Agency Advice on Environmental Assessment Report

February – May 2013

NSW DEPARTMENT OF
PRIMARY INDUSTRIES

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2004/04671
OUT13/5542

Major Projects Assessment
Department of Planning and Infrastructure
PO Box 39
SYDNEY NSW 2001

PCU042360

Attention: Alison O'Reilly

8 March 2013

Dear Ms O'Reilly,

RE: NRE No1 Colliery Underground Expansion Project

You requested a written submission from NSW Department of Primary Industries on the NRE No1 Colliery Underground Expansion Project.

You are advised that Agriculture NSW has no comments to provide on the project as the development does not impact on agricultural land.

Your sincerely,

Wendy Goodburn
Resource Management Officer (Land Use)

NSW GOVERNMENT | Department of Primary Industries

OUT13/11627

23 MAY 2013

Mr Clay Preshaw
Mining and Industry Projects
NSW Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Clay.Preshaw@planning.nsw.gov.au

Dear Mr Preshaw,

NRE No.1 Colliery Underground Expansion Project (MP 09_0013)
Response to exhibition of Environmental Assessment

I refer to your letter dated 14 February 2013 to the NSW Office of Water, a division within the Department of Primary Industries (DPI), in respect to the above matter. It is advised that this application is also of relevance to Fisheries NSW.

Comment by Fisheries NSW
Fisheries NSW is responsible for ensuring that fish stocks are conserved and that there is no net loss of key fish habitats upon which they depend. To achieve this, Fisheries NSW ensures that developments comply with the requirements of the *Fisheries Management Act 1994* (namely the aquatic habitat protection and threatened species provisions in Parts 7 and 7A of the Act, respectively), and the associated *Policy and Guidelines for Aquatic Habitat Management and Fish Conservation (1999).* In addition, Fisheries NSW is responsible for ensuring the sustainable management of commercial and recreational fishing in NSW.

In this regard, Fisheries NSW advise the proposal generates significant issues in relation to subsidence impacts on Cataract Creek, which is potentially a critical spawning habitat for Macquarie perch, a threatened fish species listed as endangered under both the *Fisheries Management Act 1994* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

Detailed advices are provided in Attachment A.

For further information please contact Bill Talbot, Director, Aquaculture, Conservation and Marine Parks (Port Stephens office) on 4916 3854, or at: bill.talbot@dpi.nsw.gov.au.

Comment by NSW Office of Water

The NSW Office of Water advises that substantial issues remain in respect to the project requiring further consideration by the proponent. On this basis, recommended conditions of approval have not been included. Key issues are raised below and detailed comments are provided in Attachment B.

(i) The NSW Office of Water requests additional assessment of the potential for the proposed mining to induce connections to surface water systems. This assessment should quantify the potential volumes of water take in the surface water system and the associated impacts to upland swamps, local creeks and Cataract Dam. Impacts and water take requirements need to be addressed both during mining operations and post closure with comprehensive consideration of mitigating measures.

(ii) Assessment of potential impacts against the requirements of the NSW Aquifer Interference Policy have not been addressed within the Environmental Assessment.

(iii) Updating of the groundwater model is requested.

(iv) A review of the existing subsidence information against performance criteria for Longwalls 4 and 5 is requested.

(v) The proponent currently has a licensed water entitlement of 365ML/yr within the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011*. Any groundwater interception in addition to this annual volume will require the proponent to obtain additional water licence entitlement.

(vi) The proponent should be required to demonstrate the ability to obtain the required licensed water entitlements within the relevant surface water and groundwater sources impacted by the project. The Office of Water advises that any potential requirement for licensed entitlement within water sources designated for Sydney's water supply may create significant limitations for the project.

For further information please contact Hemantha Desilva (Newcastle office) on 4904 2525, or at: hemantha.desilva@water.nsw.gov.au.

Comment by Agriculture NSW

It is noted that Agriculture NSW has responded by separate letter dated 8 March 2013.

For further information please contact Wendy Goodburn, Resource Management Officer (Goulburn office) on 4828 6635, or: Wendy.Goodburn@industry.nsw.gov.au.

Future referrals

To assist DPI in making a coordinated response on this application future referrals should be made to: landuse.enquiries@industry.nsw.gov.au. Internal referral will then be made to the Office of Water and Fisheries NSW as the relevant DPI agencies for this matter.

Yours sincerely

Phil Anquetil
Executive Director Business Services

Attachment A

NRE No.1 Colliery Underground Expansion Project (MP 09_0013)
Response to exhibition of Environmental Assessment

Comment by Fisheries NSW

Fisheries NSW has significant concerns about the potential impacts of the proposed longwalls on the aquatic habitats and associated fisheries in the streams overlying the mine. In particular, concerned is raised about potential impacts in the Wonga East area with proposed multi-seam mining and the uncertainty over potential subsidence that may occur, particularly after the predictions for Longwalls 4 and 5 were so underestimated.

Fisheries NSW is not convinced from the information provided that an adaptive management plan to stop mining, if subsidence under Cataract Creek reaches 250 mm, will be enough to prevent potential catastrophic collapse (potential pillar run or 'unforseen' collapse) or that monitoring can be intense enough to detect subsidence at that level before excessive subsidence, and harm, has occurred. Fisheries NSW is also not convinced from the information provided and previous experience that any remediation can be carried out effectively to repair any damage that may occur in Cataract Creek.

The fish surveys carried out in the Cataract Creek clearly identify the presence of Macquarie Perch, a threatened fish species listed as endangered under both the NSW *Fisheries Management Act 1994* (FM Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), in Cataract Creek upstream as far as the rock bar over Longwalls A2 LWO8 and A2 LW07. This species was detected using targeted surveys for Macquarie Perch that were curtailed at a rock bar that was determined as a blockage to fish passage. However, all of the rock bars from CC5 to CC9 were noted as being less than 0.5 metres high, which have a reasonable chance of drowning out in a flood or high flow event. Further information is required on the potential for fish passage of this species within this waterway and associated potential habitat extent for Macquarie Perch in order to assess the potential impact from allowing mining under this stream at Longwalls 06-09 on this species and its habitat.

Macquarie Perch lay their eggs in gravel beds in riffle areas of the stream. The eggs sit between the gravel and are well oxygenated by the flowing water. The potential impacts from subsidence, changes in slope, bed cracking, reduction in pool levels and flows over riffles and production of heavy iron floc that will smother the eggs are potentially significant enough to cause a loss of breeding opportunities for the species, and as such, the Fisheries NSW objects to any longwall mining of LW07 and 08 under Cataract Creek (despite the creek not being identified as a Stream of Special Significance Fig. 19.1).

Trout Cod (listed as endangered under both the FM Act and EPBC Act) and Murray Cod (listed as vulnerable under the EPBC Act) are known to utilise the creek at its lower end, both by adult and juveniles. It is possible that the juveniles move further upstream to avoid adult predators, however lack of sampling makes this difficult to assess. No assessment of the impacts on these species has been carried out.

The potential presence of the endangered Adams Emerald dragonfly (listed under the FM Act) is based on a desktop assessment and collections of macro-invertebrates via standard macro-invertebrate assessment methods. These dragonflies are not a common species and generally require targeted surveys by suitably qualified experts to determine if they are present. The lack of such a targeted survey is of a concern to Fisheries NSW and therefore precludes Fisheries NSW from supporting mining that may affect the streams that may support these species.

Fisheries NSW also has concerns with mining under the upland swamps due to the potential impacts on water quality and quantity as these swamps are critical to the supply of water to the downstream watercourses and aquatic habitats which contain threatened fish species.

Recommended General Terms of Approval.

Should the application be approved, it is recommended it be on the following basis:

1. Due to the potential impacts on threatened fish species, Macquarie Perch, Trout Cod and Murray Cod and their associated habitats, which include breeding habitats, the mine plan shall preclude any longwall mining of LW07 and 08 under Cataract Creek.

2. Monitoring of Cataract Creek shall be carried out weekly to determine the amount of iron floc that is developing and measures implemented to ensure that during the potential spawning period for Macquarie Perch (late spring at water temperatures of 15 to 16 °C), the floc does not smother gravel riffle zones.

3. Targeted monitoring of Macquarie Perch, Trout Cod and Murray Cod should be carried out in Cataract Creek to determine if there is any measurable impact on the fish population through the life of the mining at Wonga East and, if an impact is detected, until population recovers to pre mining conditions. The monitoring program design is to be developed in consultation with Fisheries NSW research scientists.

4. The mine plan in Wonga West is to be modified so the 20 mm subsidence boundary should not approach closer than the top of bank of the stream in Lizard Creek and Wallandoola Creek due to the potential presence of the endangered Adams Emerald Dragonfly species.

5. Mining under swamps of significance should be avoided, particularly CCUS5 in Wonga East. Monitoring of water levels in the swamp are to be monitored and if water loss becomes apparent mining should cease, particularly Longwall 07.

6. Gujarat NRE must comply with the Statement of Commitments in relation to SMP monitoring and actions in relation to Aquatic Ecology.

End Attachment A

Attachment B

NRE No.1 Colliery Underground Expansion Project (MP 09_0013)
Response to exhibition of Environmental Assessment

Comment by NSW Office of Water

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1. *Water Management Act 2000* and Water Sharing Plans

The *Water Management Act 2000* (WMA) governs sustainable and integrated management of water sources across the State. Sections 5.5.5 and 5.8.4 of the Environmental Assessment (EA) states Gujarat NRE has applied to NOW for a water licence in January 2009 for an entitlement of 365 Ml/yr. The EA states that there will have to be a modification to this application for an entitlement of 1131 Ml/yr. A licence application under the *Water Act 1912* was issued on 29 January 2013 for 365ML/yr. Any groundwater interception in addition to this annual volume will require the proponent to obtain the necessary water licence entitlement within the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011*.

An assessment of the potential for mining to induce connections with surface water systems and the associated volumes and impacts has not been provided within the EA. This is discussed further below and the proponent will be required to hold sufficient licensed entitlement within the surface water source to account for this water take. The *Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011* is relevant to the surface water system.

The NSW Office of Water can give no assurance that the required entitlement may be available to account for the take of water from the water sources governed under the two Water Sharing plans. The ability to obtain the required water licence entitlement needs to be considered within the EA. The ability to take water lawfully remains a commercial risk to the applicant, and must be resolved prior to any operation extending from the current limit of mining operations.

A dealing would be required to facilitate any trade of water to account for additional water take at the NRE site. Dealings may be conducted only in accordance with water management principles of the *Water Management Act 2000*, the *NSW Access Licence Dealings Principles Order 2004* and relevant rules of the two relevant Water Sharing plans.

2. NSW Aquifer Interference Policy

The EA identifies the application of the *NSW Aquifer Interference Policy* (NSW Department of Primary Industries, 2012) to the project and the need for the proportional contributions from different water sources to be covered by access licences. However, there appears to be a reliance on the lodged licence to be modified to authorise the take of water from the mine workings.

Considerations in relation to the *NSW Aquifer Interference Policy* require clarification. Specifically, it is recommended that the following requirements need to be met by the proponent:

- the impacts of the expansion project as assessed against the minimal impact considerations set out in section 3.2.1 of the Aquifer Interference Policy.
- the responsibilities for holding licences in section 2.1 of the Aquifer Interference Policy.
- water balances for the current mine operations and ongoing for the expansion project need to be developed and routinely and frequently updated to demonstrate actual water take from water sources and to confirm that the volumes attached to the respective authorisations are appropriate.

3. Technical Assessments

Technical assessments for stream assessment, surface water modelling, aquatic ecology, subsidence, water management and Pell's independent review are the same documents submitted for the previous application for Longwalls 4 and 5 and for the original proposal for the NRE extension which was withdrawn in 2010. Previous inadequacies appear not to have been addressed.

4. Surface Water Assessment

The following comments relate to site specific issues for Wonga East and Wonga West longwall domains, as they apply to surface water sources located within the Upper Nepean River Tributary Headwaters Management Zone of the Upper Nepean and Upstream Warragamba Water Source.

4.1 Wonga East

The interaction of surface and ground water in connection along Cataract Creek and the inflow to Cataract Dam does not appear to have been addressed in the EA. A presumption that the Bald Hill Claystone forms an effective aquaclude is not supported by evidence from the limited groundwater monitoring in the Bulgo and Hawkesbury sandstones which are separated by the Bald Hill Claystone member.

Further it is understood Cataract Creek has eroded the Bald Hill Claystone below Mt Ousley Road and is channelised into the Bulgo Sandstone, forming an interactive recharge/discharge relationship between surface and shallow ground waters. This does not appear to have been considered in the EA.

The proposed direct undermining of Cataract Creek does not consider either direct impacts or indirect impacts to continuity of water flows and supply to Cataract Dam. Direct impacts in this instance may include both induced connective fracture propagation from the Wongawilli Seam through the Bulli and Balgownie Seams to the base of Cataract Creek, or activation of geological structure(s) which may form conduit drainage from the watercourse into the fracture zone induced by mining subsidence. Indirect impacts may include activation of ferruginous springs, enhanced draw from Lake Cataract into the existing fractured geology to the east of the storage, or diversion of groundwater contributions to stream flows into the fracture zone associated with the combined goaves of the Balgownie and Bulli Seams to the proposed Wongawilli Seam.

As this is not quantified to a standard which is acceptable to the Office of Water, no recommendation as to conditions of approval to undermine Cataract Creek is provided. The Office of Water recommends that approval to undermining Cataract Creek is not considered while the above issues are not resolved and the recommendations of the NSW Government Strategic Review into the Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield have not been fully adopted by the applicant.

4.2 Wonga West

The EA acknowledges the long term consequences of mining subsidence damage to rock bars on Lizard Creek, including long term loss of low to minimum flows and increased ferruginous spring seepage into the water course. However, the EA fails to consider the cumulative and incremental consequences of additional mining-induced subsidence which may occur as a result of the proposal.

The EA fails to incorporate additional subsidence assessment information to the preliminary EA provided for review in mid 2011. This failure creates significant difficulties in understanding the likely interaction between mine subsidence in the Wongawilli Seam and overlying mining subsidence zones. Although it may be presumed remnant pillars have 'crushed out' due to goafing, no information is presented to confirm whether additional subsidence to that which is predicted to occur from the Wongawilli Seam is anticipated.

The decline from plateau upland wetlands along the structurally controlled alignments of the watercourses to the waterfalls and cascades into the Wallandoola and Lizard Gorges is likely to experience variations in subsidence expression, including possibly significant valley closure below the Lizard Creek waterfall and the Wallandoola cascade zone upstream of the Wallandoola Creek waterfall. This does not appear to be recognised in the EA, and cannot be assessed as part of the review of likely impacts and consequences to the water sources which are proposed to be subsided should the proposal be approved.

The variation in fluvial development in Lizard and Wallandoola Creeks, including the incised gorge river style in which these watercourses are formed adjacent to and north of the Wonga West mining domain, is not properly considered in the EA. This is a significant issue in terms of loss of groundwater contribution to minimum stream flows in both watercourses. As noted above, Lizard Creek demonstrates significant reductions in minimum to low flows over previously mined areas in the Bulli and Balgownie Seams. Further subsidence impacts are expected to lead to further incremental loss of flow whilst at the same time increasing ferruginous releases into both watercourses, leading to downstream water quality impacts in the surface water sources.

5. Groundwater Assessment

The groundwater assessment has had some modifications made to the report which was prepared for the withdrawn extension proposal. However:

- the assessment has not been updated to include data from the new bores installed in May 2012, or updated data from the previous bores.
- bore logs are also requested to assist in interpreting the assessment, and the water level and quality data provided is limited.
- there is a need for baseline data to incorporate sufficient temporal and spatial variation to adequately characterise the groundwater system. This analysis aids in understanding the environment pre-mining to allow for impacts to be detected.
- no surface/groundwater connectivity assessment has been undertaken.

The updated Water Management Plan has not been included. The site-water balance is within the water management section, and does not include all the take for groundwater associated with the mining operation or the amount of groundwater required for use on site.

The Office of Water notes that the EA addresses the requirement for the development of trigger levels for water level and quality in groundwater and surface water. The Office of Water agrees that a change of 10% in water level as a trigger level, however the proposed data period for comparison of the previous 12 months of water level monitoring prior to each long wall being mined is considered inadequate. This is due to the potential for impacts from adjacent long wall mining to have already influenced the water levels.

The proposed criteria for water quality for either irrigation water quality criteria or >10% variation in levels/concentration compared to the previous 12 months data is considered inadequate. Not all analytes have been taken into account for these trigger levels, especially since dissolved iron is known to cause significant impacts in the southern coal field.

No subsidence information and performance of the current criteria for Longwalls 4 and 5 have been provided (an approval requirement from the PAC approval and current SMP approval). It is therefore recommended this be provided to assist in assessing the proposal. This should include:

- maximum actual subsidence, for both initial; and incremental levels.
- proportional and total maximum subsidence from the Wongawilli, Bulli and Balgownie Seam workings.
- hogging and sagging curvature, and measured strains (both tensile and compressive).
- identification of location and severity of surface cracking, and any loss of water from upland swamps and/or surface water sources into fractured zones.
- any activation of geological structures resulting from conventional or far field subsidence effects.

The groundwater model has not been updated to include the new data and the same deficiencies/limitations have been provided to justify the simplifications and assumptions that have been made due to the lack of data. An assumption has also been made that the Bald Hill Claystone is intact which assumes that limited draw-down will occur from the shallow aquifers. Mining has occurred previously in the Balgownie and Bulli seams and thus the claystone may not be intact. This requires further justification, and review of the reach of Cataract Creek which is developed through the Bald Hill Claystone into the Bulgo Sandstone member.

Adaptive management is referred to in the EA in terms of what may trigger an adaptive management plan to be developed. However no detail has been provided on what that plan may involve, as required by Section 3.2 of the Aquifer Interference Policy. This should be included in the EA, to allow proper review of the risks and feasibility of response options raised by the applicant.

The Office of Water considers assessment of environmental impacts and long term consequences of those impacts to water sources administered under the two Water Sharing plans should not depend upon further assessment via management plans post-approval. Assessment of the likelihood and severity of those risks, and identification of potential and feasible management and mitigation and rehabilitation options to those risks should be clearly developed in the EA. These have not been provided to a suitable level of clarity and coherence.

6. Conclusion

The Office of Water recommends that the proponent be required to meet the assessment requirements outlined above prior to permitting any mining-induced subsidence, so that appropriate conditions to adequately protect water dependent assets can be developed.

Should the applicant provide supplementary information upon which an informed assessment against the Aquifer Interference Policy can be completed, the Office of Water will review this information and provide updated advice.

End Attachment B

NSW GOVERNMENT Resources & Energy

OUT13/10462

Mr Clay Preshaw
Senior Planner
Mining and Industry Projects
Department of Planning & Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Mr Preshaw

Environmental Assessment
Supplementary Subsidence Comments
NRE No 1 Colliery - Underground Expansion Project (MP09_0013)

I refer to comments made in letter dated 5 April 2013 (by the Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy (DRE) (our reference OUT13/7584) concerning the activities proposed for the *NRE No 1 Colliery Underground Expansion Project.*

The following comments represent DRE's supplementary response concerning this proposal and are relevant only to issues of mine subsidence that may arise due to:

- Proposed longwalls in Wonga West, and
- Proposed longwalls in Wonga East.

1. PROPOSED LONGWALLS IN WONGA WEST

1.1 Subsidence Prediction

The proposed longwalls are located under the previously extracted 200s and 300s longwalls at the subject site.

It is assessed that the Applicant has underestimated the subsidence that may arise from the proposed longwalls in Wonga West. This assessment has been made based on the results of substantial investigations (into multi-seam longwall subsidence) by DRE.

The Applicant should be required to revise the subsidence prediction.

1.2 Subsidence Impact Assessment

The Applicant should also be required to up-date the impact assessments for all surface and sub-surface features, based on the results of the aforementioned revised subsidence prediction. When undertaking the revised impact assessment, specific attention by the Applicant should be paid to:

Department of Trade & Investment, Regional Infrastructure & Services
Division of Resources and Energy
PO Box 344 Hunter Region Mail Centre NSW 2310
516 High St Maitland NSW 2323
Tel: 02 4931 6666 Fax: 02 4931 6776 www.industry.nsw.gov.au
ABN 72 189 919 072

- The effects of cumulative subsidence due to the extraction of the overlying extracted longwalls and the proposed longwalls, and

- The high level of subsidence expected for the subject site, which has not been experienced in the Southern Coalfield to-date. This creates a new challenge and associated uncertainties. It follows that any subsidence issues/impacts that may arise due to such high level subsidence in this environment should be specifically identified and assessed, for example, any significant waterfalls or rock pools in the nearby streams, any drainage pattern changes and the resulting erosional impacts on the land or swamps within the Sydney Catchment Authority Catchment Area or any impacts on the shallow aquifers supporting the swamps or other natural features.

2. PROPOSED LONGWALLS IN WONGA EAST

2.1 Site Characteristics

The subject site is characterised by:

(1) Complicated site conditions due to the presence of two overlying old mine workings, i.e. the Balgownie Longwall Workings and, importantly, the Bulli Pillar Workings, and

(2) Presence of significant surface features in proximity to a major population centre, i.e. Wollongong. It follows that a high quality standard should be applied in dealing with this mining application considering the potential consequences if any of the significant surface features are adversely affected by mine subsidence. The following is a list of the surface and sub-surface features that may be affected by subsidence due to the proposed mining. This list is indicative only as the Project Application does not contain an adequate description of the surface features within the footprint of Bulli Pillar Workings.

- Sydney Catchment Authority's Special Catchment Area;
- Cataract River and associated tributaries;
- Cataract Creek and associated tributaries;
- Swamps;
- Archaeological sites;
- Groundwater;
- The Illawarra Escarpment (in public view from Wollongong);
- DSC (Dams Safety Committee) Notification Area, i.e. Cataract Reservoir and associated structures;
- Transmission lines (330kV, 132 kV and 33kV) and associated structures. The angled towers, which are part of the two major transmission lines (330kV, 132 kV), may present significant difficulties as the known mitigation measures may not be effective to protect this kind of structure from mine subsidence;
- Mount Ousley Road and associated structures, which is a heavily used public road, and
- An overbridge above the Mount Ousley Road.

2.2 The Key Risks

DRE suggests that it is not possible, nor practical, to attempt the same level of clarity or confidence in predicting mine subsidence caused by multi-seam mining as that by

single-seam mining. This is especially the case when involving pillar extraction by dated hand-mining techniques, such as the present case where the Bulli Seam was extracted by mining methods such as Welsh boards, pillar splitting or quartering, etc.

There is thus a need to prioritise the tasks of assessment for the purpose of focusing on the key risks at the subject site.

Considering the nature of the Bulli Pillar Workings created by the above-mentioned hand-mining techniques, the following two key risks need to be addressed by the Applicant, when the subject site is further under-mined by the proposed Longwalls in Wonga East:

- The development of irregular subsidence profiles, which often leads to concentrations of surface deformations and adverse subsidence impacts on the surface features within the affected areas, and

- Pillar runs, i.e. propagation of instability and/or re-working of the old Bulli Pillar Workings beyond the normal limit of mine subsidence. Note that this definition differs from what is normally considered as pillar runs for underground safety. In the context of mine subsidence, pillar runs do not have to be a catastrophic event as being assessed by the Applicant.

Both kinds of risks represent the most difficult and challenging tasks in subsidence engineering/management, due to the high level of uncertainties in predicting (and planning management for) subsidence in terms of its nature/magnitude, extent/location and timing of occurrences.

2.3 The Key Technical Issues

By reference to the previous cases (in NSW) involving old pillar workings under significant surface features, both the prediction of mine subsidence and the management of the aforementioned two key risks rely critically on the understanding of:

A. **The Mine Layout of Bulli Pillar Workings**. Considering the above-mentioned hand-mining techniques and time of mining, there is a need to confirm the assumption used by the Applicant that the currently available Bulli Pillar Workings mine layout is correct. Evidence collected during assessment conducted by DRE's Principle Subsidence Engineer suggests that certain significant coal barriers as marked on the historical mine plan actually do not exist, and

B. **The Current Conditions of the Bulli Pillar Workings**, in particular, the existence, nature, geometry, distribution and stability of any significant voids and/or standing pillars/remnants within the Bulli Pillar Workings.

If the above two key technical issues are not addressed by the Applicant, the uncertainties related to the nature/magnitude, extent/location and timing of subsidence development in Wonga East will be high.

2.4 Subsidence Prediction

- As a general comment, it is assessed that the Applicant has underestimated the subsidence that may arise from the proposed longwalls in Wonga East;

- In particular, there is a high level of uncertainty about the predictions made for important surface features in Wonga East (e.g. Cataract Creek), due to a lack of site-specific investigations into the two key technical issues listed above;

- Risk of irregular subsidence development above the Bulli Pillar Workings is not considered in the Applicant's subsidence prediction. The Applicant should be required to address this risk considering the nature of Bulli Pillar Workings, and the recently observed severe surface deformations above the extracted Longwall 4, and

- Risk of pillar run within the Bulli Pillar Workings is not adequately considered in the Applicant's subsidence prediction. Despite the occurrences of mining-induced fractures well outside the normal limit of mine subsidence which were observed during the extraction of Longwall 4, no significant impacts of pillar run were observed during the extraction of Longwalls 4 and 5. This observation does suggest that risk of pillar run in areas with conditions similar to those of Longwalls 4 and 5 should be low. However, without site-specific investigations into the two identified key technical issues, the same conclusion can't be drawn for surface areas outside the footprint of Balgownie Longwalls at the subject site or for areas with conditions that are distinctly different from those of Longwalls 4 and 5. None of these cases have been adequately investigated by the Applicant.

In summary, the Applicant should be required to revise the subsidence prediction and to up-date the subsidence impact assessment based on the revised subsidence prediction.

For the important surface features within the Wonga East, the prediction should be made taking into consideration the results of site-specific investigations into the identified two key technical issues. If these investigations are practically not possible, the Applicant should be required to present an argument on how to adequately manage the high level of uncertainties related to the nature/magnitude, extent/location and timing of subsidence development in Wonga East.

2.5 Feasibility of Proposed Longwalls 1 to 3 in Wonga East

The feasibility to mine the proposed Longwalls 1 to 3 needs to be critically considered by the Applicant for the following reasons:

- Assessment by DRE suggests that Bulli Pillar Workings in the subject area may have been affected by only limited deformation/disturbances when these workings were undermined by the Balgownie Longwalls. It follows that the subject area may have a higher potential for the development of pillar runs (i.e. instability or re-working of the pillar workings), and

- There are critical surface features in the subject area, which may not be feasible to manage if affected by mine subsidence. These features include but are not limited to:

- Angled high voltage transmission towers, which are part of two major transmission lines (330kV, 132 kV) above the longwalls. Note that there are currently no established mitigation measures for the protection of this kind of structure from mine subsidence;

- The Illawarra Escarpment. The section of the Escarpment near Wollongong is known to have been affected by existing landslides. The risk to the stability of the Escarpment should be specifically assessed by the Applicant by considering i) subsidence or pillar run that may be caused by the proposed Longwalls 1 to 3, ii) the existing conditions of the relevant section of the Escarpment, in particular, any existing landslides and iii) any other relevant risk factors, and

- Mount Ousley Road. While it may be feasible to find relevant engineering measures to manage subsidence risks to roads, the proximity of this section of road to Wollongong suggests a need for specific consideration of potential community outrages if this heavily used public road is adversely affected by subsidence / pillar run caused by the extraction of the proposed Longwalls 1 to 3.

In summary, the Applicant should be required to undertake site specific investigations into the key technical issues as listed in Section 3.4 above, as well as any other relevant factors, to establish the feasibility to mine the proposed Longwalls 1 to 3.

Yours sincerely

2/5/13

for Adrian Delany
Acting Director, Industry Coordination

NSW GOVERNMENT Resources & Energy

OUT13/7584

Mr Clay Preshaw
Senior Planner
Mining and Industry Projects
Department of Planning & Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Mr Preshaw

Environmental Assessment
NRE No 1 Colliery - Underground Expansion Project (MP09_0013)

I refer to your letter dated 14 February 2013 inviting comments, including advice on recommended conditions of approval, from the Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy (DRE) concerning the activities proposed for the *NRE No 1 Colliery Underground Expansion Project.*

A review of the Environmental Assessment (EA) for this proposal has been undertaken covering the areas for which DRE has legislative responsibilities with regards to mine closure and rehabilitation.

DRE provides the following comments:

- *On the identification of post mining land use options* – the EA identifies planning instruments but does not outline land use options and associated constraints.

- *On the issue to define the project's rehabilitation objectives* – the EA relies on repeating the 'ANZMEC strategic Framework for Mine Closure' objectives. There is a need for the proponent to provide objectives relating specially to this project.

- *On the topic to outline general rehabilitation methods and procedures* – the EA does not provide rehabilitation methods and completion criteria. No information on conceptual shaft and adit sealing methods has been provided in the EA, which was a requirement by DRE.

- *Requirement for conceptual final landform design* – the EA states that landform design will not change upon closure of the mine. However, the final landform design should incorporate the removal of prescribed dams and other water management structures at both the Russel Vale and No. 4 Shaft sites. Stability

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issues associated with the Russel Vale site also needs to be addressed in the conceptual final landform design.

In addition, the Department meet with Gujarat NRE on 13 February, prior to the exhibition of the EA, and the following issues were raised directly with proponent:

1. Although the Rehabilitation Chapter within the EA has been reorganized according to the requirements of DRE's adequacy comments and the Director General's requirements (DGRs), the content is information poor. The Chapter still requires:
   - a detailed conceptual post rehabilitation landform plan,
   - a detailed description of conceptual final land use,
   - a more detailed summary of subsidence rehabilitation contingency plans
   - a more detailed information on proposed rehabilitation of pit top and other heritage items,
   - to address environmental issues, particularly at Pit Top, such as dust, water etc from a progressive rehabilitation perspective, and
   - to address the Strategic Rehabilitation Completion Criteria – nominate strategic completion criteria for the five phases of the rehabilitation process, namely;

     (1) Decommissioning;
     (2) Landform Establishment;
     (3) Growth Media Development;
     (4) Ecosystem Establishment; and
     (5) Ecosystem Development.

   If necessary, objective criteria may be presented as ranges rather than finite indicator levels. Subjective criteria may also apply where a gap in technical knowledge is experienced. It is expected that further refinement of these criteria will be undertaken and included in the Mining Operations Plan (MOP) or Rehabilitation and Environmental Management Plan (REMP).

