have limited capacity. Consequently flood flows break out of the main channels, inundating part of the floodplain for events larger than the 20% annual exceeded probability (AEP) flood. As the magnitude of event increases, the depth of flood increases. However, the area inundated only changes marginally. The difference in depth between a 1% AEP flood and a 20% AEP is approximately 1.1m.

Flooding already occurs in these catchments. But any change in the shape of the land surface has the potential to alter the way that floodwater affects different parts of the landscape in terms of depth of flow, direction of flow and velocity. The flood regime in the Dooralong and Yarramalong valleys has been the subject of ongoing studies by the Proponent for more than a decade.

3.5.1 Flooding Impacts

The *Flood Impact Assessment (FIA)* in the EIS predicts that some additional areas will be flooded in a 1% annual exceeded probability (AEP) flood. Generally the lateral extent and flood depths are predicted to increase as a result of subsidence. Flow velocities are predicted to remain similar to existing velocities.

The FIA states a total of 33 dwellings are predicted to be inundated from a 1% AEP flood. Of these 33 dwellings, four (D0060, D0061, D0063 and D0855) are not currently subject to inundation from a 1% AEP flood. Several local roads will be untrafficable for longer than pre-mining conditions and more frequently. Up to 198 dwellings within the Dooralong Valley may potentially have no emergency access if low points D50 and D70 are cut off simultaneously. The maximum period of no emergency access is 28 hours.

The Proponent will cover all costs associated with the mitigation of impacts caused by mining. These mitigation measures may include:

- house raising
- house relocation;
- flood proofing within individual flood levees;
- voluntary purchase or other compensation measures; and
- raising roads and bridges.

Wyong Shire Council (WSC) raised concerns in their submission (dated 20 June 2013) about the future long term maintenance of any mitigation measures that the Proponent may have to make to local roads as mitigate flooding issues. The long term maintenance liability issue was not dealt with in detail in the EIS. The option of improving access by raising low flood affected locations may require new culverts to allow for the flood flows to pass under the road. These works may have both adverse and beneficial impacts, and also have future maintenance implications, which WSC would need to know in advance and agree to. The Proponent will need to consult with the WSC on any mitigation measures that may be required.

The Office of Environment and Heritage (OEH) raised concerns about the suitability and calibration of the model along with concerns about how the Probable Maximum Flood (PMF) and climate change were handled in the model (submission letter dated 26 June 2013). OEH is now satisfied with the Proponent's response.

Individual stakeholders provided submissions relating to the predicted impacts on dwellings, access roads particularly access during emergency situations. This is an ongoing issue.

The Department recommended in the PAR:

"conditions of consent requiring that the Water Management Plan which must be prepared as part of the Extraction Plan, and it must include a program to monitor flooding (including updated flood modelling); minimise, manage and mitigate flood impacts on residences, private properties, roads and other infrastructure; and identify private properties where mitigation measures are not reasonable or feasible and compensation would instead be offered. This plan must be developed in consultation with NOW and OEH and must be approved by the Director-General prior to any longwall mining."

The Commission sought clarification from the Proponent on the following issues:⁴³

- (i) the uncertainties associated with the use of yielding pillars and the potential consequences (e.g. flooding) that might be expected from variations in pillar behavior;
- (ii) what is proposed for situations where there is increased risk of flooding on land that would have been suitable for development (e.g. subdivision);
- (iii) what proposals exist for assessment and compensation for impacts on enterprises such as the turf farm, noting that impacts may be direct (i.e. loss of production) or indirect (e.g. loss of markets due to failure to supply); and

⁴³ Commission's Questions to the Proponent dated 14 April 2014 (Appendix 5)

- (iv) whether the potential impact on emergency vehicle access had been considered adequately, given the increase in flood duration and subsequent road closures.

The Proponent responded formally, by letter dated 2 May 2014 (Appendix 6).

- (i) **Yielding pillars:**
First, in the unlikely situation where none of the pillars yield, then subsidence post-mining will be 55% of the maximum subsidence predicted. In this situation, the flood depth would be less than predicted in the models. Second, in the case of one or a few pillars failing to yield, changes in predicted flood impacts would be limited to an area within 300-500m from the non-yielding pillar(s). Variations in flooding depth are predicted to be in the order of less than 40mm. The greatest increase is likely to be within the creeks and streams.
- (ii) With regard to the potential for future subdivision of land, the four existing properties near the intersection of Jilliby Road and Beavers Lane are all smaller than the “minimum subdivision lot size”, defined in clause 4.1 of the Wyong Local Environment Plan 2013. Therefore there is no impact on future permissible subdivisions due to flooding.
- (iii) With regard to potential impacts on commercial enterprises, the project will increase the duration of all floods by about 30 minutes at the turf farmer’s property. There will also be an increase in depth of approximately 0.4m during the 1% AEP flood event. There is no predicted significant increase in flood frequency as a result of the project. The Proponent will consult with landowners regarding compensation for any losses attributable to the project.
- (iv) The project will have impacts on flooding of access routes, both through increased depth and duration of inundation. The maximum increase in duration is predicted to be 27 hours for one location under the 1% AEP flood event. However most dwellings, other than those located within the 1% AEP flood extent (30 existing dwellings, plus four new dwellings) will still have viable emergency evacuation routes via secondary roads. The time to access the dwellings via these secondary roads will increase. The longer inundation periods of the primary routes means that emergency access times via secondary routes will also increase.

The Commission’s findings are:

- the options for mitigating the flood-related impacts of subsidence on dwellings and roads involve proven methods;
- emergency access will still be available via secondary routes to most dwellings, except those in the 1% AEP flood extent (30 existing dwellings, plus four new dwellings). The use of these secondary routes will increase as a result of the increased duration of road closures due to flooding; and
- any mitigation measures must be carried out in consultation with the individuals impacted and the relevant agencies. Where mitigation measures are not possible, compensation will be made by the Proponent to the effected parties e.g. individual landowners and WSC.

3.5.2 Climate Change Effects on Flooding

Climate change and the impacts on the catchment were addressed in the November 2010 PAC Review Report on the project. The Proponent undertook a sensitivity analysis of the modelling to consider the impacts of climate change, through increased rainfall intensity and sea level rise. An increase in rainfall intensity of 20% on the design event would increase flood levels by up to 0.45m more than under the base case (S7.4.3 p/143 of the EIA April 2013). An increase in the intensity of the rainfall event would not impact any additional dwellings to those impacted by the base case.

This analysis considered the 'backwater effect' caused by rising sea levels impacting on the area of flood water inundation and duration of the flooding, and any impacts on the peak flow and height. The sensitivity analysis showed that increasing the height of the lakes at the downstream boundary of the model, by 1.1m to reflect increases in sea level had only minor impacts on flooding with no noticeable impact beyond 600m from the downstream boundary (S7.4.3 p/144 of the EIA April 2013).

This Commission accepts the analysis as described and the minimal impact on flood behavior that is likely to result from climate change.

3.5.2.1 Commission's Recommendations Concerning Flooding

The Department's recommendations are supported by the Commission with the addition of a specific requirement to develop emergency evacuation plans for some residences.

The Commission recommends that an Emergency Evacuation Management Plan be prepared. This plan should include clearly identified secondary access routes for those properties that will be adversely impacted by the 1% AEP flood. For those properties that do not have either a primary or secondary access route as a result of flooding, the Proponent must consult/negotiate with the individual landowners to reach a mutually agreed resolution for emergency evacuations before extraction of any longwalls that could create altered flood conditions for these properties occurs. In the situation where no agreement can be reached, either party may refer the matter to the Director-General for resolution.

3.6 Potential Subsidence Impacts on Built Features

3.6.1 Introduction

The Department's PAR deals with the potential impacts on built features at pp.40-42. As the PAR notes, there is a long history in NSW of undermining built features of the type encountered in the Wallarah 2 Project and the risks of the impacts, and the management of those risks, are well understood. There is also a statutory compensation scheme for mine-related damage to properties operated by the Mine Subsidence Board (MSB) using funds obtained by industry levies.

There are many structures and houses located in proximity to the proposed extraction area that could be impacted by subsidence. These include: the M1 Motorway and bridges, two 330 kV transmission lines with 29 towers, local roads, 8 bridges, numerous culverts, and 755 other built structures including 245 residences. The PAR notes the mine has been designed to avoid subsidence impact on the freeway, railway and school and section 3.1 of this report discusses the reliability of the predictions contained in the EIS.

The principal issue for the Commission in this project is the large number of houses to be undermined and the strong concerns expressed to the Commission about the fairness of the statutory compensation scheme operated by the MSB. This is dealt with in 3.6.2 below. The other issues requiring further work before consideration of the project by the consent authority are the potential impacts on transmission lines (see 3.6.3 below) and the potential Far-Field Effects on the M1 bridges (see 3.1.1.5 above). In other respects the Department's PAR and the attached recommended conditions of consent provide a sound scheme for dealing with the potential impacts on built features.

3.6.2 Issues Related to Compensation under the Mine Subsidence Compensation Scheme

Many submissions expressed concern about potential subsidence impacts and procedures for compensation claims, particularly in relation to privately owned residences. The PAR (p.40) provides

a summary of the likely subsidence impacts on built features and refers to the long history of mining-related impacts and the role of the Mine Subsidence Board in providing compensation for damage. Given the number of concerns about compensation for subsidence impacts on built features, the Commission wrote to the Mine Subsidence Board (MSB) on 14 April 2014⁴⁴ seeking further information on the following issues that were raised in submissions and at the public hearing:

- residences or parts of residences constructed before declaration of the MSD may not be covered by compensation arrangements if not built to MSB requirements;
- a high rate of claim rejection;
- claims for ongoing damage after initial repairs are generally disallowed and 'reactive soils' are cited as the cause;
- assessment is carried out by MSB employees or contractors (i.e. non-independent assessment);
- lengthy delays in having repairs completed causing significant stress and health impacts;
- process for resolving disputes and appeals; and
- delayed impacts from multiple longwalls.

The MSB responded in detail to each of these issues on 23 April 2014 and provided further information on dispute resolution on 19 May 2014. The full responses are attached at Appendix 6. Of note is that the MSB defends its performance including the seemingly high rate of refusal of damage claims. The reason provided is that the property owner only needs to believe that any damage has been caused by mining in order to lodge a claim. Since the MSB encourages people to make claims it is not surprising that a number of claims are found not to be related to mining impacts after they are investigated.

The MSB advised that claims are assessed by their own staff rather than independent assessors, but they seek advice from independent experts if necessary. There is an internal claim review process where the claim is reviewed by a different technical officer to the original officer. A range of alternative dispute resolution mechanisms is also available and utilized in appropriate cases.⁴⁵ The MSB advised that it adopts a 'benefit of doubt' policy when reviewing claims. Also there is an ultimate right to appeal to the Land and Environment Court.

In relation to damage that recurs after each longwall mine passes under the property (note at least three longwall operations can affect a property and each longwall operation is separated by approximately 12 months), the MSB advises that temporary or emergency repairs are carried out after each longwall pass to ensure the structure is safe and serviceable and final repairs are carried out after all longwalls have passed and no further impact is likely. The Commission understands this delay would be frustrating for property owners, but considers the process as described by MSB is consistent with the Mine Subsidence Compensation Act, 1961.

There is clearly a discrepancy between the views expressed to the Commission in submissions and at the public hearing about the adequacy of the statutory compensation scheme and the views expressed by the MSB in response to the Commission's formal questions. Without substantial further investigation it is not possible for the Commission to form a concluded view on this discrepancy and it is clearly beyond the Commission's Terms of Reference to undertake this task.

⁴⁴ Commission's questions to the MSB dated 14 April 2014, Appendix 5

⁴⁵ MSB letter to the Commission of 19 May 2014 (Appendix 6)

However, the consent authority does have to come to a conclusion about the acceptability or otherwise of project-related impacts and this clearly does encompass whether any proposed compensation is likely to be adequate.⁴⁶

In that context the Commission notes the substantial differences between key features of compensation schemes usually prescribed in consent conditions under the planning legislation (i.e. independent assessment, independent multi-layered dispute resolution processes, etc.) and the statutory scheme administered by the MSB which lacks such features. In large part the criticisms of the MSB-administered scheme provided to the Commission during this review appeared to stem from this lack of formal independence in the MSB scheme.

In making these comments the Commission is not implying that the MSB actually operates in an unreasonable or unfair manner. Indeed the comprehensive responses by the MSB strongly suggest that appropriate dispute mechanisms are utilised as a matter of policy. However there is clearly a perception in some sectors of the community and in the media that the scheme itself is flawed.

The Department has proposed conditions of consent relating to subsidence impacts on private residences. Condition 3 of Schedule 3 requires a performance measure for privately-owned residences including repair, replacement or compensation. Although this places responsibility on the Proponent, a note attached to this condition states that this condition may be met by measures undertaken in accordance with the Mine Subsidence Compensation Act 1961. This creates no conflict with the responsibilities of the MSB to repair property damage. The Commission considers the process outlined in the MSB response to the Commission and the proposed conditions allow for appropriate compensation following subsidence-related damage providing these processes are applied equitably and in a timely manner.

3.6.2.1 Commission's Recommendation Concerning Infrastructure and Improvements Impacted by Subsidence

The Commission recommends that before granting any consent, the consent authority satisfy itself that proposed compensation measures for subsidence-related damage to privately-owned built features will deliver a fair and reasonable outcome for affected property owners. If the consent authority cannot be satisfied that the outcomes will be fair and reasonable then the consent authority will have to consider whether the residual impacts make the project unacceptable within the terms of s79C of the Act.

3.6.3 Transmission lines

The PAR does not assess the likely impacts on the transmission lines and towers but states that the Proponent has committed to consultation with TransGrid and the MSB regarding the potential impacts. Transgrid has confirmed the compensation arrangements for the predicted impacts will be determined through a commercial agreement to which the Proponent has agreed and also agreed to pay the associated costs, including possible modification or relocation of the transmission lines. The Department's proposed condition 3 of schedule 3 sets a performance standard that the TransGrid Towers are always safe and serviceable and any damage that does not affect safety and serviceability must be fully repairable and must be fully repaired. The Commission is satisfied that this is a reasonable performance standard.

