BULLI SEAM OPERATIONS
RESPONSES TO SUBMISSIONS
PART A - AGENCY SUBMISSIONS

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BULLI SEAM OPERATIONS
RESPONSES TO SUBMISSIONS

PART A

RESPONSES TO AGENCY SUBMISSIONS

APRIL 2010
Project No. BHPIC-07-01

Responses to Agency Submissions on the Bulli Seam Operations Environmental Assessment

1. Industry and Investment NSW (Letters dated 15 & 23 December 2009).
2. Department of Environment, Climate Change and Water (Letter dated 2 December 2009).
3. Department of Environment, Climate Change and Water (Letter dated 16 December 2009).
4. NSW Office of Water (Letter dated 16 November 2009).
5. Sydney Catchment Authority (Letter dated 16 December 2009).
6. Roads and Traffic Authority (Letter undated).
7. Dams Safety Committee (Letter dated 11 November 2009).
8. Sydney Metropolitan Catchment Management Authority (Letter dated 3 March 2010).
9. Campbelltown City Council (Letter dated 18 December 2009).
10. Wollondilly Shire Council (Letters dated 23 December 2009 & 12 February 2010).
11. Hurstville City Council (Letter dated 2 December 2009).

Bulli Seam Operations
Response to Industry and Investment NSW Submissions
(15 & 23 December 2009)

It is noted that Industry and Investment NSW (I&I NSW) (15 December 2009) states the following in regard to the Bulli Seam Operations (the Project):

> *I&I NSW supports the Bulli Seam Operations Project as an appropriate utilisation of the State's coal resources and does not object to the approval of the proposed Bulli Seam Operations Project provided that the recommendations set out in the summary below and in Annexures A and B are taken into account and included in the conditions of approval (if granted) where appropriate.*

Each of the recommendations made by I&I NSW (reproduced below in bold) are addressed below.

REHABILITATION STRATEGY

In regard to the rehabilitation strategy, I&I NSW (15 December 2009) states:

> ***Contrary to the Director General's Requirements for rehabilitation, the EA does not provide a detailed rehabilitation strategy. To address this deficiency, the Proponent should identify rehabilitation domains for the project and propose rehabilitation objectives/end land uses for each domain together with strategic success criteria…***

In this regard I&I NSW (15 December 2009) also states:

> ***Whilst I&I NSW accepts that it is important that flexibility is available for some aspect of site closure, the Planning Approval, if granted, should identify the rehabilitation domains and the overall performance objectives for each domain where practicable.***
>
> ***The EA specifies that "as Project rehabilitation activities would be undertaken progressively, the MREMP framework would be used to both plan and track the performance of these activities as they are carried out". This is considered to be appropriate…***

Section 6 of the EA provides a description of the proposed rehabilitation strategy for the Project, including closure and rehabilitation of the West Cliff, Appin East and Appin West pit top areas; decommissioning and rehabilitation of the Appin No. 1, No. 2 and No. 3 shaft sites, North Cliff shafts site and Bulli shafts site; decommissioning and rehabilitation of the West Cliff Stage 4 Coal Wash Emplacement; rehabilitation of temporary surface disturbance areas; and rehabilitation of subsidence impacts on natural surface features.

Illawarra Coal Holdings Pty Ltd (ICHPL) also commits to the preparation of:

- Mine Closure Plans for the pit top areas (Section 6.1.1 of the EA);
- West Cliff Stage 4 Coal Wash Emplacement Management Plan (Section 6.2 of the EA);
- Rehabilitation Plans for surface disturbances (Section 6.3 of the EA);
- Risk Management Plans and Built Features Management Plans for rehabilitation of subsidence impacts over the life of the Project (Sections 5.4.5 and 6.4 of the EA).

I&I NSW (15 December 2009) provides a table identifying rehabilitation domains and invites ICHPL to nominate draft rehabilitation objectives. This table is reproduced below (Table 1) inclusive of proposed draft rehabilitation objectives consistent with the commitments in the EA (refer Table 1 below).

Table 1
Draft Rehabilitation Objectives (after I&I NSW, 15 December 2009)