2. Concerns over the accuracy of the impact assessments due to uncertainty over the accuracy of the subsidence modelling. There is a need to further validate subsidence modelling to improve certainty around the accompanying impact assessments

3. Concerns regarding the undermining of Cataract Creek by Longwall (LW) 8 & 9 with regard to impact on water loss, species impact given that LW4 experienced an actual 1.4 metres of subsidence compared to much smaller levels of subsidence predicted for LW 8 & 9.

4. Concerns regarding the undermining of swamps CCUS1 (by LW 3) and CCUS5 (by LW8) given their special significance and high risk of impact.

5. Concerns regarding the potential impact on WCUS4 and WCUS7 as well as the Lizard Creek waterfall and main channel.

Subsidence

Comments on subsidence issues associated with this proposal will be forwarded as a supplementary response after a site inspection has been undertaken. ***DRE's supplementary response is anticipated to be finalised within the next two weeks***.

RECOMMENDATIONS

The following recommendations are made with respect to this proposal:

1. The EA must be revised again to include the information previously requested but not provided in Section 16 Mine Closure and Rehabilitation.

2. The mine plan and/or subsidence predictions should be revised to give sufficient confidence that sensitive environmental features including Cataract Creek, Lizard Creek and Coastal Upland Swamps of special significance will not receive an unacceptable level of impact from mining.

3. Issues identified by DRE at its meeting with the proponent on 13 February 2013 are to be addressed.

It should be noted the proponent is currently in arrears in its legislative financial obligations associated with operations at this colliery. As a result, DRE will not support this proposal until the financial obligations have been addressed.

Yours sincerely

Adrian Delany
Acting Director, Industry Coordination
5.4.13

Dams Safety Committee
NEW SOUTH WALES
ABN 55 079 703 705

4 April, 2013

Major Projects Assessment
Department of Planning & Infrastructure
GPO Box 39
SYDNEY NSW 2001

Our ref: 10.121.046
Your ref: 09_0013

Attention: Howard Reed

Dear Howard,

Environmental Assessment
NRE No.1 Colliery – Underground Expansion Project (MP 09_0013)

The Dams Safety Committee (DSC) has received a copy of the Environmental Assessment (EA) for NRE #1 Colliery underground expansion. The PAA comprises Consolidated Coal Lease 745, Mining Purposes Lease 271, Mining Lease 1575 and covers 6,545ha. A large proportion of this area is covered by the Cataract Notification Area.

Cataract Dam is a major water supply dam which is prescribed by the Dams Safety Committee. It is a 56m, 94.3 GL mass gravity dam, which forms a significant part of Sydney's water supply. The Dam is owned by Sydney Catchment Authority (SCA) and forms a significant part of the SCA's integrated asset base, supplying Sydney with water via the Upper Canal and Prospect Reservoir.

The DSC is currently regulating mining within the Cataract Notification Area (NA) which surrounds the Cataract Dam, using its powers under the Dams Safety Act (1978) and the Mining Act (1992). The proposed mining lies partly within the NA and as such an application to the DSC to mine within the NA will be required.

The DSC is aware of previous mining related movement of the Cataract Dam wall and spillway and will be carefully assessing any application to mine within the NA for likely impacts on the dam wall or spillway. This is the first time that three seams will have been mined so close to a large dam reservoir. Cataract Dam has a consequence category of Extreme for both sunny day and flood failures.

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Together with concerns for the safety of the Dam itself, the DSC has concerns for the security of the stored waters. The proposed workings lie close to the Full Supply Level (FSL) of the Reservoir and in places below the FSL. The proximity of the proposed workings to the FSL and the possibility of geological structures intersecting the Reservoir and proposed workings is of concern. If a connection from the Reservoir to the underground workings in Wonga East was to form, there could be a significant loss of the available storage capacity of the Reservoir.

Ensuring the integrity of the Reservoir is an important objective. If a flow path was to form in the Hawkesbury Sandstone (HSS) over Wonga West longwalls A4 LWs6&7 which conducted water away from the Reservoir, there is a potential to lose significant amounts of the available storage.

These concerns are heightened by the lack of information generally and the absence of a geological assessment in particular. The quality of the data and modelling is not of sufficient detail to allow the risks to be quantified.

At the current stage of the proposal with the information before it, the DSC cannot support the proposal.

A successful application to mine within the Cataract NA must include:

> An assessment of the dam safety risks to Cataract Reservoir and to Cataract Dam Wall as a result of mining;
>
> Clear demonstration that the risks associated with mining will be tolerable as defined by the DSC.

Yours faithfully,

S Knight 4/4/13

S. Knight
Executive Engineer
Dams Safety Committee

ATTACHMENT – SUPPORTING REASONS

A. KNOWLEDGE DEFICITS

Information the DSC requires prior to making a decision about mining within the Cataract NA includes, but is not limited to:

1. A geology report for the area;
2. Detailed accurate subsidence predictions.
3. A Detailed monitoring plan.
4. A revised Groundwater Model that has been peer reviewed.

1. A GEOLOGY REPORT FOR THE AREA

A geology report is absent from the EA for both the Wonga East Area and the Wonga West Area.

Concern 1 – The presence of structure in the Wonga East Area

From the information compiled in the EA, which includes past workings, it is obvious that:

- Structures have interrupted the Bulli and Balgownie workings in the Wonga East area. However there is no discussion of the likely impact of structures on subsidence or the possible loss of storage via a structure connecting the Reservoir to the mine;
- Longwalls 6, to 11 enter the Cataract NA with LW 7 -10 in close proximity to the Reservoir. LW8 installation road is 50m from the full supply level (FSL), while LW7 installation road is 100m from the FSL. Whereas LWs 9 & 10 extend beneath the FSL.

There is nothing substantially yet provided to allay concerns from the following observations:

- Streams align with the major dyke.
- Corrimal Fault aligns with surface streams and, given the depth to the Bulli seam and the dip of the fault, these streams are in fact the surface expression of the fault.
- In this area the ENE stream aligns with a dyke.

These structures are clearly visible on an aerial photo.

Pells (2012) produced x-sections that show the Reservoir lies in the Bulgo Sandstone (BSS) below the Bald Hill Claystone (BHCS). Later 'ground truthing' of the surface geology has been undertaken verifying that the creek does indeed lie in strata below the BHCS, which is relied upon to act as an aquitard.

It is feasible that the surface expression of the Corrimal Fault could terminate at the escarpment below the Hawkesbury Sandstone (HSS) in the east, but reappear in BSS beneath the Reservoir at the confluence of the Cataract Creek and Cataract River.

Both the Balgownie and Wongawilli seams have a series of small faults (fault swarms) which line-up with the Rixons Pass Fault. Cataract Creek lines up with this fault plane. There is a possibility that two faults which extend from the mine to the surface intersect at the confluence of the Cataract Creek and Cataract River. Clearly there is the potential for seepage from the Reservoir to enter the mine via these structures.
There is no geology report that addresses these issues.

Concern 2 – Absence of Regional Aquitard – Wonga East

The absence of the BHCS (the regional aquitard) in this area means there is a permeable unit (BSS) connecting the Reservoir to the fracture zone above the Wongawilli goaf.

The rate of water loss from the Reservoir through this unit has not been estimated. A comparison of SCA web data for capacity of dams and the thalweg RL at the confluence of the Cataract Creek and Cataract River indicates that a significant capacity of the reservoir may potentially be at risk.

Assuming the Corrimal Fault exists in the floor of the Reservoir and connects to the mine, the question that needs to be addressed is how close to the fault should mining be allowed. Would mining cause the permeability of the fault to increase? This issue has not been addressed.

Concern 3 – Absence of contingency planning – Wonga East

The effectiveness of Contingency and Closure Plans for the worst case scenario, in which Reservoir water enters the mine, is complicated by the multiple seam operation. The presence of three worked seams require numerous portals to be sealed on the escarpment. Possible vertical cracks in the strata close to the escarpment would mean the sites for plug installation would have to be in competent ground away from the escarpment. This would involve old and waste workings which are inaccessible, making seals an improbable solution to containing an inflow.

Concern - 4 Location of prominent lineament over northern end of Wonga West longwalls.

Over Wonga West there is a prominent lineament that crosses Area 4 LWs 6 & 7 in an east-west direction. No assessment of the likelihood of there being a geological structure in the Hawkesbury Sandstone at this location has been made.

This lineament does loosely align with faults in the Bulli seam workings in the Bulli Colliery to the east and parallels the known fault in the Bulli seam to the north. No information about this possible structure has been provided nor the potential for any impacts on the storage.

Concern 5 - Potential connection between the Reservoir and Lizard Creek

No geological risk assessment of the likelihood of the presence of structures capable of connecting the Reservoir to the workings or to a catchment outside the Reservoir has been conducted.

As Lizard Creek is below the FSL of the Reservoir, there is potential for a substantial loss of available storage, should mining result in the formation of any connective cracking.

Concern 6 - The potential for Wonga main roads to intercept structures and intrusions.

From past mining in the Bulli seam in the 500 series longwalls, below the reservoir, it is known that igneous material intruded the Bulli seam. There is no assessment as to whether the Wongawilli seam is also intruded. From the shape of the lake in this area it appears that the igneous structure continues to the surface. There is no assessment of the likely impact of driving Wonga mainroads through this area and the likelihood of loss of storage.

Part of the approval to mine the Bulli seam (500 series) below the reservoir included the installation of plugs to isolate the Bulli goaf area below the reservoir from the mine portals. This was intended to prevent the uncontrolled escape of reservoir waters to the escarpment. The proposed drivage of the Wongawilli main roads to areas 3 & 4 will bypass the location of plugs in the Bulli seam, designed to contain an inflow of lake water into the mine and prevent it from draining the reservoir. (Bulli and Wongawilli goafs will be connected hydraulically, Reservoir water entering the Bulli 500 series will flow to the Bulli goaf above the Wongawilli Area 3 & 4 goafs and eventually along Wongawilli main roads to the portals on the escarpment). The lack of contingency planning for a worst case (and complete reliance on the subsidence prediction that no hydraulic connection to the surface will be made) is of considerable concern to the DSC.

Concern 7 – Lack of knowledge about distribution and thickness of Bald Hill Claystone -Wonga West.

Impacts on ground water and surface waters depend on the Bald Hill Claystone being intact. There is no geology report that presents a plan of its thickness over the PAA or for that matter, even demonstrates this aquitard is present in the area.

Concern 8 – The working section height appears variable and no information is provided on the maximum working height of the NRE#1 longwall.

A range of working section thickness is stated in the EA (up to 3.2m). However, it also states that extraction to the standard working section could be successful to recover more coal. The resources are based on clay band section at 1.87 to 2.61m. There appears to be a variety of working section thickness which would alter the maximum subsidence depending on which one is worked. No information is provided on the maximum working height of the NRE#1 longwall. No working section plan is provided to assess the varying height of extraction over the proposal. Since the working height will influence the degree of subsidence and hence the level of interconnected cracking in the overburden, this is a significant omission.

A geological risk assessment should be undertaken with emphasis on identifying possible conduits for loss of Reservoir water to the mine or to catchments outside that of the Reservoir's.

2. DETAILED ACCURATE SUBSIDENCE PREDICTIONS

2.1. Subsidence predictions

Concern 9 – Ongoing subsidence is underestimated and at times ignored; with no explanation being given as to why subsidence is ongoing.

2.1.1. Predictions of vertical subsidence make reference to line 'J' over LW514 under Cataract Reservoir.

- subsidence on this line over LW514 as at March 2010 had reached a maximum of 301mm. LW514 was completely extracted by June 1999; with the final longwall in the 500 series, LW518 finished by 14th December 2000. Maximum subsidence over LW514 in March 2001 was 231mm. There has been 70mm of subsidence since 2001. Subsidence has averaged 7mm a year since then and shows no signs of slowing down. No explanation of this continued subsidence is provided. A plausible explanation of the mechanism driving this subsidence over longwalls below the reservoir (and of a similar dimension to those proposed in Wonga East) will be required.

2.1.2. Wonga East is different to the 500 series longwalls in that:

- No Hawkesbury Sandstone or Bald Hill Claystone exists below the Reservoir in Wonga East;
- The probability of a fault connecting the workings to the floor of the Reservoir is high;

- A permeable unit (Bulgo Sandstone) connects the Reservoir to the top of the fracture zone above the longwalls;
- The thickness of Wongawilli seam to be extracted, is greater than that of the Bulli seam;
- Height of increased vertical permeability over longwalls 501 & 502 was to the base of the Bulgo Sandstone. LWs 501 & 502 were 110m wide. It is proposed by the mine that Wonga East longwalls be 150m wide.
- Bulli seam workings with partial extraction exist above the Wongawilli seam proposed longwalls (Wonga East). There are no such workings above the 500 series longwalls.

2.2. Reactivation of existing goaves

Concern 10 – The potential for reactivating the already extensive local and more distant goaves.

2.2.1 While Wonga West longwalls are over 1km from the dam and spillway, there is the potential to reactivate the 300 series longwalls in the Bulli seam. The 300 series previously caused movement at the dam and the goaf formed is within 1km of the dam. Movement on subsidence lines above the 500 series longwalls below the reservoir are known to have been reactivated by the extraction of Cat North and 509 and 510 pillar extraction panels. No discussion of this has been provided. A plausible explanation of the mechanism driving this subsidence over longwalls below the reservoir will be required.

2.2.2 Has subsidence re-activation along Line 'A' over early 500 series longwalls been assessed with a view to predicating reactivation of 300 series goaf and hence horizontal movement at the dam?

2.2.3 The subsidence report on page 35 says "(Figure 33) indicate no *(horizontal)* movements at 1900m from the goaf edge". The report also says that there is no database of horizontal movements associated with multiple seam extraction. This is a major concern given the proposed longwalls are 1000m from the Dam and Spillway.

2.2.4 Any longwall mining in the Wonga West area should commence at the greatest distance from the Dam and Spillway as possible and then move towards the Dam. This will allow monitoring at the Dam to determine if extraction is causing movement at the Dam and therefore allow adaptive management, whereby longwall extraction is ceased when movement at the dam above error of the method used is recorded.

3. DETAILED MONITORING PLAN

Any approval for this project should include conditions requiring:

3.1 A program to collect, analyse and report on the water chemistry of the overlying strata, the water entering the mine and the Reservoir waters.

- At a minimum, water should be sampled on a monthly basis and include algae trace element analyses and Tritium isotopes.
- Sampling sites between the mine workings and the Reservoir should be established and between the mine workings and possible exit points along Lizard Creek.

3.2 A program for monitoring the Dam Wall and Spillway for movement.

- Including a whole valley survey (previously known as Cataract Tectonic Survey).
- TARPS developed with the owner SCA.
- An agreement with the owner SCA that damage to the dam will be repaired first and questions asked later (given the number of lives at risk if the dam fails, its safety should be paramount).

4. GROUNDWATER MODEL REVISION AND PEER REVIEW

The EA lacks a groundwater model that addresses the possibility of losses from the reservoir as a result of mining.

Among the issues that are not considered in the current modelling, are the presence of pathways for loss of Reservoir Waters or the impact of mining on hydraulic conductivity:

4.1 Pathways for loss

4.1.1 Via structure to the workings.

Concern 11 – The potential for loss of Reservoir Waters Via Structure.

The FMEA looked at the impact of "lack of geological data on the ability to predict subsidence" – the geological data was deemed adequate. The Groundwater report mentions the possible impact of a permeable geological structure but goes on to say it has not been modelled. The mine has based its assessment that the Corrimal Fault peters out on 1940 record tracings of the Bulli seam workings. No notations on 1940 plans do not mean the fault is not present; it simply means that if it is present the displacement is small and not noteworthy. As discussed above, the connection of the mine to the Reservoir by geological structure is a possibility, but this is not addressed in the groundwater model.

4.1.2 Via change in water pressure.

Concern 12 – The potential for loss of Reservoir Waters Via change in water pressure.

4.1.2.1 A scenario exists whereby a change in water pressure in Bulgo Sandstone (BSS) in Wonga East area results in a pressure differential that drives water from the Reservoir to the escarpment.

It would appear from the predicted recovery in the Lower BSS of 10m along the escarpment that the escarpment is not included in the model as a drain. So any assessment of loss of reservoir water towards the escarpment cannot be modelled.

More information on the boundary conditions along the escarpment is required. How does the escarpment affect the groundwater model?

4.1.2.2 A scenario exists whereby a change in water pressure in Hawkesbury Sandstone (HSS) in Wonga West area results in a pressure differential that drives water from the Reservoir to Lizard Creek. Lizard Creek and Wallandoola Creek at Wonga West drain into the Cataract River, downstream of the Cataract Dam wall. As discussed above, this has a major consequence. However, it has not been assessed in the groundwater model.

The predicted reduction of head in the HSS over Wonga West in the Groundwater Model has been attributed to bedding plane separation. With bedding planes open and the pressure differential in the direction of Lizard Creek, the mechanism exists to impact the Reservoir.

4.1.2.3 Differential heads drive water from the Reservoir in HSS towards Area 4 Wonga West and then through a cracked BHCS into the workings.

4.2 The Impact of mining on hydraulic conductivity

Concern 13 – The hydraulic conductivity used in the model underestimates the actual hydraulic conductivity as it doesn't take into account the impact of mining on hydraulic conductivity.

The groundwater model used three values for Bald Hill Claystone (BHCS) to represent, Western, Central and Eastern areas of the PAA (Table 5 Golder Associates). The model does not adjust these values for mining impacts as none are predicted.

When comparing the horizontal conductivity from packer tests reported in table 6 of GeoTerra's groundwater report for the BHCS, it is noted that the average value is 3 orders of magnitude greater than that used in the groundwater model. These

packer test results were obtained after mining had occurred in the Bulli seam and therefore can be taken as a mining impact on the BHCS.

These packer tests give values for horizontal permeability not vertical; however mining has affected the horizontal permeability value and therefore may have affected the vertical value.

This possibility is not addressed in the groundwater model.

Concern 14 – The data that is available to provide information on the possible realworld connection of the Reservoir to surface waters/ ground waters and mine workings is simply not integrated into the groundwater model or indeed into the concepts developed for the system.

Example 1. The DSC imposed conditions on the mine before recommending longwall extraction be allowed within the Cataract Notification Area for longwalls 501, 502 & 514. These conditions included the installation of boreholes with vibrating wire piezometers in 501 & 502 and an open borehole to allow the sampling of water chemistry and the measurement of standing water level - 514. The purpose of the boreholes was to provide data on the possible connection of the Reservoir to the mine workings. Although an expensive undertaking, installation of the piezometers was to provide information that was imperative to developing an accurate understanding of the degree of possible connection between the Reservoir and the mine workings. However, there has been no discussion in the EA of whether the data from these boreholes shows a connection to the Reservoir/surface and therefore the ineffectiveness of the BHCS to act as an aquitard.

The standing water level (SWL) in 514 over time is presented as a chart in the EA, but no discussion of a relationship to the Reservoir is provided. When the Reservoir level over time is overlayed on the 514 SWL a high correlation is noted.

After 2004 the relationship between the two becomes closer. Last extraction in the area was the extraction of pillars in North Main in 2001. However a subsidence line over 514 longwall panel has shown continued subsidence throughout this period. Suffice to say that by the middle of 2009 when data was lost from the borehole, the level of water in the reservoir and the borehole are closely linked, with a slight lag of the P514 level.

According to Golder Associates (GA), the water intake for P514 is in the Bulgo Sandstone (BSS) (table 2 of GA report). If this is the case then the BHCS is not acting as an aquitard. There is however some confusion over the strata in which the water intake is located. The GeoTerra report states that the intake is within the lower Hawkesbury & Newport Formation. As the pre-mining conditions are not known it is difficult to determine if mining induced fractures have allowed a connection from the reservoir to P514 at a depth of between 160 and 188m below ground level (intake level).

Example 2 - GeoTerra made the following statement on page 36;

"Vibrating wire piezometer monitoring between longwalls 501 and 502 indicates that the hydraulic integrity of the Bulli Seam and the Hawkesbury Sandstone was not adversely affected (Seedsman, R.W. & Kerr, G. 2001)".

As longwalls 501 & 502 in the Bulli Seam have been extracted, it is difficult to conceive how the hydraulic integrity of the Bulli Seam was '*not adversely affected*'.

Concern 15 – There are constant errors between reports, suggesting that insufficient attention has been paid to detail.

Example 1 - A discussion of the P502 piezometers is included on page 38 of the GeoTerra report. This discussion has P11, P14 & P15 all installed within the Hawkesbury Sandstone (HSS). Whereas table 2 of the Golder Associates report has P11 in the mid Bulgo Sandstone (BSS) with a water level of 286.6mAHD. P14 is in the low HSS with water level of 287.3mAHD and P15 is in the low HSS with water level at 284.5mAHD. The date of these readings is given as 30/11/2009. The level of the Reservoir at this time was 284.11mAHD.

The water level in P15 Lower Hawkesbury Sandstone is very close to that of the Reservoir. Again as there is no information on the pre-mining permeability of the Lower Hawkesbury Sandstone it is difficult to determine if the vertical permeability of the Hawkesbury Sandstone has been affected by subsidence and by inference the Bald Hill Claystone (BHCS).

Further evidence that the Bald Hill Claystone has been affected by subsidence and no longer acts as an aquitard (if it ever did), is the way that P11 in the mid Bulgo Sandstone moves in unison with P15 in the Lower Hawkesbury Sandstone. There is no time lag and hence no retarding effect of the Bald Hill Claystone.

Given the numerous inconsistencies between GeoTerra and Golder Associates concerning the groundwater model and its reliance on the Bald Hill Claystone as an aquitard, it is the Committee's opinion that the groundwater model cannot be relied upon to predict losses from the Reservoir. A new groundwater model should be developed which includes:

- A description, including hydrogeological properties, of strata and all known or suspected geological features which cut across strata, including an assessment of the degree of confidence that the element exists.

- A description, including hydrogeological properties, of any natural non-strata non-structure hydrogeological elements, including an assessment of the degree of confidence that the element exists.
- A description, including hydrogeological properties, of currently present man-made permeable elements such as old mine workings, drill holes etc, including an assessment of the degree of confidence that the element exists. This item does not include the proposed mine workings.
- An identification of drainage point(s) outside the Cataract catchment.
- A hydrogeological model of the pre-mining regime which incorporates the results from above, and includes:
    - i An identification of critical hydrogeological elements which may include strata, structures, and non-strata non-structure elements.
    - ii For each critical element, a discussion of the range of properties, including probability distributions for hydraulic conductivity.
    - iii For each critical element, comments on the pre-mining groundwater regime, including head distributions, flow paths, and groundwater chemistry.
    - iv Comments on the fit of the model with known evidence.
- Comment on areas of uncertain knowledge and the implications of this.
- Comments on further work needed to refine the model.
- Evidence that a comprehensive identification of the impacts of mining has been undertaken. The review should be complete, thorough, authoritative, systematic, and adequately documented.
- An assessment of the impacts of mining, including:
    - i The probability distribution of the extent of hydraulic connection created by mining to development workings and longwall extraction.
    - ii The probability distribution of ground movements, and of changes in hydrogeological properties to elements of the model, as a result of mining.
    - iii identification of any new or modified flow paths from the reservoir, including an assessment of the degree of confidence in the flow path.
    - iv For significant new or modified flow paths from the reservoir provide probability distributions for:
        - **Hydraulic conductivity**
        - **Cross-sectional area**
        - **Length of flow path.**
        - **Potential head from lake to workings.**

- An evaluation of the risk of loss of stored waters by comparison to the risk acceptance criterion adopted by the DSC — the tolerable loss magnitude vs. probability curve.
- An assessment of the impact of any controls required to manage the risks
- A report on a risk assessment conducted in terms of AS/NZS4360:2004.
- The groundwater model should be peer reviewed.

NSW EPA

Our reference: FIL09/1355:DOC13/ 5439:PW
Contact: Paul Wearne (02) 4224 4100

Mr Clay Preshaw
NSW Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Mr Preshaw

MAJOR PROJECT APPLICATION – EXHIBITION OF ENVIRONMENTAL ASSESSMENT
NRE No 1 COLLIERY – UNDERGROUND EXPANSION PROJECT (MP 09 0013)

I refer to your letter dated 14 February 2013 to the Environment Protection Authority (EPA) advising of the exhibition of the Environmental Assessment (EA) for the above development proposal. Your letter also sought comments, including any recommended conditions of approval, regarding the project.

The EPA has undertaken a review of the exhibited EA and has provided detailed comments on the following in the attachment to this letter (**Attachment 1**):

- Environment Protection Licence
- Surface Water Management
- Emissions to Air
- Noise Impact Assessment
- Road Haulage Activities

The EPA had previously provided detailed comment on the adequacy of the draft EA in OEH submissions dated 28 March 2011 and 24 Jun 2011. Our review has revealed that many of the issues raised in these submissions had not been addressed in the exhibited EA.

The attached comments include a number of recommendations for Department of Planning and Infrastructure (DP&I) and NSW Planning Assessment Commission consideration in the assessment and determination of the application. These recommendations address a range of issues including the need for further information to inform the Environmental Assessment and additional Statements of Commitment and/or Approval Conditions.

The EPA is able to meet with DP&I at a mutually convenient time to discuss any of our comments and advice. Should you require any further information or clarification on the above matters, please contact Mr Paul Wearne on (02) 4224 4100 at the EPA's Wollongong Office.

Yours sincerely

GHoward 17/4/13

Director Metropolitan
Environment Protection Authority
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ATTACHMENT A

ENVIRONMENT PROTECTION AUTHORITY
COMMENTS ON THE NRE NO 1 COLLIERY PROJECT ENVIRONMENTAL ASSESSMENT

1. Environment Protection Licence

Gujarat NRE holds an Environment Protection Licence (EPL No 12040). The premises description for this EPL includes pit top activities at Russell Vale and a number of vent shafts.

If the project is approved, the proponent will need to seek a variation to the EPL for the proposed expanded operations prior to the commencement of activities. While a number of the conditions will not change, the variation would need to address matters including but not necessarily limited to the change in location of LDP2. In addition, DP&I should also consider the current EPL conditions when developing any recommended conditions of approval to prevent any inconsistencies with the EPL.

2. Surface Water Management

2.1 Water Discharges to Bellambi Gully Creek

The EPA has undertaken a review of the EA and considers that the water quality impact assessment does not adequately assess potential water quality impacts from the proposal. With the proposed development involving a significant expansion that includes a project life of 18 years, it is important that any discharges from the expanded operations are fully characterised and assessed.

The discharge from the mine site is a combination of stormwater runoff and mine water which is combined and treated at the Gujarat site before discharge to Bellambi Gully Creek through a licensed discharge point 2 (LDP2). The EA states that the amount of mine water collected and discharged through this licensed discharge point is expected to vary over the life of the project. Currently, the discharge is approximately 0.4 ML/d and is highly variable with the discharge contributing the majority of flow in Bellambi Creek during dry weather, when there is a surplus make of mine water.

In addition, the EA also states that increases in underground production water usage will reduce the average discharge flow rate to less than 0.4 ML/d. However, at the end of the project life, underground water make will increase resulting in the need for a permanent discharge from the site of approximately 3.1 ML/d.

The EA includes a limited water quality assessment of the LDP2 discharge by comparing test results with ANZECC 2000 trigger values for aquatic ecosystem protection and NHMRC's 2008 guideline for Managing Risks in Recreational Waters. However there was limited water quality information, for example only one sample was analysed for metals. The EPA had recommended in its submission on the Draft EA for the NRE No 1 Colliery – Underground Expansion Project (MP09 0013) dated 28 March 2011, that further assessment should be undertaken and documented to check the levels of heavy metals (if any), in the discharge.

The discharge represents a significant contribution to Bellambi Gully Creek and its future management is an important issue that requires careful consideration. On the basis of EPA review of the EA, it appears there is insufficient information to fully understand the environmental impacts from both current and future discharges. To fully assess the impacts of the current and proposed future discharge from the site, an assessment is required that addresses a range of matters including but not necessarily limited to:

- Baseline data;
- Characterisation of the discharge waters (both flow and volume) including both stormwater runoff and mine water;
- An assessment of the likely impacts of pollutants in the discharge water on receiving waters;
- The relevant environmental values of Bellambi Gully Creek in particular relevant NSW Water Quality and River Flow Objectives for the Illawarra; and
- The identification of any proposed mitigation options in order to achieve these values, if required.

The proponent has indicated that any discharges from the site over the life of the project will comply with current EPL discharge requirements. The current requirements on the EPL may need to be reviewed as part of the proposed expansion. In this regard, the EPA would like to liaise with the proponent and DP&I on this matter in developing further requirements to inform any additional EA.

2.2 Main Stormwater Control Dam

An issue with the current stormwater management system at the site has been the performance of the main stormwater control dam. This dam has been designed as a leaky dam. EPA observation has shown that the water quality of Bellambi Gully Creek is discoloured slightly (grey-black) for a period following rainfall events due to leakage through the main stormwater control dam wall. In this regard, we recommend the following requirement be secured as either a SOC or condition of approval.