Condition 5 of Schedule 3 requires a Built Features Management Plan, covering inter alia, transmission towers and lines, to be completed and approved by the Director General prior to

⁴⁶ See the judgment of Preston CJ in Bulga Milbrodale Progress Association Inc. v Minister for Planning and Infrastructure & Warkworth Mining Limited [2013] NSWLEC 48 (the Warkworth case) and especially in relation to noise impacts in that case.

commencement of second workings. While it would be usual for a consent authority to consider in detail the potential impacts on such essential infrastructure prior to making a final decision, the Commission notes the advice that there is an agreement by both parties for a commercial arrangement to be entered into and the draft conditions should provide sufficient safeguard that a commercial agreement has been reached between the Proponent and TransGrid before the second workings can commence.

The PAR notes that roads may be subjected to subsidence but can be rectified by normal road maintenance practices. Subsidence will impact bridges and culverts but is unlikely to significantly affect their serviceability or public safety and the proposed conditions of consent place onus of responsibility on the Proponent for repair or compensation.

3.7 Noise

The EIS assessed the construction, operational and transport noise from the project and states that the main potential noise sources are at the surface facilities at Tooheys Road and Buttonderry.

The main surface facilities would be located at the Tooheys Road site and the EIS states the modelling for this site was based on a worst case scenario with fixed and mobile plant operating together with train loading and the noise criteria would be met at all private residences under all weather conditions.

The Commission notes, however, the PSNLs are predicted to be exceeded at two privately owned properties (57 and 58) for more than 25 percent of a contiguous block of land in single ownership. (EIS p.161). No conclusion is drawn about the acceptability of impact on these two properties and the PAR makes no reference them and there are no proposed conditions in the draft approval relating to these exceedances. It has been conventional practice that where the noise criteria are predicted to be exceeded on more than 25 percent of land in private ownership then mitigation or acquisition options are provided to the landowner depending on the degree of noise exceedance or whether a negotiated agreement is in place between the Proponent and the land owner. The Noise and Vibration Assessment report does not state the degree of exceedance for these properties and it is not possible to tell from the noise contours. The report states that the noise contours presented are for 'descriptive purposes' and 'are presented for visual purposes only' (Wallarah 2 Coal Project EIS, Appendix N, p.46).

The EIS investigated and concluded that there would be no noise or vibration impacts from the underground operations and that surface construction works would meet both the structural and human comfort criteria. (EIS p161). The Noise and Vibration Assessment Report (NVAR) predicts the sleep disturbance criteria will be met at all private residences providing additional noise mitigation measures are incorporated. These include; no train horns on site, wagon bunching to be controlled, impact noise from product/steel coal bin contact to be reduced by 15-20 dB(A), product/plate contact noise at the head of conveyors and transfer points to be reduced by 5-10 dB(A). The Department's recommended conditions specify night time noise levels that would require these measures to be implemented.

A submission from Transport for NSW (1 Oct 2013) raised the concern about the potential for wheel-squeal noise from the proposed rail loop at the Tooheys site and stated the proposed 200m radius curves are below what is considered optimum for mitigating wheel squeal and that other measures may be needed. The Residual Matters Report responded that all curves will have a minimum radius of 200m as this was found to be the minimum necessary to prevent wheel-squeal based on observations from a number of other mining projects and the relevant RailCorp standard prescribes a minimum curve radius of 160m. (RMR 30 Oct 13 p7). The Commission sought further information from Transport NSW regarding the difference in these two recommendations. (Appendix 5)

In the response (dated 2 May 2014), Transport for NSW confirms that a minimum radius of 200m is required to reduce wheel squeal noise. However they suggest that if this is an ongoing issue, then the Proponent should consider feasible and reasonable noise measures e.g. low height barriers or lubrication of wheel/rail interface to further reduce the squeal. The Commission notes that this has been addressed within the Department's PAR and in the draft conditions of consent.

The Commission finds that the most recent Transport NSW advice accepts a minimum radius of 200m, but with a proviso that additional mitigation measures may be required if wheel squeal noise is an ongoing issue. The Commission also notes the draft operating conditions (Condition 4, Schedule 4) and Noise Management Plan (Condition 5, Schedule 4) do not include specific requirements to manage wheel squeal noise. Given the earlier Transport NSW advice that the 200m radius is considered below the **optimum** for mitigating wheel squeal, the Commission recommends Conditions 4 and 5 be amended to include monitoring of wheel squeal noise and to require additional measures to be implemented if the noise becomes an on-going issue.

The PAR notes that the main surface facility at Tooheys Road is particularly well situated as it is earmarked for future industrial use and is located between two motorways where the background noise is already elevated and therefore less likely to cause noise amenity problems for property owners. This location was chosen at additional cost including the need for a four kilometre incline tunnel to reach the mining area.

The Commission accepts that the surface facilities would be well located to minimise noise impacts and considers that noise can be adequately managed by the combination of the Department's recommended conditions and the Commission's recommendations.

3.7.1 Commission's Recommendation Concerning Noise

The Commission recommends that:

- the predicted noise levels be re-assessed for properties 57 and 58 and a condition be attached to any consent that provides for noise mitigation or acquisition for privately owned properties when noise is predicted to exceed the PSNL on more than 25 percent of privately owned land. (Note that the requirement for mitigation or acquisition should depend on the degree of exceedance of the noise criteria consistent with normal practice); and
- a requirement for monitoring of wheel squeal noise from use of the rail loop be included in any consent and that additional mitigation measures be implemented if the noise becomes an on-going issue.

3.8 Air

The primary sources of air emissions are from the surface facilities including coal stockpiles, coal loading and rail movements at the Tooheys Road site. Air pollution controls have been included in the project and the PAR concludes all the air quality criteria will be met with very few minor exceptions, and these would not have any adverse impact on human health or amenity. (PAR p.47). The Commission notes that the potential for air impacts is lower than many other mining projects because the mine is underground and there would be minimal coal processing.

Wyang Shire Council submission (November 2013) commented that the ambient air quality criteria are often exceeded (more than 16 per cent of the time), and therefore the project will necessarily exceed the criteria under adverse meteorological conditions. The Proponent's Residual Matters Report (RMR) referred to the NSW EPA Approved Methods for the Modelling and Assessment of Air

Pollutants in NSW that states no additional exceedances should occur from a new source and the RMR confirms that this requirement will be satisfied.⁴⁷

A NSW Health submission (undated) notes the predicted increase in PM₁₀ and PM_{2.5} concentrations is small and so the associated health risk is also likely to be small. NSW Health requested further information and the PAR notes that this was addressed to the satisfaction of NSW Health in the RMR.

The EIS states that dust emissions associated with train haulage have been modelled and found to be below levels known to cause adverse impacts on amenity. Further independent research has been documented on potential dust emissions from rail transport since the EIS was completed in April 2013 and this issue was discussed in detail in the Commission's Stratford Extension Project Review, April 2014. In summary the conclusions of the peer reviewed studies are that there is a statistically significant increase of approximately 10 per cent in TSP, PM₁₀, PM_{2.5} and PM₁ air particle emissions, from movement of coal and freight trains whether the wagons are loaded or empty. The Commission draws the same conclusion for this project that these findings have broader implications for rail transport of coal and the Department and EPA should take this latest information into account before submitting a final assessment report and recommendations to a consent authority.

The Commission considers the air quality impacts can be managed to acceptable levels and agrees with the Department's proposed conditions of consent.

3.8.1 Greenhouse Gas Emissions

The PAR says the strategic policy for greenhouse gas emissions should be made at a national and international level rather than at the project planning stage although several submissions including LMCC and WSC are critical of relying on a national approach as there is no carbon emissions trading scheme and the carbon tax is proposed to be abolished. The Commission accepts the validity of these concerns and therefore considers that all practical means should be adopted to minimise greenhouse gas emissions.

The PAR notes that Scope 3 accounts for over 97 per cent of the total emissions and concludes that the project's contribution to annual global GHG emissions would be very small and if the project does not proceed then the coal would be sourced from elsewhere in Australia or overseas. The generalisation that the project's contribution to global CO₂ emissions would be small could be applied to almost every project around the world and is therefore not a good comparison. It would be more helpful for comparisons to include Scope 1, 2 and 3 emissions for NSW, Australia and global.

The EIS has predicted the greenhouse gas emissions from the project and proposed emission reduction strategies including initial capture and flaring of methane gas and ultimately utilising the gas for beneficial purpose such as electricity generation at the Tooheys Road Site. The latter commitment is based on economic viability (p4, EIS Vol 1, April 2013). The EIS predicts the capture and flaring of gas would save approx. 8 Mt CO₂, or 54% of Scope 1 emissions. Onsite power generation if economically viable could produce the 10MW of electricity needed to power the site, eliminating electricity demand and further reduce 1.5 Mt CO₂ over life of Project.

The Commission notes the benefits of gas capture and flaring and beneficial use such as electricity generation as a practical means to reduce greenhouse gas emissions from the project. The EIS makes several references to these proposals but they are sometimes qualified and not necessarily time bound. For example, *Capture of methane for treatment, initially involving flaring as practicable*

⁴⁷ RMR, 3 December 2013, p.3

for greenhouse emission management and ultimately for beneficial use of methane such as electricity generation at the Tooheys Road Sited. (p4 EIS Vol 1, April 2013). Other references to the proposed electricity generation state that it will proceed *if economically suitable to do so.* (p xi EIS Vol 1, April 2013). The PAR refers to a commitment to undertake an option study for methane capture and utilisation within three years of commencement of the longwall mining production but the recommended conditions of consent make no mention of these two proposals other than to require implementation of all reasonable and feasible measures to minimise the release of greenhouse gas emissions and to prepare and implement a plan to the satisfaction of the Director General.

The Commission considers that these proposals should be included as conditions of consent with appropriate timeframes for implementation. Rather than recommend specific timeframes in this report, the Department should assess the shortest practical timeframes for implementation of these proposed measures prior to completing its assessment report for submission to the consent authority.

3.8.2 Commission's Recommendation Concerning Air Impacts

The Commission recommends that a condition be added requiring the implementation of methane gas capture and flaring within a specified timeframe and that a proposal be developed for beneficial use of the captured gas within three years of the commencement of longwall operations and to be implemented within a timeframe as required by the Director General.

3.9 Water-Related Impacts Associated with the Surface Facilities

This section deals with water quality impacts from the proposed surface facilities including the proposed water treatment plant for the mine water.

The EIS proposes construction of a combined reverse osmosis (RO) and brine treatment plant to treat mine water for operational needs. The RO plant would produce two streams, clean treated water, and a concentrated brine solution that is then further treated to produce a semi-dried salt product.

The treated clean water would be used for operational purposes with excess water proposed to be discharged to Wallarah Creek. The Proponent proposes to store the semi-dry salt product in the underground workings for the first 14 years after which time there will be enough void space, from the extracted coal, to discharge the brine solution from the water treatment plant directly underground without the need reduce its volume by concentrating it to the semi-solid state. The EIS and RTS state that the underground migration is extremely slow and it will take approximately 8000 years before any increase in salinity would reach the surface and by that time the rising groundwater would be diluted by rainfall recharge (RTS p.40).

The PAR notes that the brine will be discharged back to the coal seams that it originated from and concludes this is the most environmentally responsible option compared to other surface disposal options. (PAR p.35).

The EPA submission (9 October 2013) notes some issues in relation to the assessment of water quality and recommends a set of discharge limits for any proposed discharge to Wallarah Creek. The RTS (p.50) notes a typographical error in the monitoring data presented in the SWIA in relation to the percentile values of the results. The important point is that the water treatment plant can be designed to meet the discharge limits set by the EPA and this should be a requirement of any approval.

The water treatment systems has been designed to ensure there are no uncontrolled discharges from the storage dams to Wallarah Creek under all previous flood conditions. If there is a flood greater than past floods the RTS argues Wallarah Creek would be in flood and any discharges from the mine dams would be highly diluted (RTS p.49).

The EPA (Submission dated 28 January 2014) notes that no firm commitment has been made nor required for the brine plant and recommended the RO plant be designed to treat all mine waters discharged to Wallarah Creek. The Commission considers the requirement for a brine plant should be made clear in any approval. The need to treat all mine waters would depend on the discharge criteria set by the EPA and this should be determined prior to any final determination of the project.

Commission's Recommendations:

The Commission recommends:

- that the water treatment system, including the reverse osmosis and brine treatment plants be designed to meet the discharge criteria specified by the EPA; and
- that a requirement for construction of a reverse osmosis plant be inserted in 15 (c) of Schedule 3 of the proposed conditions of consent.

3.10 Biodiversity and Aquatic Ecology

3.10.1 Biodiversity

The Project Area is generally vegetated with a mixture of mature and regenerating forest and woodland communities. The previously cleared floodplain and adjacent slopes supports grasslands, along with some areas of wetland and riparian vegetation. The floodplain and adjacent slopes have been cleared for agricultural practices and as a result these have been substantially altered and are dominated by exotic species.

The *Ecological Impact Assessment (EIA)* was carried out by Cumberland Ecology. Flora and fauna surveys were undertaken, though some locations were not surveyed thoroughly due to hazardous terrain, or access issues onto private property (s7.9.2 p167, EIS, Vol 1, April 2013).

The surveys recorded in excess of 450 species of flora, of which six species are listed as threatened under the *Threatened Species Conservation Act 1995* (TSC Act) and/or the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act Commonwealth). These species are the Bynoes Wattle; Charmhaven Apple; Leafless Tongue Orchid; Small-flower Grevillea; Biconvex Paperbark and Black-eyed Susan (s7.9.2 p169, EIS Vol 1, April 2013).

The surveys recorded 29 threatened faunal species including eight internationally-protected migratory species. The migratory species are the Black-tailed Godwit; White Egret; Cattle Egret; Latham's Snipe; White-bellied Sea-Eagle; White-throated Needletail; Black-faced Monarch; Glossy Ibis and the Rufous Fantail (s7.9.2 p169, EIS, Vol 1, April 2013).