Domain	Rehabilitation Objective/End Land Use
Pit top areas (including mine facilities and water storages):	
• West Cliff.	• As stated in Section 6.1.1 of the EA: "…the final landuse of natural bushland is proposed for the site (Cardno Forbes Rigby, 2006a)."
• Appin West.	• As stated in Section 6.1.1 of the EA: "A final landuse of residential development is proposed for the Appin East and Appin West pit tops (Cardno Forbes Rigby, 2006b, 2006c)."
• Appin East.	• As stated in Section 6.1.1 of the EA: "A final landuse of residential development is proposed for the Appin East and Appin West pit tops (Cardno Forbes Rigby, 2006b, 2006c)."
West Cliff Coal Wash Emplacement:	
• Stage 1.	• Consistent with the West Cliff pit top area as stated above.
• Stage 2.	• Consistent with the West Cliff pit top area as stated above.
• Stage 3.	• Refer to Performance Targets in Table 8.2 of the *West Cliff Coal Preparation Plan Stage 3 Coal Wash Emplacement Management Plan* (Cardno Forbes Rigby, 2007a).
• Stage 4.	• Achievement of the Performance Targets specified for Stage 3 in Cardno Forbes Rigby (2007a). • The establishment of habitat components suitable for the Southern Brown Bandicoot (e.g. areas of dense and contiguous understorey) (Sections 5.9.3 and 6.2 of the EA). • Relocation of habitat components suitable for the Broad-headed Snake (e.g. sandstone outcrops and hollows) (Refer to the *Broad-headed Snake Management Plan for West Cliff Colliery – Stage 3 Coal Wash Emplacement Area* [Biosis Research, 2007], Appendix 3 of Appendix D of Cardno Forbes Rigby [2007a]). • Revegetation to a predominance of local native species associated with Woronora Plateau sandstone based vegetation communities (Section 5.8.3 of the EA). • Avoid disturbance to the *P. hirsuta* individuals between Stages 3 and 4 (Figure 5-19 of the EA).
Temporary disturbance of native vegetation	• Revegetation to local native species (Section 6.3 of the EA).
Major cliff lines[1]	• Ensure that there is no safety hazard beyond that existing prior to mining.
Upland swamps[2]	• Maintain physical state and function of the swamp (Table 5-3 of the EA).
Significant Streams[3]	• Return stream flow to pre-mining condition in stream reaches as described in Table 5-2 of the EA.
Built infrastructure	• Repair/restore to pre-mining condition or equivalent (Section 5.4.5 of the EA).

1 As identified in the Major Cliff Line Risk Assessment (Appendix R of the EA).
2 As identified in the Upland Swamp Risk Assessment (Appendix O of the EA).
3 As identified in the Stream Risk Assessment (Appendix P of the EA).

I&I NSW (15 December 2009) also makes the following comment in regard to the rehabilitation strategy:

> ***The proposed rehabilitation strategy… does not appear to refer to "relevant strategic land use planning or resource development plans or policies".***

The EA includes consideration of environmental planning instruments, including state environmental planning policies (Section 7.2.1 of the EA), regional environmental plans (Sections 7.2.2 to 7.2.5 of the EA), local environmental plans (Section 7.2.6 and Attachment 5 of the EA) and subregional planning (including the Metropolitan Strategy) (Section 7.2.8 of the EA).

In regard to Mine Closure Plans, I&I NSW (15 December 2009) states:

> ***…these plans have not been included in the EA, despite being referenced a number of times. In addition, I&I NSW has not previously reviewed these plans… Given that the content of the Mine Closure Plans is unknown, I&I NSW cannot support any reference to them.***

Copies of the existing Mine Closure Plans were not included as part of the EA, as this level of detail was considered excessive for an EA and recognises that these documents will be modified over the Project life. However, Section 6 of the EA summarises the key aspects of the plans. The existing Mine Closure Plans for West Cliff, Appin East and Appin West will be provided separately to the I&I NSW and the NSW Department of Planning (DoP).

The Mine Closure Plans would be revised to reflect any relevant Project Approval conditions.

In regard to Rehabilitation Plans, I&I NSW (15 December 2009) states the following requirements for any Project Approval:

- ***The Proponent must prepare and implement a Rehabilitation Plan, which covers each of the domains identified above, all associated services and infrastructure, and rehabilitation of any off-title impacts.***
- ***The Rehabilitation Plan must be prepared in accordance with I&I NSW guidelines and to the satisfaction of the DG of I&I NSW in consultation with relevant agencies and stakeholders.***

  Note: It is intended that the Rehabilitation Plan required under the Planning Approval be prepared in accordance with I&I NSW requirements so that its content satisfy the Rehabilitation Environmental Management Plan requirements under the Mining Act 1992.

  In addition, the preparation and implementation of a Rehabilitation Plan should be able to be done on a staged basis and could be prepared on a domain by domain basis.
- ***The Proponent must carry out rehabilitation progressively where operations allow and as soon as reasonably practicable following the disturbance.***

ICHPL agrees with the above I&I NSW recommendations.

In regard to major cliff lines, I&I NSW (15 December 2009) states the following requirements for any Project Approval:

> ***The Planning Approval should include Major Cliff Lines as a domain with the rehabilitation objective that there is no safety hazard beyond that existing prior to mining.***

ICHPL agrees with the above I&I NSW recommendation.

In addition, as stated in Section 5.2.4 of the EA:

> *ICHPL would develop a management plan to manage potential risks to the general public that may be visiting or passing by cliff lines that are accessible to the public in the Project area.*
>
> *…*
>
> *The likelihood of mining-induced impacts to cliff lines along Douglas Park Drive is considered to be extremely low (Appendix A). However, given the potential for significant consequences from a rock fall, management measures would be developed in consultation with WSC so that the road remains safe and serviceable throughout the mining period.*
>
> *…*
>
> *Given the potential for significant consequences from rock falls, management measures would be developed in consultation with landholders, so their properties remain safe and serviceable throughout the mining period.*
>
> *…*
>
> *Measures would be developed in consultation with the SCA to manage potential risks to personnel that may be visiting or passing by these cliff lines during periods when ICHPL is actively mining beneath the area.*

WEST CLIFF COAL WASH EMPLACEMENT

In regard to assessment of alternatives of the West Cliff Coal Wash Emplacement, I&I NSW (15 December 2009) states the following:

> ***The EA does not adequately address alternatives to the proposed Stage 4 emplacement.***
>
> ***…***
>
> ***Although I&I NSW considers that the Stage 1 and 2 emplacements have been well managed, it is I&I NSW's preference that a lower impact alternative with better rehabilitation outcomes to the Stage 4 emplacement be considered.***
>
> ***…***
>
> ***the Planning Approval should require the Proponent to investigate alternatives to the Stage 4 emplacement area. The Stage 4 emplacement area should only be permitted if no other feasible option for disposal of coal reject material can be found.***

As described in Section 2.8.5 of the EA:

> *As part of the assessment process for approval of the West Cliff Stage 3 Coal Wash Emplacement, an assessment of alternative uses for coal wash was undertaken by ICHPL (Cardno Forbes Rigby, 2007b). A range of options were examined including:*
>
> - *optimisation of the existing emplacement site;*
> - *underground disposal;*
> - *coal wash brick making;*
> - *road pavement;*
> - *using coal wash as fuel for power generation; and*
> - *civil fill applications and site rehabilitation.*
>
> *It was concluded in the assessment that the West Cliff Stage 3 Coal Wash Emplacement remained the only viable short to medium term option for coal wash disposal, supplemented by a range of possible re-use opportunities negotiated on a project-by-project basis.*

The assessment of alternatives included consideration of technical feasibility, demand, market competition, costs and environmental risks.

In this regard I&I NSW (15 December 2009) also states:

> ***The Stage 4 West Cliff Coal Reject emplacement area should only be permitted if no other feasible option for the disposal of coal reject material can be found. Accordingly, the Planning Approval (if granted) should not approve the Stage 4 emplacement at this stage. Rather, Illawarra Coal should be required to continue and expand their investigations into underground coal disposal, alternative emplacement sites and alternative beneficial uses for coal reject material. In addition, Illawarra Coal should be required to undertake additional detailed environmental studies prior to any approval for the Stage 4 emplacement area.***
>
> ***The assessment of the investigation of alternatives should be to the satisfaction of I&I NSW and any subsequent approval of the Stage 4 emplacement area should be carried out in consultation with I&I NSW.***

I&I NSW was consulted in March and May 2007 during the preparation of the application for the West Cliff Stage 3 Coal Wash Emplacement. This included the provision of an assessment of alternative uses.

The following is a summary of the conclusions of the assessment of alternative uses for coal wash as part of the *Application for Further Approval of West Cliff Emplacement Stage 3* (Cardno Forbes Rigby, 2007b):

> *Currently no alternative emplacement sites have been identified. Illawarra Coal has been investigating the availability of hard rock quarry sites in Dunmore and Bombo (Shellharbour, Kiama LGA's) however these sites will not be available in the near future, and if secured will involve lengthy consultation and approval processes. Discussions in this regard are continuing and Illawarra Coal is continuing to seek alternative emplacement sites.*
>
> *…*
>
> *While the option to reuse coal wash as fill is technologically sound and environmentally friendly, the uncertainty in the market demand does not justify it as the sole long term solution for coal wash disposal. However, it can supplement a long term strategy, and be pursued when opportunities arise.*
>
> *…*
>
> *The assessment found that whilst some options have their own merits to utilise a percentage of coal wash, none of the current options on their own or in combination are capable of negating the need of the Stage 3 emplacement. This is due to the lack of market demand for the quantity of coal wash generated by IC's washeries, the current technological constraints in developing the infrastructure for alternative disposal methods (e.g Underground stowage or power generation) or lack of other suitable surface emplacement sites within the region.*
>
> *The use of coal wash as an engineering fill in civil works has been the only alternative use that has had success in diverting significant volumes from surface emplacement.*
>
> *Until there is sufficient development of the technology and certainty in the outcomes for overburden grout injection and fluidised bed combustion, surface emplacement remains the only viable short to medium term option for coal wash disposal, to be supplemented by a range of possible reuse opportunities negotiated on a project by project basis.*

ICHPL received a Notice of Staged Development Approval for the development of the West Cliff Stage 3 Coal Wash Emplacement on 20 December 2007. The circumstances described above in regard to alternative uses or emplacement locations for coal wash are reviewed by ICHPL as part of its ongoing commitments under the Stage 3 Staged Development Approval. To date no change in these circumstances has been identified.

As stated in Section 2.8.5 of the EA:

> *ICHPL has however committed to, and would continue to (Cardno Forbes Rigby, 2007b):*
>
> - *research and consider alternatives to coal wash emplacement;*
> - *pursue the use of coal wash as an engineering fill material;*
> - *negotiate with owners of suitably located and available sites that could be used as alternative emplacement sites to extend the life of the West Cliff Stage 3 Coal Wash Emplacement; and*
> - *report progress of these actions to the NSW Government in the Annual Environmental Management Report (AEMR).*

If approved, this commitment would continue for Stage 4.

AQUATIC ECOLOGY

In regard to aquatic ecology, I&I NSW (15 December 2009) states the following:

> ***Consequently I&I NSW would expect a condition of approval for the following:***
>
> ***Continued monitoring of fish populations in Punchbowl, O'Hares Creek and the Georges River to determine the extent of the Macquarie Perch population and monitoring of the generation of iron floc and the potential for impacts on the breeding habitats of the Macquarie Perch population.***

ICHPL agrees with the above I&I NSW recommendations.