> *"The proponent must investigate the feasibility of sealing the main storm water control dam to reduce the level of turbidity in water leaking through the dam wall and discharging from LDP3 following wet weather events. This feasibility study must also include a recommended program of works and time frame for completion if sealing is feasible. If sealing is not feasible the study must also identify any other option to mitigate any harm to the waterway".*

3. Emissions to Air

3.1 Deficiencies in Air Impact Assessment

EPA has undertaken a review of the EA and its associated Air Impact Assessment (AIA) and considers that the air quality assessment does not adequately assess potential air quality impacts from the proposal. In this regard, EPA is unable to determine and fully understand the predicted air impacts associated with the project. In this regard, EPA recommends that DP&I seek further information from the proponent that addresses the following issues:

a) Dispersion modelling undertaken for the assessment does not include all significant emission sources. Emissions from truck movements along Bellambi Lane were not included in the modelling assessment. Haulage emissions typically represent a significant proportion of total particle emissions from mining operations. Historic operations at the site have lead to community concern regarding haulage activities. The assessment should be revised to quantitatively assess impacts from all dust generating activities associated with the proposal, including ROM haulage on adjacent roads.

b) Background air quality data was sourced from the NSW OEH monitoring site at Newcastle. Figure 6.1 of the assessment shows that ambient particle monitors (high volume air samplers and TEOMs) are located in the immediate vicinity of the mine site. The assessment does not discuss or present the historic ambient monitoring data. The assessment should be revised to include all available ambient air quality data to robustly characterise background air quality surrounding the project site and characterise local air quality impacts in the vicinity of the proposal in the context of historic operations.

c) The assessment does not demonstrate that meteorological data used for modelled is representative of long term conditions experienced at the site. The assessment should be revised to include a comparison of the modelled (2007) meteorology against long term data at or near the mine site.

d) The assessment makes numerous references (for example, Sections 7.1 and 7.3 of the AIA) to an allowable 5 exceedances of the 24-hour PM10 impact assessment criteria based on the National Environment Protection (Ambient Air Quality) Measure. Additionally, section 8.2.1 of the AIA advises that the mine is predicted to be in compliance with the NEPM. The application of the criteria is incorrect as, by definition, it is not possible for the mine to be in compliance with the NEPM. The NSW impact assessment criteria for 24-hour PM10 does not allow any additional exceedances of 50 ug/m^3. The assessment should be revised to remove reference to allowable exceedances of the NSW impact assessment criteria.

e) Table B.1 provides model input information including source release parameters. Justification should be documented in the AIA on the assumptions and inputs used in the model. In particular, it is unclear why the initial sigmas have been adopted. Additionally, the values are not consistent with guidance provided in the model user guide (*User's Guide for the AMS/EPA Regulatory Model – AERMOD*).

f) Table C.1 provides emission estimates for sources included in the dispersion model. The assessment does not reference the emission estimation methodologies adopted. Additionally, the emission control efficiencies included in the emission estimation are not explicitly quantified and justified. There is not sufficient information included in the assessment to enable a thorough evaluation of the modelled

emissions inventory, however, a screening review found that the assessment emission estimation contains possible calculation errors for example, refer to the table below:

	Source	PM10 Emission Factor (kg/ha/hr)	Area (Ha)	Activity Rate (hours/day)	Uncontrolled Emission (kg/day)	Uncontrolled Emissions (g/s)
NRE assessment calculation	Wind erosion from large stockpile	0.22	1.98	24	0.4	**0.005**
EPA calculation check	Wind erosion from large stockpile	0.22	1.98	24	10.5	**0.121**

g) Table D.1 lists dust control measures that will be adopted at the mine. In most cases, the measures listed are generic, for example, "*water sprays used to minimise dust*". The proposed controls are not quantifiable, auditable or enforceable. Further, the control measures are not directly linked to the emissions inventory to quantify the expected control efficiency from each action. The assessment should be revised to benchmark proposed particle controls against Best Management Practice (BMP). For your information, in response to a Pollution Reduction Programme (PRP) the proponent has recently completed a site specific BMP determination to assess existing dust controls at their Bellambi NRE operations. EPA is currently reviewing this determination, however, this assessment has identified dust emissions from stockpiles to be the most significant issue at the site. In this regard, this determination should be revised taking into account the following EPA documents:

- *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining* (http://www.environment.nsw.gov.au/resources/air/KE1006953volumeI.pdf).
- *Coal Mine Particulate Matter Control Best Practice Site-specific determination guideline* (http://www.environment.nsw.gov.au/resources/air/20110813coalmineparticulate.pdf)

h) The assessment should be revised to include an Air Quality Management Plan that explicitly links proposed emission controls to the modelled emissions for the project. In particular, EPA recommends that a real time air quality system should be installed and maintained at the site. Such a contemporary system would also assist in guiding the deployment of reactive and proactive dust mitigation measures at the site. For all dust generating activities at the site, the proponent should prepare and document an air quality management plan that includes, as a minimum, the following elements:

- Key performance indicator(s);
- Monitoring method(s);
- Location, frequency and duration of monitoring;
- Record keeping;
- Response mechanisms; and
- Compliance reporting.

To remove any doubt, each key performance indicator must be transparent, measurable, auditable and enforceable. Additionally, nominated controls must be explicitly linked to calculated emission reductions in the air quality impact assessment emissions inventory, with all assumptions documented and justified.

3.2 Sealing of Internal Haul Roads

The EA states that the majority of the new internal haul route will be unsealed from the main access road past the stockpile. The last section of the road then will be sealed. Water trucks and dust suppression sprays will be used on the unsealed portion of the road. The EPA considers that with intensification of stockpile activities and haulage, it is important that the haul road is sealed and separated from dirty areas

of the site. In addition, it is the EPA's experience that unsealed haul roads can be a significant source of wind blown and traffic generated dust. In this regard, EPA recommends the following requirement be secured as either a SOC or condition of approval:

"The proponent must ensure all internal haul roads are sealed and maintained".

3.3 Off-Road Diesel Exhaust Emissions

There is growing community concern regarding both the health and amenity impacts associated with particle emissions from coal mines. The EPA air emissions inventory published in 2012 identified fugitive (28%) and diesel exhaust (6%) emissions from EPA-licensed coal mines contribute nearly 35% of all man-made $PM_{2.5}$ emissions in the NSW Greater Metropolitan Region (GMR). In this regard, off road emissions from diesel powered mobile equipment contributes significantly to air emissions of particulate matter and NO_x.

With a proposal that involves a significant increase in production and intensification of pit top activities that will be undertaken over 18 years, EPA considers opportunities should be explored and documented that manage and mitigate off-road diesel exhaust emissions. This is further warranted with pit top activities located adjacent to residential areas. In this regard, EPA recommends that the proponent should undertake a feasibility assessment of best practice measures to reduce diesel exhaust emissions from off-road diesel powered mobile equipment. This assessment would provide an opportunity to identify and implement reasonable and feasible emission controls on all off-road diesel powered mobile equipment at the site. In this regard, EPA recommends the following requirement be secured as either a SOC or condition of approval:

"The proponent must undertake a feasibility assessment of best practice measures to reduce diesel exhaust emissions from off-road diesel powered mobile equipment at the site within 12 months of approval. It should include, but not necessarily be limited to:

- *a detailed site-specific evaluation of either retrofitting, repowering, replacing and/or procuring EU/US compliant off-road diesel equipment;*
- *establish existing practices for reducing diesel exhaust emissions and benchmark those against international best practice; and*
- *estimate the likely reduction in diesel exhaust emissions, equipment costs and health benefits associated with adopting those international best practice measures which are technically and economically feasible.*

Based on the outcomes of the feasibility assessment, a program must be developed that documents timing for implementing reasonable and feasible emission controls on off-road diesel powered mobile equipment at the site".

In relation to underground operated diesel powered mobile equipment, EPA understands that there are legislative requirements for their design, operation and emission standards for this equipment. These are addressed in the *Coal Mine Health and Safety Act 2002, Coal Mine Health and Safety Regulation 2006* and their associated gazetted notices which are regulated by Department of Primary Industries.

4. Noise Impact Assessment

4.1 Adequacy of Noise Impact Assessment

EPA has undertaken a review of the EA and considers that the EA and its associated Noise Impact Assessment (NIA) have not been undertaken in accordance with the *New South Wales Industrial Noise Policy* ("INP", EPA 2000). In addition, the configuration of the proposed development is not fully understood. The EA also states that the final design and location of the truck loading facility will be subject to local site constraints and limitations particularly considering site infrastructure and services such as power lines, pipelines and site access constraints.

EPA is unable to determine and fully understand the predicted noise impacts associated with the project. Many of these issues were also identified in the EPA submission on the Draft EA for the NRE No 1 Colliery – Underground Expansion Project (MP09 0013) dated 28 March 2011. In this regard, EPA recommends

that that DP&I seek additional information from the proponent in order to address the following deficiencies. These include but not necessarily limited to:

a) Confirmation that the matters raised in the EPA submission on the Draft EA for the NRE No 1 Colliery – Underground Expansion Project (MP09 0013) dated 28 March 2011 have been addressed;

b) The EA notes the predicted exceedence of Project Specific Noise Levels (PSNL) by up to 2 dBA during the evening period at sensitive receivers and that "further noise reduction may be achievable." However, the EA does not detail what further noise reduction measures may be used in an effort to achieve the PSNL. In this regard, the EA should include an analysis of all feasible and reasonable mitigation measures which could be implemented during both the construction and operational phases of the proposal to meet PSNL. Following the application of all feasible and reasonable mitigation measures, the proponent should provide model results and the expected duration of each component of construction and operation of the proposal;

c) The NIA does not appear to assess sleep disturbance impacts adequately, as modelled L_{Amax} values were not presented. In this regard clarification should be sought from the proponent that the assessment of sleep disturbance impacts has been undertaken in accordance with the INP application notes (http://www.environment.nsw.gov.au/noise/applicnotesindustnoise.htm);

d) The NIA does not assess the cumulative impact of the proposal with existing industry as the noise impact of existing industry is not quantified. The EA should include an assessment of the noise amenity impact of the proposal in accordance with the INP, taking into account the quantitative impact of existing industry;

e) Prevailing weather conditions were assessed from data collected at the Bureau of Meteorology (BOM) Automated Weather Station (AWS) No 068228 located at Bellambi Sewage Treatment Plant between 1 January 2008 and 3 September 2009. According to the BOM website, the Bellambi AWS records wind speed and direction every minute. Australian Standard 3580.14 requires at least 360 measurements over at most 10 minutes for the calculation of stability category by the sigma theta method. Information should be sought from the proponent on the parameters used in the analysis and at what frequency;

f) The location of the Bellambi AWS is on a low-lying exposed coastal headland, meaning the wind environment is likely to be dominated by coastal processes such as sea breezes. However, the premises is located very close to the Illawarra Escarpment and so is more likely to be influenced by katabatic drainage. In this regard, justification is required on the weather data used in the NIA to demonstrate that it is representative of the conditions experienced at the Russell Vale site. If this is not possible, the proponent should re-model the construction and operational noise impacts of the proposal under adverse weather conditions including at least a 3m/s katabatic drainage flow wind;

g) The EA states that noise mitigation in particular noise barriers proposed as part of Stage 1 of the Project have not been constructed. The EA also states that these barriers will be replaced with alternate noise mitigation in accordance with findings of a noise audit. However, the stage 1 activities have commenced in the absence of these barriers. Justification is required on replacing noise barriers required as part of the Stage 1 Approval and document alternate noise mitigation which have had their performance confirmed through noise modelling;

h) The proposal involves two additional stockpile areas (SP2 and SP3) will be installed east of SP1, each with a capacity of up to 140,000t. Coal will be delivered to SP2 and SP3 via an overhead conveyor and tripper arrangement. Coal will be reclaimed from the stockpile via a new reclaiming system. A dozer will be used to push coal to reclaim points where required. The stackers will have a height of 31 metres (approximately 91 m AHD). It is unclear in the EA and NIA whether the potential noise source of dozers working on top of the 31 metre stock piles has been assessed. The EPA's experience with these arrangements is that in the absence of appropriate noise mitigation, these activities can cause significant noise impacts. Clarification is required on whether the noise assessment has taken into account noise sources such as operations including dozers working on top of stock piles (ie new stockpiles 91 m AHD).and if so, what mitigation is proposed to address this potential noise source;

i) The EA states that the average number of coal trucks operating in 2019 is projected to generate between 512 and 682 vehicle trips per day, which represents a 202 per cent increase from current rates. The calculated 'average' and 'peak' $L_{eq(1hour)}$ road traffic noise levels was undertaken using the

Calculation of Road Traffic Noise (CoRTN) algorithm. From these results, it appears that the proposal will contribute more than 60 dBA to the average and peak road traffic noise levels at a number of receivers and will therefore exacerbate existing exceedence of ECRTN criteria at these receivers. However, the EA proposes no mitigation strategies other than validation and then mitigation if required. In this regard, details of proposed mitigation measures to address exceedances of road traffic noise criteria should be documented;and

j) The NIA argues that the *Interim Construction Noise Guideline* (the "ICNG", DECC 2009) should apply to construction noise generated by the proposal as it "would be considered as "normal construction" [sic] activities and is [sic] the focus of the ICNG". However, the ICNG does not apply to noise from mining and the proposed construction activities are expected to be undertaken for up to three years. On-site construction was predicted to result in noise impacts to sensitive receivers up to 5 dBA above the PSNL for up to 36 months. Neither the EA nor the NIA appear to demonstrate that all feasible and reasonable mitigation measures will be implemented by the proponent in an effort to meet the PSNL.

The EPA also recommends that the following requirement be secured as either a SOC or condition of approval:

The proponent must prepare and implement a Construction Noise Management Plan (CNMP), prior to commencement of construction activities, that includes but is not necessarily limited to:

a) identification of each work area, site compound and access route (both private and public);
b) identification of the specific activities that will be carried out and associated noise sources at the premises and access routes;
c) identification of all potentially affected sensitive receivers;
d) the noise and vibration objectives identified in accordance with the New South Wales Industrial Noise Policy and Assessing Vibration: A Technical Guideline;
e) assessment of potential noise and vibration from the proposed construction methods (including noise from construction traffic) against the objectives identified in (d);
f) where the objectives are predicted to be exceeded an analysis of feasible and reasonable noise mitigation measures that can be implemented to reduce construction noise impacts;
g) description of management methods and procedures and specific noise mitigation treatments that will be implemented to control noise and vibration during construction, including the early erection of operational noise control barriers;
h) procedures for notifying residents of construction activities that are likely to affect their noise and vibration amenity; and
i) measures to monitor noise performance and respond to complaints.

5. Road Haulage Activities

Environmental impacts associated with trucks include increased noise levels on transport routes and air emissions of particulate matter and NOx. In particular, these air quality issues are pollutants of concern in the Illawarra region. Trucks and road haulage was also a common theme in the public submissions reviewed by EPA for similar developments in the Wollongong area. A major source of public complaints is noise from engine brakes.

The EA states that the average number of coal trucks operating in 2019 is projected to generate between 512 and 682 vehicle trips per day, which represents a 202 per cent increase from current rates. A majority of these truck movements will be to the Port Kembla Coal Terminal (PKCT).

A justification for the recent PKCT 10 MTpa Monitoring Trial was the expected increase in road haulage to the Terminal from expanded coal mining operations in the Illawarra including Gujarat NRE. Supporting information for the trial revealed that all transport contractors (including Gujarat NRE) servicing the Coal Terminal has demonstrated a commitment to continuously seek to improve the efficiency and environmental performance of their truck fleet. While we support this commitment, with a proposal involving a significant increase in road haulage activities, the EPA considers that it is important that as the trucking fleet grows, it should be meeting Best Management Practices to minimise air and noise emissions.

In this regard, the DGRs required consideration of noise and air impacts of coal haulage of trucks in the local air shed and in areas along the coal transport corridor. Due to the expected increase in road haulage activities, EPA recommends that DP&I should seek from the proponent a feasibility assessment of Best Management Practices to minimise the air and noise emissions from heavy vehicle movements. In this regard, EPA recommends the following requirement be secured as either a SOC or condition of approval:

The proponent must prepare a feasibility assessment of Best Management Practices to minimise the air and noise emissions from heavy vehicle movements. It must include but not necessarily be limited to:

i. *The development and implementation of a truck noise auditing program to confirm trucks achieve acceptable noise standards for engine brake noise; and*

ii. *All on-road diesel trucks associated with the project should:*
   - *Conform with relevant and current emission standards as prescribed in Australian Design Rules for heavy-duty engines and vehicles (EURO IV); or*
   - *where the vehicle is older than the 2006 model year (that is, EURO I, EURO II or EURO III standards), the vehicle should be fitted with a diesel exhaust treatment device.*
   - *consider emission reduction options in the diesel NEPM; and*
   - *use best practise acoustically treated trucks and trailers for road transport of coal.*

iii. An appropriate and agreed timeline on when the above requirements can be achieved.

This approach is also consistent with previous EPA advice provided to DP&I regarding the Port Kembla Coal Terminal 10 MTpa Monitoring Trial and other road transport intensive activities proposed in the Port Kembla area.

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Job ID: 10/013221
Your Ref:MP 09_0013

Mr Clay Preshaw
Senior Planner – Mining & Industry Projects
Department of Planning & Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Mr Preshaw

RE: Heritage comment on the Environmental Assessment for NRE No. 1 Colliery – Underground Expansion Project (MP 09_0013).

I refer to your letter dated 14th February 2013 referring the Environmental Assessment (EA) for the NRE No. 1 Colliery Underground Expansion Project currently on public exhibition to the Heritage Council for comment.

It is noted that the Heritage Council has previously provided comment on this project in February 2011 and that these comments have been incorporated in to the Environmental Assessment and the Draft Statement of Commitments for the project.

It is considered that as long as the Applicant adheres to their Statement of Commitments, the historic heritage at this site (which relates to the former South Bulli Colliery) will be adequately managed during the lifetime oft his project.

If you have any questions regarding the above advice, please feel free to contact Katrina Stankowski at Katrina.Stankowski@heritage.nsw.gov.au.

Yours sincerely

25/02/2013

Vincent Sicari
Manager – Conservation Team
Heritage Branch
Office of Environment & Heritage
Department of Premier & Cabinet

As Delegate of the NSW Heritage Council

NSW GOVERNMENT | Office of Environment & Heritage

Our reference: Doc13/5191
Contact: Susan Harrison 9995 6864

Mr Clay Preshaw
Mining and Industry Projects
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Mr Preshaw

I refer to your correspondence dated 14th February 2013 seeking comment from the Office of Environment and Heritage (OEH) on the exhibited Environmental Assessment (EA) for Gujarat NRE No.1 Colliery – Underground Expansion Project MP09_0013.

OEH has reviewed the documents and provides detailed comment on groundwater, biodiversity, Aboriginal cultural heritage and greenhouse gas emissions in Attachment 1. In summary, the major environmental and Aboriginal cultural heritage issues identified are:

- Subsidence impacts are likely to have been underestimated with consequences for the adequacy of the environmental and Aboriginal heritage impact assessments.
- Significant connected stream and swamp networks have been considered on a sectional basis only and not as connected natural streams and without appropriately considering the downstream flow on effects from the loss of water.
- Baseline groundwater data is limited and the experimental designs of monitoring programs are often inadequate to assess impact.
- Water and groundwater models have been constructed based on extremely limited flow and groundwater level data resulting in high levels of uncertainty, limited calibration and effectively no validation.
- Negative environmental consequences are predicted for 30 upland swamp endangered ecological communities (EECs) with an area of approximately 60ha. This includes nine swamps of special significance.
- Despite the impacts to upland swamps, no offsetting or remediation of groundwater or biodiversity impacts are proposed. This is not consistent with current government principles of avoid, mitigate or offset environmental impacts.
- Longwall mining below Cataract Creek should be avoided for the following reasons: (i) it cannot be determined that there will be a non-negligible impact as determined by the Planning Assessment Commission (PAC); (ii) it meets multiple criteria for special significance and has demonstrated habitat and recorded populations for a number of threatened species; and (iii) there is no effective method for mitigating impacts once mining under it commences.
- Longwall mining below (or within the angle of draw) of Wallandoolla and Lizard Creeks and the Lizard Creek third order tributaries should be avoided as it cannot be determined that there will be a non-negligible impact as determined by the PAC.
- The sampling methods used to assess impacts on aquatic ecology are not scientifically robust.

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- Not all previously recorded Aboriginal sites have been relocated. It is recommended that further attempts are made to relocate these sites. If the predicted subsidence impacts are revised a re-assessment must be undertaken of impacts on Aboriginal sites.
- Impacts to registered Aboriginal sites need to be avoided. In particular, it is recommended the layout of Longwall 8 should be altered as sites associated with it are of high cultural significance and should be conserved. As this is an important women's site consultation with the relevant Aboriginal women should occur to ensure that there is no inappropriate access to these sites during the mining process.
- There is insufficient information to enable an adequate assessment of greenhouse gas emissions and additional information is required before the assessment can be undertaken.

Based on the information contained in the exhibited EA, the OEH is concerned that the mine plan as proposed would have a significant impact on what is clearly acknowledged as an environmentally significant and culturally rich area.

Despite previous Government comments regarding the adequacy of assessments and significance of of potential adverse impacts raised during the preliminary approval process, the longwall layout has not been modified to protect significant natural features, including Coastal Upland Swamp endangered ecological communities (EEC) and significant streams that provide important habitat for threatened species within an almost wholly natural catchment area that is a major part of Sydney's drinking water supply.

OEH recommends the mine plan be amended to ensure that there is scope to accommodate coal mining, protection of Sydney's drinking water supply and integrity and conservation of threatened species, ecological communities and aquatic habitat.

The attached comments provide detailed recommendations on the information required to adequately assess this proposal. I trust this is of assistance. If you have any queries regarding this matter please contact Susan Harrison (9995 6864).

Yours sincerely

12/4/13

LOU EWINS
Manager Planning and Aboriginal Heritage
Regional Operations, Metropolitan

Attachment1: Office of Environment and Heritage (OEH) Review of Gujarat NRE Coking Coal Ltd (NRE) Environmental Assessment for the Major Underground Expansion of NRE No.1 Colliery – MP09_0013

ATTACHMENT 1

Office of Environment and Heritage (OEH) Review of Gujarat NRE Coking Coal Ltd (NRE) Environmental Assessment for the Major Underground Expansion of NRE No.1 Colliery – MP09_0013

1. Groundwater and Subsidence

The longwall panels proposed in the Wonga West area, if approved, would be the widest yet to be utilized in the Metropolitan or Woronora Special Areas at 390 metres wide. These longwalls will also occur under previously mined seams. The cumulative total subsidence from 2-3 mined seams will potentially lead to even greater impacts than a similar mining geometry in areas where there has been no previous seams extracted. Due to the panel width and previous mining history, a logical inference is that where swamps and streams are directly undermined or within the angle of draw of the current proposal, impacts are likely to be at least equal to (and potentially worse than) previous mining impacts identified on the Woronora Plateau. The Environmental Assessment (EA) does not adequately address relevant information requirements and observed impacts in areas immediately adjacent to the proposed mining domain (e.g. Dendrobium).

OEH considers that the EA remains inadequate in a number of areas. Concerns with subsidence and groundwater issues in the EA are:

- Given documented impacts from previous longwall mining on the Woronora Plateau, subsidence is most likely underestimated as are the risks and consequences to environmental assets.
- Existing impacts from previous mining activities are used as a justification for not assessing sites as significant, while at the same time the assessment of potential impacts of the proposed expansive mine layout are minimised (often referred to as "minor" or "unlikely" to occur).
- The assessment considers significant connected stream and swamp networks as sections only and then assesses risk of impact in these small sections without appropriately considering the downstream flow on effects from the potential loss of water.
- This sectional approach is justified by an argument that any water loss comes back somewhere downstream either in the river or storage, without any quantitative scientific data to support this claim.
- Extremely limited flow and groundwater level data within the mining domain are used to construct water and groundwater models with high levels of uncertainty, limited calibration and effectively no validation.
- Baseline data remains limited and the experimental designs of monitoring programs are often inadequate to assess impact.
- Baseline data is insufficient to determine parameters for rehabilitation should this be required.
- There is no commitment by the Proponent to rehabilitate any area that is impacted by this mine proposal.

1.1 Subsidence

Predictions of subsidence are fundamental to any assessment of the likelihood and consequence of risks to the natural environment and Aboriginal cultural heritage from the proposed mine plan . If the subsidence predictions are invalid or underestimated then any risk assessment based on those predictions will also be invalid or underestimated. OEH has previously expressed serious reservations about the subsidence modelling provided for this mine plan, as has the Department of Resources and Energy's (DRE) Chief Subsidence Engineer. These reservations remain as the estimates of subsidence have largely remained unchanged despite the considered expert debate over the last four years and the experiences gained with the recent extraction of Longwall 4 (LW4) in the Wonga East area.

OEH notes that measured subsidence and tilt over LW4 were considerably larger than initial predictions. Furthermore, no three-dimensional subsidence data is currently available to help assess the potential effects of valley closure and upsidence as a result of the mine plan. There are no estimates of valley closure or upsidence for the Wonga West domain (up to 390m wide longwalls and 2.55m predicted subsidence) and those provided for the Wonga East domain appear to be highly subjective and severely underestimated when compared to previous subsidence predictions on the Woronora Plateau (e.g. Metropolitan mine, Bulli Seam proposal, Dendrobium mine). Further detailed comparative analysis of previous subsidence predictions and observed measurements for LW4 have been undertaken by OEH and are available for future discussion.

The use of the Seedsman 'visualisation' method is largely untested and is yet to be validated, particularly for multi-seam mining applications. The EA states that the Seedsman Geotechnics Pty Ltd methodology was necessary because of the multi-seam nature of the extraction and the variety of mining techniques (e.g. bord and pillar, narrow and medium size longwalls) applied in the past. OEH reiterates that there are a number of issues with the adequacy of this explanation as stated below:

1. There are areas of the mine plan where no previous secondary extraction has occurred and the incremental profile method could usefully be applied to give greater certainty (or at least comparability) in subsidence predictions;
2. Chain pillar strength and load will be dependent on the strata strength surrounding the coal seam. Failure of the strata within the interburden is common in sections of weak to moderate strength strata. Such failure will reduce pillar loads and increase subsidence (ACARP C11032 2004);
3. Surface subsidence from multiple seams will be an accumulation of each equivalent single seam subsidence profile, chain pillar compression and additional goaf consolidation above underlying pillars. Subsidence is therefore likely to be greater and more complex than the addition of single seam subsidence profiles. Empirical predictions should be seen as initial approximations based on idealised ground behaviour (ACARP C11032 2004); and
4. Concept planning for multi seam operations may be undertaken using empirical pillar strength and subsidence characteristics, however planning at a feasibility to operational level requires computer modelling of the strata section and mine geometries. Detailed characterisation of the strata within the total mining section is an essential requirement to undertake realistic mine planning (ACARP C11032 2004).

It is noted that the original subsidence assessment methodology used by Seedsman Geotechnic (2010) was not a detailed characterisation of the strata within the total mining area. The Seedsman Geotechnic (2010) report stated:

- *"A large degree of judgement has been used to decide on maximum vertical subsidence outcomes for the various layouts that are proposed".*
- *"Base Case Wongawilli West subsidence prediction and visualisation is based on a very large degree of judgement in the absence of calibration/validation data"*
- *"The available subsidence data has been manipulated to give an indicative contour plan of the vertical subsidence across the first 4 panels"* (no details on the 'manipulation' applied)
- *"Based on a large degree of judgement there may be some valley closure and upsidence in these creeks, possibly in the order of 100mm" and*
- *"It is acknowledged that there is a need for calibration and verification before these can be used as predictions".*

While the above phrases now no longer appear in the Seedsman Geotechnics (2012) report, the subsidence methodology and predictions used in the current EA are still essentially the same – i.e. based on exactly the same methodology as described in Seedsman Geotechnic (2010). In addition, despite detailed discussions about the potential impacts of the proposed mine and adequacy of subsidence assessment (alluded to in Seedsman Geotechnic 2012 p.6), little to no change occurs to the subsidence "visualisations", particularly in the Wonga West domain (see Figure 1). It is these "visualisations" which form the underlying predictive base for subsidence assessment and risk assessment in the current proposal.

While OEH appreciates the technical difficulties and uncertainty inherent in any subsidence prediction methodology under such difficult conditions (and lack of knowledge), OEH does not support a trial and error approach to mining utilizing such wide, untested and potentially damaging panels in what is a very sensitive and important area. **OEH suggests that the risk assessments in the EA are highly flawed (especially for streams and swamps) and have not validly considered the potential impact of valley upsidence and closure movements of the magnitude likely to occur for this proposal.**

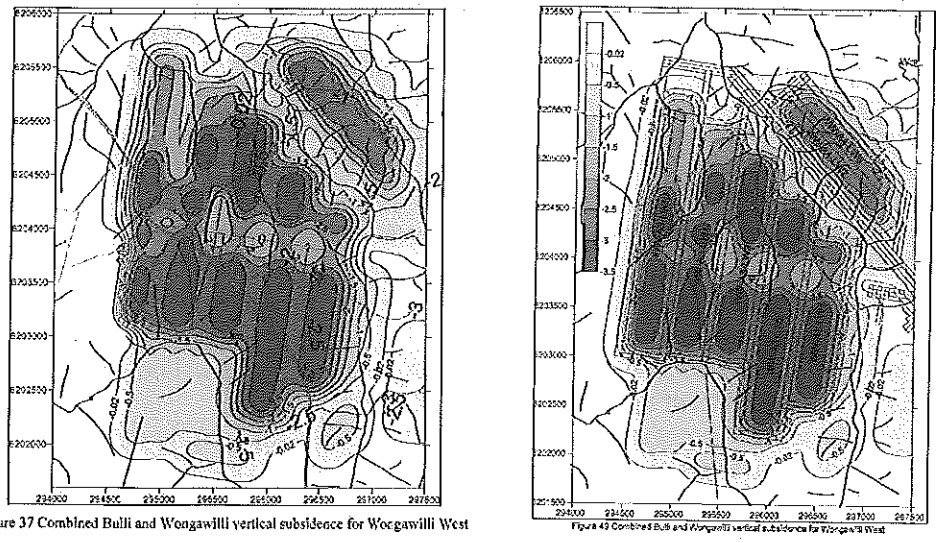

Figure 37 Combined Bulli and Wongawilli vertical subsidence for Wongawilli West

Figure 1. Subsidence "visualisations" for the Wonga West domain from Seedsman Geotechnics (2010) left and Seedsman Geotechnics (2012) right.

One of the more recent pieces of work to be included in this EA is a review of the original expanded mine proposal (and Government Agency comments) by Pells (2011; see Appendix E of the Longwalls 4 and 5 EA). While Pells expresses differences of opinion in regards to subsidence predictions and probabilities of pillar runs, he also identifies significant shortfalls in the assessment of impacts to groundwater aquifers, streams and swamps. If the Proponent's independent peer-review of the original NRE expanded mine plan EA (deemed to be inadequate by a number of Government agencies) also identifies significant deficiencies, then a normal expectation would be that these inadequacies are addressed by the Proponent prior to re-submittal. This does not occur in the current EA.

1.2 Faults

OEH also has concerns over the potential presence of faults in the project area and the potential for faults to exacerbate impacts. It is now well demonstrated that longwall mining at Angus Place and Springvale has impacted Newnes Plateau Shrub Swamp EEC (Aurecon 2009; DECCW 2010; Goldney et al 2010; Commonwealth Government 2011). The explanations provided for the damage to East Wolgan Swamp and increased subsidence at Narrow Swamp all point to issues associated with geological structure interacting with subsidence, upsidence and valley closure, and in at least one case this led to catastrophic failure of the East Wolgan swamp.