To minimise the impacts on these threatened species, the Proponent has used some avoidance measures, including modification of the mine plan and shortening longwalls. A staged Biodiversity Management Plan (BMP) is also required to be prepared prior to the commencement of construction. The BMP is to be prepared in consultation with the relevant agencies and be approved by the Department.⁴⁸

⁴⁸ See condition 19 of Schedule 4 of the draft recommended conditions of consent attached to the PAR.

The Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) raised concerns about the Biodiversity Offset Package (BOP). In their letter (22 August 2013) they state that the BOP only covers the minimal required offsets for all species except the Giant Barred Frog (*Mixophyes iterates*), for which the Package meets only 91.4% of the minimum offset requirements. SEWPaC advised the Proponent that the “rest of the offset requirement can be met through either further direct or indirect offset” which may include a financial contribution to research or education programs. SEWPaC also advised that approval for the Controlled Action under the EPBC Act would only be provided once the offset packages are finalised, and are agreed to by SEWPaC.

In the previous PAC assessment of the project, there were concerns regarding the level of ecological information provided as part of the EA and the assumptions that were made by the Proponent. The major concerns were in the steeper western end of the Project Area. Removal of the 11 western longwalls from the current project proposal has reduced the potential biodiversity impacts in the steeper terrain of the Jilliby Jilliby State Conservation Area (SCA). Following the PAC 2010 recommendations, further survey work has also been undertaken by the Proponent, largely to the satisfaction of the Office of Environment and Heritage (OEH), with the exception of the frog survey work (which is covered in the Aquatic Ecology section).

In the PAR the Department recommends that the offsets provided by the Proponent are permanently protected through a BioBanking Agreement, a Voluntary Conservation Agreement under the *National Parks and Wildlife Act 1974* or another appropriate mechanism. The PAR includes a number of draft conditions of approval:

- Performance measures to protect threatened species, threatened populations, or endangered ecological communities (condition 1, Schedule 3);
- The implementation of the Biodiversity Offset Strategy (BOS), as described in the EIS (condition 17, Schedule 4);
- Within 12 months of the commencement surface facilities site construction, the Proponent will provide appropriate long term security for the land within the BOS, to the satisfaction of the Director-General (condition 18, Schedule 4);
- The Proponent will prepare and implement a Biodiversity Management Plan (BMP) for the development, which will be prepared in consultation with OEH and Fisheries NSW, and approved by the Director-General prior to the commencement of construction of the surface facilities sites (condition 19, Schedule 4); and
- Within 6 months of the approval of the BMP, the Proponent will lodge a conservation bond with the Department to ensure that the BOS is implemented in accordance with the BMP (condition 20, Schedule 4).

The Commission is satisfied that the biodiversity issues have now been addressed adequately and the Department’s recommended conditions are appropriate.

3.10.2 Aquatic Ecology

The *Aquatic Ecology Impact Assessment (AEIA)* was carried out by Marine Pollution Research. They identified 17 aquatic macrophytes, 77 aquatic macroinvertebrates and three fish species, including two native species (Firetail Gudgeon and Flathead Gudgeon) and one exotic species (Plague Minnow). There were no recorded water dependent mammals (S7.11, EIS Vol 1 and Appendix P, EIS, April 2013).

The *Ecological Impact Assessment (EIA)* was carried out by Cumberland Ecology, which identified four potential Groundwater Dependent Ecosystems (GDEs) above the longwalls in the 25 year mining area. The GDEs are all listed as Endangered Ecological Communities (EECs), and are described as Coachwood-Crabapple rainforest; Woollybutt-Paperbark sedge forest; *Phragmites australis* and *Typha orientalis* wetland; and Swamp Mahogany forest (S 7.9, EIS, Vol 1 and Appendix O, EIS, April 2013).

3.10.2.1 Impacts on Groundwater Dependent Ecosystems (GDEs) and Threatened Frog Species

The AEIA identified three categories of potential impacts on aquatic ecology. These are:

- surface infrastructure development such as clearing and bulk earthworks for required infrastructure and associated ancillary works;
- longwall mining, including indirect impact from subsidence; and
- surface operations, such as mine water discharges during mine operations.

The Office of Environment and Heritage (OEH) raised concerns regarding the potential subsidence-related impact on streams and GDEs from the mining process (submission dated 26 June 2013). In particular, OEH concerns related to the potential for impacts on the water table levels, especially within the Jilliby SCA. In addition to this, OEH also raised concerns about any associated impact to threatened frog species which may inhabit the GDEs.

A number of submissions also raised issues concerning these GDEs both at the public hearing and in writing. These include the extent of subsidence-induced changes to the water table underlying these GDEs, whether the GDEs actually access this water table directly at present and whether the Department's recommended performance criteria and monitoring strategies would protect the GDEs.

In its preliminary assessment of the risks to GDEs the Department's PAR notes at p.39:

"the GDEs in the elevated areas of the Jilliby SCA are within WACIV's 42-year conceptual mine plan, as shown in the EIS. It is clear that this application is only for 25 years of mining and that 11 longwalls proposed within the Jilliby SCA are not part of the current project, which has eliminated many of OEH's concerns."

The Department has also recommended a performance measure of negligible environmental consequences for these GDEs (Schedule 3, condition 1) and supported this with strong requirements for monitoring any impacts (Schedule 3, condition 5h). The Commission accepts that these recommended conditions can satisfactorily address subsidence-related impacts on GDEs within the Project Area.

The PAR (p.39) notes that OEH has no residual concerns about impacts on aquatic ecology generally and concludes that subsidence-related impacts are likely to be minimal. The proposed BMP also has comprehensive provisions requiring monitoring of aquatic ecology impacts. These include:

- a set of permanent sites for aquatic ecology and surface water monitoring;
- site-specific aquatic ecology monitoring (upstream and downstream) of stream segments to be undermined; and
- monitoring will commence at least two years prior to mining, during mining and for at least two years post-mining (this would provide a minimum of four seasonal surveys prior to mining).

The BMP will be developed in consultation with the relevant regulators, and will provide data on the condition of aquatic ecology pre- and post-mining. This will allow comparisons of impacts to be

made, recommendations for remediation as required and to evaluate the success of any such remediation measures. The Commission considers that these monitoring requirements are adequate.

The Department considered OEH's concerns regarding the threatened frog species survey work and agrees with OEH that these species require protection. As such the Department recommends that the Proponent establishes a research program prior to mining to identify existing populations of threatened frog species and to monitor the impacts on the species for the life of the mining project. This includes preparation and implementation of a Frog Research Program, to the satisfaction of the Director-General and allocation of \$156,000 over four years for this program (condition 16, Schedule 4 of the draft recommended conditions of consent). This research program should provide more than enough lead time to gather relevant data before undermining of areas of potential frog habitat occurs.

The Commission agrees with the preliminary assessment by the Department and the draft consent conditions provided and considers that the aquatic ecology issues have been adequately addressed.

3.11 Heritage – Aboriginal and Non-Aboriginal

One of the reasons given for the refusal of the previous application was "the 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".

The environmental impact statement prepared for the development application includes 2 reports, namely, the Aboriginal Cultural Heritage Assessment and the Historic Heritage Assessment. Both reports were prepared by OzArk Environmental and Heritage Management Pty Ltd and dated December 2012.

Wyong Shire Council (WSC) in its submission to the Department (dated 20 June 2013) commented that "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."

Section 5.5 of the Preliminary Assessment Report (PAR) considers the potential impacts on heritage sites, Aboriginal heritage and historic heritage.

The PAR identified six sites of Aboriginal heritage significance and four sites of local historic heritage significance that may be affected by the project based on the EIS's Aboriginal Cultural Heritage Assessment and the Historic Heritage Assessment. The Aboriginal heritage significant sites include one open artefact scatter site and 5 axe grinding groove sites. The historic sites include the Brick & Iron Silo, the House 'Bangalow', the Little Jilliby road Bridge and a dwelling near Little Jilliby Jilliby Creek.

These sites are expected to experience subsidence impact with the exception of the open artefact scatter site, which is located within the proposed surface facilities area and is expected to be directly impacted. The Proponent has committed to protecting the sites where practical during construction.

OEH acknowledged the Proponent's commitment to develop and implement an Aboriginal Cultural Heritage Management Plan (ACHMP) for the project and the consultation with registered Aboriginal parties (RAP) in developing the plan. It recommends that the ACHMP should detail the consultation process/procedures and provide specific archaeological procedures/triggers if significant finds are identified during investigations. The RAP should be consulted in the development of the procedures to record and managed salvaged objects.

The PAR includes a number of draft conditions of approval. They are:

- Performance measures to protect natural and heritage features (Condition 1, Schedule 3);
- Requirement of an extraction plan to include a Heritage Management Plan to be approved before any longwall coal extraction (Condition 5(k), Schedule 3); and
- Preparation and implementation of an Aboriginal Cultural Heritage Management Plan (Condition 21, Schedule 4).

The Commission notes the draft performance measures listed in Condition 1, Schedule 3 are as follows:

Heritage sites	
Aboriginal heritage sites listed in Table 1 of Appendix 4	Negligible subsidence impacts or environmental consequences
Historic heritage sites listed in Table 2 of Appendix 4	Negligible loss of heritage value
Other Aboriginal and historic heritage sites	Negligible subsidence impacts or environmental consequences

The term 'negligible' is defined in the Glossary of the draft conditions as 'small and unimportant, such as to be not worth considering'. The Commission is mindful of the potential disagreement between the Proponent and the Aboriginal community/Wyong Shire Council on what is 'small and unimportant'. It is therefore important to include a mediation process in the condition.

3.11.1 Commission's Recommendations Concerning Aboriginal and Non-Aboriginal Heritage

The Commission recommends that:

- (i) the Heritage Management Plan (condition 5(k), Schedule 3) should include a trigger action response plan to manage unexpected subsidence impacts (similar to condition 21, Schedule 4); and
- (ii) a note should be included in condition 1, Schedule 3 that any dispute in relation to impacts on Aboriginal heritage sites should be referred to the OEH for a final determination, and dispute in relation to impacts on historic sites should be referred to the Secretary of the Department of Planning and Environment for a final determination.

3.12 Economic and Social Impacts

3.12.1 Economic Assessment

Recent amendments to the mining SEPP direct the consent authority to consider a number of matters when assessing the economic benefits of a mining project. The Proponent's EIS and RTS were produced before these amendments to the mining SEPP came into effect in November 2013. Consequently, it is not a simple task to apply the SEPP provisions to this project.

Clause 12AA is the principal provision. In sub-clause (1) it requires the consent authority to consider the significance of the resource having regard to two matters. The first is the economic benefits, both to the State and the region in which the development is being carried out, and the second is any advice from the Director-General of DTIRIS as to the relative significance of the resource.

For this project there is no advice from the Director-General of DTIRIS that meets the requirements of the second limb. However, there is some evidence available to the Commission relevant to the matters the Director-General is required to consider under sub-cl.(3). This is set out below under each of the parts of the sub-clause.

(a) the size, quality and availability of the resource

The overall significance of the resource in terms of NSW coal production is not addressed in detail in the body of the Department's PAR. However, there is a statement to the effect that the Department has carefully considered the significance of the coal resource under cl.12AA(1) of the SEPP and mention that the application seeks to extract up to 125 million tonnes of high-grade expert quality thermal coal at a rate of 5 Mtpa, with a further 17 years of mining proposed beyond the present project. The Commission accepts that this deals with the size and quality aspects of the clause, but not availability.

The Commission notes that 'availability' is not defined in the SEPP. Nor is it entirely clear what work it is meant to do in this clause. The issue was discussed in more detail in the recent review of the Stratford Extension Project⁴⁹ at p.63. The conclusion reached, (albeit a tenuous one) was that 'availability' was primarily a matter for the Proponent: if they could access the resource economically and in an environmentally sound manner, then it was 'available'.

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

The project is located close to major transport facilities, including the M1 Motorway and the main northern rail line. There is an existing proposal to upgrade this part of the rail line.

As there is no coal washing proposed, there is relatively little major surface infrastructure that could be shared with another mine.

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

The project is a 'greenfield' mining development. However, there is a strong history of mining on the Central Coast and the project is located close to the proposed extension of the existing Mandalong Mine. The relevance of either 'relationship' is difficult to assess.

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

The EIS makes substantial claims for flow-on economic benefits to the region and NSW. These are largely repeated in the Department's PAR. The magnitude of these claims has been challenged in several expert submissions. The Commission finds the criticisms persuasive and considers that a more robust study would be necessary to determine the nature and extent of any real flow-on benefit to other industries or projects.

The Commission did receive submissions at the public hearing on the plight of some regional manufacturing industries and also the relatively poor employment situation on the Central Coast (particularly for young people). However, there is no clearly demonstrated link between the matters raised in these submissions and the project.

As a general proposition the Commission accepts that some local trade and employment opportunities must arise from supply to miners and their families for a development of this size. However, that falls well short of demonstrating that other industries or projects are dependent on the development of the resource. This 'test' is particularly difficult for a new mine proposal where no significant established links to local contractors or other suppliers are evident.

Overall, the purpose of the second limb of cl.12AA(1) is obscure. Apart from the issues in cl.12AA(3)(a) relating to size and quality of the resource, consideration of the rest of the matters listed in cl.12AA(3)(b)-(d) essentially involves ticking boxes. It is unclear what inference is to be

⁴⁹ PAC Review of the Stratford Extension Project, April 2014

drawn if all the boxes cannot be ticked (as is the case in any greenfield development, including this one). Does the project then fail to meet the test of significance?

Turning to 12AA(1)(a), this requires the Commission to have regard to ‘*the economic benefits, both to the State and the region in which the development is proposed to be carried out, of developing the resource*’. Matters considered to be relevant for the purposes of sub-clause (1)(a) are set out in 12AA(2) as follows:

- (a) employment generation,
- (b) expenditure, including capital investment,
- (c) the payment of royalties to the State.