SUBSIDENCE

In regard to subsidence effects on Razorback Range, I&I NSW (23 December 2009) states the following:

> ***…subsidence-related risks associated with Razorback Range will need to be further and critically assessed.***

As committed in Section 8 of the EA (Statement of Commitments):

> *ICHPL will undertake a study into the potential subsidence related impacts on the steep slopes of Razorback Range (incorporating Donalds Ridge), focussing on steep slopes near roads and structures. The study will seek input from structural and geotechnical engineers and subsidence engineers, and will be conducted in consultation with the Wollondilly Shire Council (WSC) and landholders. The results of this assessment will be incorporated into management and mitigation measures (if required) as a component of future Extraction Plans to maintain the roads and structures in a safe and serviceable manner throughout the mining period.*

In regard to management of subsidence impacts, I&I NSW (23December 2009) states the following:

> ***…there are numerous recommendations by the Subsidence Consulting Engineers (Report MSEC404 Rev. D) for the Applicant to study the potential impacts to a range of surface structures and vital infrastructure items.***
>
> ***The EA does not make it clear whether or not the above-mentioned recommendations have been implemented by the Applicant.***

Section 5.4.5 of the EA lists proposed mitigation measures, monitoring and management measures for subsidence related impacts, and refers to management measures in Appendix A of the EA.

The measures outlined in Section 5.4.5 of the EA and the recommendations in the Subsidence Assessment (Appendix A of the EA) would form the basis of mitigation measures, management and monitoring that would be incorporated in future Extraction Plans.

In this regard I&I NSW (23 December 2009) also states:

> ***The EA does not make it clear how it will be feasible to manage subsidence impacts on a range of significant surface features.***

Conservative cost estimates (based on previous and current experience) for mitigation measures, management and monitoring and/or environmental impacts (including those associated with subsidence) were included in the Benefit Cost Analysis (BCA) undertaken for the Project (Appendix L of the EA). As described in Section 2.4.2 of Appendix L of the EA:

> *Allowance for suitable pre-mining infrastructure management and mitigation costs by ICHPL is included where relevant in the Project operating cost profile in the BCA.*
>
> *ICHPL Mine Subsidence Fund contributions have been included in the Project BCA.*

The BCA demonstrated that the Project is feasible from an economic perspective (Appendix L of the EA).

In regard to Project Approval, I&I NSW states the following:

> ***I&I NSW recommends the consideration of the following two options for the EA.***
>
> ***Option A*** ***A staged approach to the determination of the EA, to ensure adequate environmental assessment by the Applicant in relation to each of the stages.***
>
> ***Option B*** ***If the determination is not based on a staged process, there is a need for strong mechanisms to ensure adequate consultation, feasibility studies and lead time for the development of major management strategies, that is, the Extraction Plans Stage.***

Option A is not acceptable to ICHPL from a business investment perspective. Option B is consistent with ICHPL's preferred approach and is consistent with:

- the NSW planning process (see Figure 44 of the Southern Coalfield Panel Report [DoP, 2008]); and
- contemporary Project Approvals under Part 3A of the *Environmental Planning and Assessment Act, 1979* (e.g. Metropolitan Coal Project [08_0149]) which include the staged submission of detailed strategies, plans and programs (e.g. Subsidence Management Plans and/or Extraction Plans).

The above process includes strong consultation mechanisms, feasibility studies and long lead times (i.e. typically the lodgement of a Subsidence Management Plan six months prior to its desired approval).

REFERENCES

Cardno Forbes Rigby (2006a) *West Cliff Colliery Mine Closure Plan*. Report prepared for Illawarra Coal Holdings Pty Ltd.

Cardno Forbes Rigby (2006b) *Appin Mine Closure Plan*. Report prepared for Illawarra Coal Holdings Pty Ltd.

Cardno Forbes Rigby (2006c) *Douglas Colliery Mine Closure Plan*. Report prepared for Illawarra Coal Holdings Pty Ltd.

Cardno Forbes Rigby (2007a) *West Cliff Coal Preparation Plan Stage 3 Coal Wash Emplacement Management Plan*. Report prepared for Illawarra Coal Holdings Pty Ltd.

Cardno Forbes Rigby (2007b) *Application for Further Approval of West Cliff Emplacement Stage 3. Volume 1 of 3 Assessment of Alternative Uses for Coal Wash*. Report prepared for Illawarra Coal Holdings Pty Ltd.

Department of Planning (2008) *Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield – Strategic Review*. Southern Coalfield Panel Report.

Bulli Seam Operations
Response to Department of Environment, Climate Change and Water Submission
(2 December 2009)

Each of the recommendations made by Department of Environment, Climate Change and Water (DECCW) (2 December 2009) (reproduced below in bold) are addressed below.

WEST CLIFF COAL WASH EMPLACEMENT

In regard to assessment of alternatives of the West Cliff Coal Wash Emplacement, DECCW (2 December 2009) states the following:

> ***The EA does not thoroughly investigate other options including alternative emplacements and reuse for this coal wash reject emplacement.***

As described in Section 2.8.5 of the EA:

> *As part of the assessment process for approval of the West Cliff Stage 3 Coal Wash Emplacement, an assessment of alternative uses for coal wash was undertaken by ICHPL (Cardno Forbes Rigby, 2007b). A range of options were examined including:*
>
> - *optimisation of the existing emplacement site;*
> - *underground disposal;*
> - *coal wash brick making;*
> - *road pavement;*
> - *using coal wash as fuel for power generation; and*
> - *civil fill applications and site rehabilitation.*
>
> *It was concluded in the assessment that the West Cliff Stage 3 Coal Wash Emplacement remained the only viable short to medium term option for coal wash disposal, supplemented by a range of possible re-use opportunities negotiated on a project-by-project basis.*

The assessment of alternatives included consideration of technical feasibility, demand, market competition, costs and environmental risks.