Pells' (2011) peer review of the expanded Gujarat NRE proposal (included in the EA) identified inadequate assessment of the interaction between mining and faults. It included the statement that "*documentation of important geological structures such as faults, joint swarms and igneous intrusions is very limited, and consideration of such structures on surface deformations, groundwater flow, and impacts on creeks and swamps, is not adequate*" (p.18). These inadequacies have not been addressed in the current EA.

1.3 Stream Assessment

Alteration of the natural flow regimes of streams is recognised as a major factor contributing to loss of biological diversity and ecological function in aquatic ecosystems (NSW Scientific Committee 2002). In reviewing this proposal, it is useful to reflect on two observations made by the Bulli Seam PAC on the issue of impacts of longwall mining to streams. These were:

1. ***The Panel does not subscribe to streams being represented as a series of discrete features in the landscape.*** *Streams form a connected linear network. Many stream values depend on the recognition of the stream system as a continuum with the value of any segment heavily dependent on what happens up and downstream and in higher and lower order components of the system. Protecting the values of streams from impacts that are broad in scale will rarely require intervention only at a series of discrete locations – it is more likely to require some form of intervention or control throughout the interconnected linear network.*
2. ***In the remote areas of sandstone gorges to the east and south of the Study Area, the Panel's assessment finds that much of the value of the stream network is closely associated with its natural characteristics and its pristine setting.*** *Values relying on 'naturalness' have two distinguishing traits:*
    a. *Even small impacts can have major consequences for naturalness values. The response is non linear with a major threshold at very low levels of impact.*
    b. *Even with appropriate remediation, recovery of naturalness values has a long hysteresis and may in fact be irreversible. Reliance on remediation as a primary risk management option does not recognise this trait.*

OEH notes that the Gujarat NRE No.1 EA considers the streams and swamp networks only where they lie above the mining domain and as segments only without due regard to the stream as a continuum that is likely to be significantly affected by the mining activities. Much is made of existing impacts in Wallandoola and Lizard Creeks as a result of past mining in the area, despite the vast majority of these streams and their tributaries still providing significant aquatic habitat, which in some cases supports populations of threatened species. Previous mining impacts are used to argue that this no longer makes these streams of 'special significance' over the Gujarat NRE mining domain and that it is therefore appropriate to afford these important streams a lesser level of protection and effectively continue to impact/degrade them. OEH does not accept this as an objective assessment of the value of these systems, and does not believe that further areas of Wallandoola and Lizard Creeks should be degraded to a similar level because past mining impacts have occurred and the mining companies responsible for these impacts have failed to return and remediate these areas.

When considering potential impacts to Wallandoola Creek and Lizard Creek, OEH considers the suggestion that a connected stream worthy of a high level of protection (via a negligible impact criteria) in one area suddenly changing to being worthy of a much lower level of protection in another area, simply because it crosses an arbitrary adjoining mining lease boundary, to be flawed logic.

OEH also notes that the Proponent only considered avoidance of 'named' streams. OEH considers the arbitrary 'naming' convention of a 3rd order stream to be a highly inappropriate criteria for deciding which streams are or are not undermined and believes it is inconsistent with SCI and PAC recommendations. OEH notes that the Metropolitan PAC review considered the unnamed 3rd order tributary of Waratah Rivulet to have many significant features worthy of protection. It is also considered illogical and inconsistent that the Geoterra (2012) stream assessment can conclude that Lizard Creek Tributary 2 is of "special significance" yet the mine is still planning up to 390m wide longwalls directly under this 3rd order tributary. If a section of an important 3rd order or contributing stream in this area is further impacted/degraded, there is further loss of flow (and the water quality is degraded), this will automatically impact on the downstream reaches and their values that have already been assessed by the Bulli Seam PAC as being of "*special significance*".

OEH believes that the following streams are of 'special significance' and therefore require a performance criterion of ***negligible subsidence-related impact*** in any approval:

- Cataract Creek - 3rd order and above, habitat for threatened Macquarie Perch;
- Wallandoola Creek – 3rd order or above, drains from significant upland swamp;
- Lizard Creek – 3rd order or above, drains from significant upland swamp, habitat for threatened Giant Burrowing Frog and Red-crowned Toadlet;
- Lizard Creek Tributary 1 – 3rd order section, 1st and 2nd order sections draining from upland swamp, known breeding habitat for threatened Giant Burrowing Frog and Red-crowned Toadlet; and
- Lizard Creek Tributary – 3rd order section, 1st and 2nd order sections draining from upland swamp, multiple known breeding pools of threatened Giant Burrowing Frog, pool at commencement of 3rd order section identified as a highly significant Aboriginal cultural heritage site.

Geoterra (2012) excludes first and second order streams from consideration of value and consequence if impacted. This ignores the Bulli Seam PAC's view of their vital role in the interconnectivity of the system. The PAC considered them to be particularly important in protecting the continuity of flow and the quality of water conveyed between the upland swamps and the larger streams. In numerous places within Geoterra's (2012) assessment, first and second order streams are described as "ephemeral" without any appropriate assessment of flow.

The presence of an upland swamp in the headwater of a drainage line can lead to a more stable groundwater discharge, thereby ensuring perennial flow (outside of drought conditions). This is supported by piezometric monitoring which indicates that many swamps on the Woronora Plateau maintain a perched water table (Parsons Brinckerhoff 2007, 2009, BHPIC unpublished data) even during periods of significant rainfall deficit, often with continuous or near-continuous (but at this point in time unquantified) supply to the stream network at the downstream end of the swamp. OEH therefore has concerns with the EA identifying first and second order streams and swamp aquifers as "Ephemeral" particularly when they are connected to one another and, as in the Gujarat EA, are located close to the escarpment in a high rainfall zone (i.e. average annual total of 1419 mm at Darkes Forest). Such an assessment ignores the effect upland swamps have on baseflow delivery and makes no allowance for the high rainfall that occurs in these catchments. In addition, these 1st and 2nd order streams have significant habitat value for threatened frogs, dragonflies and the Macquarie Perch. There are no proposals in the EA to avoid, mitigate or remediate impacts on lower order streams.

Given concerns about the existing subsidence predictions and its likely underestimation of impacts, the only way that the Proponent can meet criteria of negligible environmental outcomes for these streams is by modifying the longwall layout to avoid and minimise impacts. It should also be noted that the PAC made recommendations for protection of Lizard and Wallandoola Creeks in full recognition of the impacts already evident in Lizard and Wallandoola Creeks.

1.4 Water modelling

WRM Water and Environment (2012) (Appendix A in Annex O) has attempted to model stream flows within the Gujarat NRE domain with extremely limited flow, rainfall, runoff and evaporation data, especially within the most important streams that are actually proposed to be undermined. WRM (2012) notes:

- Volumetric flow monitoring has not been conducted in Lizard Creek between LC3 and LC6 due to two zones of subsidence cracking in the creek bed resulting in disconnected stream flow during low flow periods due to mining subsidence over the Bulli Seam workings;
- No flow monitoring has been conducted to date in Wallandoola Creek;
- Volumetric stream flow monitoring has not yet been conducted in Cataract Creek; and
- Volumetric stream flow has not yet been conducted in Cataract River.

OEH also notes the absence of flow measurements for the two 3rd order tributaries of Lizard Creek or any potentially permanent sections of first or second order streams leading from swamps within the Gujarat NRE mining domain. The EA is therefore considered inadequate for not having real flow data for the vast majority of streams to be directly undermined or potentially impacted by the proposed NRE mine. As

such, there is no means (apart from poorly calibrated and unvalidated models) to assess either the potential loss of flow in these streams or recovery if any remediation is applied. OEH notes there is no commitment by the Proponent to rehabilitate any stream that is impacted by this mine proposal.

WRM (2012) considers 2 scenarios of flow loss (0.5 ML/day and 1 ML/day) to Wallandoola and Lizard Creeks as a result of mining. Whilst acknowledging the significant caveats on the calibration and validation and therefore reliability of the WRM models, Figure 7.5 (p.64 Appendix A in Annexure O) suggests the following:

- Lizard Creek and Wallandoola Creeks currently experience flows less than 0.01 ML/day approximately 15% of the time (modelled as opposed to real data);
- If 0.5 ML/day were lost to Lizard Creek then Lizard Creek would experience flows less than 0.01 ML/day approximately 52% of the time (modelled as opposed to real data);
- If 1 ML/day were lost to Lizard Creek then Lizard Creek would experience flows less than 0.01 ML/day approximately 62% of the time (modelled as opposed to real data);
- If 0.5 ML/day were lost to Wallandoola Creek then Wallandoola Creek would experience flows less than 0.01 ML/day approximately 54% of the time (modelled as opposed to real data);
- If 1 ML/day were lost to Wallandoola Creek then Wallandoola Creek would experience flows less than 0.01 ML/day approximately 64% of the time (modelled as opposed to real data)

The exact low flow statistics for this modelling are not presented in WRM (2012), however both loss scenarios could potentially mean that Wallandoola Creek and Lizard Creek cease to flow more often than they would actually flow. This has significant ramifications for aquatic habitat, threatened species populations, stream connectivity and drinking water supply. OEH does not consider this magnitude of flow loss acceptable and recommends modification of the mine plan to reduce likely impacts to significant streams to negligible environmental consequences.

OEH also disputes Geoterra's (2012 p.24) opinion that "*the quantum of surface water lost to cracking from intermittent or ephemeral streams will therefore be low.*" There is no quantitative scientific foundation for this opinion because actual flows have not been measured throughout the majority of the mining domain and there is virtually no baseline flow data. OEH contends that the potential cumulative loss of flow from the many small streams, particularly those draining upland swamps, and the upland swamps themselves, are in actual fact extremely significant for stream flow and aquatic habitat maintenance in these areas. As discussed above, if the modelling provided by WRM (2012) is considered (acknowledging the earlier caveats expressed about the reliability of these models), losses of only 0.5-1 ML/day could potentially increase the low flow periods in Wallandoola and Lizard Creeks from approximately 15% of the time (modelled data) to over 50-60% of the time (modelled data). At these modelled levels of impact/flow loss, these streams would potentially undergo a major change from a perennial to intermittent stream. OEH's view is that the whole area requires a proper hydrological assessment based on real gauging data to assess the full consequence of water loss as a result of mining subsidence impacts.

1.5 Groundwater Modelling

Golder Associates (2012) state that "*because of the limited extent of available data and the uncertainties regarding subsidence over multi-seam coal extractions, it is only possible to provide predicted values for changes in groundwater levels and groundwater inflows to/outflows from surface water bodies*". Also, "*the limited piezometric data and borehole geological information available for this modelling study has resulted in simplifications and assumptions to be made regarding model structure and parameters.*"

OEH reiterates that it the responsibility of the Proponent to provide the necessary data upon which major decisions about impacts to groundwater resources, and their interaction with environmental values, are to be made. As with the stream flow models, the lack of adequate baseline data to build, calibrate and validate the groundwater model means that there is high uncertainty in prediction, outcome and potential consequence.

Direct impacts to groundwater

It is noted that there is little direct comparison of the groundwater modelling results in the EA to other areas in the Southern Coalfields. Whilst acknowledging that there is high uncertainty in the results of the groundwater model of Golder Associates (2012), if these predictions are compared to the most recent reviews of Dendrobium groundwater impacts (see Table 1) they suggest that predicted groundwater draw downs in the Wonga East and Wonga West domains are:

- potentially greater than those directly measured over Dendrobium for the lower sandstone seams and coal measures, and
- potentially underestimated for the Hawkesbury Sandstone strata; with a 7.6m decline in groundwater level measured in the upper Hawkesbury Sandstone (GHD 2008) and up to 25m groundwater level decline for the lower Hawkesbury Sandstone over Dendrobium (Heritage Computing 2012).

	Groundwater Drawdown		
Strata	**Wonga East (Golder Associates 2012)**	**Wonga West (Golder Associates 2012)**	**Dendrobium Observed groundwater decline (GHD 2008; Heritage Computing 2012; Krogh 2012)**
Upper Hawkesbury Sandstone	<5m	<12m	Variable, Low to at least 7.6m
Lower Hawkesbury Sandstone	8m	<12m	Up to 25m
Bald Hill Claystone	? Assumed to remain intact	? Assumed to remain intact	?
Upper Bulgo Sandstone	8m	100m	5-50m
Lower Bulgo Sandstone	30m	180m	5-50m
Scarborough Sandstone	110m	140m	10-40m
Bulli Coal Seam	130m	120m	40-60m
Wongawilli Coal Seam	60m	40-90m	Depressurized

Table 1. Effects of Groundwater Declines on Surface Water over the NRE Mining Domain

Most conceptual models of groundwater aquifers suggest that they provide significant baseflow to the many streams within the Sydney Catchment Authority (SCA) Special Areas. However, groundwater discharge areas and the effect of lowering of groundwater aquifer levels have not been adequately investigated in the EA. The Hawkesbury Sandstone and Bulgo Sandstone aquifers are likely to provide most of the baseflow to streams within the SCA Special Areas (Madden 2008). If the stage 2 predictions for drawdown over the NRE's mine plan for just the Bulgo Sandstone are considered, the Wonga West longwalls are predicted to alter the Bulgo Sandstone groundwater aquifer levels by a drawdown of 100-180m. If the experiences at nearby Dendrobium are considered, Hawkesbury Sandstone aquifers will also experience large drawdowns in aquifer levels, potentially of the order of 5 to 25m. It is clear that the EA has not adequately considered the environmental impact of such groundwater declines on baseflow to the stream networks.

Geoterra (2012b, p.37) identify significant groundwater impacts in the piezometer responses for P501 and P502 over Bellambi West panels 501 and 502 in the vicinity of the Wonga West domain. However they fail to identify that under the proposed plan for Wonga West (up to 390m wide pillars – 3.5 times the width of the 501 to 509 panels), subsidence is predicted to be 12 times greater (maximum 2.55m; Seedman Geotechnics 2012) and stress values are predicted to be 17 to 30 times greater than that measured for the 501 to 509 panels. If the Bulli Seam PAC discussion of height of fracturing above the mine is also considered, then there is a real potential for surface to seam fracturing for the 390m wide longwalls proposed for the Wonga West domain.

2. Biodiversity

2.1 Upland Swamp Assessment

In general, OEH supports the use of the draft *Upland Swamp Environmental Assessment Guidelines* (OEH 2012) to inform the identification of swamps of special significance and the risk assessment process. The guidelines are based on the premise (first raised in the 2009 Metropolitan PAC report) that:

> *Negative environmental consequences are considered undesirable for all swamps and*
> *a) swamps of special significance will be protected from negative environmental consequences;*
> *b) a presumption of protection from significant negative environmental consequences will exist for all other swamps unless the Proponent can demonstrate for an individual swamp that costs of avoidance would be prohibitive and mitigation or remediation options are not reasonable or feasible. Under circumstances where the decision is to allow significant negative environmental consequences to occur and remediation is not feasible offsets may be considered appropriate.*

Biosis (2012) has provided a very good on-ground survey and characterization of the vegetation type and extent of upland swamp EECs over the Gujarat NRE mining domain. This assessment identified 84 upland swamp EECs over the mining domain. Biosis has applied the OEH draft guidelines appropriately in identifying swamps of potential special significance, identifying 15 swamps as meeting the criteria, including seven in Wonga East (CCUS1, CCUS10, CCUS4, CCUS5, CRUS1, CRUS2 and CRUS3) and eight in Wonga West (LCUS1, LCUS27, LCUS6, LCUS8, WCUS1, WCUS11, WCUS4 and WCUS7). OEH notes that Biosis (2012) has only considered these swamps of special significance in its risk assessment, rather than following PAC recommendations to assess *"All swamps subject to the risk of negative environmental consequences".*

Of the 15 swamps considered to be of 'special significance' Biosis (2012) identifies nine (CCUS1, CCUS10, CCUS4, CCUS5, CRUS1, WCUS11, LCUS8, WCUS4 and WCUS7) which are likely to be subject to negative environmental consequence based on PAC thresholds for potential impacts to swamps (see subsidence section above). OEH agrees with Biosis (2012) that these swamps are likely to be subject to negative environmental consequence due to the proposed mine on the basis of the information provided in the EA. Such impacts are likely to include fracturing of the sandstone underlying the swamp, drainage of perched aquifers within the swamp and significantly altered swamp hydrology.

Unfortunately Biosis (2012) also applies a 'flow accumulation' model which separates these potentially impacted swamps further, with some swamps assigned a 'low' potential for impact based largely on 'limited available data' and flow accumulation indicating a 'small' potential for change (Table 16; Biosis 2012). OEH notes that 'small' is not appropriately defined and impacts to flow accumulation, as applied by Biosis, would be over and above impacts as a result of bedrock fracturing and perched aquifer draining.

OEH does not accept the assumption that low impacts to 'flow accumulation' automatically means a lower level of impact to upland swamps will occur. As an illustration of the inconsistency in Biosis' approach, subsidence values as calculated by Biosis, are provided in Table 2 for the swamps of *"Special Significance"* CCUS4 and CCUS5. It is clear that there is very little to differentiate CCUS4 and CCUS5 on the basis of subsidence predictions and that tilt, tensile stress and compressive stress are all well above PAC thresholds for negative consequences for upland swamps. The suggestion that one swamp (CCUS4) has a 'low' potential for impact and the other (CCUS5) has a presumably high potential for impact leading to a recommendation to adjust layout, is not supported by the subsidence predictions. From OEH's perspective both swamps are at risk of bedrock fracturing and loss of perched aquifers and it is the loss of the perched aquifer and continued draining into the fracture network that represents the biggest risk to these upland swamps (not potential changes to their 'flow accumulation').

Swamp	Special Significance	Predicted Subsidence (m)	Tensile stress (mm/m)	Compressive stress (mm/m)	Tilt (mm/m)	Valley Closure
CCUS4	Yes	-1.00	4.63	-8.03	21.04	0.00
CCUS5	Yes	-1.00	4.74	-8.03	21.30	0.00

Table 2. Extract from Appendix 2 Swamp matrix; Source Biosis (2102).

Biosis acknowledges that "*subsidence predictions are inexact and provide a guide for understanding potential subsidence effects. Analysis based on these will also have the same level of uncertainty and provide a guide only*". It is therefore very surprising that it then uses these "inexact" predictions to undertake a very fine scale of assessment to determine the likely fracturing zones within swamps. Conclusions such as "*the base of this swamp* (CCUS4), *where water dependent vegetation communities occur and rockbar is present, will be subject to lower levels of strain and risk of fracturing*" cannot be justified given the low level of confidence in the accuracy of the subsidence predictions.

The Appendix 2 Swamp Matrix also throws up a number of other fundamental inconsistencies:

- All swamps have a stated closure level of 0.00 mm;
- Both compressive and tensile stresses have a mix of positive (+) and negative (-) values;
- A number of swamps using the Biosis (2012) assessment methodology have a predicted subsidence greater than 3m (maximum of 3.35m), but Seedsman has stated a maximum subsidence in Wonga West of only 2.55m; and
- Predicted subsidence at CCUS4 and CCUS5 is given as - 1.00m but subsidence over longwall 4 (similar areas to where CCUS4 and CCUS5 exist) was measured at 1.4m.

It is clear in the EA that Gujarat NRE has not attempted to modify its mine plan to avoid these nine swamps of special significance identified to be at risk of negative environmental consequence and therefore any impacts to these swamps will not meet PAC recommendations for negligible impact. If these nine swamps are considered in terms of community value ($2M/Ha based on choice modelling for the Bulli Seam proposal; BHPBIC 2009) then their value to the community would be estimated at approximately $79M (total area of 9 swamps is 39.43 Ha; Biosis 2012 Appendix 2). The community value of these swamps has clearly not been included in any cost-benefit analysis for the mine plan.

In addition, a further 21 swamps (BCUS11, BCUUS4, CCUS11, CCUS12, CCUS2, CCUS21, CCUS23, CCUS3, CCUS6, LCUS12, LCUS18, LCUS19, LCUS20, LCUS21, LCUS25, LCUS28, LCUS29, LCUS9, WCUS12, WCUS8, WCUS9) are also at risk of negative environmental consequence based on the PAC subsidence thresholds for swamps. If these 21 swamps are considered in terms of community value ($2M/Ha based on choice modelling for the Bulli Seam proposal; BHPBIC 2009) then their value to the community would be estimated at approximately $42M (total area of 21 swamps is 20.92 Ha; Biosis 2012 Appendix 2). The community value of these swamps has also clearly not been included in any cost-benefit analysis for the mine plan.

Collectively, the mine plan is predicted to cause negative environmental consequence to 30 upland swamp EEC's with an area of approximately 60ha. This represents approximately 3% of all swamps on the Woronora Plateau as mapped by OEH and all contained within the key Wallandoola Creek cluster of swamps. OEH notes there is no offsetting or remediation proposed for any of the upland swamp EECs predicted to be impacted in the EA.

OEH supports Biosis (2012) recommendations for adjusting longwall layouts to reduce impacts to swamps CCUS1, CCUS5, CCUS10, CRUS1, WCUS4 and WCUS7. OEH believes similar recommendations should be made for CCUS4, LCUS8 and WCUS11. A fuller justification for the full environmental and social consequences of the loss of a further 21 swamps not considered specially significant, should also be provided.

Geoterra (2012b, p.74) states:
"It should be noted that headwater swamps have undergone up to 1.0m of subsidence, up to 1.5mm/mm of strain and up to 4.5mm/m of tilt due to undermining by the Bulli 200 and 300 series longwalls at Wonga

West, along with the Bulli bord and pillar, Bulli seam pillar extraction and Balgownie longwall extraction at Wonga East, with no apparent adverse effects on their water holding capacity or ecology".

Apart from the lack of quantitative monitoring in these swamps during older mining operations, the consultants fail to identify that under the proposed plan for Wonga West (up to 390m wide pillars – 2-2.7 times the width of the 200-300 series longwalls), maximum subsidence is predicted to be 2.5 times greater (maximum 2.55m; Seedman Geotechnics 2012), maximum stress values are predicted to be 8 to 9 times greater and maximum tilts are predicted to be 2.8 to 3.9 times greater (see Table 1 Subsidence section). Further, this subsidence will be acting over and above subsidence from the earlier mined panels. Thresholds that had not previously been breached could now very well be exceeded. The assessment also ignores the most recent experience over Dendrobium (narrower longwall panels) and other areas where impacts to swamps have clearly been demonstrated as a result of longwall mining (Heritage Computing 2012, Krogh 2012, Aurecon 2009, Goldney et al 2010).

This relevant information should have been included in the swamp impact assessment. As a result of the range of deficiencies above, OEH does not consider the conclusions of Geoterra (2012b) to be credible, including those of *"no observable impact, no observable adverse consequences, not anticipated to undergo any adverse effects or consequences".*

Swamp Aquifer Monitoring

Due to various iterations of the mine plan and negotiations with Government for previous approvals, a number of piezometers now exist in some of the upland swamps overlying the Gujarat NRE mining domain. A review of monitored swamps identifies that of the nine special significance swamps potentially suffering negative environmental consequence as a result of the mine plan, only four of these (CCUS4, CCUS5, WCUS11 and WCUS4) currently have a piezometer (often only a single one) installed to measure water levels.

Comparative Analysis

Biosis (2012) provide a section on comparative analysis of subsidence impacts to swamps, however OEH believes the literature cited is highly selective and does not provide an objective assessment of the potential causes and consequences of impacts to swamps. Biosis (2012) states:
"Although hypothesized to be a contributing factor, subsidence has not been determined to be a sole reason for any observed impacts to upland swamps; however subsidence effects are believed to be a contributing factor" (p. 35), and *"It's too early to tell whether reductions in Swamps 12 and 15a* (Dendrobium Area 2 and 3A) *will result in impacts to these swamps"* (p.37).

Both sentences appear to suggest that loss of a perched aquifer in a swamp is somehow not an impact. There is now ample evidence on the Woronora Plateau (Swamp 1 Dendrobium 2, Swamp12 and 15b - which Biosis later refers to) and Newnes Plateau (East Wolgan Swamp, Kangaroo Creek Swamp) to demonstrate longwall mining has caused the loss of perched aquifers and surface water within the affected swamps (Heritage Computing 2012, Aurecon 2009, Gibbins 2003, DECCW Krogh 2012). These are quite clearly impacts. If Biosis' statement is meant to imply that swamp vegetation has or does not change as a result of altered groundwater levels within the swamp then it is clear that it has not considered the extensive Australian and worldwide literature on the effects of draining of peat swamps.

Potentially of more concern in Biosis' comparison is the lack of citation of:

- its own work (e.g. Biosis 2001) discussing the condition of Swamp 18 immediately prior to the fires of 2001 which identified significant but unexplained soil fracturing within Swamp 18, similar to recent soil fractures over Dendrobium;
- The work of Gibbins (2003) who identified significant fracturing within the bedrock beneath Swamp 18; and
- the BACI statistical analysis of vegetation data for Dendrobium Swamp 1 by Symbolix (2011), who noted significant impacts to the swamp community as a result of undermining (see discussion in Krogh 2012).

2.2 Aquatic Ecology Assessment

Ordinarily OEH would be supportive of the experimental design outlined in the Aquatic Ecology report (Cardno Ecology Lab 2012). However, this report fails to adequately address potential impacts to aquatic ecology as a consequence of the proposal as they have inadequately sampled all major streams in the area and a demonstrably inferior (potentially inappropriate) sampling method (250 µm mesh dipnet) has been employed to sample fish throughout the majority of the proposed mining domain. OEH would argue that backpack electrofishing should have been used throughout the mining domain to assess the potential species present and that an inadequate baseline assessment for fish has been achieved over the majority of the mining domain. Further, the data collected to date is clearly insufficient to assess the effects that any impacts of the proposed mine plan would have on the fish communities in these areas. OEH again reiterates that it is the Proponent's responsibility to provide the baseline information upon which major decisions need to be made.

Additionally, the sampling is actually extremely limited in areal extent, particularly for the potentially more damaging Wonga West proposal. What is of more concern is that the overwhelming majority of sites are in areas outside of predicted impacts or in areas where predicted impacts are suggested to be low. There are no sampling sites in any of the streams to be directly undermined. OEH does not believe an adequate or objective assessment of impacts from the proposal is achievable with the current monitoring program.

Cataract Creek
Geoterra's report (2012, p.2) states:
"The proponent has provided an undertaking that it will terminate mining beneath Cataract Creek if subsidence and ground movements are predicted to exceed 250mm and the creek experiences greater than negligible impact".

It also states:
"Cataract Creek is proposed to be undermined by longwalls in the Wonga East (Area 2) with a predicted maximum subsidence of 0.8m along with up to 10mm/m compressive and 5mm/m tensile stress over WE-A2-LW8" (Seedsman Geotechnics, 2012).

It is clear that the NRE subsidence predictions (which OEH considers are under estimates) are already above the 250mm mark for Cataract Creek and there is a very real likelihood of negative environmental consequence. It is far too late to stop/withdraw once the creek has experienced greater than negligible impacts. OEH also notes that there is no commitment to remediation should this negligible impact criteria be breached. OEH believes the Proponent's undertaking to terminate mining is ineffective as an impact mitigation strategy in this context and that the Proponent should be required to avoid directly undermining Cataract Creek altogether (and not allow longwalls to encroach within the angle of draw). This is a creek that satisfies multiple criteria for special significance and has demonstrated habitat and recorded populations of a number of threatened species.

The views of the EA's own peer reviewer (Pells 2011) are at significant odds with the 'minimalist' view of impacts suggested by the stream (Geoterra 2012), groundwater (Geoterra 2012b), swamp (Biosis 2012) and aquatic ecology (Cardno 2012) assessments. OEH believes that the Pells (2011) review provides a more objective assessment of potential impacts to streams, swamps and groundwater aquifers.

OEH notes there is no conclusion in the Cardno assessment (2012) related to streams directly above the longwall mine (including 3rd order streams defined in the EA as being of special significance or streams flowing from upland swamps) or adequate consideration of the potential loss of baseflow as a result of disruption to groundwater aquifers.

2.3 Threatened Species and EECs

The Terrestrial Flora and Fauna Assessment by ERM concludes that the study area contains a number of ecological features of special significance including threatened species and endangered ecological

communities. The Coastal Upland Swamp EEC has been discussed at length in the sections above and OEH has concluded that the proposed longwall layout must be modified to reduce the impact to the level of negligible environmental impact.

The assessment of significance (7-part test) undertaken by ERM for this proposal concludes that there will be a significant impact on the Giant Burrowing Frog. OEH raised significant concerns about the likely impact on this species and other threatened frogs in its comments on the preliminary environmental assessment back in 2009. The longwall layout for the Wonga West domain has not changed since that time. Measures to avoid and minimise the impacts of the proposal on significant natural features, including populations of nationally listed threatened species have not been adequately explored. OEH recommends that the proposal be modified to reduce the impact on the species to a non-significant level. This can be achieved primarily by adjusting the longwall layout to avoid and/or minimise impacts on streams of special significance within the Wonga West domain.

Furthermore, given the likely significant impact on the nationally threatened Giant Burrowing Frog, OEH strongly advises that Gujarat NRE refer the proposal to the Australian Government for assessment under the *Environment Protection and Biodiversity Conservation Act* (1999).

OEH believes that the impacts on other swamp dependant threatened species have not been adequately assessed. In particular, the Giant Dragonfly (*Petalura gigantea*) was not surveyed for as part of the terrestrial fauna assessment. OEH has previously argued that the Giant Dragonfly was likely to be present in upland swamp EECs on the Woronora Plateau and this was recently confirmed (January 2013) with sightings and captures of the Giant Dragonfly in swamps Den1b and Den14 over Dendrobium Area 3. This species is particularly at risk if the perched aquifers in the swamps are lost as a result of longwall mining. Given the large number of Coastal Upland Swamps that are likely to be subject to negative subsidence-related impacts then a more rigorous survey and assessment for this species is warranted. Given that there will be negative impacts on over 30% of all swamps in the project area, a species that is wholly dependant on this habitat requires a greater focus. It is recommended that a robust assessment of significance be undertaken for this species.

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Parsons Brinckerhoff 2007 Potential impacts of the proposed Upper Nepean Borefield on Temperate Highland Peat Swamps on Sandstone. Report 2116730A PR_6388 RevH. December, 2007.