Some information relevant to cl.12AA(2)(a)-(c) is contained within the economic assessment included as part of the EIS⁵⁰, with supplementary information contained in the Proponent’s Response to Submissions (RTS). However, submissions on the EIS and to the Commission conducting this review have highlighted several major areas of concern with the economic analysis for this project.

The first relates to the methodologies used to produce the analysis. The adequacy of these methodologies for providing a properly balanced view of the potential costs and benefits of the project has come under serious and sustained criticism from economists, the judiciary, public authorities, a major economic consultancy firm, and the Commission itself.⁵¹ These criticisms include, *inter alia*, use of the Input-Output (IO) modelling to produce employment figures, the failure to account properly for externalities, and the inclusion of estimates of social benefit of employment in calculations of project benefits. These are fundamental criticisms of the basis for the assessment.

While the Department notes in the PAR some of the concerns raised with the analysis (and appears to accept at least some of them – see pp.48, 50), the PAR then proceeds to do two things:

- (i) it minimizes the potential impact of the issues raised:

‘Nevertheless, even if some of the EAL’s criticisms are accepted, the Department is satisfied that they would not fundamentally alter the fact that the project would result in significant economic benefits for the State and region. Further, the Department does not believe that any of the EAL’s criticisms of the CBA are determinative, and consequently do not alter the broad conclusion of the CBA that the project would result in a net benefit to the community.’
(PAR, p.48)

‘The Department notes that the CBA’s calculation of the NCB assumes a ‘negligible cost’ in relation to most of the key externalities. While the Department expects there to be more than negligible impacts in relation to some, if not all, of these issues, it is satisfied that the recommended conditions of consent would provide for appropriate offsets, mitigation of management of these impacts. Consequently, the Department believes that it is likely that full consideration of all externalities would only lead to a minor reduction in the predicted NCB.

While the Department accepts that the estimation of NCB is not a precise science, and will vary from one expert to another or in response to any sensitivity analysis, it is satisfied that the findings of the CBA are robust in this instance, and that any of the criticisms of this CBA

⁵⁰ EIS, Appendix W

⁵¹ e.g. Campbell, R. submission on the EIS June 2013 (Economists at Large) and submission to the Commission March 2014 (the Australia Institute); Preston CJ in Bulga Milbrodale Progress Association Inc. v Minister for Planning and Infrastructure & Warkworth Mining Limited [2013] NSWLEC 48 (Warkworth) at p.155-160; Australian Bureau of Statistics cited by Campbell, R. *op cit*; Deloitte Access Economics, ‘Economic and social impacts of the Warkworth Extension Project’, Report prepared for Singleton Council, August 2012; PAC Review Report on the Stratford Extension Project, April 2014

would not materially change the broad conclusion that the project would result in a net benefit to the community.’ (PAR, p.50)

- and
- (ii) it continues to use the Proponent’s discredited figures to state the benefits attributable to the project:

‘The project would generate a significant number of employment opportunities within the local region and the state, including 300 direct jobs and an estimated 500 flow-on jobs in related industries.’ (PAR, p.48)

‘The project would have direct economic benefits to the State, including \$134million in taxes and \$207 million in mining royalties over the life of the project.’ (PAR, p.48)

‘The IOM predicts the following benefits to the regional economy:

- \$625 million in direct and indirect regional output;
- \$79 million in household income; and
- 805 direct and indirect jobs.

The IOM also predicts the following benefits to the NSW economy:

- \$900 million in direct and indirect output;
- \$154 million in household income.

The Department considers that these are significant benefits, which should be given significant weight in assessing the development’s overall merits.’ (PAR, p.49)

‘The CBA calculates the net community benefit (:NCB) of the project to be \$531 million, which comprises:

- \$207 million in mining royalties;
- \$134 million in taxes; and
- \$186 million in social/economic values f employment. (PAR, p.50)

‘The project would have direct economic benefits to the State, including \$134 million in taxes and \$207 million in mining royalties over the life of the project. The project would also generate approximately 800 jobs, which would be a significant boost to both the Wyong LGA and the Central Coast region, which have relatively high unemployment levels compared to the rest of NSW. These are significant benefits, which must be given significant weight in assessing the project’s overall merits.’ (PAR, p.53)

Dealing with the main issues raised by these quotations:

- (i) Employment Generation: the use of Input:Output Modelling (IOM) to generate estimates of flow-on employment creation is thoroughly discredited.⁵² This means that only the 300 jobs directly created by the mine can be used as a reliable estimate of employment creation. There is some evidence in the materials cited in footnote 53 that flow-on employment is likely to be very small.
- (ii) Inclusion of estimates of social benefit of employment: this is also thoroughly discredited,⁵³ but at \$186m accounts for over 35% of the Net Community Benefit (NCB) of \$531m quoted in the PAR at p.50. In this context the Commission notes that the

⁵² See Preston CJ *op cit* in Warkworth, the Commission’s summary in the PAC review of the Stratford Extension Project, April 2014 at p.68 and Campbell, R., 2014, *op cit* at pp.6-7

⁵³ See Campbell, R., 2014, *op cit* at pp.4-5 and the materials cited there. See also the PAC review of the Stratford Extension Project, April 2014 at p.67

\$531m is itself an overestimate because it includes undiscounted royalties and taxation at the full company rate (see (iii) and (iv) below). If the total figure for the NCB was reduced by using more appropriate estimates for royalties and taxes, the social benefit of employment would contribute a much higher proportion than 35% to a revised NCB as used in the PAR.

- (iii) Commonwealth taxes: the use of \$134m⁵⁴ for the taxation benefits to the Commonwealth has two problems. The first is that it probably significantly over-estimates the actual tax revenue receivable by the Commonwealth. Campbell points out that the tax revenue in the EIS is based on the 30% company tax rate, but that the effective tax rate for mining companies generally is well below this at 14-18%.⁵⁵ The second is that, whatever the accurate Commonwealth taxation figure is, it is not directly relevant to the requirements of the Mining SEPP, which specifically refers to benefits to NSW in cl.12AA(1)(a). Only some (unspecified) proportion of the Commonwealth tax revenue will benefit NSW.
- (iv) Royalty payments: the \$207m claimed as a benefit is almost certainly an over-estimate. However, as Campbell points out it is not possible to calculate just how much of an over-estimate it might be because the key assumptions underlying the claim are not stated by the Proponent.

For example, there are multiple deductions available from royalties that can significantly reduce the amount payable (by as much as \$3.50 per tonne, i.e. nearly 50%). Although some of these potential deductions are not applicable to this project, it is unclear what, if any, allowance has been made for those applicable. Also, royalties are calculated on coal produced and NSW mines characteristically produce less per year than their authorized extraction limits. However, the claimed benefits are based on full production.

Campbell (2014) suggests that a reasonable lower estimate for royalties from the project would be \$100m.

- (v) Externalities: the economic analysis in the EIS largely ignores the externalities. The PAR recognises this, suggests that this is incorrect and then proceeds to use the incorrect figures to justify the project. For this particular project the externalities are of uncertain magnitude as well as being inherently difficult to value (this is mainly because the subsidence impacts on some key attributes, such as water availability, are unknown). It is only if the consent conditions effectively control the external impacts that the PAR's assessment that the externalities would not have a significant impact on the NCB (see PAR at p.50) may have some validity.⁵⁶

The unreliability of the Proponent's estimates of project benefits is succinctly summarized by Campbell (2014) referring to the claims made for the project's predecessor against the claims made for the current project. Even allowing for the reduced number of longwalls (11) in the current project, the difference of over \$1 billion in claimed benefits is staggering.

⁵⁴ But note that the EIS uses \$139 m at Appendix W, p.4

⁵⁵ There may be some dispute about the final percentages to be applied, but the Commission accepts that it is well below the figure used by the Proponent.

⁵⁶ Note that it is very difficult to get an accurate picture from Appendix W of the EIS of how these externalities have been treated. For example, subsidence impacts on built features (a major impact of the project) appears in the text at p.12 and as a single line in Table 2.2 and then is subsumed into operating costs in Attachment 2. Nowhere is there a detailed analysis of the potential costs of this impact for this project – the (untested) assumption is that MSB levy payments are a satisfactory surrogate.

The first assessment of the project estimated:

Overall the WCCP is estimated to have net benefits to the community of \$1,519M and hence is desirable and justified from an economic efficiency perspective.

[citing Gillespie Economics, 2008, p.3]

Yet five years later the same consultants, Gillespie Economics, evaluating the same mine, assuming the same production rate and an even higher coal price found:

Overall, the Project is estimated to have net benefits to Australia of between \$346M and \$531M and hence is desirable and justified from an economic efficiency perspective.'

[citing Gillespie Economics, 2013b, p.16]⁵⁷

The Commission's view is that the PAR's acceptance of the benefits of the project as presented by the Proponent is simply not credible. No attempt has been made to address the specific points raised by the critics of the economics assessment, yet these points appear to be soundly argued and entirely plausible. It is not acceptable practice to gloss over this material with a few generalisations of the kind found on pp.48 and 50 of the PAR.

The question is how this affects consideration of the project in terms of cl.12AA(1), (4) and (5) of the Mining SEPP. The Commission's view is that, if the consent authority is required to weigh the significance of the resource against the other matters in Part 3 of the SEPP, then the material supporting significance of the resource must be able to withstand rigorous scrutiny. In this instance the Commission finds that the claims made in the PAR cannot meet this test.

The opponents of the project clearly consider that this is sufficient ground to recommend refusal of the project. However, even the opponents concede that the project will have some benefits, albeit much smaller than those claimed by the Proponent and accepted in the PAR.

The Commission's finding in relation to further assessment of the project is that the benefits of the project used to determine the significance of the resource for the purposes of the Mining SEPP are:

- (a) employment generation: only 300 direct jobs can be considered for the operational phase of the mine;
- (b) expenditure including capital investment: capital investment is stated to be around \$805m, but there is little justification provided for this figure in the EIS. Given the Commission's concerns with the claimed benefits that are able to be examined, there can be no confidence in the quantum claimed. However, there will obviously be some hundreds of millions of capital investment in a project of this size; and
- (c) Royalty payments to NSW: the claimed amount of \$207m is challenged strongly, with a lower bound of \$100m suggested for the project. Under the circumstances a range of \$100-200m is recommended.

It is also arguable that account could be taken of the Commonwealth tax revenue, since some of it will be spent in NSW. The SEPP does not require its inclusion (or exclude it), but the amount of this tax revenue and the proportion likely to return to NSW are not likely to be established convincingly in the short term.

13.12.1.1 Commission's Recommendation Concerning Estimates of Project Benefits

The Commission recommends that, for the purposes of assessment under cl.12AA of the Mining SEPP, the significance of the resource is limited to the creation of 300 direct jobs, royalty payments of between \$100m and \$200m and capital investment significantly less than \$800m. If this becomes crucial in the consent authority's task of assessing the project under s.79C of the Act, then the

⁵⁷ Campbell, R., 2014, *op cit*, p.1

Commission recommends that the consent authority require that a new economic analysis be undertaken and subjected to external rigorous independent review before a decision is made.

13.12.1.2 Commission's Comments in Relation to the Application of the Mining SEPP to the Project

The Commission is clearly of the view that the above situation is unsatisfactory and that far greater quality control is required over inclusion in assessment reports of untested claimed benefits for a project that are directly relevant to a consideration of the project under Part 3 of the Mining SEPP. There is now a substantial body of adverse comment about the standard of economic analysis for mining projects in NSW generally and this appears to be increasing rather than abating.

The SEPP requires under cl.12AA(4) that 'the significance of the resource is to be the consent authority's principal consideration under this Part'. 'Principal consideration' is not defined. It clearly doesn't mean 'only consideration' because cl.12AA(5) requires 'the weight to be given by the consent authority to any other matter for consideration under this Part is to be proportionate to the importance of that other matter in comparison with the significance of the resource'. The task seems simple enough until we look at the 'other matters' under the Part. These are not necessarily framed in a way that facilitates comparison under cl.12AA(5). For example, cl.14(1)(a), which deals with impacts on water resources (a key issue for this particular project) is structured as a prohibition on consent unless the consent authority has considered whether conditions should be imposed to avoid or minimise impacts on significant water resources. This can be done independent of amassing the information that might be relevant to 12AA(5).

There is another major problem with the direction to the consent authority in sub-clause 12AA(5). The significance of the resource can be determined in economic terms. However, some of the 'other matters' in Part 3 are usually described as 'externalities' or 'non-market impacts' and are notoriously difficult to quantify in economic terms.⁵⁸ The result is that there is no way to compare (weight) these matters against the significance of the resource in the scheme established under cl.12AA.

It is also not entirely clear what the role of sub-clauses 12AA(4) and (5) is in relation to s.79C. This section sets the overriding requirements for evaluation of a State Significant Development project by a consent authority. It requires the consent authority to consider a number of matters that are not included in the consideration under cl.12AA. One of these is the public interest (s.79C(e)).

An example of the problem is that, even if you could contrive a position that the significance of the coal resource under cl.12AA meant that under average conditions the water in Jillilby jilliby Creek was of lesser importance (as the Department has concluded at p.28 of the PAR, but without providing any supporting evidence), the consent authority must consider project risks across the entire climatic spectrum. That includes severe drought and, under such conditions, it is difficult to see how the public interest would be served by mining coal at the expense of harvesting water.

In the Commission's view cl.12AA of the Mining SEPP does not necessarily sit comfortably with the consent authority's task under s.79C of the Act. Even if it can be argued that cl.12AA is not technically flawed, applying it to this project application is difficult in practice.

Despite the above concerns with the economic assessment the Commission is of the view that it is in the public interest that this review assess the overall merits of the project and not be diverted by disputes over one or more elements of the technical or process aspects of the assessment. It is ultimately for the consent authority to decide whether the project can be approved or not after

⁵⁸ See the discussion on this issue by Preston CJ in [Warkworth](#)

considering the requirements of s.79C of the Act. This review is only one element of that consideration (albeit a mandatory one under s.89H).