DECCW was consulted in March and May 2007 during the preparation of the application for the West Cliff Stage 3 Coal Wash Emplacement. This included the provision of an assessment of alternative uses.

The following is a summary of the conclusions of the assessment of alternative uses for coal wash as part of the *Application for Further Approval of West Cliff Emplacement Stage 3* (Cardno Forbes Rigby, 2007a):

> *Currently no alternative emplacement sites have been identified. Illawarra Coal has been investigating the availability of hard rock quarry sites in Dunmore and Bombo (Shellharbour, Kiama LGA's) however these sites will not be available in the near future, and if secured will involve lengthy consultation and approval processes. Discussions in this regard are continuing and Illawarra Coal is continuing to seek alternative emplacement sites.*
>
> *…*
>
> *While the option to reuse coal wash as fill is technologically sound and environmentally friendly, the uncertainty in the market demand does not justify it as the sole long term solution for coal wash disposal. However, it can supplement a long term strategy, and be pursued when opportunities arise.*
>
> *…*

The assessment found that whilst some options have their own merits to utilise a percentage of coal wash, none of the current options on their own or in combination are capable of negating the need of the Stage 3 emplacement. This is due to the lack of market demand for the quantity of coal wash generated by IC's washeries, the current technological constraints in developing the infrastructure for alternative disposal methods (e.g Underground stowage or power generation) or lack of other suitable surface emplacement sites within the region.

The use of coal wash as an engineering fill in civil works has been the only alternative use that has had success in diverting significant volumes from surface emplacement.

Until there is sufficient development of the technology and certainty in the outcomes for overburden grout injection and fluidised bed combustion, surface emplacement remains the only viable short to medium term option for coal wash disposal, to be supplemented by a range of possible reuse opportunities negotiated on a project by project basis.

Illawarra Coal Holdings Pty Ltd (ICHPL) received a Notice of Staged Development Approval for the development of the West Cliff Stage 3 Coal Wash Emplacement on 20 December 2007. The circumstances described above in regard to alternative uses or emplacement locations for coal wash are reviewed by ICHPL as part of its ongoing commitments under the Stage 3 Staged Development Approval. To date no change in these circumstances has been identified.

As stated in Section 2.8.5 of the EA:

ICHPL has however committed to, and would continue to (Cardno Forbes Rigby, 2007b):

- *research and consider alternatives to coal wash emplacement;*
- *pursue the use of coal wash as an engineering fill material;*
- *negotiate with owners of suitably located and available sites that could be used as alternative emplacement sites to extend the life of the West Cliff Stage 3 Coal Wash Emplacement; and*
- *report progress of these actions to the NSW Government in the Annual Environmental Management Report (AEMR).*

If approved, this commitment would continue for Stage 4.

DECCW (2 December 2009) states:

Importantly the current emplacement is approved for the next ten years which provides a long lead time to develop and consider alternatives without the need to secure a specific long term approval at this stage. In addition the financial impact of the recently introduced coal washery levy may stimulate more economically justifiable alternatives during this timeframe thereby extending the life of the existing coal waste emplacement.

…

…DECCW requests that the proponent be required to investigate other sustainable solutions for the management of this material into the future including consideration of alternative locations in the vicinity of West Cliff. Any approval for continued emplacement for Stage 4 can be postponed until this thorough analysis has been completed.

Alternative emplacement sites were investigated as part of the *Application for Further Approval of West Cliff Emplacement Stage 3* (Cardno Forbes Rigby, 2007a):

Currently no alternative emplacement sites have been identified. Illawarra Coal has been investigating the availability of hard rock quarry sites in Dunmore and Bombo (Shellharbour, Kiama LGA's) however these sites will not be available in the near future, and if secured will involve lengthy consultation and approval processes. Discussions in this regard are continuing and Illawarra Coal is continuing to seek alternative emplacement sites.

Not having approval for the emplacement of all of the coal wash produced over the life of the Project is not acceptable to ICHPL from a business investment perspective.

As discussed in Section 7.2.2 of the EA, the coal washery rejects levy would make off-site coal wash disposal options (that are not subject to a levy exemption) markedly less economically viable.

In regard to the Southern Brown Bandicoot, DECCW (2 December 2009) states:

> ***…There is no information presented in the EA that supports the notion that the records in the emplacement area represent a component of a larger population that is distributed widely outside this area…***
>
> ***…These surveys failed to confirm the extent of habitat used by this species within the emplacement area…***

Under normal circumstances with representative fauna surveys, the presence of one animal can be an indicator of a viable population of that species being present. In the case of the Southern Brown Bandicoot, a summary of the extensive surveys undertaken is provided below:

- As part of the Project baseline surveys (March 2008 to October 2008), 15 trapping survey sites were established either within the proposed Stage 4 Coal Wash Emplacement or its immediate surrounds and 24 other trapping sites were established on the Woronora Plateau. Traps set at each site included five ground hair tubes (minimum of four nights), 25 Elliot traps (20 small and five large, minimum of four nights) and five cage traps (minimum of four nights). **A total of 780 hair tube nights, 3,900 Elliot trap nights and 780 cage trap nights.**
- During the above surveys, a single male Southern Brown Bandicoot was trapped (small Elliot trap) in the proposed Stage 4 Coal Wash Emplacement on one occasion in September 2008. The individual was identified, photographed and released at the location of capture.
- Following this record, additional targeted hair tubes and Elliot traps were set at four sites in April 2009 within the proposed Stage 4 Coal Wash Emplacement Area and its surrounds targeting potential Southern Brown Bandicoot habitat (i.e. dense shrub layer with sandy soil), particularly areas with signs of bandicoot activity (i.e. bandicoot diggings). Fifty hair tubes were set at each site for seven nights and 25 Elliot traps were set for five nights. **A total of 1,400 hair tube nights and 500 Elliot trap nights.**
- Six motion sensing cameras were deployed within the proposed Stage 4 Coal Wash Emplacement Area and its surrounds in April 2009 and left in the field for approximately 150 days until mid September 2009. Bait (including oats/peanut butter mix, live mealworms, chopped apples, mushrooms and truffle oil) was positioned in front of the cameras to attract fauna, particularly bandicoots. Cameras were left in place for several weeks before being moved and bait stations were refreshed every one to two weeks. Camera locations were selected based on the presence of potential Southern Brown Bandicoot habitat (i.e. dense shrub layer with sandy soil) and signs of bandicoot activity (i.e. bandicoot diggings). **A total of 900 camera days.**
- Forty-eight motion sensing cameras were deployed within the proposed Stage 4 Coal Wash Emplacement Area and its surrounds in February 2010 and are planned to be left in the field for approximately 42 days. Bait (primarily truffle oil) will be used to attract fauna, particularly bandicoots, and will be refreshed every one to two weeks. Camera locations were selected based on the presence of potential Southern Brown Bandicoot habitat (i.e. dense shrub layer with sandy soil) and signs of bandicoot activity (i.e. bandicoot diggings). **A total of 2,016 camera days.**

- **In summary and to date, a total of 2,180 hair tube nights, 4,400 Elliot trap nights, 780 cage trap nights and 900 camera days** have been undertaken in native vegetation within the proposed Stage 4 Coal Wash Emplacement Area and wider surrounds. **One Southern Brown Bandicoot individual has been recorded on one occasion.** The results of the **additional 2,016 camera days** will be provided once the survey period is complete.

As described above a very significant effort has been directed towards determining the presence, distribution and abundance of Southern Brown Bandicoot's in this particular location. The more recent motion sensing camera based targeted surveys have been designed and implemented (including captured image identification) by Dr David Paull from the University of NSW. Dr Paull is one of Australia's leading experts' on the Southern Brown Bandicoot and is involved in ongoing surveys and research with the DECCW Reserve Conservation Planning and Performance Unit regarding the Southern Brown Bandicoot. Dr Paull recently authored the Southern Brown Bandicoot chapter of *The Mammals of Australia (Third edition)* (Paull, 2008).

While absence of evidence does not completely rule out the possibility of the presence of a viable 'population' of Southern Brown Bandicoot, the evidence from trapping and remote sensing suggests that such a population is not present. If that is the case then this observation of a lone male, may be the result of dispersal from a nearby meta-population. This would seem a more reasonable interpretation of the data and in keeping with our current understanding of both population and behavioural ecology. As described in Sections 5.9.3 and 5.9.4 of the EA, management measures for the Southern brown Bandicoot may include the undertaking or sponsoring of additional targeted surveys for the Southern Brown Bandicoot consistent with a "Priority 1 Action" from the Southern Brown Bandicoot Recovery Plan (DEC, 2006a).

Despite the above, the species evaluation for the Southern Brown Bandicoot (Section 6.5.1 of Appendix F of the EA) conservatively assesses the potential impacts on the species assuming that all surface disturbance required by the Project is a disturbance to Southern Brown Bandicoot habitat.

DECCW (2 December 2009) states:

> ***…DECCW does not support the identification of this species from diggings as claimed in the EA, due to the similarity of such diggings to those produced by the more common and co-occuring Long-nosed Bandicoot Perameles nasuta. Diggings of these two species, and potentially also the Long-nosed Potoroo Potorus tridactylus, cannot be distinguished with sufficient confidence in the field to enable identification to the species (or genus) level.***

Section 6.5.1 of Appendix F of the EA summarised the Southern Brown Bandicoot data set and recognised the tentative nature of the digging record, *viz.*:

> *One adult male Southern Brown Bandicoot was trapped during the Project surveys by Biosphere Environmental Consultants in the proposed West Cliff Stage 4 Coal Wash Emplacement Area (Figure 5)…However, numerous Southern Brown Bandicoot diggings were located outside of the Stage 4 Coal Wash Emplacement Area (including within land to the north, in the Dharawal State Conservation Area to the east and in the Metropolitan Special Area to the south). In addition, some other bandicoot diggings were recorded however could not be distinguished between the Long-nosed Bandicoot and the Southern Brown Bandicoot. A bandicoot skull was found within the Metropolitan Special Area and was subsequently identified as belonging to a Southern Brown Bandicoot by palaeontologist Henk Godthelp from the University of NSW.*

Further to the above, Southern Brown Bandicoot diggings have previously been tentatively recorded on the eastern extent of the Project as part of the Metropolitan Coal Project Terrestrial Vertebrate Fauna Survey (Western Research Institute and Biosphere Environmental Consultants Pty Ltd, 2008). Some bandicoot diggings were considered most likely to belong to the Southern Brown Bandicoot (D. Goldney, pers. comm., 2009), however, given the difficulty in digging confirmation and feedback from the DECC, diggings were recorded as potentially belonging to the Southern Brown Bandicoot, Long-nosed Bandicoot or Long-nosed Potaroo and assessed accordingly.