3. Aboriginal Cultural Heritage

OEH has reviewed the Aboriginal cultural heritage assessment provided as part of this application and has the following comments to make.

Site survey and investigation at Gujurat NRE No.1 colliery targeted previously recorded sites only and was not able to relocate the majority of these sites. Furthermore, three newly identified sites were recorded while trying to relocate the known sites.

The following table illustrates this:

	Relocated sites	**Sites not relocated**	**Newly identified sites**	**Total**	**% relocated**	**% not relocated**
Wonga East	5	17	0	22	*23*	*77*
Wonga West	9	21	3	33	*30*	*70*

OEH considers that it highly likely that, given the cultural significance of this area and the relatively intact landscape, further previously unrecorded sites are likely to be located within the study area.

Recommendations

In relation to the known sites that have not been relocated, OEH recommends that further effort be made to relocate these sites so as to better inform the assessment of the Aboriginal cultural heritage impacts of the proposal.

In relation to unrecorded sites that are predicted to be within the study area, it is recommended that these be surveyed for while undertaking the survey to relocate previously identified Aboriginal sites. Any newly identified sites must be recorded on AHIMS as soon as practicable.

If subsidence predictions are remodelled, further assessment of impacts on previously known and any newly relocated or new sites must be undertaken.

Every effort must be made to avoid impacts to Aboriginal sites, especially those of cultural significance. In particular, OEH recommends that the layout of Longwall 8 be reconfigured to ensure that there is no impact on the identified women's site AHIMS #52-2-1183 (Lizard Creek 14). Furthermore, OEH recommends that the Proponent be required to discuss access to the site for the purposes of any ongoing monitoring of this site.

All known Aboriginal sites located within the mine areas and predicted subsidence impact zones must be subject to a programme of archaeological monitoring consisting of thorough baseline recording prior to the commencement of mining activities, at appropriate points during mining and up to six months after mining has ceased in the longwall.

Consultation with the Aboriginal community must continue through the life of the mine, particularly in relation to appropriate management of all Aboriginal sites and mitigation in the event that any site is impacted as a result of mining activities.

4. Greenhouse Gas Emissions

OEH considers that the EA does not provide sufficient information to enable an adequate assessment against the Director General's Requirements. OEH recommends that the Proponent be required to provide additional information on:

- the impact of the Commonwealth's Carbon Price Mechanism on the project;
- assumptions used in the quantitative assessment of greenhouse gas emissions;
- measures to ensure that the project is energy efficient; and
- the technical and economic feasibility of alternatives to the free venting of mine methane.

These issues are detailed below.

4.1 The impact of the Carbon Price Mechanism on the Project's viability

The EA does not appear to include any estimate of the liability of the Project under the Commonwealth's Carbon Price Mechanism (CPM). While analysis of the CPM was not an explicit Director General's Requirement, OEH considers that liabilities under the CPM should be treated like any other Project cost.

OEH estimates that under the Commonwealth Treasury's "Core Policy" scenario for the future carbon price, the Project could be liable to purchase emissions units valued at a total of $1.86 billion over its life, or $769 million in net present terms. Under this carbon price scenario the CPM will reduce the Project's net present value by 31% and its total value by 38%. This does not include assistance under the Commonwealth's Coal Sector Jobs Package which may or may not reduce the CPM liability up to the year 2017.

Given the significant nature of this omission, OEH considers that the EA is currently inadequate and recommends that the Proponent be required to revise Section 28 Economic Analysis and Section 11 Greenhouse Gas Emissions Assessment accordingly.

4.2 Quantitative assessment of potential Scope 1, 2 and 3 greenhouse gas emissions and qualitative assessment of the potential impact of these emissions on the environment

The EA contains a quantitative assessment of the potential Scope 1, 2 and 3 emissions from the project. It does not contain a qualitative assessment of the potential impact of these emissions on the environment.

There are at least two claims made by the Proponent that are not supported by documentation. These are that:

- 95% of diesel consumption is underground and therefore associated greenhouse gas emissions are already accounted for separately in ventilation air measurements; and
- greenhouse gas intensity of NSW grid electricity will reduce to 0.82 tCO_2e/MWh by 2015 based on a forecast in a consultant's report that is not adequately referenced.

OEH estimates that these two assumptions reduce Scope 1 emissions by 0.2% and Scope 2 emissions by 7.9%. OEH recommends that the Proponent be required to submit a revised assessment including:

- a qualitative assessment of the potential impact of emissions on the environment;
- additional information on the calculation of the proportion of diesel consumed underground; and
- an estimate of Scope 2 emissions using methods consistent with the 2012 National Greenhouse Accounts (NGA) Factors as these estimates are publicly available and are based on actual data.

4.3 A detailed description of the measures that would be implemented to ensure the project is energy efficient

The EA contains an outline of a limited number of measures to implement energy efficiency on the Project. These include:

- consideration of energy efficiency in procurement of fuel-powered vehicles;
- increased production leading to greater energy productivity;
- upgrades of haulage routes to improve efficiency;
- maintenance of site equipment to retain energy efficiency;
- conducting energy audits where practicable;
- maintenance of an emissions inventory; and
- reporting under the National Greenhouse and Energy Reporting Scheme.

OEH considers that there is insufficient detail in the description of these energy efficiency measures to meet the Director General's Requirements. OEH recommends that the Proponent be required to provide additional information detailing:

- how energy efficiency will be incorporated into procurement processes for fuel-powered vehicles (e.g. life cycle cost analysis to evaluate options);
- how this procurement process will apply to electrical equipment (e.g. fans, motors, crushers, lighting, elevators); and
- estimated fuel and electricity savings from maintenance regime, improved haulage routes and productivity improvements.

OEH notes that the Proponent may be required to participate in the Commonwealth's Energy Efficiency Opportunities (EEO) program. This program requires companies that consume more than 0.5 PJ of energy per year to conduct energy assessments and report on implementation of identified measures annually. The Project is estimated to consume 0.56 PJ per year based on estimates of electricity and diesel consumption in the EA.

OEH recommends that the Proponent be required to include additional measures that will be undertaken should the Proponent be required to participate in the EEO program in the EA.

4.4 Possible alternatives for the use or combustion of methane rather than direct venting to the atmosphere

The EA contains a basic assessment of the potential for alternatives to venting of fugitive emissions. The EA states that:

- the mine expels fugitive methane through the ventilation stream at very low concentrations (0.2%) which make cost effective utilisation difficult;
- technology that would allow gas utilisation requires a minimum methane concentration of 0.3% to operate effectively;
- the current methane concentrations in the ventilation stream cannot be increased without risking safety;
- gas utilisation would become possible should a separate post-drainage network be developed but current gas concentrations are not sufficient to support a standalone gas drainage network;
- as the mine expands to the West it is likely that gas concentrations will increase;
- this will enable the installation of a separate post-drainage network with flaring and treatment of 30% of Ventilation Air Methane (VAM) to mitigate a combined total of 29% of fugitive emissions; and

- it is not possible at present to determine when a post-drainage network or VAM treatment could be established but the Proponent will investigate the potential for gas utilisation from 2015 onwards.

OEH considers that this wasted energy is a significant resource and that detailed investigation into utilisation is warranted. OEH estimates that peak annual VAM emissions are 96,000 tCH4 or 5.32 PJ of coal seam gas per annum based on the data presented in the EA. This wasted energy (5.3 PJ) is equivalent to 7.5 per cent of the total energy content of the Project's peak production of coal (70.3 PJ) or 3.1% of NSW natural gas consumption in 2010/11 (168.9 PJ) and is 18% greater than the amount of coal seam gas currently produced by the Camden Gas Project Stage 1 (4.5 PJ).

OEH considers that the existing mine operations are some of the gassiest in the state based on the mine specific fugitive methane emissions factor detailed in the EA (0.7887487 t CO_2e/t ROM). This emissions factor is more than double the generic emissions factor for gassy underground mines given in the NGERS (Measurement) Determination 2008 (0.305 t CO_2e/t ROM).

Several mines in NSW already use pre-drainage and post-drainage techniques to harvest coal seam gas before and during mining activities (e.g. Xstrata Coal's Bulga mine, BHP's West Cliff mine). There are commercially available technologies to oxidise ventilation air methane (VAM) at very low concentrations that have been successfully deployed in the Southern Coalfields.

OEH considers that statements made in the EA are not supported by the documentation provided. OEH recommends that the Proponent be required to submit a more detailed assessment of alternatives to free venting of methane including:

- an outline of historical and future predictions of methane concentrations and ventilation rates under the Project to support the claims that gas concentrations are currently not high enough for use or combustion but could be in the future;
- additional information on the limitations of the existing ventilation system that prevent an increase in methane concentrations in ventilation streams to 0.3%;
- an assessment of the technical and economic feasibility of alternative VAM use or combustion technologies including technologies that use VAM as primary fuel (e.g. thermal flow reversal oxidisers, catalytic flow reversal oxidisers) and supplementary fuel (e.g. gas turbine intake air), to provide evidence that technologies require 0.3% to operate effectively and that only up to 30% of VAM could be treated;
- additional information to support the claim that the existing in-situ gas concentrations are insufficient to support a post-drainage network;
- additional information to support the claim that emissions could be mitigated by 13% through a future post-drainage network and by 30% through goaf sealing;
- an assessment of technical and economic feasibility of pre-drainage of coal seam gas before mine construction begins; and
- identification of methane concentrations and / or carbon prices that would make pre-drainage gas, post-drainage gas and / or VAM use or combustion technologies commercially viable for the project.

Our Ref: STH09/02098/08
Contact: Andrea Boes 4221 2771
Your Ref: MP 09_0013

Transport Roads & Maritime Services

Department of Planning & Infrastructure
GPO Box 39
Sydney NSW 2001

Attention: Clay Preshaw

WOLLONGONG CITY COUNCIL – MAJOR PROJECT APPLICATION MP 09_0013 – NRE NO.1 COLLIERY UNDERGROUND EXPANSION PROJECT – EXHIBITION OF EA

Dear Sir

Reference is made to your letter dated 14 February 2013 regarding the subject project application forwarded to Roads and Maritime Services (RMS) for consideration.

RMS has reviewed the submitted information and provides the following comments.

- Consent under Section 138 of the Roads Act, 1993 is required for any proposed longwall adjacent to or under Mount Ousley Road, or any RMS network, as well as any works within the classified road reserve. It should be noted that the proponent would need to enter into a Deed of Agreement to manage the mining impacts and relationships.
- Any longwall within a distance of 5 times the seam depth to an RMS asset needs to be submitted to RMS for a risk assessment of subsidence impacts and far-field effects. Consideration of subsidence impacts on RMS infrastructure would need to include consequential impacts on infrastructure, functionality and user safety, and far-field effects.

RMS is unable to make an informed comment on the subject proposal. To assess the proposal the following information is required:

- RMS requires an assessment to be carried out to determine the impact of increased loading of additional heavy vehicle traffic on the pavements useful life along the designated haulage route. The assessment should identify the truck configurations to be used, axle loadings and the additional equivalent standard axle loading along the haulage route. This assessment should include all State Classified roads impacted by the proposal including Memorial Drive, M1 Princes Motorway (F6 Freeway), Masters Road, Springhill Road and Old Port Road.

- RMS requests an electronic copy of the SIDRA analysis for assessment. RMS notes a SIDRA analysis has been carried out for 2009 and 2019. With a likely construction period of 18 months, the analysis should be updated to consider likely traffic volumes with and without the development in 2015 and 10 year projected volumes for 2015.

RMS will reconsider the application once the above issues are addressed to its satisfaction. If you have any questions please contact Andrea Boes on 4221 2771.

Yours faithfully

4 APR 2013

Brian Lefoe
Road Safety and Traffic Manager
Network Management, Southern Region

Cc – The General Manager, Wollongong City Council (via email)

SYDNEY CATCHMENT AUTHORITY

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Our Ref: D2013/29381

Mr Howard Reed
Manager Mining Projects
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Attention: Clay Preshaw

Dear Mr Reed

ENVIRONMENTAL ASSESSMENT NRE NO. 1 COLLIERY
STAGE 2 UNDERGROUND EXPANSION PROJECT APPLICATION NO. MP 09_0013

I refer to your letter dated 14 February 2013 inviting the Sydney Catchment Authority (SCA) to make a written submission on the Environmental Assessment (EA) relating to the above mining proposal by Gujarat NRE Coking Coal Pty Ltd (Gujarat). The SCA has reviewed the EA report and its submission is attached.

It is noted that the proposal consists of four separate mining domains that amongst other things involve:

- multi seam extraction involving a third coal seam under two previously extracted seams in Wonga east mining area – a first for Australia
- the extraction of 390m wide longwall panels in Wonga west – substantially wider than the previous 305m wide longwalls in the Southern Coalfields
- longwall extraction within the Cataract Dam Notification Area
- longwall extraction under the main channel of Cataract Creek, and
- longwalls laid parallel to and in close proximity to Lizard Creek.

The SCA remains concerned about the lack of detailed geological investigations and information in the EA, and the uncertainties and limitations with the subsidence predictions that have largely been based on expert opinion and personal judgement and in the absence of detailed geological information. Further, the proposed Wonga east and Wonga west mining areas are in a complex geological area characterised by intersecting faults and dykes that can give rise to variable subsidence profiles. This has been demonstrated by the results of Area-2 longwall 4 extraction, where observed vertical subsidence was two to three times the predicted value. There are other uncertainties and limitations with groundwater modelling, catchment yield modelling and subsequent environmental consequences. It could therefore be expected that higher than predicted subsidence impacts and environmental consequences may occur in the mining area if mining were to proceed as proposed.

The SCA has adopted a set of principles that underpin its decision making in relation to mining activities in the Special Areas. The SCA has also developed performance measures for natural and built features of interest to the SCA for this project which is included in the attached submission. The SCA has assessed the proposed mining proposal and associated information contained in the EA documents against its mining principles and performance measures.

The SCA has significant concerns for the potential impacts as follows:

- The structural integrity and stability of Cataract Dam wall from the subsidence induced far-field horizontal movements and any damage to the dam structure due to the proposed mining in Wonga west.
- The loss of stored waters of Cataract Reservoir to underground mine workings at the upper arm of Cataract Reservoir as a result of mining induced leakage.
- The reduced baseflow to streams and Cataract Reservoir due to subsidence induced cracking, leakage and groundwater depressurisation, which can contribute up to 35% of average annual inflow, particularly during drought periods when surface runoff is substantially reduced.
- The reduced catchment yield to Cataract Reservoir due to subsidence related leakage resulting in significant loss of low flows, and can be potentially more important during extended dry periods.
- The environment of Cataract, Wallandoola and Lizard creeks and associated tributaries, swamps and dependent ecosystem as a result of loss of stream flow, localised, increased acidification and iron precipitation and reduction in shallow water table affecting swamp vegetation and may result in significant impacts to the "*Special Significance*" upland headwater and valley-infill swamps.

The SCA therefore has the following requirements and/or recommendations:

1. A modified mine plan for each mining area that demonstrates that the performance measures identified by the SCA for natural and built features will be met.
2. That the Dams Safety Committee Notification Area around the Cataract Dam wall and Cataract Reservoir should be adopted as an Exclusion Zone where no mining is permitted.
3. The SCA does not support the adaptive management approach proposed for mining activities given the lag time for mining-related impacts to manifest and changes required to be implemented.
4. The SCA considers that baseflow must be maintained given that it contributes 20-35% of total inflow to the Cataract Reservoir and Broughton Pass Weir by ensuring that:
    a. there is no change in the extent or duration of stream connectivity in low flow conditions, and
    b. the average annual baseflow from the impacted catchments of Cataract, Wallondoola and Lizard creeks not be reduced by more than 10% or 100 ML/yr. (whichever is the lesser).
5. With regards to 3rd or higher order creeks and all related upland swamp ecosystems overlying the mining area, the SCA considers that mining should not be allowed under or within 40 degree angle of draw.

The SCA requests the opportunity to continue to be involved in any ongoing assessment of the application including providing comments on the Response to Submissions report.

Should the Department not accept any of the recommendations made above or wish to clarify matters discussed in this submission, please do not hesitate to contact Dr Girja Sharma on 4724 2459 or via e-mail girja.sharma@sca.nsw.gov.au or Malcolm Hughes on 4724 2452 or via e-mail malcolm.hughes @sca.nsw.gov.au

Yours sincerely

Ross J Young.

ROSS YOUNG
Chief Executive

15-04-13

SYDNEY CATCHMENT AUTHORITY - SUBMISSION

TRANSITIONAL Part 3A PROJECT

NRE No. 1 COLLIERY UNDERGROUND MINING EXPANSION
for
ASSESSMENT of the ENVIRONMENTAL ASSESSMENT

APRIL 2013

1. LOCATION OF MINING AREA & RELATIONSHIPS TO SCA AREAS OF INTEREST

The areas of interest to the SCA and the reasons for its interest are summarised below:

- The entire mining area is located under land owned by the SCA and managed as Schedule 1 Special Area.
- Longwalls (LWs) 6 and 7 of the Wonga west Area-4 are located about 1km from the Cataract dam wall and within the Cataract Dam Notification Area specified by the NSW Dams Safety Committee (DSC), and have the potential to impact the dam wall and reservoir.
- The longwalls of Wonga west Area-3 and Area-4, located west of Cataract Dam and reservoir, have the potential to induce leakage from the reservoir into mine workings with a potential loss of stored water.
- LWs 1 to 5 of Wonga west Area-3 are located in close proximity to and are predicted to impact Wallandoola and Lizard creeks and their tributaries which drain to Cataract River downstream of the dam.
- LWs 6 to 11 of Wonga east Area-2 are partially located within the Cataract Dam Notification Area, with Longwall 10 partially underlying the high water mark of Cataract Reservoir, and have the potential to induce leakage from the Reservoir into mine workings with the possible significant loss of stored water.
- LWs 8 and 9 of Wonga east Area-2 underlie the main channel of Cataract Creek, and are predicted to impact the creek which drains directly to the reservoir.

2. THE SCA'S PRINCIPLES FOR MANAGING MINING IMPACTS

The SCA has adopted a set of principles that underpin its decision making in relation to mining activities in the Special Areas. The principles establish the outcomes the SCA considers as essential to protect the drinking water supplies to the four and half million people of Sydney and the surrounding region, and are:

1. ***Protection of water quantity***

   Mining must not result in a reduction in the quantity of surface and groundwater inflows to storages or loss of water from storages or their catchments.

2. ***Protection of water quality***

   Mining activities must not result in a reduction in the quality of surface and groundwater inflows to storages.

3. ***Protection of water supply infrastructure***

   The integrity of the SCA's water supply infrastructure must not be compromised.

4. ***Protection of human health***

   Mining activities must not pose increased risks to human health as a result of using water from the drinking water catchments.

5. ***Protection of ecological integrity***

   The ecological integrity of the Special Areas must be maintained and protected.

6. ***Sound and robust evidence regarding environmental impacts***

Information provided by proponents, including environmental impact assessments for proposed mining activities must be detailed, thorough, scientifically robust and holistic. The potential cumulative impacts must be comprehensively addressed.

3. PERFORMANCE MEASURES

The SCA has adopted a risk management approach to assess this mining proposal and developed specific performance measures required for key aspects of interest to the SCA in the proposed mining area. The proponent shall ensure to the satisfaction of the Director-General, that the project does not cause any exceedance of the performance measures identified in Table 1 below.

Table 1: Subsidence Impact Performance Measures

Water Storages	
Cataract Dam	Zero subsidence and zero impact Always safe and serviceable
Cataract Reservoir	Negligible environmental consequences including: • negligible reduction in the quantity or quality of surface water inflows to the reservoir • negligible reduction in the quantity or quality of groundwater inflows to the reservoir • negligible increase in the quantity of water entering the groundwater system from the reservoir, and • negligible leakage from the reservoir to underground mine workings. No connective cracking between the reservoir surface and the mine.
Watercourses	
Wallandoola Creek Cataract Creek Cataract River	Negligible environmental consequences including: • negligible diversion of flows or changes in the natural drainage behaviour of pools • negligible gas releases and iron staining • negligible increase in water cloudiness • negligible increase in bank erosion, and • negligible increase in sediment load.
Lizard Creek and other watercourses	No further environmental consequences beyond existing conditions.
Waterfalls identified in the EA on Lizard Creek and Wallandoola Creek as being of "*Special Significance*"	Negligible environmental consequences including: • no rock fall occurs at the waterfall or from its overhang • no impacts on the structural integrity of the waterfall, its overhang and its pool • negligible cracking in the watercourse above and below the waterfall for a distance of 30 m, and • negligible diversion of water from the lip of the waterfall.
Swamps	
Swamps identified in the EA as being of "*Special Significance*"	Negligible environmental consequences including: • negligible change in the size of swamps • negligible erosion of the surface of swamps • negligible change in the functioning of swamps • negligible change to the composition or distribution of species within swamps, and • negligible drainage of water from swamps, or

	redistribution of water within swamps.
All other swamps mapped in the EA	No significant environmental consequences beyond predictions in the EA.
Land	
Cliff identified in the EA adjacent to lizard Creek as being of "*Special Significance*"	Negligible environmental consequences (i.e. occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing, that in total do not impact more than 0.5% of the total face of the cliff).
Other cliffs	Minor environmental consequences (that is occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing, that in total do not impact more than 3% of the total face of such cliffs within any longwall mining domain).
Biodiversity	
Threatened species, threatened populations, or endangered ecological communities	Negligible environmental consequences

4. SCA'S DETAILED ASSESSMENT

The SCA has reviewed the Environmental Assessment (EA) report and considers that the overall information in EA is improved over the draft version for adequacy assessment in 2011 (refer SCA's letter D2011/10439, dated May 2011). Nevertheless, there are still significant inadequacies in regard to subsidence predictions and the impacts that flow from them, uncertainties and limitations as well as inconsistencies and errors between different specialist reports and the main EA report.

Considering the SCA's mining principles and performance measures developed for the proposal, the main issues of concern to the SCA are the potential impacts and environmental consequences on:

- the structural integrity of Cataract Dam wall
- the structural integrity of Cataract Reservoir
- the loss of stream baseflow and catchment yield
- environmental consequences including water quantity and quality of Cataract, Wallandoola and Lizard creeks and associated tributaries, swamps, cliffs and waterfalls and dependent ecosystem.

The drivers of these issues and potential impacts are subsidence predictions which are discussed below. The issues, potential impacts and environmental consequences are discussed following the subsidence predictions.

SUBSIDENCE PREDICTIONS

The subsidence predictions for Wonga east have been revised after the extraction of LW4. The revised maximum vertical subsidence for the Wongawilli seam is predicted to be 1.2-1.4m (within the error bars of the original prediction of 1.0m in the draft EA for adequacy assessment in 2011), with maximum tilt of 26 mm/m and strain of +6 to -10 mm/m.

The subsidence predictions for Wonga west have not been revised in this EA from that in the draft EA for adequacy assessment in 2011. The EA states that there is no new data on which revised predictions can be based. The maximum predicted vertical subsidence for the Wongawilli seam is 2.5m in Area-3 and 2.0m in Area-4, with a maximum tilt of about 18 mm/m and a maximum strain of +14 to -12 mm/m.

Significant concerns were expressed by all government agencies including the SCA regarding uncertainties and reliability of subsidence predictions particularly for multi-seam longwall mining in Wonga east and very wide longwalls in Wonga west; an absence of

detailed geological knowledge of mining areas; and impacts of geological features on subsidence predictions during an adequacy assessment of the proposal in 2011 (refer SCA's letter D2011/10439, dated May 2011). The concerns were also raised related to an absence of empirical subsidence data, and that subsidence predictions were largely based on expert opinion and personal judgement.

Comprehensive geological investigations have still not been undertaken for the proposed mining areas and the impacts of geological structures have not been addressed in the subsidence predictions. The Pells Consulting report (2011) stated that when faults and dykes were added to the subsidence modelling, very high strains were predicted.

The SCA considers that the multi-seam longwall mining in Wonga east and very wide longwalls in Wonga west (for which there is no experience in the Southern Coalfields), coupled with the network of faults and dyke features in the mining areas, is likely to give rise to variable and complex degrees of interaction across the mining areas. It represents a serious impediment to predicting surface subsidence profiles with a reasonable degree of accuracy, irrespective of the prediction methodology employed. This has been demonstrated by the results of Area 2 LW4 extraction, where actual observed vertical subsidence of 1.38m was three times greater than the predicted value of 0.4m, and the observed tilt of 23 mm/m was more than twice the predicted value of 10 mm/m.

The reliability of subsidence predications are critical for the assessment of all other impacts and environmental consequences, including on surface and groundwater resources, key features on watercourses such as waterfalls, pools, rock bars, swamps ecosystems and landscape features like cliffs. The unreliability and uncertainty of subsidence predictions still remain.

POTENTIAL IMPACT OR DAMAGE TO CATARACT DAM

The EA states that the structural integrity of the Cataract Dam wall and Cataract Reservoir is predicted to be unaffected by mining activity. The SCA disagrees with this assertion and has significant concerns about the potential impact on the structural integrity of Cataract dam wall and Cataract Reservoir because:

- the proposed Wonga west Area-3 and Area-4 longwalls underlie previously mined Bulli seam 200 and 300 series longwallls and are also very close to the old 500 series longwalls
- the Wonga west Area-3 and Area-4 longwalls are in a geologically complex area characterised by intersecting faults and dyke intrusion that can give rise to variable subsidence profiles
- Wonga west Area-4 longwalls lie within the Cataract Dam Notification Area. The Wonga west Area-3 longwalls though are outside DSC Notification Area but have very wide panels that have never before been undertaken in the Southern Coalfields, and
- the previous Bulli seam longwall extraction caused significant lateral movement due to far-field horizontal movement at the dam wall, spillway and surrounding area.

The impacts of far-field horizontal movements from longwall extraction can be observed at a considerable distances from the extracted longwalls and large structures such as dams are very sensitive to these far-field horizontal movements. The risk of impacts of far field movements on Cataract dam can occur in Area 3 even it is proposed outside the notification area.

In the Southern Coalfield, far-field horizontal movements have been detected more than 1km away from mining activity, well beyond the distance predicted by any traditional angle of draw. Reid (1998) reported horizontal movements of 25 mm up to 1.5km from mine workings, while Hebblewhite *et al.* (2000) reported 60mm horizontal displacements at distance of 1.5km from workings.

The DSC defines Notification Areas around prescribed dams and advises the Minister on the extent and type of mining that can be permitted in these areas and any special conditions that should apply (taking into consideration mining layout, the proximity to dams and storages, and local geology). A Notification Area is defined by a 35 degree angle of draw plus half depth of cover from the full supply level of the reservoir (DSC4A, March, 2011).

The SCA has significant concern regarding the potential impact of the far-field horizontal movements on the stability of the Cataract Dam wall and any damage to the rigid dam structure could be very hazardous and costly, and given that remediation of a dam wall is extremely difficult, such damage to the structure is highly undesirable and should be prevented at all costs. Therefore the SCA recommends:

- That the DSC Notification Area around the Cataract Dam wall should be adopted as an Exclusion Zone where no mining is permitted. The SCA objects to mining in Wonga west Area-4 LWs 6 and 7.
- The SCA requests additional information and assessment to demonstrate that mining in Wonga west Area-3 will not cause far field horizontal movements and impact on Cataract Dam structure. Such information should include prediction of uplift or valley closure at dam wall and the basis for such predictions, and may necessitate 3D structural modelling of the dam foundation to predict any dam movement based on predicted regional movement. The SCA considers that changes to the mine plan for Wonga west Area-3 may be necessary in this regard.

WATER QUANTITY

The catchment yield and quantity of water in Cataract Reservoir can be impacted due to:

- induced leakage from the reservoir
- reduced baseflow to the reservoir, and
- reduced catchment yield due to reduced baseflow and/or induced leakage from the catchment, streams and swamps.

Induced Leakage From The Reservoir

The alteration of the reservoir hydrological system may occur as a result of:

- Intersection of geological structures such as dykes and faults that would induce leakage from the reservoir. Past experience of mining under Cataract Reservoir revealed that the presence of such structures is likely to increase reservoir leakage.
- Creating a connection between the Reservoir and the fractured zone above the Wongawilli coal seam mined.
- Changes in shallow groundwater level with respect to reservoir water level determines if groundwater is discharging to the reservoir, or if the reservoir is losing water by recharging the shallow groundwater system.

The EA states there are no known geological structures that could cause a mining-induced hydraulic connection between the base of the reservoir and mine workings. It further states that the Wonga west Area-4 longwalls have been located to avoid any hydraulic connection via subsidence cracks to the reservoir.

The SCA's identified issues in relation to Wonga west are:

- The proposed Wonga west Area-3 and Area-4 longwalls underlie previously mined Bulli seam 200 and 300 series longwalls and are also very close to the old 500 series longwalls.
- The Wonga west Area-3 and Area-4 longwalls are in a geologically complex area characterised by intersecting faults and dyke intrusion that can give rise to variable subsidence profiles.
- The variable subsidence profiles and intersecting faults and dykes has the potential to form a connection through the Hawkesbury Sandstone overlying the Wonga west longwalls with the resultant loss of water from the reservoir.

- Any water lost from the reservoir, but reintroduced downstream of the dam could in turn lead to operational difficulties at the Broughton Pass Weir due to limiting buffering capacity of the weir.
- There is a lack of detailed geological investigations in relation to the above issues and the potential impacts.

The SCA's identified issues in relation to Wonga east are:

- The Wonga east longwalls underlie both the previously bord and pillar mined Bulli seam and the longwall mined Balgowine seam, and the Area-2 LWs 6 to 11 are partially located within the Cataract Dam Notification Area and in close proximity to Cataract Reservoir.
- The EA states that mining within the Notification Area in Wonga east i.e. Area-2 LWs 6 to 11 cannot be operationally avoided, and proposes narrow longwalls and wide chain pillars for mining in this area. Mining in this area require DSC approval.
- The Wonga east area is bounded by NW-SE trending gravity faults (Corrimal, Rixon Pass and Woonona faults) with upthrown and downthrown blocks forming a series of step faults that could exacerbate any mining subsidence movement.
- The creation of a connection between the reservoir and the fractured zone above the Wongawilli goaf, where Bald Hill Claystone is eroded and fracturing is predicted in the Bulgo Sandstone which outcrops in Cataract Creek, has the potential for the loss in the order of 50% of stored water to mine workings.
- No detailed geological investigations have been undertaken to address this potential impact.