13.12.1.3 Commission's Findings on Evaluation of the Project

The Commission's finding is that, provided the reduced figures suggested in the above recommendation are used for assessment purposes, the evaluation of the project under s.79C could proceed. However, with the benefits substantially reduced the Proponent will need to ensure that the residual impacts are reduced to a level that is commensurate with this altered evaluation environment. The key will be convincing the consent authority that the potential impacts on water supply for the Central Coast have been reduced to the level indicated in 3.3 of this review report.

3.12.2 Impacts on Agricultural Business

Traditional agricultural land use of the alluvial land and the near hills within the Project Area has been dairying and beef grazing together with associated cropping. A more recent development has been the commencement of turf farming on some of the more traditional dairy flats including those associated with Jilliby Jilliby Creek.

Urban development of the Central Coast has seen many of the larger holdings being fragmented and converted to rural lifestyle blocks intermingled with small scale beef grazing and horse enterprises ranging from breeding to pleasure.

The EIS (Appendix Y, Agricultural Impact Statement, Tables 7 & 8) identifies the quantum of land allocated to each enterprise and the value within the project boundary. In summary 28 hectares allocated to Turf Farming, 2,392 hectares allocated to cattle breeding and horse activities, and 2,129 hectares where no agricultural activity was conducted. This was then summarised into the gross value or current agricultural production per enterprise as being:

- Turf farming \$1,275,373
- Cattle \$211,209
- Horses \$561,650

A submission from the owner / operator of the turf farm within the project boundary submits that the currently there is 40 hectares in turf production and they are averaging 2 harvests per year not 3 every 2 years as stated in the EIS. The Commission therefore conservatively estimates the current gross value of turf farming to be in the order of \$1.8 to \$2m.

Five horse training activities (thoroughbred & performance horses) have been identified by the Proponent within the Project Area.

Impacts

The potential impacts identified are:

- subsidence;
- ponding and scaling;
- changes to stream alignment; and
- flooding.

Flooding, changes to stream alignment as well as ponding and scaling are the natural consequences of flood events producing increased stream velocities. It can therefore be assumed that mining-induced impacts are principally related to subsidence.

Turf Farm

The RTS (3.19.2) indicates the predicted maximum conventional subsidence at this property is 1,750mm. Subsidence is predicted to occur through four episodes commencing when the longwall panel preceding the panel directly under the property is mined. The second episode will generally cause the highest predicted subsidence.

The RTS suggests the changes in slope predicted are not expected to interfere with the efficiency of turf cutting equipment, however it is predicted the subsidence could affect underground structure such as irrigation mains.

The submissions from the owner/operator advise they average two harvest every year. Therefore, depending on the extent of the subsidence impacts there could be the potential for a particular area to be subsiding and settling for 24 weeks.

The RTS goes on to indicate remediation would only be required if subsidence effects are greater than predicted and the AIS assumes that if remediation involving re-levelling of the surface topography is required it would take three years to re-establish production.

The Proponent has undertaken to prepare a SMP and PSMP's in accordance with any conditions of consent.

The PAR draft Performance Measures for built features are found in condition 3 of Schedule 3. Table 2 sets out the categories of infrastructure and the performance measures applying to these categories. However, the Commission considers Table 2 is not clear as to which performance measures apply to which subsidence impacts – particularly under the 'other infrastructure' category. The Commission's interpretation is that all the performance measures listed in the second column under 'other infrastructure' apply to all categories of 'other infrastructure' in the first column. However, this interpretation is not without its difficulties when seeking to identify what 'loss of serviceability must be fully compensated' might mean in relation to swimming pools, temporary disruption to power supply, etc.

Table 2 also does not include other agricultural improvements such as laser-levelled land for particular cropping enterprises (e.g. the turf farm). It is not clear to the Commission why fences and farm buildings are worthy of protection and compensation but other potentially subsidence-affected improvements are not. The requirement to prepare a 'Land Management Plan' under condition 5(j) does not address the issue to the Commission's satisfaction.

The Commission also considers that a non-appellable dispute resolution mechanism (condition 4 of Schedule 3) that relies on consultation between the Executive Director Mineral Resources (notionally an industry advocate) and the Director-General probably does not meet the test of independent arbitration that normally applies to dispute resolution under the NSW Planning system.

3.12.3 The Commission's Recommendation Concerning Agricultural Businesses

The Commission recommends that the performance measures included in the Department's draft conditions of consent for built features (condition 3 Schedule 3) be amended to include a wider range of improvements relevant to agriculture that may be impacted by subsidence (e.g. those relevant to the turf farm) and that the relevance of the listed performance measures to each of the categories of other infrastructure that might be impacted by subsidence be reviewed.

3.13 Other Significant Issues

3.13.1 Rail

A Rail Study (RS) was carried out by Rail Management Consultants Australia Pty Ltd, which included significant input from RailCorp (Appendix Q, Vol 5, EIS, April 2013). The study provides a detailed analysis of the existing network capacity and infrastructure constraints. The proposed mining project will be occurring in parallel with the Northern Sydney Freight Corridor (NSFC) Stage 1 project. The NSFC Stage 1 project is a joint State and Commonwealth funded program to improve the capacity and reliability of the Main Northern Rail Line, between Sydney and Newcastle. It is designed to cope with the expected increase of rail traffic including general freight, interstate freight, and export and domestic coal freight. Future volumes of coal trains are forecast to increase south of Newcastle, such that the entire rail network will require intensive integration.

The additional train traffic is expected to increase road closures at two level crossings being St James Road, Adamstown and Clyde Street, Islington. At Adamstown, the level crossing closure will increase from 432 minutes per day to 488 minutes per day. While at Islington, the level crossing closure will increase from 463 minutes per day, to 529 minutes per day. The majority of these additional closures will generally occur at night, and during non-peak times (s7.13.1, p197, EIS Vol 1, April 2013).

The RS expects that six train cycles will be required to service the mine. The RS considered a number of options for improving reliability of the network, and 'future proofing' the network, through modelling. The modelling suggests that the suitable option is to construct northbound and southbound passing loops at Awaba. This option is suggested as the key mitigation measure.

During the consultation period a number of stakeholders raised concerns regarding the rail location and impacts on the wider network, passenger and freight trains.

The two key issues are:

1. Awaba rail bypass loop
2. Darkinjung Local Aboriginal Land Council

Awaba rail bypass loop

Lake Macquarie City Council (LMCC) raised concerns about the project in its original submission to the Department and reiterated the concerns at the meeting with the Commission on 1 April 2014 and in a letter to the Commission dated 1 April 2014. LMCC was concerned that the EIS does not provide information regarding the timing of the proposed mitigation measures (the Awaba rail bypass loop). LMCC has no confidence in the timing of any investigations or works that will be taking place. Whilst there is a commitment to improve the reliability of the network, there is no commitment to the timing of the measures, or whether this timing would be linked to "*operation or staging of the development*". It is also a concern to the Council that the environmental impact of the proposed Awaba rail loop is unknown.

LMCC also raised concerns as to whether the network, which passes through the city, is suitable for the proposed development. LMCC was concerned that the issues raised were not discussed in the PAR, and that the report concluded that the Department is satisfied that the project will have limited impacts on the network.

LMCC has proposed draft conditions of approval, if consent is granted:

- That prior to coal movement from site, the Proponent should undertake a revised Rail Study to ensure that the rail network is suitable and has the capacity to cater for the increased trains from the development; and

- Any works or approvals required to enhance the rail network, are complete prior to coal movement from the site.

In response to the LMCC submission, the Proponent reiterates that the maximum train cycles a day will be six with an average of 4.33 train cycles. The Rail System Capacity Assessment has determined that these additional six cycles are possible, providing the bypass loop at Awaba is constructed. The Proponent has committed to make contribution to the construction of the Awaba bypass loop, and the Department has included a draft condition accordingly.

The Commission finds that the train movements generated by this project form part of the general increase in freight traffic on the rail corridor and it is reasonable to require a contribution for the improvement works. The Commission disagrees with the LMCC that the rail network improvements should be completed prior to coal movements from the site. The rail infrastructure improvements are the responsibility of the RailCorp/ARTC, and are outside the control of the Proponent. As to the assessment of potential environmental impacts of the Awaba rail bypassing loop, there are well established environmental assessment and community consultation processes that a Proponent/applicant for the improvement works is required to follow.

3.13.2 Issues Raised by Darkinjung Local Aboriginal Land Council (DLALC)

The Darkinjung Local Aboriginal Land Council (DLALC) has provided several letters and a submission post the submission period objecting to the project. These letters are dated 28 March 2014, 11 April 2014 and the supplementary submission dated 24 April 2014.

The three key objections from the DLALC are:

- land owners' consultation and consent;
- impact on future development potential; and
- validity of the DA as Lot 7305 is not included in the DA.

Land owners' consultation and consent

DLALC raised that they are the registered land owner of Lots 193 and 195 DP 1032847, and that they had not been approached by the Proponent to request owner's consent to make the application. They are also concerned by the lack of consultation by the Proponent regarding the DLALC access to Lots 193 and 195 DP1032847, through Lot 7305 DP1165648, which would be covered by a mining lease.

There is currently a Native Title Claim, over Lot 7305 DP1165648 (NSD 780/2013 – lodged 13 May 2013) which is awaiting determination by the Federal Court. The DLALC believes that it is inappropriate to approve a development that is dependent on critical land title issues being resolved.

The Commission understands that the issue of land owner's consent is currently subject to a Land and Environment Court proceeding and is largely outside the Commission's Terms of Reference. The Commission considers that the review and the court proceedings can continue independently since nothing in the review can influence the court proceedings and the court proceedings do not include matters relevant to the substance of the review.

Impact on future development potential

Lots 193 and 195 DP1032847 are part of larger DLALC landholdings in the area. The lots are zoned industrial in the Wyong Local Environmental Plan 2013 (Wyong LEP 2013). The DLALC provided a brief history of its intention to develop the lands for various uses. It is of the view that the EIS fails to consider the social or economic impact of the proposed rail loop on the DLALC land. The proposed rail loop will have significant impact on the DLALC proposal to develop its land and isolate part of Lot 195 with no access. As a result that part of Lot 195 appears to become undevelopable.

The Department's PAR, in recommending the project to be approved, also fails to consider the impacts on the DLALC lands. Granting consent to the project would sterilise access to Darkinjung's land, and impact on future development options for their lands. The DLALC therefore submitted that the project should not be approved. If the project were to be approved, the DLALC recommends 9 conditions to be imposed to safeguard its interests. Of the 9 recommended conditions, 6 are related to the granting of the mining lease. The remaining 3 are relevant to the project application that is being considered by the Commission. These are:

1. That the alignment of the rail corridor over Lots 193 and 195 be determined in consultation with Darkinjung;
2. That WACJV, at its cost, provide up to 4 vehicular bridges or underpasses across its rail spur on Lots 193 and 195, to be designed and constructed in a manner and to a standard necessary to best effect any development approvals which Darkinjung or its assigns obtains in respect of Lots 193 or 195; and
3. That the cost of any measures reasonably necessary to abate the dust, noise, and any other impacts of the use of the rail infrastructure on future developments on Lots 193 and 195 shall be borne by WACJV.

The Commission notes the DLALC's concern and considers the use and access to lands that are not owned by the Proponent is a matter to be negotiated between the Proponent and the relevant land owner. The Commission also agrees that the alignment of the rail corridor should be determined in consultation with the DLALC so as to minimise potential sterilisation of residual land. Access to any residual land should also be part of the negotiation between the DLALC and the Proponent.

As to mitigation measures to minimise noise and dust impacts, the PAR includes approval conditions to protect adjacent landowners and the environment.

Validity of the DA

The DLALC have raised concerns regarding the validity of the DA, given that Lot 7305 was not included in the development application. This lot is required for the development.

The Commission sought clarification from the Department, which advised by email dated 13 May 2014 that:

Walarah 2 Coal Project has previously been amended to include Lot 7305 DP1165648 (Lot 7305), which is currently subject to an ongoing Aboriginal land claim by the Darkinjung LALC.

... registration of Lot 7305 did not take place until June 2011, after the applicant undertook detailed investigation of the site and affected land parcels. As a result of this, the Applicant did not include this parcel of land in the initial schedule of affected Lots and other parcels of land which accompanied the development application. However, the EIS otherwise reflects the assumption that this parcel of land was subject to the development proposal (ie the plans included in the EIS indicated that this Lot was affected by the project).

The oversight was subsequently noticed and corrected within the Applicant's Response to Submissions report, which was submitted to the Department of 16th September 2013. The Applicant also raised this issue with the Department staff in October 2013. The Department's acceptance of the Applicant's amendment to its DA is reflected in 'Appendix 1: Schedule of Land' of the recommended development consent referred to the Planning Assessment Commission.

... the Applicant is revisiting whether it has amended its application with the necessary degree of rigour required to guarantee satisfaction of judicial review. ...the Applicant is currently proposing to amend its DA in a more formal sense. ...

The Commission is not in a position to comment on the validity or otherwise of the DA. There are actions in train to deal with the outstanding issues and these will need to be resolved before the project is submitted to the consent authority.

Commission's Findings

The Commission finds that:

- (i) The issues of rail network capacity and reliability will require further investigation, regardless of this proposal, and for the purposes of this project have been adequately addressed in the Rail Study and the Department's PAR;
- (ii) The recommended performance measures (Condition 3, Schedule 3) that the Main Northern Railway always remains safe and serviceable is appropriate;
- (iii) The requirement for a Built Features Management Plan (condition 5g, Schedule 3) to protect public and private infrastructure and development is also reasonable; and
- (iv) Conditions 4 and 5 in Schedule 4 should be amended to include specific requirement to manage wheel squeal noise and provide for implementation of mitigation measures if required.

3.13.2 Draft VPA and Security Bonds

Draft Voluntary Planning Agreement

At its meeting with the Commission on 1 April 2014, Wyong Shire Council officers advised the Commission that a draft Voluntary Planning Agreement (VPA) between the Council and the Proponent was prepared and Council had agreed to place it on public exhibition on 10 April 2014. Council would consider the VPA following public submissions, notwithstanding its objection to the proposed development. Council officers also advised that the total VPA package is valued at about \$17 million. There is no s94 plan that is applicable to the proposal. A normal s94 plan would generate about \$5 million benefits. Therefore, Council officers are of the view that the VPA could be of significant public benefit. However, they believe the draft VPA should not be amended without the agreement of the Council and the VPA should be given certainty in the consent, if the project were to be approved.