It is considered likely that a viable population of the Southern Brown Bandicoot exists, made up of meta populations. The Southern Brown Bandicoot is probably best described as present but rare.

As described above, the conclusions drawn in the Terrestrial Fauna Assessment (Appendix F of the EA) are based on a number of lines of evidence including:

- trapping;
- known distributions of species, and
- other traces of the species (e.g. skull).

In recognition of the DECCW's views, the observed diggings are considered to potentially belong to all three species.

DECCW (2 December 2009) states:

DECCW does not support the proposed mitigations strategy for this species* [Southern Brown Bandicoot]*, which includes translocation, data collection and measures to secure already protected conservation reserves…DECCW does not support translocation as a mitigation or offset strategy…

Section 5.2.2 of Appendix F of the EA describes the proposed management strategy for the Southern Brown Bandicoot, which has been developed cognisant of the Southern Brown Bandicoot Recovery Plan (Department of Environment and Conservation [DEC], 2006a). The management strategy includes the development of a Southern Brown Bandicoot Management Plan (SBBMP) in consultation with DECCW and the Sydney Catchment Authority (SCA) and to the satisfaction of the NSW Department of Planning (DoP), with the following aims (Section 5.2.2 of Appendix F of the EA):

1. *Assist with the protection, rehabilitation and enhancement of known or potential Southern Brown Bandicoot habitats (i.e. land to the north of Stage 4, reserved land to the east [Dharawal State Conservation Area - DECC] and protected land to the south-east [Metropolitan Special Area – SCA]).*
2. *Collect information to better understand the extent, distribution, density and population dynamics of the local Southern Brown Bandicoot population.*
3. *Provide vegetation clearance measures to minimise impacts of the Project (particularly the Stage 4 Coal Wash Emplacement Area) on the local Southern Brown Bandicoot population.*

Within already protected potential habitat for the Southern Brown Bandicoot (e.g. Dharawal State Conservation Area and Special Areas), ICHPL propose to assist with pest control, erosion and sediment control works and management of other activities that may impact Southern Brown Bandicoot habitat.

The term "translocation" has been used in the EA to be consistent with the terminology used in the Stage 3 Coal Wash Emplacement Environmental Management Plan, approved by the Commonwealth Department of the Environment, Water, Heritage and the Arts on 10 December 2007. There is a need to differentiate between relocation and translocation of fauna. Relocation may be possible to nearby areas in cases where fauna are not strongly site attached. Where this is unlikely to be successful, translocation is a sensible proposal for consideration in consultation with DECCW. The research proposed in Sections 5.9.3 and 5.9.4 of the EA would collect information relevant to this issue. The translocation/relocation program would require co-operative effort from DECCW, Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA) and ICHPL to be successfully implemented.

ICHPL expects that any Project Approval would include a condition that requires management measures to be developed in consultation with DECCW and DEWHA through the preparation of a Stage 4 Coal Wash Emplacement Environmental Management Plan or similar prior to the commencement of disturbance associated with the emplacement.

Translocation represents only one proposed management measure among a large suite of mitigation measures, monitoring, management and offsets for the Southern Brown Bandicoot (see above). The species evaluation (Section 6.5.1 of Appendix F of the EA) does not rely on the success of translocation measures in the assessment of potential impacts.

In regard to *Persoonia hirsuta*, DECCW (2 December 2009) states:

> ***…the proponent concludes that "it is considered the local population would survive in the area given the stringent measures that would be employed in the Biodiversity Management Plan to protect the remaining plants" (pES-4, Appendix E). DECCW is not convinced that this is the case, especially considering the threats to the remaining*** **[Persoonia hirsuta]** ***plants outlined above, and concludes that the proposal would significantly affect the species. The proposed mitigation measures (Appendix E Terrestrial Flora Assessment p156) include protection of the remaining core area plants by creation of a fenced, restricted environmental protection area and planting individuals propagated by seed, facilitation*** **[sic]** ***research programs, as well as monitoring and employment of strict dust controls. The proponent has not demonstrated how these measures will adequately address the threats summarised above.***

The species evaluation for *Persoonia hirsuta* in regard to potential impacts of the West Cliff Stage 4 Coal Wash Emplacement (Section 7.2.10 of Appendix E of the EA) addresses the following three key issues:

- The impact of clearing 65 ha of native vegetation.
- The impact of emplacing coal wash into Brennans Creek Gully.
- The impact of dust from the emplacement and access roads.