The proposed first workings for the western driveage (Wonga Mains) under the south arm of the reservoir may interact with a known geological feature in the area (see Drawing PO43-3, Annex N - Pell Consulting Report, 2011). The SCA is concerned that this has the potential for accelerating leakage from the base of the reservoir to the workings. No assessment or likely impacts of this issue have been provided in the EA.

There is a high degree of risk that mining close to the reservoir will result in significant rates of induced leakage. Further it is probable that there will be a significant delay in reporting the induced leakage from the reservoir to the mine by which time it will be too late to modify the extraction plans for the relevant panels as part of the proposed adaptive management approach.

The leakage from the reservoir cannot be measured directly, but can be inferred from the hydraulic gradient. The groundwater model presented in the EA does not provide sufficient assessment of mining impacts on reservoir leakage and/or baseflow reduction. It is particularly important in Wonga east where the Bulgo Sandstone outcrops in the base of Cataract Creek and is predicted to experience fracturing. This was one of the main concerns raised and discussed by all government agencies including the SCA during an adequacy assessment meeting (refer SCA's submission D2011/10439, dated May 2011) and still has not been addressed. The EA has failed to demonstrate that mining in Wonga west and east would not cause induced leakage.

Given the lack of detailed understanding of the geological and hydrological conditions, and the high levels of uncertainty in subsidence predictions, estimates of hydraulic parameters and groundwater modelling, the SCA recommendations are:

- The SCA objects to any mining under the main channel of Cataract Creek.
- That the DSC Notification Area around the Cataract Reservoir should be adopted as the Exclusion Zone where no mining is allowed.
- The SCA considers changes to the mine plan are necessary to meet the performance measures identified for Cataract Reservoir.
- The SCA requests additional information for mining in Wonga west Area-3 and an assessment to demonstrate that the mining in this area does not induce leakage and the loss of water from Cataract Reservoir.

- The SCA requests additional information and assessment to demonstrate that the first workings of the western driveage (Wonga Mains) do not induce leakage and result in a loss of water from Cataract Reservoir.

Reduced Baseflow to Reservoir and Streams

The groundwater modelling has predicted the depressurisation of the regional groundwater and temporary lowering of shallow groundwater level within the upper Hawkesbury Sandstone by:

- 4m with complete subsequent recovery in Wonga east
- 12m with subsequent limited recovery (of up to 2m) in Wonga west, with
- groundwater quality not to be affected.

Overall baseflow is predicted to be reduced by up to:

- 0.5 to 0.6% (0.06-0.07 ML/day) in Cataract Creek in Wonga east
- 0.5% (0.1 ML/day) in Lizard Creek in Wonga west, and
- 0.2 to 0.8% (0.06-0.25 ML/day) in Wallandoola Creek in Wonga west.

Mine inflow is predicted to temporarily increase from the current 1.1 ML/day to 3.1 ML/day.

Groundwater modelling and assessment in the EA has predicted a negligible reduction in groundwater derived baseflow to Cataract Reservoir and streams.

Reduction of baseflow discharge depends on the radius of mine influence that may impact shallow groundwater level outside the mining area. The EA predicts negligible consequences to streams as a result of the 12m groundwater drawdown in Wonga west except during dry periods due to depressurisation resulting in gaining sections of the streams. However, the long-term implications of a significant net drawdown (10m) in groundwater on downstream gaining sections of Lizard and Wallandoola creeks, associated swamps and dependent ecosystem have not been addressed in the EA.

Sensitivity analysis undertaken in the EA indicate that if fracturing increases over the proposed workings in Wonga east, this could result in up to 20m groundwater drawdown with higher stream flow losses and higher inflows to the workings. The results presented in the Annex P - Groundwater Assessment report (p23) indicate an increased loss of baseflow in Cataract and Bellambi creeks yet shows no change in the mine inflow rate of 1.4 ML/day. Clarification of this discrepancy is required. The implications of a 20m groundwater drawdown on downstream gaining sections of Cataract and Bellambi Creeks and Cataract River, associated swamps and dependent ecosystems have not been addressed in the EA.

The SCA has identified a number of further limitations, uncertainties and inconsistencies in the groundwater modelling and assessment, including in particular limited data for hydrogeological and geological interpretations:

- The groundwater model is based on limited (only 10 years) climate data and a limited and inadequate groundwater monitoring dataset.
- There are no groundwater monitoring bores down-gradient in the Wonga west and Wonga east mining areas.
- The groundwater model does not take into account any cumulative impact from previous mining or the presence of faults and dykes, and there is larger than normal degree of uncertainty in estimation of the subsidence extent and impacts on permeability.
- In the groundwater modelling "creeks were modelled as always flowing", and it is not clear whether ephemeral or intermittent flowing tributaries were included in the model. Groundwater models developed for the Metropolitan and Dendrobium mines modelled ephemeral creeks as "drainage cells", that allows groundwater discharge to the drainage line, and the permanently flowing rivers and reservoirs as "river" cells (with a constant head boundary), that enabled a two way movement of water with the aquifer.
- Because there is limited information about the status of the existing workings, "all existing workings were assumed to be flooded". This suggests that the groundwater

system had already reached equilibrium, thus no effects of past mining were considered in the model.

- The Bald Hill Claystone was assumed to be unaffected by subsidence in the Wonga west area and Wonga east, except where the Hawkesbury Sandstone was eroded through such as in the Cataract Creek valley. This is not a conservative approach that takes into consideration uncertainties in subsidence predictions.
- The statement "There is larger than normal degree of uncertainty in subsidence predictions plus additional uncertainty in correlating changes between predicted subsidence and permeability" does not give confidence in model predictions.

Recent studies and regional groundwater modelling for a Subsidence Management Plan (SMP) for Dendrobium Area 3B (Coffey Geotechnics Pty Ltd, October 2012) indicated that existing longwall mining reduces groundwater discharge to streams by 50%. The results of this modelling have applicability beyond SMP area and to the Cataract Reservoir catchment.

Further, the wider panels (such as the proposed 390m longwalls in Wonga west) are considered to result in significant increased inflows to mines. CSIRO COSFLOW modelled inflow to Springvale Colliery found that wider (400m) panels resulted in 66% greater inflows to the mine that compared to narrower (240m) panels (ACARP, 2007; Report C14033).

The SCA has estimated that the average annual inflow to Cataract Reservoir is approximately 81,000ML, with baseflow contributing approximately 28,000ML, or some 20% to 35% of total inflow. This baseflow contribution is at a significant cumulative risk from proposed longwall mining. The catchment of Cataract Creek which comprises approximately 4% of the Cataract Reservoir catchment, and is located in the high rainfall escarpment area, is likely to contribute well over the 1100ML of annual baseflow based on average values for the whole catchment. The current mining proposal in this catchment is likely to severely diminish this contribution, which becomes more important during extended drought periods when surface runoff is substantially reduced.

Considering existing and predicted impacts on shallow groundwater systems in the proposed mining area and the high uncertainty and significant limitations of the predictive modelling, it could be expected that higher than predicted reductions in baseflow discharge may occur. Therefore the SCA recommendations are:

- The SCA considers that baseflow must be maintained given that it contributes 20-35% of total inflow to the Cataract Reservoir and Broughton Pass weir by ensuring that:
  - there is no change in the extent or duration of stream connectivity in low flow conditions, and
  - the average annual baseflow from the impacted catchments of Cataract, Wallondoola and Lizard creeks not be reduced by more than 10% or 100 ML/yr. (whichever is the lesser).
- The SCA recommends the installation of additional groundwater monitoring bores down gradient of Wonga east and Wonga west.
- The SCA recommends updating the groundwater model and assessment as more monitoring data become available.

Reduced Catchment Yield to Streams, Swamps and Reservoir

Surface Water Assessment

The surface water assessment has predicted the potential for creek bed cracking of Cataract, Wallandoola, and Lizard creeks and their tributaries and a potential reduction in stream flow (but with downstream flow re-emergence) and a potential effect on pool water-holding capacity.

The SCA strongly disagrees with the claim in the EA that any lost sub-surface flows via fractures will re-emerge further downstream, which has not been proven to date. The SCA's experience in remediation and ongoing research on the Waratah Rivulet (Metropolitan Mine)

on surface and ground water interactions suggest that fracture networks extend further than predicted below the watercourses and the sub-surface flows may not completely re-emerge further downstream.

The EA states that the Proponent is committed to an adaptive management approach whereby monitoring of subsidence will be undertaken and when vertical subsidence reaches 250mm in the Cataract Creek, mining LW8 beneath the creek will be discontinued. There is no equivalent commitment to adaptive management for Cataract Creek over LW9; or Wollandoola and Lizard creeks in Wonga west where increased setbacks or narrower longwalls might be considered. The wide longwalls in Wonga west was one of the main concerns raised by all government agencies including the SCA during an adequacy assessment meeting (refer SCA's submission D2011/10439, dated May 2011). There is also no rationale or linkage with the impacts and environmental consequences on creeks for selecting the threshold subsidence value of 250mm vertical for adaptive management for Cataract Creek.

Valley closure, systematic tensile strain and systematic compressive strain, not vertical subsidence, is considered a more appropriate subsidence parameter for determining impacts on watercourses. Furthermore, subsidence impacts may not manifest in sufficient time to enable adaptive management practices to be implemented to prevent further changes.

The exclusion zones around creeks and swamps provide buffer zones from subsidence effects and impact. There are a number of different approaches to determining setback to watercourses to provide protection from mining effects, one based on predicted subsidence criteria, the other on risk management zones.

Mine Subsidence Engineering Consultants (MSEC) have undertaken substantial investigations to determine appropriate thresholds to determine longwall setback distances from major creeks for the Southern Coalfields. These are as follows:

- maximum predicted total valley closure across a major watercourse of 200mm
- maximum predicted total systematic tensile strain within the bed of a major watercourse of 0.5mm/m, and
- maximum predicted total systematic compressive strain within the bed of a major watercourse of 2mm/m.

The Southern Coalfield Inquiry (2008) recommended the concept of risk management zones, based on either a 35-40 degree angle from the vertical down to the coal seam which is proposed to be extracted, or by a surface lateral distance of 400m, whichever is the greater.

The SCA notes that maximum damage to watercourses, rockbars and pools in terms of fracturing has occurred in Southern Coalfields when longwall panel layout is parallel to or undermines watercourses such as Waratah Rivulet (Metropolitan Collliery).

Sections of Lizard and Wallandoola creeks have already been impacted by previous Bulli Seam mining including stream bed cracking, loss of water and iron precipitation. The SCA is concerned about any further damage to the Wallandoola and Lizard creeks, and any damage to Cataract Creek. Lizard and Wallandoola creeks do not report to the Cataract Reservoir, but make important contributions to water supply and environmental flows downstream of the storage. Both creeks support significant areas of valley-infill swamps. Any damage to valley infill swamps in these creeks has significant implication for water quantity (in dry times) and quality at the Broughton's Pass Weir.

It is noted that the PAC report (2010) on *Bulli Seam Operations* recommended that Wallandoola Creek be afforded "*Special Significance*". Lizard and Cataract creeks also warrant "*Special Significance"* based on biodiversity, flow and other criteria, and require performance criteria of negligible subsidence-related impact, to be defined as:

> *"no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, minimal gas releases and continued maintenance of water quality as its pre-mining standard"*

Catchment Yield Modelling

Catchment yield modelling indicated that frequency of flows in Lizard and Wallandoola creeks would change as follows:

- a loss of 0.5 ML/day would reduce the frequency of flows greater than 1.0ML/day from 38% to 32%
- a loss of 1.0 ML/day would reduce the frequency of 1.0 ML flows to 28%
- a loss of 0.5 ML/day would reduce the frequency of 0.1ML flows from around 70% to 46%, and
- a loss of 1.0 ML/day would reduce the frequency of 0.1ML flows to 37%.

The catchment yield modelling and surface water assessment in the EA has predicted a negligible impact on overall catchment yield. Modelling has indicated that a loss of 1 ML/day would have very little overall impact on Cataract Reservoir water levels, and that the maximum reduction in stored volume would have occurred in early 2007. Modelling has also indicated that for daily losses of 0.5ML and 10ML this would have resulted in a total loss of 940ML and 1,385ML respectively, although a large loss of 10 ML/day is not predicted to occur.

The SCA considers while these yield reductions are minimal in terms of average yield they can be significant during extended dry periods. At times such as around February 2007, when the reservoir was already at a low level, a modelled loss of 10ML/day could potentially have reduced storage capacity by 50%. Further, the SCA has significant concerns for the loss of low flows by up to 50% which are very important during dry periods and can have significant impact on stream ecosystem.

The SCA has also significant concerns about the credibility, limitations and uncertainties associated with catchment yield modelling and surface water assessment, including:

- The absence of stream flow data for the major watercourses impacted by the mining proposal, namely Cataract River, Wallandoola and Cataract creeks, and the minimal monitoring data for Lizard Creek.
- The development of a catchment yield model based on the Loddon River and Bellambi Creek catchments (located to the east of Cataract Reservoir with higher rainfall, and which do not overlie the mining area and are not impacted by the mining proposal) in the absence of stream flow data for creeks impacted by mining.
- The inherent uncertainty and risk of using a model based on a high (1800mm) annual rainfall and extrapolating this to Wallandoola and Lizard creek catchments which are located in a lower (1000mm) annual rainfall area.
- The validation of the model against portions of the stream flow records at Broughtons Pass Weir which may be impacted by reservoir operation and which is at a different scale to the impacted streams.
- The use of this catchment yield model to describe the range of modelled frequency loss rates in potential subsidence areas, given statements in the WRM report that "modelled low flows have not been fully validated against measured low flows due to insufficient stream flow monitoring sites" and that "based on the available subsidence assessments, it is not possible to directly predict the magnitude of losses or the lengths of streams likely to be impacted".
- The lack of consideration of the impact of geological structures such as faults and dyke and before and after mining impacts of changes to creeks and swamps.

The above issues do not provide confidence in the modelled predictions of loss of catchment yield and the resultant impact on streams and swamps.

Assessment Of Swamps

The upland swamps in Wonga east and Wonga west are predicted in the EA to result in fracturing of bedrock below some swamps, with the reduction in shallow water table affecting swamp vegetation. The upland headwater swamps CCUS1 and CCUS5 in Wonga east are

predicted to be at significant risk whilst upland valley-infill swamps WCUS4 and WCUS7 in Wonga west are predicted to be at moderate risk. Other swamps are predicted to be at low risk such as CCUS4, CRUS1, LCUS8 and LCUS1.

These swamps (CRUS1, CCUS1, CCUS4, CCUS5, CCUS10, LCUS8, LCUS1, WCUS4 and WCUS7) meet the criteria of "*Special Significance*" in accordance with the draft Upland Swamp Environmental Assessment Guidelines (OEH, 2012).

Both headwater and valley-infill swamps are important in terms of their hydrological function, such as buffering storm runoff, maintaining stream flow during post-rainfall periods, and maintaining water quality. The SCA has significant concerns about the impacts of mining on the enhanced leakage and changed hydrology of all upland swamps overlying or in close proximity to the mining area in particular CRUS1, CCUS1, CCUS4, CCUS5, CCUS10, LCUS1, LCUS8, WCUS4 and WCUS7. The dewatering and drying of swamps due to subsidence fracturing of the bedrock not only results in loss of water but also increase the erosion potential of swamps, particularly the valley-infill swamp LCUS1, WCUS4 and WCUS7.

The EA states the subsidence monitoring data will be used to validate predictions prior to mining under features of special significance and employ alternate layout, altered start and end lines. This would require further assessment and approval. It further states that NRE will monitor initial longwall mining in Wonga west to confirm predictions associated with multi-seam extraction. The SCA considers that the subsidence impacts and environmental consequences on swamps are not immediately evident and may take few years to become apparent. Therefore the mine plan needs to be modified at the planning approval stage to demonstrate that it can achieve the SCA's performance measures.

Considering the overall assessment of the proposed mining proposal on water quantity including catchment yield modelling and the resultant impact on streams and swamps and associated significant uncertainties and limitations, it could be expected that higher than predicted loss of low flows may occur and have significant impact on stream ecosystem. Consequently the SCA's recommendations are:

- The SCA considers that mining should not be allowed under or within the 40 degree angle of draw for 3rd or higher order creeks and all related upland swamp ecosystems overlying the mining area.
- The SCA recommends that appropriate and adequate flow monitoring be implemented for Cataract River, and Cataract, Wallandoola and Lizard creeks.
- The SCA recommends the update and revalidating of the catchment yield model and associated assessment based on this flow monitoring data.

WATER QUALITY ISSUES

Mining proposals can affect reservoir water quality through:

- damage to streams and swamps leading to release of contaminants, organics, colour and/or nutrients
- discharge of contaminated groundwater downstream of reservoir
- spills of contaminants, and
- induced erosion.

Of the above stream-bed cracking and fracturing of the base of the swamps are the main impacts of underground mining that affect water quality. The other impacts identified above are of a comparatively minor nature that can be dealt with through appropriate management measures and have been addressed in the EA.

The EA predicts creek bed cracking of Cataract, Wallandoola and Lizard creeks and their tributaries and the potential for reduction in stream flow, localised increases in acidification and iron precipitation. However, water quality inflow to Cataract Reservoir is predicted not to be affected. The EA also predicts fracturing of base of the some swamps resulting in

dewatering of swamps, loss of vegetation and the potential for erosion, particularly valley fill swamps.

Sections of Lizard and Wallandoola creeks have already been impacted by previous Bulli Seam mining including stream bed cracking, loss of water, iron precipitation and cloudy water. Some of the impacts and environmental consequences like iron staining are evident even today several years since the mining occurred. The erosion of some swamps has resulted in sediment being transported downstream to Broughton Pass Weir and impacting bulk water quality at the intake to the water treatment plant.

The SCA is concerned that any damage to Cataract Creek, and further damage to Lizard and Wallandoola creeks, their tributaries and to upland swamps that overlie or are close proximity to the proposed mining area will impact on water quality. Therefore the mine plan needs to modify at the planning approval stage to demonstrate that it can achieve the SCA's performance measures.

The SCA's recommendation is that:

- The SCA considers that mining should not be allowed under or within 40 degree angle of draw for 3rd or higher order creeks and all related upland swamp ecosystems overlying the mining area.

SYDNEY CATCHMENT AUTHORITY

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Our Ref: D2013/38356

Mr Howard Reed
Manager Mining Projects
Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Attention: Clay Preshaw

Dear Mr Reed

ENVIRONMENTAL ASSESSMENT NRE NO. 1 COLLIERY
STAGE 2 UNDERGROUND EXPANSION PROJECT APPLICATION NO. MP 09_0013

I refer to the Sydney Catchment Authority's (SCA) submission dated 15 April 2013 on the Environmental Assessment (EA) relating to the above mining proposal by Gujarat NRE Coking Coal Pty Ltd (Gujarat). The SCA Board considered the matter at its meeting on the 30 April 2013. The Board wishes to convey its objections to the proposal in its current form due to the unacceptable risks it poses to the SCA's critical assets, catchment yields and ecosystems. The Board seeks assurance that:

1. The Dams Safety Committee Notification Area around the Cataract Dam wall and Cataract Reservoir will be adopted as an Exclusion Zone where no mining is permitted.
2. Mining will not be allowed under or within 40 degree angle of draw of 3rd or higher order creeks and major upland swamp ecosystems overlying the mining area.
3. The adaptive management approach will not be adopted for proposed mining activities because the lag time for mining-related impacts to manifest is too long to allow for effective controls or changes to be implemented.
4. Baseflow will be maintained by ensuring that:
    a. there is no change in the extent or duration of stream connectivity in low flow conditions, and
    b. the average annual baseflow from the impacted catchments of Cataract, Wallondoola and Lizard creeks is not reduced by more than 10% or 100 ML/yr. (whichever is the lesser).
5. More robust methods for the modelling and assessment of baseflow dynamics are established, and the inconsistencies between the groundwater and surface water modelling of groundwater recharge and discharge rates are resolved.

The Board considers the above requirements are necessary to address the risks to:

- The structural integrity and stability of Cataract Dam wall from the subsidence induced far-field horizontal movements.
- The integrity of the stored waters within Cataract Reservoir from mining induced leakage particularly in the vicinity of the upper arm of Cataract Reservoir.
- The baseflow in streams and Cataract Reservoir from subsidence induced cracking, leakage and groundwater depressurisation. This is particularly concerning as baseflow contributes up to 35% of average annual inflow, and is critical to supply during drought periods.

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- The environment of Cataract, Wallandoola and Lizard creeks and associated tributaries, swamps and dependent ecosystem as a result of loss of stream flow, localised, increased acidification and iron precipitation, and reduction in shallow/perched water tables supporting the "*Special Significance*" upland headwater and valley-infill swamps.

The Board looks forward to seeing a modified mine plan for each mining area which demonstrates how the above requirements and the performance measures identified by the SCA in its submission will be met.

Yours sincerely

Ross J Young

ROSS YOUNG
Chief Executive
03-05-13

CC: David Clarkson – Gujarat NRE Coking Coal Pty Ltd

wollongong
city of innovation

WOLLONGONG CITY COUNCIL

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Attn : Clay Preshaw
Major Projects Assessment
Department of Planning & Infrastructure
GPO BOX 39
SYDNEY NSW 2001

APPLICATION	**MP-2009/13**
Date	11 April 2013

Dear Sir

MAJOR PROJECT APPLICATION – ENVIRONMENTAL ASSESSMENT – NRE No. 1 COLLIERY – UNDERGROUND EXPANSION PROJECT (MP-2009/13)

Thank you for providing Council with the opportunity to comment on the above major project.

Council has reviewed the Environmental Assessment (EA) for the project. Please note that Council considered the proposal at its meeting on 8 April 2013 and resolved to endorse the attached submission, with the following emphasis:

- Council acknowledge the importance of the region's traditional mining and heavy industries in the Illawarra economy and employment profile and demands operations in those sectors to adopt world's best practice in the areas of environmental, cultural and societal impact.

- Freight haulage to be conducted by rail (or sea where appropriate) rather than by road.

Should the Department of Planning and Infrastructure support the application with conditions, the conditions should include, but not be limited to –

a The affected residents of Bellambi Lane be compensated with window replacement of double glazing and/or soundproof fencing.

b NRE be responsible for the maintenance of Bellambi Lane to Council standards as long as truck movements exceed 250 movements per day.

c Noise barriers be installed, specifically –

i 3 metre high barrier to the south of Brokers Street, Russell Vale.

ii 3.6 metre high roadside barrier to the north of the internal access weighbridge to the Princes Highway.

d Appropriate dust suppression measures should be implemented. These measures should be –

- The completion of all Stage 1 coal handling facility upgrade namely:

  i The removal of the existing Balgownie decline conveyor and storage bin and replacement with a newly designed Wongawilli decline conveyor on a similar alignment.

  ii Decommissioning of the existing Bulli decline conveyor.

  iii Construction of a stackout conveyor and tripper system.

  iv Construction of a new screening and sizing station.

- The full enclosure of all coal conveyors on site.
- Appropriate fast-growing planting.
- The full enclosure of the screening and sizing plant in order to minimise dust emissions.
- An automatically controlled fixed stockpile spray system around the stockpile areas.
- A mobile water truck be used throughout the site.
- Roadside sprays.
- Truck washing facilities that are used for all trucks, prior to departure from the site.
- All trucks must be covered before leaving the site in order to minimise the potential for dust impacts along haulage routes.
- All surfaces on which trucks park or travel in the truck loading area shall be sealed to facilitate dust control and water management.
- A bobcat mounted road sweeper be used on all sealed surfaces.
- Fixed water sprays at selected points on a number of surfaces and underground conveyor systems.

Please find attached further detailed comments and recommendations in response to the major project.

Should you have any enquiries or wish to discuss these matters further, please contact Vivian Lee, Senior Development Project Officer on (02) 4227 7314.

Yours faithfully

David Farmer
General Manager
Wollongong City Council
Telephone (02) 4227 7111

KEY ISSUES CONCERNING THE PROPOSED EXPANSION OF NRE No. 1 COLLIERY

1. Potential Land Subsidence Impacts

Land subsidence is one of the major issues of concern regarding the proposed expansion of the NRE No. 1 colliery project.

According to the predictive modelling results, subsidence is expected up to 1.2 metres in Wonga East extraction precinct and up to 2.55 metres at Wonga West, during the proposed extraction period.

Depending on the accuracy of the applied model, the magnitude and the rate of the subsidence can easily surpass the estimated values with unpredictable consequence on the local unconfined aquifer, the regional aquifer as well as the flow rate, water quality and connectivity of several local creeks and their tributaries. This scenario could be exacerbated by previous mining activities and coal extraction in both the Wonga East and Wonga West areas that have already created voids in subsurface strata with certain degree of subsidence already recorded.

2. Potential Surface Water and Groundwater Impacts

Due to the proposed long wall extraction activities, the Wallandoola Creek and Lizard Creek in Wonga west and Cataract Creek in Wonga East are under threat. There is no guarantee that the proposed *"alternate layout"* or "*altered start and end line*" procedure could effectively save these creeks from the impact of the subsidence.

In the proposed activity area, similar to elsewhere on the tableland, there is a sequence of 5m to 6m thick sandy and gravelly erosional deposits of Quaternary age above the Hawkesbury Sandstone. This sequence forms a very dynamic and rich unconfined aquifer. This aquifer ensures the base flow to many local creeks and the upland swamps.

According to the environmental statement, the Bald Hill Claystone with semi-confining properties will maintain the hydraulic separation between the Quaternary unconfined aquifer and the Hawkesbury regional aquifer and Bulgo Sandstone and deeper system. Bald Hill Claystone is a highly fractured and jointed formation; and considered will fail to act as an adequate barrier to protect the local confined aquifer and the regional aquifer from the impact of the subsidence.

It is expected that the predicted subsidence will increase soluble iron and manganese concentrations in these aquifers and subsequently result in iron hydroxide precipitation in the affected creek systems.

3. Potential Impacts on Coastal Upland Swamp Endangered Ecological Communities (EEC)

<u>Groundwater Dependent Ecosystems</u>

Changes induced by subsidence to the groundwater table of the unconfined aquifer not only can impact water levels in the uplands swamps; drops in the water table can reduce the moisture continents of the soil and impact the local terrestrial flora.

Coastal Upland Swamp Endangered Ecological Community (EEC)

The subject site contains 84 upland swamps. All these upland swamps within the study area are identified as being Coastal Upland Swamp Endangered Ecological Communities (EEC).

According the Environmental Assessment (EA) report, there are 39 swamps located within 600m of the coal extraction precinct at Wonga East, of which 14 swamps are classified to be of "special significance". Similarly, 45 swamps are located with 600m of coal extraction precinct at Wonga west and 8 of these swamps are identified as special significance. Theses swamps are fed and supported by the Quaternary unconfined aquifer. Any changes caused by subsidence which may impact the water holding capacity and the flow rate of this aquifer may directly impact the swamps viability and its floral and faunal composition.

The NSW Scientific Committee made a Final Determination which listed the Coastal Upland Swamp in the Sydney Basin Bioregion as an Endangered Ecological Community (EEC), pursuant to Part 3 of Schedule 1 of the Threatened Species Conservation (TSC) Act 1995.

The Final Determination for the Coastal Upland Swamp EEC states that *"subsidence and warping of the land surface associated with longwall mining of underground coal seams potentially changes hydrological processes involving both ground water and surface water. Longwall mining results in fracturing of bedrock layers between the coal seam and the surface, as well as subsidence, upsidence, tilting and buckling of the ground surface and valley closure (Department of Planning 2008). Horizontal and vertical displacements may occur up to 1-3 km outside the footprint of the mine workings (ACARP 2001, 2002) and may continue several years after seam extraction, although most movement occurs soon afterwards (Holla & Barclay 2000). There are two general mechanisms by which these movements may cause changes in the hydrology of upland swamps (Booth 2006; NSW PAC 2009): i) water drains into cracks in the bedrock that open beneath or upslope of the swamp as a result of simple tensile strains or complex buckling and shear that enhances connectivity of fractures; and ii) tilting of the surface results in re-distribution of overland flows, loss of water from swamp margins and/or concentration and channelisation of runoff. Specific hydrological impacts may include: desiccation indicated by decline of piezometric levels; reduction of baseflow discharge to streams; alteration of groundwater flow patterns; water quality changes including unconfinement of confined aquifers, accelerated leaching of iron; and leakage of upper aquifers to lower aquifers (Booth 2002, 2006, 2007; Booth et al. 1998; Madden & Merrick 2009; Madden & Ross 2009)."*

The Final Determination for the Coastal Upland Swamp EEC notes that the *"...impacts of longwall mining on Coastal Upland Swamps are difficult to predict and detect due to non-linearities and complex dependencies on geological features and mine characteristics, time lags in hydrological and ecological responses and stochastic influences such as rainfall variation during and after subsidence. Adjustment of the swamp biota to new hydrological regimes may involve considerable ecological lags and potential interactions with climatic conditions, as well as fire regimes, which govern life-cycle processes in a wide range of species. Thus changes in species composition resulting from subsidence may not be fully evident until multiple fire cycles after the completion of mining operations. The risks of subsidence impacts on swamps are related to mine layout and design characteristics, including panel width, panel height, pillar width, depth of mining operations, as well as the structure of geological strata (including faults and joints), and surface topography (Krogh 2007). The NSW Planning and Assessment Commission (2010) defined thresholds for geological strains, tilt, valley closure and relative depth of cover that should be used to identify risks of negative environmental consequences on Coastal Upland Swamp. Large swamps, those that contribute most to biodiversity and hydrological function, are likely to be more susceptible to these impacts than smaller swamps because they usually span two or more longwall panels and are consequently exposed to greater tensile and compressive strains, increasing the risk of bedrock fracture and tilting. The impacts of mine subsidence*

include gradual or rapid drying of swamp soils, decline of the most groundwater-dependent plant species and consequent changes in vegetation structure, decline of groundwater-dependent fauna including macro-invertebrates and stygofauna, channelisation and consequent erosion of swamp sediments, oxidation of peaty sediments resulting in increased hydrophobicity and flammability."

According to the NSW Scientific Committee, the Coastal Upland Swamp in the Sydney Basin Bioregion is facing a very high risk of extinction in New South Wales in the near future.

The Southern Coalfield Inquiry (SCI) found that the southern coalfields underlie a landscape containing highly significant ecological features that are sensitive to subsidence impacts as a result of longwall mining. The sensitive landscape features include streams, swamps, rocky habitats, endangered ecological communities (EEC) and threatened species.