Council met on 28 May 2014 to consider the draft VPA and resolved to "authorise the General Manager to execute the Voluntary Planning Agreement" if the project were to be approved and that submitters were to be informed of Council's resolution. Council also re-endorsed its opposition to coal mining in the water catchment areas.

The Commission agrees that the draft VPA provides an appropriate level of public benefit for the community and that a condition should be included in any consent to require the Proponent to enter into a VPA with the Council in accordance with the draft VPA.

Security Bond

In its submission to the Commission, Council also requested the Commission to recommend imposition of an unconditional security bond of \$20 million to be held by the Council to be drawn upon for investigations and remediation in the event of unfavourable monitoring results and/or infrastructure damage.

The Commission does not agree a security bond is required. Although the Commission acknowledges there are uncertainties concerning the subsidence predictions, it has recommended

two formal reviews be undertaken to ensure Extraction Plans are based on site-specific experience. The Commission also recommends no net impact on water supply from the mining operation.

3.13.3 Strategic Regional Land Use Policy

The Department's Preliminary Assessment Report (PAR) considered the strategic context of land use giving particular reference to the State-wide Strategic Regional Land Use Policy (SRLUP). The PAR considered that, as the Project Area is not mapped as Biophysical Strategic Agricultural Land (BSAL), the provisions of the SRLUP relating to BSAL are not relevant to this project.,

Submissions at the public hearing refuted the Department's assessment that the Project Area has not been mapped as BSAL by referring to draft BSAL maps gazetted in January 2014. SRLUP – Sheet STA_039 and Sheet STA_040C clearly identifies land in the Wyong Local Government Area mapped as BSAL and covers the Yarramalong and Dooralong Valleys.

However the Mining SEPP exempts mining development proposals from the SRLUP process (including referral to the Gateway Panel), where DGR's were issued before September 2012. In the case of the project under review the DGR's were issued on 12 January 2012. Although the SEPP provides that in such circumstances the Minister or the DG may still seek the advice of the Gateway Panel, no such advice has been sought for this project proposal.

Notwithstanding the above, a key plank of the SRLUP is the Aquifer Interference Policy (AIP), which details the way the NSW Office of Water (NOW) will assess aquifer interference projects to determine their potential impacts on water resources.

The assessment criteria are called "minimal impact considerations" and include impacts on water table levels, water pressure levels and water quality in different types of groundwater systems. Impacts on connected alluvial aquifers and surface water systems are also considered, as well as the impacts on other water-dependent ecosystems and culturally significant sites that are groundwater-dependent.

NOW undertook an assessment against the AIP for the project. The assessment identified the following:

- a comprehensive groundwater monitoring program to include measurements of rates of groundwater seepage and monitoring of groundwater quality as part of the mine water management system will be satisfactory if implemented as described;
- baseline data is limited and incomplete as a result of very limited spatial coverage of the bore network. However, provided adequate monitoring and mitigation measures are in place going forward, this should be acceptable;
- the minimal impact conclusions for the alluvial aquifers for both water table and water quality were regarded as acceptable; and
- assessment of impact level for the porous rock or fractured rock aquifer was not made due to the information not being available.

The Proponent provided additional information in the *Residual Matters Report (October 2013)*. This additional information indicated, "The hard rock groundwater system underlying the alluvial lands has hitherto been regarded as a non-productive system due to the very low hydraulic conductivities of the rock strata which would not support a useful water supply." An assessment in respect of minimal harm criteria prescribed in the AIP was undertaken. The PAR reported that NOW accepted the additional information and is satisfied there is a low risk of vertical hydraulic connectivity and

there is likely to be only minimal impacts to aquifers. Recommended conditions have been adopted requiring the development of a monitoring, response and mitigation strategy in the event that vertical leakage is greater than predicted.

The Commission accepts the conclusion by NOW concerning the application of the AIP to the project.

4. CONCLUSIONS AND FINDINGS CONCERNING THE TERMS OF REFERENCE

The Wallarah 2 Coal Project has had a long history (since 2006). There have been multiple reviews and reports relevant to the project between 2006 and the present review. This particular review was undertaken in response to a request from the Minister under s.23D of the Act and forms part of the assessment process for the project. The Minister's Terms of Reference (see 2.1 above) require the Commission to consider a range of documents and other information, hold public hearings, assess the merits of the project as a whole and recommend any further measures required to avoid, mitigate or manage the potential impacts of the project.

The Commission has carefully considered all the information identified by the Minister as relevant to the review. It also held a public hearing at Wyong at which it received multiple submissions, some of which required further investigation by the Commission.

The merits of the project as a whole have been considered within the relevant statutory context, with a close focus on the Mining SEPP and s.79C of the Act. The approach has been to examine critically the potential impacts of the project, determine whether these impacts can be avoided, mitigated or managed successfully within the scope of the draft conditions of consent recommended by the Department, or whether some further steps could avoid or lessen the impacts. The benefits claimed for the project have then been examined closely to determine whether they can provide an adequate basis for assessment.

In considering the merits of the project as a whole the Commission has found that the benefits claimed for the project by the Proponent (and largely adopted in the Department's Preliminary Assessment Report) are not credible. The reasons are set out in detail in section 3.12 of this report. The Commission essentially had two options: reject the claims and recommend that a new economic assessment be undertaken (and that it be reviewed independently); or revise the claims to a level consistent with the Commission's findings and recommend that the revised level be utilised in any further assessment of the project.

In order to complete the review within the already-extended timeframe the Commission has chosen the latter option whilst recognising that it is open to the Department in preparing its final assessment report, or to the consent authority, to choose the former. However, the Commission considers in this case that there are sufficient benefits remaining (namely estimated royalty payments of \$100-200 million, direct employment of 300 staff and contractors during the operational phase and significant capital investment) to warrant further assessment of the project against the potential impacts without the need for a further economic analysis.

The potential impacts have been examined in detail in this review. They can be divided broadly into those associated with subsidence (i.e. potential impacts on water supply, stream morphology, groundwater, flooding, biodiversity, built infrastructure, etc.), those associated with the proposed surface facilities (i.e. noise impacts, air impacts, water balance, etc.) and a miscellaneous group including rail transport, land development, etc.

The principal findings and recommendations of this review can be summarised as follows:

- (i) Whilst there is inevitable uncertainty concerning the subsidence predictions, they provide a basis for assessment of the potential subsidence-related impacts of the project. There is ample scope to revise the predictions based on experience as the mine progresses and a rigorous adaptive management regime can be imposed to ensure impacts and consequences remain within the performance criteria in any consent.

The Commission has recommended two formal reviews and that each Extraction Plan be based on subsidence predictions that have been revised utilising site-specific experience and that these revised subsidence predictions are consistent with achieving the performance criteria during mining of the longwall in question.

- (ii) As presented, the project predicts risk of reduced availability of water for the Central Coast Water Supply in some years if the subsidence impacts on the catchment coincide with adverse climatic conditions. The maximum predicted impact on catchment yield is 300 ML/y.

The Commission has recommended that there be no net impact on potential catchment yield from the mining operation and that the maximum predicted impact should be offset by return of suitably treated water to the catchment side of the CCWS system for the period during which subsidence may impact on the Project Area catchments.

- (iii) The project presents an array of water supply risks to landowners in the Project Area. The Commission has recommended a number of conditions to ensure that potential impacts are properly investigated and that the affected landowners receive prompt compensatory supply.
- (iv) The project will have impacts on the morphology of streams within the Project Area. These impacts are predicted to be no greater than 'minor consequences', unless a flood event happens to coincide with a period of particular vulnerability for a section of stream undergoing subsidence changes.

The Commission considers that, as the impacts are likely to lie within expectations for normal variation for the Project Area streams, the performance criteria should be set at 'minor consequences', with a requirement to return impacted streams to an equivalent or better condition than their pre-subsidence condition.

- (v) The project will have some impact on flood levels and behaviour. With one exception, these are considered to be manageable with standard approaches. The exception is increased delays for emergency access to some properties in major floods.

The Commission has recommended that individual emergency access plans be prepared in consultation with the owners for each of these at-risk properties.

- (vi) The project will undermine or potentially cause subsidence impacts to a substantial number of residences (some 245) and an array of other public and private infrastructure. For most of these structures the strategies for managing the subsidence impacts are well developed and, within the statutory concept of the Mine Subsidence Districts and statutory compensation scheme, well understood.

The Commission has recommended some improvements to the performance criteria for built infrastructure and that some other types of infrastructure need to be included in the relevant provisions.

- (vii) Impacts from the surface facilities are expected to be both minor and manageable. Where necessary, recommendations have been included to address the residual impacts.
- (viii) Potential biodiversity and aquatic ecology impacts have been reduced by removal of the eleven western longwalls under the steeper terrain in the Jilliby SCA in the previous version of this project. The Commission is satisfied that the draft consent conditions attached to the Department's PAR deal adequately with these impacts.

Turning to the merits of the project as a whole. The Commission considers that, if the recommendations concerning improved strategies to avoid, mitigate or manage the predicted impacts of the project are adopted, then there is merit in allowing the project to proceed. However, if the recommendations are either not adopted, or adopted only in part, then the Commission's position would probably change in favour of a precautionary approach. This particularly applies to water-related impacts.

The Commission considers that commissioning a new economic assessment designed to increase the estimated benefits so as to create a new assessment playing field cannot substitute for reducing or managing the impacts as recommended. In this context it is worth noting that the courts have consistently held that the public interest is a much broader concept than the economic value of a mining project, particularly when this value is calculated using methodologies that cannot properly estimate the costs associated with non-market impacts. The Act specifically requires a consent authority to consider the public interest in s.79C(e).

5. RECOMMENDATIONS

Conventional Subsidence

- that a rigorous set of performance measures be included in any consent. Rigorous in this context means able to be measured or assessed in a scientifically and legally sound manner and be capable of enforcement. These performance measures must be supported by:
 - (i) a requirement that the Extraction Plan for each longwall contains revised subsidence predictions based on experience from previous mining on the site and that these revised predictions will not allow the performance criteria to be exceeded;
 - (ii) a requirement that the Extraction Plan for each longwall contains:
 - (a) appropriate triggers to warn of the development of an increasing risk of exceedance of the performance criteria (e.g. the subsidence predictions themselves and/or other relevant subsidence-related measurements);
 - (b) specific action plans to respond to increased risk of exceedance that will ensure the criteria are not exceeded (e.g. cessation of mining, narrowing the longwall, altering seam height, etc.); and
 - (c) an assessment of remediation measures that may be required if exceedance does occur and the capacity to implement the measures;
- although the risks to the significant public infrastructure such as the M1 Motorway and the Buttonderry Waste Management Facility appear small, the necessary steps to prevent impacts should be included in any consent and the consent authority should be satisfied that these steps will in fact, ensure the safety and/or integrity of the infrastructure; and

- that at least two formal reviews of the predicted subsidence impacts should be required: one after the first 5 longwalls have been completed (LW 1N-5N) and one after the next four have been completed (LW 6N-9N)

Non-Conventional Subsidence

- that appropriate monitoring of non-conventional subsidence effects be included as a requirement in any consent and that the relevant Extraction Plan be required to contain appropriate measures to control the risks from non-conventional subsidence so as to ensure that the environmental performance criteria are not exceeded.

Potential Losses of Baseflow from Impacts on Groundwater

- Before submission of the project for determination the consent authority be provided with revised estimates by year for:
 - (i) increased storage in the alluvium as a result of subsidence;
 - (ii) losses to the alluvium from near-surface cracking of bedrock and movement of water into fracture zones;
 - (iii) losses to the alluvium from leakage through the constrained zone to the zone of depressurisation;
 - (iv) losses to baseflow from any changes to catchment flows (i.e. loss of catchment area) for streams potentially supplying the CCWS; and
 - (v) any other potential sources of loss of water from subsidence-induced changes to either the streams or the alluvial aquifers.

These estimates must indicate whether the losses are expected to be temporary or extend beyond the life of the mine. The estimates should also have been reviewed by NOW.

- Given the sensitivity of the CCWS to drought, both temporary and permanent potential losses of baseflow are to be treated as potential impacts on the CCWS.
- Potential impacts on shallow groundwater systems be included in the performance criteria in Schedule 3 of any consent, particularly in relation to potential losses that could contribute to decreases in baseflow to streams supplying CCWS. The maximum predicted impacts of 300 ML/y should not be allowed to be exceeded unless the environmental impacts remain within existing predictions and any loss can be compensated.
- Appropriate monitoring arrangements, satisfactory to NOW, be incorporated into the conditions of any consent to ensure that all potential losses of baseflow be accounted for.

Subsidence Impacts on Privately-Owned Bores and Wells

- pre-mining testing of privately owned registered bores and wells be required to establish their performance characteristics; and
- the burden of proof that any declines in performance were not due to mining impacts rest with the Proponent.

Potential Impacts on the Central Coast Water Supply (CCWS)

- the project be required to meet a no net impact performance outcome on catchment water resources during the life of the mine;
- consideration be given to augmentation of CCWS supply by return of sufficient minewater treated to the required standards for raw water supply to compensate for estimated losses during the life of the mine;
- the principles governing this augmentation of CCWS supply be as described in section 3.3.1.4 of this review report; and

- that mining beyond LW 5N not be permitted until the mechanism to compensate for potential impacts on water availability for CCWS is operational; and
- that no compensation be required beyond mine closure for the predicted 36.5 ML/y loss provided that a review prior to mine closure confirms that the loss does not exceed 36.5 ML/y.

Potential Impacts on Water Availability for Users Other Than CCWS

- specific provision be made in the conditions of any consent to ensure that landholders whose access to surface waters is negatively affected by the project have compensatory supply provided within 24 hours and that the Proponent be responsible for restoring access as soon as practicable; and
- the Proponent bear the onus of proof in the event of a dispute over subsidence-induced impacts on surface water access.