The SCI noted that *"...where swamps appeared largely unaffected by mining beneath it was where the mining had been restricted to either narrow panels or some form of partial extraction only (ie bord and pillar operations) which restricted subsidence."*

The SCI also acknowledged that there was no conclusive scientific consensus over the role that mining subsidence may play in impacting swamps. However, the Panel believed that on the basis of current available evidence, *"....there is a distinct possibility that undermining of valley infill swamps has or will cause drainage, water table drop and consequent degradation to swamp water quality and associated vegetation."*

In response to the Southern Coalfield Inquiry, DECC identified four contiguous networks of intact upland swamps to be of particular conservation significance (DECC 2007a) including the Wallandoola Creek swamp cluster, that is mapped as extending across the majority of the Study Area.

'Special Significance' Upland Swamps within the Subject Site

The Environmental Assessment (EA) report confirms that 15 out of the 84 upland swamps in the study area are considered of 'special significance' based upon the most recent criteria defined by the NSW Office of Environment & Heritage's *"Draft Upland Swamp Environmental Assessment Guidelines."*

The EA identified that seven (7) of the 39 upland swamps in Wonga East are considered to be of 'special significance' according to criteria set out in NSW Office of Environmental Heritage (OEH)(2012) *"draft Upland Swamp Environmental Assessment Guidelines: Guidance for the underground mining industry operating in the Southern Coalfields of NSW"*.

It is noted that these guidelines reflect previous determinations made by the Planning Assessment Commission for both the Metropolitan Colliery (PAC 2009) and Bulli Seam Operations (PAC 2010) projects.

The Office of Environmental Heritage (OEH)(2012) *"draft Upland Swamp Environmental Assessment Guidelines"* indicate that an upland swamp is of 'special significance' when it meets three of the following five criteria:

- Statutory thresholds, indicated by the presence of threatened ecological communities or threatened species; or
- Swamp size greater than 7.4ha being in the top 10% of swamps in the region; or
- Unusual complexity or biodiversity supported by a full range of habitats associated with a mosaic of hydrological characteristics from drier fringing areas to permanently wet areas. Where vegetation mapping has been undertaken, complexity is indicated by the presence of Banksia Thicket, Tea-tree Thicket and Sedgeland-Heath Complex. Where

mapping of NPWS (2003) is relied upon, the presence of Tea-tree Thicket is an indicator of unusual complexity;
- Closely proximate habitat being a swamp occurring in one of the four key clusters of swamps (as defined by the PACs); or
- Scientific research importance being those swamps in Dharawal upland swamp scientific research area plus paired reference sites.

In this regard, seven (7) upland swamps in the Wonga East study area are identified as being 'special significance' upland swamps, namely: CRUS1, CCUS1, CCUS4, CCUS5, CCUS10, CRUS2 and CRUS3.

Upland swamp CRUS1 is considered to be of 'special significance' based on its size, while CCUS1, CCUS4, CCUS5, CCUS10, CRUS2 and CRUS3 are considered to be of 'special significance' due to the complexity of vegetation sub-communities within these swamps, as all support Banksia Thicket, Tea-tree Thicket and Sedgeland-Heath complex.

The EA (page 272) confirms that 5 'special significance' upland swamps within the Wonga East study area (CCUS1, CCUS4, CCUS5, CCUS10 and CRUS1) may be potentially adversely affected by subsidence impacts.

The 'special significance' attributes of these 5 upland swamps are, as follows:
- CCUS1 – 'Special Significance' based on complexity of vegetation sub-communities - Tea-tree Thicket, Sedgeland-Heath Complex (Sedgeland), Sedgeland-Heath Complex (Restioid Heath) and Sedgeland-Heath Complex (Cyperoid Heath) – This upland swamp is identified as having a significant risk from subsidence related impacts;
- CCUS4 – 'Special Significance' based on complexity of vegetation sub-communities within this swamps, as all support Banksia Thicket, Tea-tree Thicket and Sedgeland – Heath Complex - Banksia Thicket and Tea-tree Thicket;
- CCUS5 – 'Special Significance' based on complexity of vegetation sub-communities within this swamps, as all support Banksia Thicket, Tea-tree Thicket and Sedgeland – Heath Complex - Banksia Thicket and Tea-tree Thicket – This upland swamp is identified as having a significant risk from subsidence related impacts;
- CCUS10 – 'Special Significance' based on complexity of vegetation sub-communities within this swamps, as all support Banksia Thicket, Tea-tree Thicket and Sedgeland – Heath Complex - Banksia Thicket and Tea-tree Thicket; and
- CRUS1 –'Special Significance' based on size – Banksia Thicket and Tea-tree Thicket – This swamp is identified as having a significant risk from subsidence related impacts.

The EA (page 373) states that swamp CCUS1 was previously undermined by Bulli seam first workings in the early 1900's and subsequently by Bulli seam pillar extraction and the Balgownie longwalls with no obvservable adverse effects on stream / swamp flow, water quality or ecosystem health. Swamps CCUS4 and CCUS5 were undermined by Bulli seam first workings in the early 1900's and subsequently by Bulli seam pillar extraction and the Balgownie longwalls. Additionally, CCUS10 was undermined by Bulli seam first workings but not the Bulli seam pillar extraction or the Balgownie longwalls, with no observable adverse impacts from subsidence. Further, swamp CRUS1 was undermined by Bulli seam first workings, but not the Bulli pillar extraction or the Balgownie longwalls, and has had no observable adverse effects on stream / swamp flow, water quality or ecosystem health.

The EA (page 272) also identified that 8 of the 45 upland swamps in Wonga West are considered to be of 'special significance' according to criteria set out in OEH (2012) *draft Upland Swamp Environmental Assessment Guidelines"*. These are LCUS1, LCUS27, LCUS6, LCUS8, WCUS1, WCUS11, WCUS4 and WCUS7. All of these swamps are considered to be of 'special significance' due to the complexity of vegetation sub-communities within these swamps, as all support Banksia Thicket, Tea-tree Thicket and Sedgeland- Heath Complex.

The EA (page 275) confirmed that 4 of these 'special significance' upland swamps in the Wonga West study area may be potentially adversely affected by subsidence related impacts, namely LCUS8, WCUS4, WCUS7 and WCUS11.

The 'special significance' attributes of these 4 upland swamps are, as follows:

- LCUS8 – 'Special Significance' based on complexity of vegetation sub-communities within this swamps, as all support Banksia Thicket, Tea-tree Thicket and Sedgeland – Heath Complex - (Both Headwater and Valley Infill Swamp type) - Banksia Thicket, Tea-tree Thicket and Sedgeland-Heath Complex (Restioid Heath);
- WCUS4 – (Both Headwater and Valley Infill Swamp type) - 'Special Significance' based on complexity of vegetation sub-communities within this swamps, as all support Banksia Thicket, Tea-tree Thicket and Sedgeland – Heath Complex - Sedgeland-Heath Complex (Restioid Heath), Sedgeland-Heath Complex (Sedgeland), Tea-tree Thicket and Banksia Thicket – This upland swamp is identified as having a moderate risk from subsidence related impacts;
- WCUS7 – 'Special Significance' based on complexity of vegetation sub-communities within this swamps, as all support Banksia Thicket, Tea-tree Thicket and Sedgeland – Heath Complex - Banksia Thicket – This upland swamp is identified as having a moderate risk from subsidence related impacts; and
- WCUS11 – 'Special Significance' based on complexity of vegetation sub-communities within this swamps, as all support Banksia Thicket, Tea-tree Thicket and Sedgeland – Heath Complex - Sedgeland – Heath Complex (Restioid Heath).

The EA (page 387) makes a number of recommendations to avoid or minimise impacts to upland swamps considered to meet the criteria for 'special significance', including:

- Adjust the layout in respect of Longwall A1 LW3 to avoid impacts to CCUS1;
- Adjust the layout in respect of Longwall A2 LW7 and A2 LW8. If this is not feasible, detailed monitoring of CCUS5 should be undertaken during the extraction of Longwalls 7 and 8. Detailed triggers relating to changes in gradient, groundwater monitoring and / or observational monitoring should be developed, and if triggered measures to minimise impacts should be considered;
- Adjust the layout in respect of Longwalls A3 LW2 to minimise impacts on the headwaters of WCUS4; and
- Adjust the layout in respect of Longwalls A3 LW3 and A3 LW4 to reduce predicted strains to WCUS7 and Wallandoola Creek.

The proposal involves progressive extraction of longwalls starting at the lower risk Wonga East domain, before moving to extraction from the wider longwalls of Wonga West. The proposal includes an ongoing monitoring regime of areas of special significance, in order to identify subsidence impacts as early as possible; identify other areas that are vulnerable to similar impacts; and provide recommendations to alter the mine plan to reduce the risk of subsidence impacts.

However, it is considered that the current longwall panel layout has the potential to cause unacceptable subsidence related impacts upon the abovementioned 'special significance' upland swamps. These swamps are likely to experience changes to surface water or groundwater regimes as a result of fracturing of the bedrock underlying the swamps, due to subsidence.

Subsidence is likely to adversely affect swamps directly overlying the proposed longwalls, due to either transient and / or spatial changes in porosity and permeability of a swamp or its underlying weathered sandstone substrate through generation of cracks or differential displacement of the perched aquifer.

In this regard, upland swamp CCUS1 is particularly susceptible to any loss of surface water and / or groundwater. Therefore, it is recommended that if the project is ultimately supported, the longwall panel A1-LW3 should be shortened significantly in length to ensure that the longwall panel does not sit below swamp CCUS1.

Upland Swamp CCUS5 may also be subject to unacceptable subsidence related impacts. This upland swamp spans two longwalls (A2 LW7 and A2 LW8). Therefore, if the project is ultimately approved, it is recommended that longwall panels A2 LW7 and A2 LW8 either be deleted or shortened in length to ensure that swamp CCUS5 is not undermined / adversely affected by any subsidence related impacts.

Upland swamp WCUS4 may be subject to tensile strains that could result in fracturing of the bedrock below this swamp. The lower sections of the headwater swamp are subject to greatest strains, and these areas are particularly susceptible to impact as they support areas of Tea-tree Thicket (MU43) and Cyperoid Heath (MU44c). Therefore, it is recommended that if the project is ultimately approved, the longwall panel A3 LW2 be deleted or shortened to ensure that the 'special significance' swamp WCUS4 will not be subject to subsidence related impacts. If longwall panel A3 LW2 was deleted, other upland swamps LCUS18 and WCUS11 would also be protected from any subsidence related impacts / hydrological losses. This may also assist in the retention of breeding and foraging habitat for threatened frog species.

Upland swamp WCUS7 is likely to be subject to tensile strains sufficient to result in fracturing of bedrock below this swamp and along Wallandoola Creek. There is substantial iron staining in this section of Wallandoola Creek. Therefore, it is recommended that if the project is approved, the longwall panels A3 LW3 and LW4 be reduced in length to ensure that swamp WCUS7 will be adequately protected.

It is noted that the EA (page 383) proposes that a monitoring program will be designed and implemented to:

- Assess the swamp hydrology;
- Provide advance warning of potential breaches of subsidence predictions;
- Detection of adverse impacts on a swamp and underlying strata hydrology; and
- Characterise the relationship between swamp/s and their role in recharging the regional groundwater systems.

NRE has also provided an undertaking that the mining operations will be modified as required through adaptive management measures informed through monitoring of actual subsidence impacts, to reduce negative outcomes. The adaptive management plan will be developed to use the monitoring program to detect the need for adjustment to the mining operations such that the subsidence predictions are not exceeded and that the likelihood of subsidence impacts creating a risk of negative environmental consequences do not occur in upland swamps.

Notwithstanding this, it is considered that the "precautionary principle" should override all considerations. Therefore, the deletion or shortening of longwall panels as outlined above is the most appropriate measure to protect the health and viability of the 'special significance' upland swamp ecosystems, rather than the reliance on the monitoring and use of post-mining adaptive management plans.

It is also noted that these 'special significance' swamps provide breeding or foraging habitat for nationally significant species (as identified in DECCW 2011) including the Giant Burrowing Frog and the Heath Frog (also known as Littlejohn's Tree Frog). Therefore, these swamps should be given priority protection from longwall mining impacts.

4. Potential Impacts on Threatened Frog Species

General

The Coastal Upland Swamp EEC in the Sydney Basin Bioregion contains the threatened Giant Burrowing Frog (*Heleioporus australiacus*) and the Red-crowned Toadlet (*Pseudophryne australis*).

The NSW Scientific Committee listed the *"Alteration of habitat following subsidence due to longwall mining"* as a key threatening process in its Final Determination. This final determination states that "mining subsidence is frequently associated with cracking of valley floors and creeks and with subsequent effects on surface and groundwater hydrology (Booth et al and Barclay 2000, ACARP 2001, 2002, 2003)." The final determination also states that "subsidence can also cause the deterioration of water quality due to a reduction in dissolved oxygen and to increased iron oxides and manganese. The final determination further stated that the "conversion of perched water table flows into subsurface flows through voids, as a result of mining-induced subsidence, may significantly affect the balance of upland swamps (eg Young and Wray 2000). The final determination also noted that the upland swamps and the hanging swamps provide habitat for a range of threatened fauna, including the Giant Burrowing Frog (*Heleioporus australiacus*), the Red-crowned Toadlet (*Pseudophyrne australis*), the Stuttering Frog (*Mixophyes balbus*) and Heath Frog (or Littlejohn's Tree Frog (*Litoria littlejohni*)). These frogs "are likely to suffer the greatest impacts as a result of hydrological change in the swamps because of their reliance on the water within these areas either as foraging or breeding habitat."

Giant Burrowing Frog (*Heleioporus australiacus*)

The NSW Department of Environment and Climate Change *"Threatened and pest animals of Greater Southern Sydney"* study (page 26) states that the Giant Burrowing Frog (*Heleiporus australiacus*) is uncommon in the Greater Southern Sydney. The study also acknowledged that a key threat to the Giant Burrowing Frog is habitat loss and other threats are not well known but may include hydrological changes. Longwall mining may be a significant threat as this can crack bedrock, draining pools and creeks that are important breeding habitat for the Giant Burrowing Frog.

The NSW Department of Environment and Climate Change *"Threatened and pest animals of Greater Southern Sydney"* study also stated *"A presence-only model predicts moderate quality habitat across all areas of Hawkesbury and Narrabeen sandstones, with higher quality habitat in the vicinity of Upland Swamps. The association with Upland Swamps is not direct, rather it is the fact that they are invariably associated with minor drainages that contain pools of fish free breeding habitat and they occur on deep, sandy soils suitable for this burrowing species."*

The NSW Department of Environment and Climate Change *"Threatened and pest animals of Greater Southern Sydney"* study (page 26) advises that the *"... Giant Burrowing Frog is locally abundant in restricted habitat, and most of this is within protected areas. It is a moderate conservation priority overall." The "Protection of Upland Swamps and associated creeks is paramount to the survival of this frog on the Woronora Plateau. Longwall mining under the Woronora Plateau must not result in the draining or disturbance of swamps or waterways."*

During the 2009 surveys, the Giant Burrowing Frog was recorded within the Lizard Creek Tributary 1 (LCT1) and the Lizard Creek Tributary 2 (LCT2). Giant Burrowing Frog tadpoles were also recorded within LCT1 and LCT2. The Eco Logical report (page 22) also confirmed that *"Giant Burrowing Frog breeding habitat is extensive along much of Wallandoola and Lizard Creeks where in-stream ponding occurs. Foraging and shelter habitat for this species*

can also be identified in those areas of Upland Swamp that can be readily demarcated." The Eco Logical report (page 15) confirmed that over 60 large late stage Giant Burrowing Frog tadpoles were observed in a large lateral drainage line to Lizard Creek.

The EA states that a number of 1st order streams in Wonga East were assessed as providing suitable breeding habitat for the Giant Burrowing Frog.

The Assessment of Significance (pages E29 & 30 in Annex E) confirms that potential habitat exists in most of the 84 upland swamps recorded in the study area.

Recent assessments undertaken by Biosis for the A2 LW4 and A2 LW5 SMP has identified suitable breeding habitat for the Giant Burrowing Frog in the 1st order streams associated with upland swamps CRUS1, CRUS2 and CCUS4. Tadpoles of Giant Burrowing Frog were recorded in the 1st order stream to the south of upland swamp CRUS2 in August 2012 (N.Garvey Biosis per comm).

Annex B in Annex S (Eco Logical Report) (page 15) states that *"Giant Burrowing Frogs are notoriously difficult to detect due to their burrowing habit and the fact that when not breeding the adults may range across extensive areas of woodland and heath to forage and shelter. This less obvious habitat may be large distances from the more readily identifiable breeding habitat along pooled section of upland, low relief drainage lines. The Giant Burrowing Frog preferentially breeds during the warmer months of the year and this is when it is most often heard calling, however it may also take advantage of rain events in late Summer and extending into early Autumn."*

The Eco Logical report (page 16) states that the Giant Burrowing Frog is reliant upon ephemeral or intermittent non-perennial stream flows to form ponded sections and soaks within headwater swamps, along feeder creeks and in or adjacent to other poorly defined drainage features as well as within and adjacent to upland swamps. Such features are often found in broad, low relief headwater valley areas that constitute a significant proportion of the upper parts of the drainage lines on the subject land. The upper sections of many of the drainage lines of the subject land are, by their nature, of low relief and, in combination with shallow water tables, form a habitat mosaic for both species."

Eco Logical report (page 17) also indicates that the Giant Burrowing Frog is sensitive to changes in water quality and pH changes as well as hydrological changes that influence the duration of water persisting at the surface (NPWS 2001 a. b: Green et al. 2004, Thumm and Mahony 1999, Stauber 2006).

The Eco Logical report (page 17) confirms that Giant Burrowing Frogs are generally very sparse and in the southern Sydney, Illawarra and Nowra areas have never been detected with numbers greater than 8 calling males at any one location (Daly 1996; G. Daly pers.comm). They may also be quite sedentary because while they may move substantial distances across the landscape to forage they also show site fidelity in the ponded sections of streams they use for breeding."

The EA (page viii in the Executive Summary) concluded that *".....significant impact assessments under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) found that there is potential for significant impacts for the Giant Burrowing Frog (Heleioporous australiacus) and that disruption to the breeding cycle of Heath Frog (Litoria littlejohni) may occur. While the assessments determined that the proposed mine plans have the potential to impact local populations of these species, the Project is not predicted to interfere substantially with the recovery of any of these species as a whole."*

The EA (page 429) states that *"Cataract Creek is proposed to be undermined by longwalls in Wonga East (Area 2) with a predicted maximum subsidence of 0.8m, along with up to 10mm/m compressive and 5mm/m tensile strains over A2LW8 (GeoTerra 2012a). Potential subsidence impacts include potential cracking of the 4th order stream bed due to subsidence near or over A2LW7, A2LW8, A2LW9 and A2LW10. Environmental consequences are potential impact on stream flow, with downstream flow re-emergence; potential effect on pool holding capacity of rock bars and potential iron hydroxide seepage. It is noted that iron hydroxide seepage is currently occurring (GeoTerra 2012a)."*

The EA (page 430) states that *"There is a significant risk posed to the stream condition or extent in Cataract Creek based on predicted maximum subsidence of 0.8m, along with up to 10mm/m compressive and 5mm/m tensile strains over Longwall A2 LW8 (GeoTerra 2012a). Potential subsidence impacts include potential cracking of the 4th order stream bed due to subsidence near or over Longwalls A2 LW7, A2 LW8, A2 LW8, A2 LW9 and A2 LW10. Environmental consequences are potential holding capacity of rock bars and potential iron hydroxide seepage."*

The EA (page 432) states that *"....the proposed longwall mining may result in subsidence and alter hydrological processes of the swamps, in particular the headwater swamps, as the mine plan has been revised to avoid the more sensitive valley infill upland swamps along Lizard Creek and Wallandoola Creek in Wonga West."*

Notwithstanding this, the EA (page 434) still confirms that *"significant impact assessment for the Giant Burrowing Frog concluded that the proposed action may have a significant impact on the species, in particular the population in the tributaries of Lizard Creek in Wonga West. The assessment found that, the proposed action was likely to: lead to a long-term decrease in the size of an important population of a species; reduce the area of occupancy of an important population; fragment an existing important population into two or more populations; disrupt the breeding cycle of an important population; and modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decrease the availability or quality of habitat to the extent that the species is likely to decline."*

It is noted that the EA (page 442) proposes a reduction in a number of potential impacts upon the Giant Burrowing Frog through:

- Realigning the longwall panel layouts to avoid sensitive areas identified by ERM in 2007;
- Abandoning plans for longwall panels underneath the main channel of Lizard Creek and Wallandoola Creek;
- Abandoning plans for longwall panels underneath Lizard Creek valley infill swamps and much of the Wallandoola Creek valley infill swamps;
- Locating the fully supported driveage underneath Lizard Creek; and
- Realigning and reducing the width of longwall panels in Wonga East.

The Assessment of Significance under the TSC Act concludes that the Giant Burrowing Frog will be subject to significant potential subsidence related impacts as a result of the current proposal. In this regard, there is a high risk for subsidence related impacts to result in the loss of breeding habitat. It is likely that surface cracking as a result of mine subsidence will lead to a reduction in surface water availability including standing pools within LCT 1 and LCT 2 where this species was recorded. This will have direct consequences for the availability of breeding habitat for Giant Burrowing Frog as alteration of habitat following subsidence due to longwall mining is listed as a Key Threatening Process. The alteration or modification of Giant Burrowing Frog habitat is considered likely to occur as a result of the project. Therefore, the project will have an adverse effect on the life cycle of the Giant Burrowing Frog such that a viable local population is likely to be placed at a risk of extinction.

In light of the above, the current longwall panel layout is recommended to be modified by way of the following changes, in order to protect the habitat of the Giant Burrowing Frog:

- The lateral tributary of Lizard Creek in which a colony of the Giant Burrowing Frog was detected, including its upland catchment area, should be further protected from subsidence impacts.
- Deletion of longwall panel A3 LW2 to protect the 'special significance' headwater swamp WCUS4 and upland swamps WCUS11 and LCUS18 and to protect the habitat of the Giant Burrowing Frog.
- Deletion of longwall panels A3 LW4 and A3 LW5, in order to protect 1st order streams of Lizard Creek Tributary 2 and to protect the breeding habitat of the Giant Burrowing Frog.
- Reduction in the length of longwall panels A3 LW2 and A3 LW3, in order to protect the 1st order streams of Lizard Creek Tributary 1 and upland swamp LCUS18 and 'special significance' upland swamp WCUS11.
- Reduction in the length of longwall panel A2 LW9 to protect Cataract Creek from undermining and potential subsidence related cracking.
- Deletion of longwall panel A2 LW8 to protect Cataract Creek from potential subsidence related impacts and to protect the 'special significance' upland swamp CCUS5 and the 1st order streams connected to CCUS5.
- Reduction in the length of longwall panel A2 LW7, to protect the 'special significance' upland swamp CCUS5.
- Reduction in the length of longwall panel A2 LW6 to protect the 'special significance' upland swamps CCUS4 and CRUS1.

Heath Frog (Littlejohn's Tree Frog) (*Litoria littlejohni*)

The NSW Department of Environment and Climate Change's *"Threatened and pest animals of Greater Southern Sydney"* study (page 32) found that the Heath Frog (Littlejohn's Tree Frog) (*Litoria littlejohni*) is extremely rare within the Greater Southern Sydney Region. The Heath Frog (Littlejohn's Tree Frog) is one of the most infrequently recorded frogs in NSW (Lemckert 2005) and consequently, very little is known about the threats operating on this species. The NSW Scientific Committee (2005a) listed this species as one that is likely to have habitat affected by subsidence due to longwall mining. The study also indicated that the *"paucity of records would suggest that it is extremely rare, although Lemckert (2005) cautions that the species is likely to be under-recorded due to the lack of information available on which to base targeted surveys."* Further survey should be undertaken under appropriate conditions. Upland Swamps on sandstone are important habitat for this species.

The NSW Department of Environment and Climate Change *"Threatened and pest animals of Greater Southern Sydney"* study (page 32) recommends that Littlejohn's Tree Frog is a high conservation priority and known breeding sites should be treated as being of high conservation value and disturbance to breeding habitat or degradation of water quality should be avoided. Longwall mining under the Woronora Plateau must be monitored to ensure that it does not affect Upland Swamps or minor drainages that appear important for this species.

The EA (page 419)confirmed that *"suitable habitat for Heath Frog (Litoria littlejohni) was recorded within the Wonga West area during field surveys by both Eco Logical (2009) and Biosis (2009) and in some of the 1st and 2nd order streams associated with upland swamps CRUS1, CRUS2, CCUS4 in Wonga East (N.Garvey, pers.comm). The condition of the habitat varied from good to poor condition in Wonga West. The greatest extent of suitable habitat for this species was recorded within the pooled sections of Wallandoola Creek (Biosis 2009, Eco Logical 2009)."*

The EA (page 434) confirms that the Heath Frog is likely to occur within the Wallandoola Creek drainage, and suitable habitat for breeding occurs within the valley infill swamp WCUS7. *"This swamp is likely to be subject to subsidence impacts and cracking of substrate may occur (GeoTerra 2012a). If cracking of pond bars or substrate were to occur, habitat condition may become degraded to a point such that Heath Frog could no longer successfully breed there. The assessment found that if that were the case, the proposed action may disrupt the breeding cycle of an important population."*

Large pooled sections of Wallandoola Creek that are identified as potential Heath Frog breeding habitat should be protected from subsidence induced hydrological impact.

The EA also states that a number of 1st order streams in Wonga East were assessed as providing suitable breeding habitat for Heath Frog (*Litoria littlejohni*).

The EA also confirms that the project is predicted to have an adverse effect on potential breeding habitat for the Heath Frog associated with upland swamps and associated streams. If a population is present within the affected areas, *"the Project would accordingly have an effect on the life cycle of this species such that the local populations may be placed at the risk of extinction."*

The Assessment of Significance for the Heath Frog found that the greatest extent of suitable habitat for the Heath Frog was recorded within the upper reaches of Lizard Creek, the Lizard Creek swamp complex and within the pooled sections of Wallandoola Creek within the associated swamp complex. Subsidence and related disturbance including cracking of creek beds has the potential to reduce water quality in these areas and limit the breeding potential for this species. If cracking were to occur, the project may have an adverse effect on the life cycle of this species such that a viable local population is likely to be placed at a risk of extinction. Upland swamps of 'special significance' that may experience moderate or significant environmental risk are WCUS4, WCUS7, CCUS4, CCUS5 and CCUS1. Habitat values of these swamps and associated 1st order streams may be adversely affected such that it may affect individuals dependent upon these habitats.

The proposal is also likely to disrupt the breeding cycle of the Heath Frog, based upon the significant impact assessment under the EPBC Act.

Therefore, it is recommended that the following changes be made to longwall panel layout, in order to protect the habitat of the Heath Frog:

- Deletion of longwall panels A3 LW4 and A3 LW5, in order to protect 1st order streams of Lizard Creek Tributary 2 and to protect the breeding habitat of the Giant Burrowing Frog.
- Reduction in the length of longwall panels A3 LW2 and A3 LW3, in order to protect the 1st order streams of Lizard Creek Tributary 1 and upland swamp LCUS18 and 'special significance' upland swamp WCUS11.
- Reduction in the length of longwall panel A2 LW9 to protect Cataract Creek from undermining and potential subsidence related cracking.
- Deletion of longwall panel A2 LW8 to protect Cataract Creek from potential subsidence related impacts and to protect the 'special significance' upland swamp CCUS5 and the 1st order streams connected to CCUS5.
- Reduction in the length of longwall panel A2 LW7, to protect the 'special significance' upland swamp CCUS5.
- Reduction in the length of longwall panel A2 LW6 to protect the 'special significance' upland swamps CCUS4 and CRUS1.

Red-crowned Toadlet (*Pseudophryne australis*)

The Red-crowned Toadlet (*Pseudophryne australis*) is listed as a 'vulnerable species' under the Threatened Species Conservation (TSC) Act 1995.

The NSW Scientific Committee listed the *"Alteration of habitat following subsidence due to longwall mining"* as a key threatening process in its Final Determination. This final determination states that "mining subsidence is frequently associated with cracking of valley floors and creeks and with subsequent effects on surface and groundwater hydrology (Booth et al and Barclay 2000, ACARP 2001, 2002, 2003)." The final determination also states that "subsidence can also cause the deterioration of water quality due to a reduction in dissolved oxygen and to increased iron oxides and manganese. The final determination further stated that the "conversion of perched water table flows into subsurface flows through voids, as a result of mining-induced subsidence, may significantly affect the balance of upland swamps (eg Young and Wray 2000).

The final determination also noted that the upland swamps and the hanging swamps provide habitat for the Red-crowned Toadlet (*Pseudophyrne australis*). This frog is likely to suffer adverse impacts as a result of hydrological change in the swamps because of their reliance on the water within these areas either as foraging or breeding habitat.

The NSW Department of Environment and Climate Change *"Threatened and pest animals of Greater Southern Sydney"* study (page 34) states that habitat alteration due to longwall mining is a key threatening process affecting the Red-crowned Toadlet (*Pseudophryne australis*). This study also recommends that longwall mining be monitored, in order to ensure that it does not affect the Upland Swamps or minor drainages that appear to be important for this species.

The Environmental Assessment report (page 419) confirmed that the Red-crowned Toadlet (*Pseudophryne australis*) was recorded during survey work.

The accompanying Eco Logical report (page 22) confirmed that *"Red-crowned Toadlet ephemeral breeding habitat is predominantly located along the lateral streams entering Lizard and Wallandoola Creek and is most likely also present in some of the soaks and drainage depressions throughout the Upland Swamp areas. These are what can be considered the only concentrations of potential habitat for this species. The patchy extent of other ephemeral habitat, that includes ill-defined ephemeral drainage depressions across sandstone bench areas, is scattered across large areas of the study area and the impact zone."*

The Assessment of Significance for the Red-crowned Toadlet (*Pseudophryne australis*) confirmed that this species was recorded within the study area during field investigations in Lizard Creek (LCUS1 and LCT1) and in the tributary downstream of the headwater swamp LCUS18. Suitable habitat may also occur in streams associated with other upland swamps throughout the study area in particular, those associated with the upland swamps WCUS11, LCUS2, LCUS8, LCUS9, LCUS11, LCUS12, LCUS20, LCUS21 and LCUS25 below the Transitional Shale / Sandstone forest EEC.