Potential Impacts on Stream Morphology

- Before the project is submitted to the consent authority, the risks to stream morphology of interaction between significant rainfall event(s) and the interface between subsided and unsubsidised sections of a stream be assessed with a view to properly describing the risk (and quantifying it if possible), and providing a detailed assessment of the options available to deal with any such eventuality and an assessment of the capacity to implement any such options on the Project Area streams.
- That the performance criteria for stream morphology for streams in the Project Area underlain by alluvium be:
 - (i) no more than minor consequences in any part of the stream at any time; and
 - (ii) post-subsidence, stream sections be returned to a condition equivalent or better than their pre-subsided condition.
- Rigorous conditions be included in the Extraction Plan for each longwall to ensure that:
 - (i) the previous experience of impacts on stream morphology are incorporated;
 - (ii) there are appropriate triggers to warn of developing problems;
 - (iii) there is a clear response plan to prevent exceedance of the criteria; and
 - (iv) clear strategies are identified to address any exceedance that might occur despite the adaptive management requirements.

Water Quality Monitoring in Response to Subsidence Impacts

- that before extraction of longwall 6N commences a program of water quality monitoring that can differentiate subsidence-induced impacts from background variation be implemented. The program is to be developed in consultation with the Water Supply Authority, EPA and NOW and be approved by the Director-General before implementation; and
- that the program be subject to independent audit each year at least until the Director-General is satisfied that longer intervals can provide appropriate safeguards.

Porters Creek Wetland

- that a performance measure of negligible consequences should be specified for Porters Creek Wetland in any consent and that this should be supported by a monitoring regime sufficient to alert the Proponent and regulators to any change that may cause greater than negligible consequences to the wetland.

Water Monitoring Generally

- that the consent authority review water-related monitoring requirements carefully to ensure that they will provide (a) the information necessary to assess performance of the project against performance criteria in any consent and (b) also provide the information necessary to support the adaptive management requirements in Extraction Plans for individual longwalls.

Flooding

- that an Emergency Evacuation Management Plan be prepared. This plan should include clearly identified secondary access routes for those properties that will be adversely impacted by the 1% AEP flood. For those properties that do not have either a primary or secondary access route as a result of flooding, the Proponent must consult/negotiate with the individual landowners to reach a mutually agreed resolution for emergency evacuations before extraction of any longwalls that could create altered flood conditions for these properties occurs. In the situation where no agreement can be reached, either party may refer the matter to the Director-General for resolution.

Infrastructure and Improvements Impacted by Subsidence

- that before granting any consent, the consent authority satisfy itself that proposed compensation measures for subsidence-related damage to privately-owned built features will deliver a fair and reasonable outcome for affected property owners. If the consent authority cannot be satisfied that the outcomes will be fair and reasonable then the consent authority will have to consider whether the residual impacts make the project unacceptable within the terms of s79C of the Act.

Noise

- that the predicted noise levels be re-assessed for properties 57 and 58 and a condition be attached to any consent that provides for noise mitigation or acquisition for privately owned properties when noise is predicted to exceed the PSNL on more than 25 percent of privately owned land. (Note that the requirement for mitigation or acquisition should depend on the degree of exceedance of the noise criteria consistent with normal practice); and
- that a requirement for monitoring of wheel squeal noise from use of the rail loop be included in any consent and that additional mitigation measures be implemented if the noise becomes an on-going issue.

Air Impacts

- that a condition be added requiring the implementation of methane gas capture and flaring within a specified timeframe and that a proposal be developed for beneficial use of the captured gas within three years of the commencement of longwall operations and to be implemented within a timeframe as required by the Director General.

Impacts Associated with the Surface Facilities

- that the water treatment system, including the reverse osmosis and brine treatment plants be designed to meet the discharge criteria specified by the EPA; and
- that a requirement for construction of a reverse osmosis plant be inserted in 15 (c) of Schedule 3 of the proposed conditions of consent.

Aboriginal and Non-Aboriginal Heritage

- that the Heritage Management Plan included in the Department's draft recommended conditions (condition 5(k), Schedule 3) should include a trigger action response plan to manage unexpected subsidence impacts (similar to condition 21, Schedule 4); and
- that a note should be included in condition 1, Schedule 3 that any dispute in relation to impacts on Aboriginal heritage sites should be referred to the OEH for a final determination, and dispute in relation to impacts on historic sites should be referred to the Secretary of the Department of Planning and Environment for a final determination.

Estimates of Project Benefits

- that, for the purposes of assessment under cl.12AA of the Mining SEPP, the significance of the resource is limited to the creation of 300 direct jobs, royalty payments of between \$100m and \$200m and capital investment significantly less than \$800m. If this becomes crucial in the consent authority's task of assessing the project under s.79C of the Act, then the Commission recommends that the consent authority require that a new economic analysis be undertaken and subjected to external rigorous independent review before a decision is made.

Agricultural Businesses

- that the performance measures included in the Department's draft conditions of consent for built features (condition 3 Schedule 3) be amended to include a wider range of improvements relevant to agriculture that may be impacted by subsidence (e.g. those relevant to the turf farm) and that the relevance of the listed performance measures to each of the categories of other infrastructure that might be impacted by subsidence be reviewed.

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APPENDIX 1

TERMS OF REFERENCE

Request to the Planning Assessment Commission Wallahah 2 Coal Project

Section 23D of the *Environmental Planning and Assessment Act 1979*
Clauses 268R and 268V of the *Environmental Planning & Assessment Regulation 2000*

I, the Minister for Planning and Infrastructure request the Planning Assessment Commission to:

1. Carry out a review of the Wallarah 2 Coal Project, and:
 - a) consider the Department of Planning and Infrastructure's assessment report of the merits of the project;
 - b) consider the EIS for the project, the issues raised in submissions, the formal response to submissions and any other relevant information provided on the project during the course of the review;
 - c) assess the merits of the project as a whole, paying particular attention to potential water and biodiversity impacts of the project; and
 - d) recommend any further measures required to avoid, minimise, and/or manage the potential impacts of the project.
2. Conduct public hearings during the review as soon as practicable after the Department of Planning and Infrastructure provides a copy of its assessment report for the project to the Planning Assessment Commission.
3. Submit its final report on the review to the Department of Planning and Infrastructure within 6 weeks of the public hearings, unless the Director-General of the Department of Planning and Infrastructure agrees otherwise.



The Hon Brad Hazzard MP
Minister for Planning and Infrastructure

Sydney

16 JAN 2014

2014

APPENDIX 2

LIST OF SPEAKERS AT THE PUBLIC HEARING

Hearing Date: Wednesday, 2 April 2014

Venue: Wyong Golf Club

1. Wyong Shire Council - Doug Eaton, Mayor
2. Wyong Shire Council – Greg Best, Councillor
3. Wyong Shire Council - Scott Cox & Garry Casement
4. Darkinjung Local Aboriginal Land Council - Sean Gordon
5. Member for Lake Macquarie - Greg Piper, MP
6. Malcolm Brooks OAM
7. Mining and Energy Services Council of Australia - Brendan Rutherford
8. Australian Industry Group - Adrian Price
9. Anthony Kirk
10. Matthew Ross
11. Caroline Jenkinson
12. Australian Coal Alliance - Alan Hayes OAM
13. The Australia Institute - Rod Campbell
14. Central Coast Poultry Club - David Gaggin
15. Australian Coal Alliance – Prof. Philip Pells
16. Lock the Gate Alliance - Steve Phillips
17. Our Land Our Water Our Future Inc - Paul Burton
18. Alexia Martinez
19. Kate DaCosta on behalf of Heather Ingram
20. Michael A Campbell OAM
21. Wayne McCauley
22. Laurie Eyes
23. John Barrow
24. Douglas Ford
25. Ken Scales
26. Ronald Sokolowski
27. Justine Merzian
28. Gray Gerard Phelan
29. Sandra Norman
30. Paul Phillips
31. Guy Wernhard
32. Daniel Keating
33. Community Environment Network - Michael Conroy
34. Doug Williamson
35. Dr Anthony Glenn D'Cruz
36. Nature Conservation Council - Kate Smolski

APPENDIX 3

SUBMISSIONS AND PRESENTATIONS MADE AT THE PUBLIC HEARING

Copies of the submissions, together with any copies of presentations and speeches made during the public hearing that were later provided to the Commission in written form, are available on the Commission's website, <http://www.pac.nsw.gov.au>. A brief summary of the issues raised at the public hearing is provided below.

Issues	Submissions presented at the Public Hearing
Comments supporting the project	
Social and Economic	<ul style="list-style-type: none"> • The mine will provide regional employment growth and increase business confidence in the area. • Mining royalties will contribute to the NSW State Government economy. • Ability to advance and develop new technologies and increase manufacturing and production efficiencies in the Central Coast Region. • Employment opportunities for the indigenous community. • The Proponent plans to source 70% of the labour force for the construction phase locally and 25% of their machinery and equipment during construction stage within the region. • The mine provides indirect economic benefits to local businesses in the area.
Comments objecting to the project	
Water	<ul style="list-style-type: none"> • Surface and groundwater impacts not considered to be adequately assessed. • Inconsistencies identified in the EIS and data modelling and potential impacts on ground water being underestimated. • Concerns of a loss of ground water in the Gosford and Wyong LGAs. • Impacts on Central Coast water system infrastructure including 2 dams, 3 weirs, 3 water treatment plants, 50 reservoirs and more than 200 kilometres of pipeline. • Groundwater depressurisation. • Concerns regarding the Mardi-Mangrove pipeline. • Concern that water for industry and local population will be affected, lost or possibly compromised. • Potential impacts on Jilliby Jilliby Creek are underestimated: <ul style="list-style-type: none"> - gradient changes are not uniform and will lead to head cuts, bank erosion, and sediment movement; - no hard evidence presented to demonstrate that the stream will remain stable; and - mitigation and remediation options are not specified in detail.
Flooding	<ul style="list-style-type: none"> • Concerns about the risk of greater flooding. • Flooding has not been adequately addressed by the applicant.
Biodiversity	<ul style="list-style-type: none"> • Concerns about the loss of 4 endangered ecological vegetation communities, loss of threatened species and loss of 89 ha of native vegetation. The Project Area is at the intersection of two bioregions and therefore contains unusually high species richness. • Concern that biodiversity offsets proposed are not adequate. • Threatened Species – Jilliby SCA contains a significant number of threatened species that may be impacted.
Compulsory Land acquisition	<ul style="list-style-type: none"> • Concerns from The Darkinjung local Aboriginal Land Council that a development consent would result in compulsory land acquisition of their land. • Concern regarding lack of approval for use of land.

Issues	Submissions presented at the Public Hearing
Land	<ul style="list-style-type: none"> Concerns that longwall mining has historically caused huge devastation and will do so on this project. Subsidence of 2 metres or more would affect water flows and aquifers and risk toxic chemicals entering the catchment. Fear that the Proponent is unwilling to accept financial responsibility for subsidence aside from dwellings (does not include fences, etc). Concern that, as the Proponent is the final entity judging appropriate compensation for subsidence, there is a conflict of interest.
Air	<ul style="list-style-type: none"> Concern that airborne dust will cause increase morbidity. Require assurance that coal wagons, coal stockpiles are covered.
Adequacy of the assessment provided by the Proponent	<ul style="list-style-type: none"> The Environmental Impact Statement is inadequate and outdated. Questions about the data modelling and statistics are not based on actual data drawn from the area.
Social and Economic	<ul style="list-style-type: none"> The economic benefits have been significantly overstated and the disbenefits significantly understated. The economic analysis uses discredited methodology. The distributional aspects of the benefits and disbenefits have not been properly addressed. Difficulty in gauging whether all the economic benefits will be achieved. Potential for more properties to be under threat than listed. Concern that money will be going overseas instead of the local or state economy. Limited commitment to ensuring apprenticeships direct from local employment. Concerns about the social impacts on the community and displacement of residents. Loss of culturally significant places and indigenous landscape. Importance of ambience – ‘aesthetics of the Central Coast and the ambience that it creates has become a priceless commodity to generations of folk’. Fears of bushfires as the Wallarah One mine was responsible for one previously. Lack of water in dams for the rural fire services. Stress related issues over fear of potential damage to property. Health fears from coal dust. Concern that adaptive management often fails.
Climate Change	<ul style="list-style-type: none"> Concerns about the project contributing to climate change. Lack of consideration for the Precautionary Principle. Concern about sea level rises in an area that is already in the top 3 listed as most vulnerable.
Other	<ul style="list-style-type: none"> Lack of transparency from the Proponent and the Department. Demand for the PAC to prove its independence.

APPENDIX 4

SUMMARY OF MEETINGS WITH OTHERS

Meeting with Department, Friday, 7 March 2014

The purpose of this meeting was for the Department to brief the Commission about this project. The four key issues discussed in this meeting were:

- the differences between this project and the one reviewed by the previous Commission and subsequently refused by the then Minister.
 - The Department assessed this application as submitted, not to compare the current one with the previous application.
 - The two key changes are: the change of mine plans, particularly the exclusion of the western part of the site, and additional information provided on impact on water resources.
 - The current application is for approval of a 28 year project, 3 years construction and 25 years extraction operation, even though the mine layout shows a 38 year mine plan.
 - The Department agreed to provide the Commission a summary of the key differences between the current application and the previous one.
- additional lands that would be subject to flooding
 - increased risk to landowners;
 - if over 25% of a property is to be flooded as a result of the proposed mine, should right of acquisition be offered to the land owner, similar to impact from noise?
- compliance issues with the recommended performance measures for streams (80% negligible consequences and 20% minor consequences for the length of the stream that is to be affected by subsidence):
 - It is impossible to enforce the 80/20 split;
 - If the performance criteria cannot be measured, they are not acceptable;
 - adaptive management requires ability to change the mining operation so as not to exceed the performance measures.
- the impact of subsidence on dwellings
 - the time taken for the pillars to collapse and the duration of subsidence;
 - health impact (stress) on residents;
 - repair not carried out until all subsidence occurs;
 - proportion of residences that may pre-date the subsidence area declaration;
- issues of water licences
 - mining itself will take very little surface water as it will primarily use the salty coal seam water;
 - consideration of no net loss to public consumption water (town water supply);
 - water sharing plan does not distinguish active/inactive licences;
 - whether purchase of licenses can compensate for water losses under all climatic conditions.

The DGRs focused on the need for additional information that was identified in previous reviews and submissions.

Meeting with Wyong Shire Council and Lake Macquarie City Council, Tuesday, 1 April 2014

The purpose of the meeting was for the Commission to hear Council's concerns about the project.

The key issues discussed in the meeting included:

- Council had resolved not to support the application;
- Water

- Council has over \$3 billion of bulk water infrastructure in the area;
- Community is very sensitive to issues concerning water supply;
- Council considered 3 conditions that should be imposed: a \$20 million bond, stop work when monitoring results indicate impact, and establish town water supply as the priority water use over mining.
- Draft Voluntary Planning Agreement (VPA)
 - VPA was on exhibition and would be considered by Council in May/June 2014.
 - there should be direct negotiation between the Council and the Proponent for any amendment to the draft VPA;
 - No s.94 plan applies to the project. Comparatively a s.94 plan would raise about \$5 million when the VPA is likely to amount to around \$17 million. Therefore, the draft VPA meets the public benefit test.
- \$20 million bond
 - No need to draw the bond if the project performs as predicted;
 - The bond is to be held by the Council and released after the last panel.
- Stop work when negative impact detected
 - If the Proponent is confident that the project will perform as predicted, such a condition should not be an issue.
 - NSW Health issued new public health water quality criteria late last year, which apply to treated and raw water. It is therefore important that a stop work condition be included when negative monitoring results are reported. If water supply is impacted, Council will have to cart water from the Hunter to maintain supply to the community.
- Landfill facility
 - Its life expectancy is about 120 to 200 years.
 - The concern is the loss of geotechnical integrity of the facility and it is almost impossible to prove the mine caused leachate or leaking.
- Flooding
 - Reasonably comfortable with the flooding assessment;
 - Experience from Chain Valley was discussed, particularly in relation to issue of ponding.
- Wetland
 - Need to revisit the system in regard to protection as it is a significant wetland and is sensitive to change of water level;
 - Mitigation measures to protect the wetland.

Site Visit and Meeting with Proponent, Tuesday, 1 April 2014

This was a briefing meeting for the Commission to get a broad understanding of the project and the additional works that have been carried out since the last application. The issues discussed in the meeting included:

- additional studies and assessment for the current application
 - additional subsidence modelling;
 - additional groundwater monitoring, revised modelling of alluvial and bedrock groundwater systems and assessment of possible impacts associated with underground disposal of brine and salt mixture. Both modelling and impact assessment were peer reviewed;
 - surface water including the water balance model, development of a water management system, survey of upland streams, further inspections of alluvial streams, and assessment of impact of treated water discharges to Wallarah Creek
 - additional ecology survey;
 - additional heritage surveys;

- extensive agency and stakeholder consultation and negotiations with Wyong Shire Council (VPA) and Darkinjung LALC;
- key issues considered: catchment yield and water supply, water quality management, flooding, SCA sensitive feature avoidance, stream impacts, ecological offset strategy;
- air and noise impacts are within guidelines;
- project benefits include \$671 million (net present value), 800 jobs (300 direct and 500+ indirect) in the area and 1700 in NSW, and \$1.58 billion (undiscounted) taxation and royalty benefits.
- The Commission raised its concern about:
 - the potential loss of drinking water supply in view of the projected population increase. Therefore, no net loss would be the key;
 - the 80/20 rule for stream protection is unlikely to be acceptable for this project and other performance measures should be considered;
 - potential implication and impact of non-yielding pillars.

Meeting with Central Coast Water Authority (Wyong Shire Council and Gosford City Council), Monday, 28 April 2014

This meeting was held to discuss both Councils' concerns regarding potential impacts on surface water and groundwater within the catchment and the potential for impact on water supply in the future.

Issues that were discussed included:

- Security of water supply, now and into future, including any proposals to augment water supply and potential capacity constraints within the catchment, including the link between the Gosford/Wyong and Hunter systems.
- Surface water connection to the mine – mine water balance. The volume of water that is draining out of the rock strata and aquifers and entering the mine should be balanced by the volume of water that is being returned from the mine, through the treatment plants. If the water is flowing into the mine instead of into the creek system, then there will be a negative impact on base-flow in the creeks. This is not such an issue during average years; it becomes an issue during extended dry (below-average) years, when water becomes critical.
- What a nil net loss of the water resource might look like including how this could be complied with and monitored, if this approach was taken on board.
- Impacts to roads due to subsidence, which would result in Council needing to repair and possibly reconstruct sections of the road. Would the Proponent or Council be responsible for the cost of these repairs and reconstruction works? What are the potential impacts to residents becoming stranded due to inundation of roads and bridges?
- Potential impacts to stream morphology if the pillar yield design, doesn't perform as expected. What potential impact would this have on water supply within the catchment, and would this lead to relocation of streams.

Council to provide the PAC with additional information and their concerns about potential impacts on wetlands, in particular the Porter's Creek wetland, which is fed by Hue Hue Creek.

Meeting with Professor Philip Pells, Monday, 28 April 2014

This meeting was held to discuss further with Prof. Pells his views and concerns raised in submissions and at the public meeting regarding the potential for impacts on water supply to the Central Coast and also to landholders within the catchment.

Issues that were discussed included:

- Water loss from the catchment – water balance. The volume of water that is draining out of the rock strata and aquifers and entering the mine should be balanced by the volume of water that is being returned from the mine, through the treatment plants. If the water is flowing into the mine instead of into the creek system, then there will be a negative impact on base-flows in the creeks. This is not such an issue during average years; it becomes an issue during extended dry (below-average) years, when water becomes critical.
- Connective cracking of the rock strata. It is unlikely that there will be connective cracking from the mine to the surface, though there will be a cracking zone. Due to the depth of the mine, these cracks will not propagate to the surface.
- Draw down of bores – diagram provided – the draw-down of bores is potentially significant.
- Adaptive management guidelines – the performance criteria should be set and monitoring requirements should ensure that impacts approaching the criteria can be detected. When detected, this must lead to changes/adaptations to the mining plans. Adaptive management is not changing the performance criteria to allow the development to continue.
- Mine subsidence – vertical subsidence isn't generally a problem, so long as the subsidence is uniform. Problems arise with non-uniform subsidence across a building or property, such that distortion occurs. The Mine Subsidence Act only covers improvements to the property, and not the land itself.

Meeting with NSW Office of Water, Tuesday, 29 April 2014

The purpose of this meeting was to seek further clarification from NOW on the topics included in the Commission's letter to NOW of 14 April 2014:

- Duration of the direct impact of subsidence on the alluvium and the loss of baseflow to the streams contributing to the Central Coast Water Supply (CCWS).
- If duration depends in part of the effective sealing of fractures beneath the alluvium, what evidence does NOW have that would convince the Commission that there would not be a continuing impact?
- How will the purchase of irrigation (or similar) licences result in no loss for the GWWSS in extended periods of drought?
- Is NOW able to prioritise access to water allocations under the WSP in times of drought? If so, how does it classify (a) the loss of baseflow from subsidence, (b) the operational requirements for the mine in comparison to priorities for agricultural and domestic purposes and the CCWS offtake?
- Does NOW agree that any potential loss from the catchment could be significant given the recent history of water restrictions in the Central Coast, the fact that these water restrictions were in force in a period that was well below the severity of some earlier droughts, and the projected increases in population to be supplied by the CCWS?
- In the context of the possible impacts of the zone of depressurization on groundwater, can NOW indicate whether it accepts the drawdown figures indicated on Professor Pell's diagrams showing hypothetical bores at year 0 and year 20 of mining? If not, why not?
- Does NOW accept that Department's proposition that there will be no impact of the zone of depressurization of the mine on the baseflow to the streams supplying the CCWS?

NOW pointed out that there is no single mitigation measure for addressing potential impacts on water; several different mitigating measures will be required. NOW agreed that licences could not compensate for losses from subsidence impacts during periods of very low flow

Baseflow – there is likely to be a loss of baseflow, as water is likely to permeate through the rock and alluvial material and enter fractures within the strata. However, it is hard to predict how much water

will be lost. During low flow periods, this reduction in baseflow may result in dry creek sections; this is likely to be a finite process, with duration similar to that of the duration of mining.

Depressurisation zone – most of the water that will be entering the mine will be coming out of the rock strata and coal due to depressurisation. It will come from various locations and could be moving vertically and laterally. It may even come from rock strata under the sea floor.

Central Coast water supply – there have been changes to the water supply system, including operational and infrastructure changes. At some point in the future the water supply will need to be augmented to provide water for the projected increased population of the Central Coast.

Groundwater impacts and GDE'S – every mine does have a zone of impact around it, which can be large. They may be a reduction in pressure, due to mining, but not necessarily a reduction in the level of the water table. To identify the worst case scenario; NOW sought additional information regarding the vertical hydraulic connectivity. The modelled output was accepted by NOW.

Meeting with Proponent and Proponent's experts, Tuesday, 29 April 2014

The purpose of this meeting was to seek further clarification on the following topics:

- Water Supply – the potential impact on Central Coast water supplies
- Impacts on Jilliby Jilliby Creek and Little Jilliby Jilliby Creek - impacts associated with subsidence; water quality and performance measures to measure and mitigate the impacts of subsidence
- Flooding:
 - Uncertainties associated with the use of a yielding pillar mine design – what happens if the pillars do not yield as predicted? What are the potential consequences compared to those predicted?
 - How many properties may be affected by flooding that would have been suitable for development (e.g. subdivision)?
 - What proposals exist for assessment and compensation for impacts on enterprises such as the turf farm?
- Subsidence:
 - Yielding pillar approach in this mine design has not been attempted in this area previously. The Commission wished to understand:
 - Potential impacts on stream morphology and flow characteristics arising from changes in gradient greater or less than those predicted
 - Potential impacts on built infrastructure
 - Timeframes for reaching surface stability
 - Expected period from initial impact on a feature of built infrastructure to final stability may be affected by the yielding pillar design. Can the Proponent provide estimates of this period of impact for the proposed mining method including the upper bounds.
 - Buttonderry WMF, Council has advised this is valued at \$1.3bn and will be very difficult to repair/remediate if it is impacted by subsidence.

The Proponent provided the Commission with a presentation covering these questions.

The presentation outlined the following:

Water Supply

- There will be no impact on water supply infrastructure. Potable water supply requirements will be sourced from the town water supply and not directly from the catchment.

- Groundwater inflow of up to 25 ML/day is likely to enter the mine from storage in the coal and adjacent strata.
- Increased water storage within the alluvium material will vary with the migrating longwall panels, and will be returned to the system when adjacent panels are subsided.

Yielding Pillars

- This technique has not been used in mines in NSW. However, with the deeper depths at Wallarah, they do not expect the pillars not to yield.
- Vertical subsidence is about 1.5m, the difference between the peaks and troughs is approx. 300mm, this is within the natural variation in topography of the floodplain.
- Duration of impact of subsidence is likely to be in the range of 2-3 weeks, with 2 episodes of impact over about 12 months.
- Buttonderry WMF is outside the predicted subsidence area.

Impact on Streams (Jilliby Jilliby Creek and Little Jilliby Jilliby Creek)

- These streams are very dynamic due to hydrological and geomorphological processes. It would be difficult to identify changes that are actually caused by subsidence from those that are due to natural processes.
- Intervention may not be essential to prevent impacts on stream health and mechanical remediation of minor impacts is probably counter-productive.
- Subsidence impacts will be monitored pre- and post-subsidence to determine mitigation measures as required.

Flooding

- Less flooding (modelled sensitivity analysis) if all pillars fail to yield.
- Flood depth will vary across the floodplain for a non-yielding pillar.
- All 10 properties which have greater flooding impacts, are not eligible for subdivision (the property size is below the threshold).
- The turf farm will have a slight increase in flood depth and duration for all floods, along with the extent of the flood and the frequency of flooding.

Emergency Access

- There are 2 low points along the primary access (Jilliby Rd) for many properties.
- Inundation duration will be increased an additional 13 hours.
- This access is already cut during flooding events.
- Secondary access routes are unaffected by subsidence.

The Proponent also provided the Commission with a formal response to these issues on the 2 May 2014.

Meeting with Proponent, Friday, 30 May 2014

Purpose of the meeting was for the Commission to outline the assessment process following submission of the review report and to outline the findings and recommendations.

- Procedures after submission of the review report:
 - the Commission report, including findings and recommendations, would be forwarded to the Minister and Acting Secretary for their consideration;
 - the Department will consider the Commission's report before finalising its assessment;

- the current Ministerial direction provides that the application be referred back to the Commission for determination;
- under the Act the consent authority is required to consider the findings and recommendations of this review in making its decision; and
- a new Commission will be formed to determine the application.
- Commission's findings and recommendations discussed included:
 - that the recommendation that the project should be allowed to proceed is based on the assumption that the Commission's recommendations will be adopted;
 - that the inherent uncertainty of subsidence impact predictions requires a rigorous adaptive management approach. Two formal reviews are required, the first review to be carried out after the 5th LW and the 2nd review after the 9th LW;
 - that the burden of proof that impacts are not caused by mining lies with the Proponent;
 - that the Proponent's economic assessment was of poor quality and that the estimated project benefits should be significantly reduced for the purposes of further assessment; and
 - the Commission briefly outlined the findings and recommendations considered to be of major importance such as those related to the Central Coast Water Supply, stream morphology, water quality, flooding and economic impact.
- The competing views as to where the discharge point for the return of mine water into the water supply system should be located were discussed.
- The Proponent was advised that a late (30 May 2014) request by Wyong Shire Council for a condition to protect the local road network was too late for the Commission's consideration and would be referred to the Department for consideration in its final assessment.