LCUS12, LCUS18, LCUS20, LCUS21 and LCUS25 are likely to be undermined by the project and are at risk of adverse environmental consequences.

Additionally, it is considered that surface cracking as a result of mine subsidence will lead to a reduction in surface water availability including standing pools within LCT1 and its tributaries as well as the reach of LCT2 over the northern end of longwall A3 LW5. This is

expected to have direct consequences for the availability of habitat for the Red-crowned Toadlet.

The 1st, 2nd and 3rd order tributaries, in particular LCT1 (over Longwall A3 LW3) and LCT2 (near northern end of Longwall A3 LW5) which overly the proposed 20mm subsidence zone are at risk of subsidence related stream bed cracking, enhancement of stream bed underflow, discharge of ferruginous springs and reduced stream water quality at their confluence with Lizard Creek. It is not anticipated however, that the total volume of water entering Lizard Creek will be adversely affected. It is noted, that all of these aspects of LCT1 are currently adversely affected by existing Bulli workings subsidence (GeoTerra 2012a).

A potential risk to the integrity of stream flow and connectivity in Wallandoola Creek could be present in the area that may potentially undergo up to 0.5m of subsidence and 6mm/m of tensile strain to the south of Longwalls A3 LW3 and A3 LW4.

There is a low potential risk to the integrity of stream flow and connectivity in Lizard Creek in the area that may potentially undergo 6 to 7mm/m of tensile strain to the north of Longwall A3 LW2 and south of the northern end of Longwall A4 LW5.

The project is likely to have a significant impact on habitat for local populations of the Red-crowned Toadlet, specifically in the tributaries of Lizard Creek in the Wonga West area. It is likely that the project will have an adverse effect on the life cycle of the Red-crowned Toadlet associated with LCT1 and LCT2 such that a viable local population of the species in Wonga West may be placed at risk of extinction.

Subsidence related impacts associated with the project are likely to result in modification of Red-crowned Toadlet breeding habitat to an extent that it would reduce breeding success within at least part of the local population.

Therefore, it is recommended that the following changes be made to longwall panel layout, in order to protect the habitat of the Red-crowned Toadlet:

- Deletion of longwall panel A3 LW2 to protect the 'special significance' headwater swamp WCUS4 and upland swamps WCUS11 and LCUS18 and to protect the habitat of the Giant Burrowing Frog and the Red-crowned Toadlet.
- Reduction in the length of longwall panel A3 LW3, in order to protect the 1st and 2nd order streams of LCT1.
- Deletion of longwall panel A3 LW5, in order to protect 1st order streams of Lizard Creek Tributary 2, LCUS25 and to protect the breeding habitat of the Red-crowned Toadlet.

Stuttering (Barred) Frog (*Mixophyes balbus*)

The Stuttering (Barred) Frog (*Mixophyes balbus*) is listed as an "endangered species' under the TSC Act and is also listed as a "vulnerable species" under the EPBC Act.

The NSW Department of Environment and Climate Change *"Threatened and pest animals of Greater Southern Sydney"* study (page 36) states that the Stuttering (Barred) Frog (*Mixophyes balbus*) is extremely rare within the Greater Sydney basin. The Stuttering (Barred) Frog (*Mixophyes balbus*) is of the highest conservation priority and any extant populations are critical to the survival of the species across its range. The NSW Department of Environment and Climate Change *"Threatened and pest animals of Greater Southern Sydney"* study (page 36) states that *"further survey for this species should be conducted, particularly where there are unconfirmed recent records such as on the Illawarra Escarpment."*

The EA (page 431) confirms that suitable habitat and good quality breeding habitat for the Stuttering (Barred) Frog (*Mixophyes balbus*) has been identified in the upper reaches of

Cataract Creek, upstream of proposed longwall A2 LW8 in Wonga East. Based on worst case subsidence predictions, habitat for the Stuttering Barred Frog above longwalls A2 LW8 and A2 LW7 will be adversely affected by the proposal. A large section of habitat for this species occurs upstream of the affected reach of Cataract Creek and the proposal is predicted to have negligible environmental consequences.

The Assessment of Significance for the Stuttering (Barred) Frog (*Mixophyes balbus*) concluded that the worst case predictions extraction of the longwall panels in the upper reaches of Cataract Creek may have an adverse impact on stream flow, pool holding capacity of the rock bars and potential iron hydroxide seepage.

Areas of potential Stuttering (Barred) Frog habitat within Cataract Creek should be protected from subsidence induced hydrological impact.

Therefore, the following changes are recommended to the longwall panel layout, in order to protect the habitat of the Stuttering (Barred) Frog:

- The deletion of A2-LW8 and reduction in A2-LW7 to protect 'special significance' upland swamp CCUS5 and to protect the habitat for the Stuttering Barred Frog.
- The monitoring of the current longwall A2 LW5.

Green and Golden Bell Frog (*Litoria aurea*)

The Green and Golden Bell Frog (*Litoria aurea*) is listed as an "endangered" species under the Threatened Species Conservation (TSC) Act 1995 and is listed as a "vulnerable" species under the Environment Protection and Biodiversity Conservation (EPBC) Act 1999.

The NSW Department of Environment and Climate Change *"Threatened and pest animals of Greater Southern Sydney"* study (page 28) states that the Green and Golden Bell Frog (GGBF) is an extremely rare frog species within the wider Sydney Basin but notes that the GGBF was previously recorded at Woonona. Therefore, the GGBF is identified as being of the 'highest conservation priority.'

The NSW Department of Environment and Climate Change *"Threatened and pest animals of Greater Southern Sydney"* study states that *"it is very difficult to predict the presence of the Green and Golden Bell Frogs by looking at habitat features (Pyke and White 1996; Hamer et al. 2002). To statistically model what is currently 'suitable habitat' for this frog is likewise a problem, as its distribution is now a vast contraction of what was once habitable.....In addition, the fact that the species is a generalist with a wide range of ecological tolerances meant that fine-scale delineation of habitat preferences was not possible or appropriate."*

The EA (Annex S page 77) states that *"Biosis (2009) recorded one dam which represented poor quality habitat for the Green and Golden Bell Frog, no individuals were recorded. A visit to the site by Ross Wellington from Eco Logical determined that the dam was not suitable habitat for this species (Eco Logical 2009). Green and Golden Bell Frog have previously been recorded within the NRE Colliery at Russell Vale, which is outside of the Study Area, on the coastal slopes below the Illawarra Escarpment."*

It is noted that no detailed environmental impact assessment (eg Assessment of Significance) was undertaken with regard to the Green and Golden Bell Frog, on the basis that the consultants assumed that no work was being carried out on the NRE colliery pit top area. Detailed assessment of the GGBF should be required for the entire study area.

However, major upgrading works are proposed within the pit top area of the NRE Colliery site, including changes to the creek realignment, dam removal, increasing the size of the coal stockpile and new coal loading and manoeuvring facilities.

Therefore, it is considered that targeted survey work and impact assessment is required for the Green and Golden Bell Frog (GGBF) prior to any determination of the project. This detailed assessment is required to verify whether there are any GGBF frogs within the NRE site, particularly since GGBF had previously been recorded within the site and at the nearby Edgewood residential estate.

Further, a detailed Assessment of Significance is required for the Green and Golden Bell Frog is also required, prior to the determination of the project. This is considered essential since the GGBF was previously recorded within the NRE No. 1 Russell Vale Colliery site and works are proposed within the pit top area of the colliery.

5. Noise and Vibration Issues

The main Environmental Assessment report by ERM is supported by Appendix H which contains the Noise Assessment report by ERM dated 30 November 2012. However, it is noted that background noise monitoring by ERM was for a limited time, between 1 December 2008 and 28 December 2008 only. The December 2008 background noise monitoring was used to determine the existing ambient noise environment at the sensitive receiver locations. Sensitive receiver locations were grouped into representative areas and the background (LA90) noise levels within the representative areas adjacent to the Russell Vale site were assessed using the results of this monitoring.

It is considered that the noise assessment methodology is questionable given the limited background noise monitoring in December 2008. The background noise monitoring should have also occurred in 2012 to ensure up to date background noise levels were assessed, rather than relying upon data obtained for a single month in December 2008.

The Noise Assessment report by ERM dated November 2012 also recommends the construction of the following two acoustic noise barriers, in order to mitigate noise generation issues arising from pit top activities:

- A 3 metre high barrier to the south of Broker Street, Russell Vale near the intersection with West Street; and
- A 3.6 metre high roadside type barrier to the north of the internal access road from weighbridge to the Princes Highway.

In addition, the ERM November 2012 report also indicates that NRE is proposing to construct an additional noise bund to the south of the site. This will provide further screening to residents located to the south. This noise bund was not included in the ERM acoustic modelling.

Notwithstanding this, NRE representatives have previously advised the NRE No. 1 Colliery Community Consultative Committee in November 2012 and again in February 2013 that no acoustic noise barriers will be provided as part of this project. It is noted that the main EA report (Section 9 Acoustics) is silent on any recommendations to include the abovementioned noise barriers.

Further, a noise audit report (prepared by Pacific Environment Limited) recommended that a noise barrier will have little effect in reducing the noise level. The audit carried out by Pacific Environment does not however consider the long term assessment results and weather conditions (wind speed and direction, cloud cover).

With a change in weather conditions, the noise levels may at times exceed more than the predicted 2dB(A).

However, it is noted that the ERM acoustic modelling for the Stage 2 project was in fact based on the assumption that certain mitigation measures recommended are implemented. These include noise mitigation of equipment including dozer and mine ventilation fan and construction of the two noise barriers on the northern part of the site, within CCL745.

Therefore, concern is raised about the potential noise impacts upon surrounding residential properties from pit top operational activities, if the noise barriers are not installed.

Accordingly, it is recommended that the three (3) abovementioned noise barriers be required as part of any conditions of consent. Additionally, it is considered that the other noise mitigation measures identified in the ERM acoustic report should also be implemented. This will ensure that some acoustic relief is provided to residents from any pit top activities.

According to the EA, the project will (by 2018) generate up to 3 million tonnes of coal being transported to the Port Kembla Coal Terminal. This will result in 682 peak truck movements per day.

The potential noise generated by this level of truck movement would be of great concern to those residents living along the proposed haul route and transport corridor, especially Bellambi Lane and surrounding residential neighbourhoods to the site.

The proponent considers by using a special brake system that the level of intrusive noise would be reduced. In view of the increasing number of truck trips per day, it is unclear how long the brakes will last and what guarantee the proposed prevention and mitigation process would provide in noise reduction.

The increase in heavy vehicles will have implications for increased noise disturbance in residential areas such as those living on or near to Bellambi Lane. To address this, a condition limiting compression-braking in residential areas is also recommended.

6. Air quality

The EA indicates that the Stage 1 (Preliminary Works project (MP10-0046)) involves the following coal handling facility upgrades which will feed into Stage 2 (ie current project):

- Removal of the existing Balgownie decline conveyor and storage bin and replacement with a newly designed Wongawilli decline conveyor on a similar alignment;
- Decommissioning of the existing Bulli decline conveyor;
- Construction of a stackout conveyor and tripper system;
- Construction of a new screening and sizing station;
- Construction of a partial temporary and partial permanent new internal haul road.

The current Stage 2 project proposes further upgrading of coal handling infrastructure to improve on operational efficiency and minimise environmental impacts.

The EA also indicates that coal will be delivered to the existing stockpile (SP1) via the newly constructed Wongawilli decline belt (Stage1). The existing stockpile has a capacity of 60,000 tonnes to 80,000 tonnes. Two additional stockpile areas (SP2 and SP3) will be installed east of SP1. Each stockpile will enable up to approximately 140,000 tonnes of coal to be stockpiled and reclaimed for loading through a new truck loading facility. The installation of SP2 and SP3 (together with the existing SP1 stockpile) will enable a total stockpiling capacity of approximately 340,000 tonnes up to 360,000 tonnes of coal on-site.

Coal will be delivered to SP2 and SP3 via an overhead conveyor and tripper arrangement. Coal will be reclaimed from the base of SP2 and will be returned to SP1 via a new reclaim conveyor. The coal is then transferred to the truck loader via a conveyor.

It is agreed that the findings of the EA concerning the main potential air quality issues resulting from the project are particulate emissions associated with the: (i) handling of coal on-site, (ii) wind erosion impacts generating dust emissions from the three (3) stockpile areas and (iii) truck haulage of coal off-site.

In this regard, concern is raised that these three (3) stockpile areas are situated in close proximity to adjoining residential areas and represent a major source of potential dust emissions / air pollution to the locality.

Should the project be approved, it is recommended that appropriate dust suppression measures be implemented within the site, especially at the stockpile and truck loading areas.

The dust suppression measures should include the following:

- The completion of all Stage 1 coal handling facility upgrades namely: (i) the removal of the existing Balgownie decline conveyor and storage bin and replacement with a newly designed Wongawilli decline conveyor on a similar alignment (ii) decommissioning of the existing Bulli decline conveyor (iii) Construction of a stackout conveyor and tripper system and (iv) construction of a new screening and sizing station;
- The full enclosure of the coal conveyor to the stockpile areas;
- The full enclosure of the screening and sizing plant, in order to minimise dust emissions;
- An automatically controlled fixed stockpile spray system around the stockpile areas;
- A mobile water truck be used throughout the site;
- Roadside sprays;
- Truck washing facilities that are used for all trucks, prior to departure from the site;
- All trucks must be covered before leaving the site, in order to minimise the potential for dust impacts along haul routes;
- All surfaces on which trucks park or travel in the truck loading area shall be sealed to facilitate dust control and water management;
- A bobcat mounted road sweeper be used on all sealed surfaces; and
- Fixed water sprays at selected points on a number of surface and underground conveyor systems.

7. Emission of greenhouse gases

The extraction and transfer of 3 million tonnes of coal per year is estimated to emit approximately 2,548,453 tonnes of CO2/ per year (scope 1 and 2). This estimated volume can increase for various reasons over the life of the project without any measures of controlling and reducing these emissions.

8. Aboriginal Cultural Heritage Issues

The EA (page 455) identified 50 recorded Aboriginal sites and 6 new Aboriginal cultural heritage sites as occurring within the Study Areas. In this regard, the EA (page 457) confirms that *"Rock shelters may be adversely affected by cracking, movement along joints ir bedding planes, by block fall and by water seepage. All these impacts may directly affect the stability of the shelter and consequently any rock art within a shelter.*

Impacts arising from valley closure can put additional strain on the cliff tops, which may cause consequential strain on any rock shelters present beneath the upper most landforms. Grinding grooves can be affected by upsidence only where they are located at or near the valley floor and thereby causing cracking as well as cracking from strain.

Artefact scatters can be indirectly impacted by tilt, causing rain water to run off in differing ways resulting in increased levels of erosion. Artefact scatters are the least likely Aboriginal site type to be impacted by mining subsidence. (DoP 2008b)."

The EA (page 463) further states that *"In Wonga West, there are 15 sites within the potential subsidence footprint including:*

- *Three rock shelters with high significance (52-2-1183, 52-2-1187 and 52-2-1198);*
- *One rock shelter with moderate significance (New NRE Rock Shelter 1);*
- *Five rock shelters with low significance (52-2-1184, 52-2-1196, 52-2-1197 and 52-2-1225);*
- *Four axe grinding grooves with low significance (52-2-1191, 52-2-1196, 52-2-1197 and 52-2-1224);*
- *One women's site with high significance (New NRE Women's site); and*
- *One scarred tree with low significance (New NRE scarred tree)."*

The EA (page 464) also states that *"In Wonga East, there are six sites within the potential subsidence footprint. These include:*

- *Four rock shelters with moderate significance (52-3-0311. Wonga East 1, Wonga East 2 and Wonga East 3);*
- *One axe grinding groove with low significance (52-3-0320); and*
- *One artefact scatter with low significance (52-3-0313)."*

It is noted that four of these sites are of high archaeological significance and five sites are of moderate archaeological significance.

The EA (page 464) states that *"NRE have committed that where high or moderately significant sites within the envelope defined by a 600m barrier around the mining footprint at Wonga East and Wonga West are at moderate or high risk they will be actively managed and monitored throughout and following the mining period."*

However, it is considered that the current mine layout results in subsidence risks to the following Aboriginal archaeological sites in Wonga West:-

- The three (3) highly significant rock shelters (52-2-1183, 52-2-1187 and 52-2-1198);
- One rock shelter with moderate significance (New NRE Rock Shelter 1); and
- The highly significant new Women's site.

Once the other identified major issues pertaining to project have been resolved, it is considered that the current mine layout should be redesigned, in order to reduce the length of longwall panels in Area A3.

Further, the current mine layout for the A2 LW9 and A2 LW10 longwall panels cause unacceptable potential subsidence impacts to the four (4) moderately significant rock shelters in Wonga East. Therefore, A2 LW9 and A2 LW10 require a reduction in length.

However, any changes to the length of longwall panels in Areas A3 and A2, needs to also take into consideration the other impacts of the project.

<u>Aboriginal Cultural Heritage Issues</u>

Aboriginal cultural heritage consists of places and items that are of significance to Aboriginal people because of their traditions, observances, customs, beliefs and history. Aboriginal cultural heritage may comprise of physical (or tangible) and / or non-physical elements.
The EA (page 456) states that *"OEH advise that the performance measures for Aboriginal cultural heritage need to be aligned with the Bulli PAC recommendations and that in particular this should include the quantification of potential impacts to Aboriginal cultural heritage as a result of mining. The survey methodology and field work for this assessment was completed prior to the release of the Bulli PAC. As such, a commitment has been made that additional monitoring and risk assessment in accordance with the Bulli PAC for sites*

particularly within the predicted subsidence footprint will be undertaken prior to LW mining relevant Longwalls."

The Director-General's requirements dated 18 August 2009 (for the preparation of the EA) included an attachment of policies, guidelines and plans which should be reviewed / addressed – This included the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC). However, the EA appears to have failed to properly address Aboriginal cultural heritage issues, which is considered important given that the project may potentially destroy some culturally significant sites, due to subsidence impacts.

Therefore, it is recommended that proper assessment of Aboriginal cultural heritage issues is required prior to any project determination; in line with the Department's EA requirements and the previous PAC decisions for similar coal mining operations such as the Bulli project.

Any such Aboriginal cultural heritage assessment should include a range of matters including (but not necessarily limited to) the following:

(a) A preliminary assessment to determine if the project is likely to have an impact on Aboriginal cultural heritage.
(b) Identify any Aboriginal cultural heritage values associated with the study area through consulting with local Aboriginal people with cultural knowledge or responsibilities for country in which the proposed project occurs.
(c) Written and oral research of Aboriginal cultural heritage of the study area and surrounding locality.
(d) Understanding the significance of the identified Aboriginal cultural heritage values.
(e) Assessing the impact of the proposed project on Aboriginal objects and Aboriginal places.
(f) Describing and justifying the proposed outcomes and alternatives.
(g) Documenting the Aboriginal cultural heritage impact assessment and the conclusions and recommendations to afford appropriate protection of areas of high Aboriginal cultural heritage significance.
(h) Any other relevant matter pertinent to the study area.

As part of the cultural heritage assessment, it is recommended that proper consultation should take place with representatives from Council, the Illawarra Local Aboriginal Land Council and other local Aboriginal groups as well as any registered Native Title claimant(s).

9. Traffic Issues

Council notes that the proposed major expansion of NRE colliery has a potential production mine life of up to 18 years (ie Year 2031).

The project proposes to increase coal production output from 1 million tonnes per annum (mtpa) up to 3mtpa which will result in an increase in daily coal truck movements to and from the NRE No. 1 Russell Vale site.

Presently, NRE generates 226 (average) daily coal truck movements (in 2009) between the NRE site and the Port Kembla Coal Terminal (PKCT) site.

The proposal seeks approval for up to 512 (average) coal truck movements per day with peak operating scenario of 682 (peak) daily coal truck movements between the site and the PKCT.

The EA was supported by a Traffic Study Addendum Report (ie prepared by Cardno Eppel Olsen (Appendix J)). This report is based on actual (rather than forecasted) 2010 traffic volume counts after the Northern Distributor came into existence and hence, updates the

previous Cardno Traffic Impact Assessment report dated 26 August 2010 which used traffic count data prior to the Northern Distributor.

The Addendum Report used a forecasted future 10 year (Year 2019) date in its traffic modelling / assessment but did not include any traffic modelling for the full life of the project (ie up to 18 years -Year 2031).

It is considered that further traffic modelling and assessment is warranted for the full life of the coal mine up to Year 2031. The required traffic modelling / assessment should focus on relevant key intersections and mid-block performance. The modelling should also include an additional 12 years of background traffic growth at 1% for Bellambi Lane and 5% for the Northern Distributor (RMS responsibility).

Concern would be raised if the development-generated traffic is shown to affect the future performance of the local road network. However, the revised traffic modelling / assessment is considered the first step in assessing the proposal's impact upon the local road network, particularly Bellambi Lane.

Should the project be approved without the additional traffic modelling, the following matters are recommended to be included in the conditions of consent:

- The proponent shall be required to enter into negotiations with Council and RMS regarding the funding of additional road maintenance to mitigate the impact of additional trucks along the haulage route.
- Changes to the internal layout should comply with the relevant Australian Standard and provide adequate parking and turning space to accommodate staff, delivery and service vehicles. Separation of employees' vehicles and heavy vehicles is recommended to ensure that conflicts do not occur.

10. General Concerns

General concerns are raised that the environmental assessment approach is not holistic but rather piecemeal. Environmental impacts cannot be considered separately in isolation rather, to appropriately assess the cumulative impacts consideration is also required of the development on the site in particular Major Project 2010/46 MOD 1 that includes the extraction of coal using longwall mining techniques in the Wongawilli Seam for Longwalls 4 and 5. It is noted that the concern of the piecemeal approach was also raised during the assessment of the modification to MP-2010/46.

Summary of Specific Recommendations

'Special Significance' Upland Swamps

The current longwall panel layout is recommended to be modified by way of the following changes, in order to protect 'special significance' swamps:

1. Longwall panel A1-LW3 be shortened in length to ensure that the longwall panel does not sit below swamp CCUS1.
2. Longwall panels A2 LW7 and A2 LW8 be either deleted or shortened in length to ensure that swamp CCUS5 is not undermined / adversely affected by any subsidence related impacts.
3. Longwall panel A3 LW2 be deleted or shortened to ensure that the 'special significance' swamp WCUS4 will not be subject to subsidence related impacts. If longwall panel A3 LW2 was deleted, other upland swamps LCUS18 and WCUS11 would also be protected from any subsidence related impacts / hydrological losses. This may also assist in the retention of breeding and foraging habitat for threatened frog species.
4. Longwall panels A3 LW3 and LW4 be reduced in length to guarantee that swamp WCUS7 will be adequately protected.

Giant Burrowing Frog

The current longwall panel layout is recommended to be modified by way of the following changes, in order to protect the habitat of the Giant Burrowing Frog:

5. The lateral tributary of Lizard Creek in which a colony of the Giant Burrowing Frog was detected, including its upland catchment area, should be further protected from subsidence impacts.
6. Deletion of longwall panel A3 LW2 to protect the 'special significance' headwater swamp WCUS4 and upland swamps WCUS11 and LCUS18 and to protect the habitat of the Giant Burrowing Frog.
7. Deletion of longwall panels A3 LW4 and A3 LW5, in order to protect 1st order streams of Lizard Creek Tributary 2 and to protect the breeding habitat of the Giant Burrowing Frog.
8. Reduction in the length of longwall panels A3 LW2 and A3 LW3, in order to protect the 1st order streams of Lizard Creek Tributary 1 and upland swamp LCUS18 and 'special significance' upland swamp WCUS11.
9. Reduction in the length of longwall panel A2 LW9 to protect Cataract Creek from undermining and potential subsidence related cracking.
10. Deletion of longwall panel A2 LW8 to protect Cataract Creek from potential subsidence related impacts and to protect the 'special significance' upland swamp CCUS5 and the 1st order streams connected to CCUS5, in order to maintain the habitat of the Giant Burrowing Frog.
11. Reduction in the length of longwall panel A2 LW7, to protect the 'special significance' upland swamp CCUS5.
12. Reduction in the length of longwall panel A2 LW6 to protect the 'special significance' upland swamps CCUS4 and CRUS1.

Heath Frog

The following changes are recommended to be made to longwall panel layout, in order to protect the habitat of the Heath Frog:

13. Deletion of longwall panels A3 LW4 and A3 LW5, in order to protect 1st order streams of Lizard Creek Tributary 2 and to protect the breeding habitat of the Giant Burrowing Frog.
14. Reduction in the length of longwall panels A3 LW2 and A3 LW3, in order to protect the 1st order streams of Lizard Creek Tributary 1 and upland swamp LCUS18 and 'special significance' upland swamp WCUS11.
15. Reduction in the length of longwall panel A2 LW9 to protect Cataract Creek from undermining and potential subsidence related cracking.
16. Deletion of longwall panel A2 LW8 to protect Cataract Creek from potential subsidence related impacts and to protect the 'special significance' upland swamp CCUS5 and the 1st order streams connected to CCUS5.
17. Reduction in the length of longwall panel A2 LW7, to protect the 'special significance' upland swamp CCUS5.
18. Reduction in the length of longwall panel A2 LW6 to protect the 'special significance' upland swamps CCUS4 and CRUS1.

Red-crowned Toadlet

The following changes are recommended to be made to longwall panel layout, in order to protect the habitat of the Red-crowned Toadlet:

19. Deletion of longwall panel A3 LW2 to protect the 'special significance' headwater swamp WCUS4 and upland swamps WCUS11 and LCUS18 and to protect the habitat of the Giant Burrowing Frog and the Red-crowned Toadlet.
20. Reduction in the length of longwall panel A3 LW3, in order to protect the 1st and 2nd order streams of LCT1.

21. 'Deletion of longwall panel A3 LW5, in order to protect 1st order streams of Lizard Creek Tributary 2, LCUS25 and to protect the breeding habitat of the Red-crowned Toadlet.

Stuttering Barred Frog

The following changes are recommended to the longwall panel layout, in order to protect the habitat of the Stuttering (Barred) Frog:

22. The deletion of A2-LW8 and reduction in A2-LW7 to protect 'special significance' upland swamp CCUS5 and to protect the habitat for the Stuttering Barred Frog.
23. The monitoring of the current longwall A2 LW5.

Green and Golden Bell Frog

24. Targeted survey work and impact assessment is recommended to be undertaken for the Green and Golden Bell Frog (GGBF) prior to any determination of the project.
25. A detailed Assessment of Significance is required for the Green and Golden Bell Frog is also recommended, prior to the approval of the project. This is essential since the GGBF was previously recorded within the NRE No. 1 Russell Vale Colliery site and works are proposed within the pit top area of the colliery.

Noise Mitigation Measures

The following noise mitigation measures are recommended to be implemented as part of any conditions of consent to the project:

26. Construction of a 3 metre high barrier to the south of Broker Street, Russell Vale near the intersection with West Street.
27. Construction of a 3.6 metre high roadside type barrier to the north of the internal access road from weighbridge to the Princes Highway.
28. Construction of a 3 metre high noise barrier to the south of the site.
29. Other noise mitigation measures identified in the ERM acoustic report be implemented. This will ensure that some acoustic relief is provided to residents from any pit top activities.

Air Quality Mitigation Measures

30. The completion of all Stage 1 coal handling facility upgrades namely: (i) the removal of the existing Balgownie decline conveyor and storage bin and replacement with a newly designed Wongawilli decline conveyor on a similar alignment (ii) decommissioning of the existing Bulli decline conveyor (iii) Construction of a stackout conveyor and tripper system and (iv) construction of a new screening and sizing station.
31. The full enclosure of the coal conveyor to the stockpile areas.
32. The full enclosure of the screening and sizing plant, in order to minimise dust emissions.
33. An automatically controlled fixed stockpile spray system around the stockpile areas.
34. A mobile water truck be used throughout the site.
35. Roadside sprays.
36. Provision of truck washing facilities that are used for all trucks, prior to departure from the site.
37. All trucks must be covered before leaving the site, in order to minimise the potential for dust impacts along haul routes.
38. All surfaces on which trucks park or travel in the truck loading area shall be sealed to facilitate dust control and water management.
39. A bobcat mounted road sweeper be used on all sealed surfaces.
40. Fixed water sprays at selected points on a number of surface and underground conveyor systems.

Aboriginal Cultural Heritage Issues

41. Longwall panels A2 LW9 and A2 LW10 be reduced in length, in order to protect significant Aboriginal archaeological sites.

42. The assessment of Aboriginal cultural heritage issues is recommended to be undertaken prior to any project determination; in line with the Department's EA requirements. Any such Aboriginal cultural heritage assessment should include a range of matters including (but not necessarily limited to) the following:

(a) A preliminary assessment to determine if the project is likely to have an impact on Aboriginal cultural heritage.

(b) Identify any Aboriginal cultural heritage values associated with the study area through consulting with local Aboriginal people with cultural knowledge or responsibilities for country in which the proposed project occurs.

(c) Written and oral research of Aboriginal cultural heritage of the study area and surrounding locality.

(d) Understanding the significance of the identified Aboriginal cultural heritage values.

(e) Assessing the impact of the proposed project on Aboriginal objects and Aboriginal places.

(f) Describing and justifying the proposed outcomes and alternatives.

(g) Documenting the Aboriginal cultural heritage impact assessment and the conclusions and recommendations to afford appropriate protection of areas of high Aboriginal cultural heritage significance.

(h) Any other relevant matter pertinent to the study area.

Traffic Issues

43. Further traffic modelling and assessment is recommended for the full life of the coal mine up to Year 2031. The required traffic modelling / assessment should focus on relevant key intersections and mid-block performance. The modelling should also include an additional 12 years of background traffic growth at 1% for Bellambi Lane and 5% for the Northern Distributor (RMS responsibility).

Irrespective of point 43 above, the following requirements are recommended to be included in the conditions of consent:

44. The proponent shall be required to enter into negotiations with Council and RMS regarding the funding of additional road maintenance to mitigate the impact of additional trucks along the haulage route.

45. Changes to the internal layout should comply with the relevant Australian Standard and provide adequate parking and turning space to accommodate staff, delivery and service vehicles. Separation of employees' vehicles and heavy vehicles is recommended to ensure that conflicts do not occur.