Specific measures to minimise these potential impacts on *P. hirsuta* were developed and are presented in Section 6.2 of Appendix E of the EA, these include:

- *The Stage 4 Coal Wash Emplacement has been designed to avoid disturbance to over ninety percent of the local P. hirsuta population.*
- *Protection of the remaining core area plants in the corridor between the Stage 3 and 4 emplacements by creation of a fenced, restricted, environmental protection area. The fencing would be designed to allow normal movement of wildlife (including Swamp Wallabies that are likely to disperse seed [Section 7.2.10]) into and out of the patch of P. hirsuta located between the Stage 3 and 4 emplacements,*
- *Close supervision of clearing contractors.*

- *A program with the aim of increasing the density of P. hirsuta in the area north of Stage 4 Coal Wash Emplacement. There is already a sparse population present, indicating the habitat is suitable for P. hirsuta. The species would be propagated from seed collected in the core area, possibly by the Mt. Annan Botanic Garden, and planted out in the northern patch to boost its density and reproductive success. There may also be potential to duplicate this in the area between the Stage 3 emplacement and the Appin Road.*
- *Monitoring of the existing population and propagated plants for survival and reproduction.*
- *Facilitate relevant research programs to ensure the most appropriate measures to protect the P. hirsuta population are being implemented. It is recommended that such a program involve institutions such as the University of Wollongong, which has considerable expertise in this area.*
- *Planting out propagated plants in the rehabilitation areas on suitable saved topsoil.*
- *Employment of strict dust control on access roads and on the emplacements.*

Other general vegetation clearance, dust and weed measures are included in Section 6 of Appendix E of the EA.

It is recognised that scientific evidence of resilience to potential impacts and effectiveness of the proposed mitigation strategies is limited for *P. hirsuta*.

However, recent (February 2010) observations of areas around the coal wash emplacements by FloraSearch could find no evidence of dust deposition on *P. hirsuta* foliage, or on other plants in the same area. There does not appear to be a significant dust problem associated with the emplacements at West Cliff compared with some other mining operations in NSW, particularly open-cut mines where explosives are used at the surface generating dust clouds that may drift onto nearby vegetation. Dust problems are unlikely to reach dangerous levels for *P. hirsuta* at West Cliff for the following reasons:

- The typical moisture content of coal wash from the West Cliff Washery is between 7.2% (coal wash bin) and 33.8% (coal wash belt) (Table 2.4 in Section 2 of the EA) such that there is expected to be low levels of dust generated.
- The moisture content of the material to be emplaced is often high, requiring measures to dry the material until suitable moisture content for compaction is achieved (West Cliff Coal Preparation Plan Stage 3 Coal Wash Emplacement Management Plan [Cardno Forbes Rigby, 2007b]).
- The rainfall at West Cliff is relatively high so that any dust deposited on the surrounding vegetation would be washed off at regular intervals.
- The strict dust control measures currently implemented at west Cliff and proposed to continue (Section 5.13.4 of the EA).

It was also observed in the recent inspections by FloraSearch that great care had been taken during construction of an access road to the Stage 3 emplacement area to avoid disturbance to three known plants of *P. hirsuta*. The road passed between the plants such that two plants were 4 metres (m) and 5 m south and the other 8 m north of the road disturbance.

A risk management approach has been adopted in the EA which has identified potential threats to the remaining *P. hirsuta* population. Realistic mitigation strategies for each threat are included in the EA. These include:

- Fencing of the conservation area to exclude men and machinery (Section 5.8.3 of the EA).
- Dust control using water trucks on roads and sprays on emplacement areas as necessary (Section 5.8.3 of the EA).
- Monitoring of *P. hirsuta* numbers, plant health and reproduction (Section 5.8.3 of the EA).

As an added precaution propagated plants would be used to enhance the small 'northern' population.

In regard to the Broad-headed Snake, DECCW (2 December 2009) states:

> ***…Impacts are proposed to be minimised/mitigated by the development of a Broad-headed Snake Management Plan similar to that used in Stage 3. The proposed mitigation measures include the translocation of individuals found within the Stage 4 emplacement. As stated above for the Southern Brown Bandicoot, DECCW does not support translocation as a mitigation of* [sic] *offset measure.***

The implementation of translocation measures for the Broad-Headed Snake is consistent with the Broad-headed Snake Management Plan for the West Cliff Stage 3 Coal Wash Emplacement that was approved by the DEWHA on 10 December 2007.

Translocation represents only one proposed management measure among a large suite of mitigation measures, monitoring, management and offsets for the Broad-headed Snake (Section 5.2 of Appendix F of the EA). The species evaluation for this species (Section 6.3.1 of Appendix F of the EA) does not rely on the success of translocation measures in the assessment of potential impacts.

In regard to the Heath Monitor, DECCW (2 December 2009) states:

> ***…DECCW requires clarification on whether this species was found within or outside the coal wash reject emplacement areas…***

Table 7, Figure 4 and the text of Appendix F of the EA correctly describe a record of the Heath Monitor within the disturbance area of the approved West Cliff Stage 3 Coal Wash Emplacement. The legend of Figure 5 of Appendix F of the EA incorrectly mixes up the symbols for the Red-crowned Toadlet and the Heath Monitor, and therefore is not consistent with the rest of Appendix F of the EA.

The species evaluation for the Heath Monitor (Section 6.3.2 of Appendix F of the EA) correctly assesses the potential impacts on this species in consideration of the record within the disturbance area of the approved West Cliff Stage 3 Coal Wash Emplacement.

In regard to the Red-crowned Toadlet, DECCW (2 December 2009) states:

> ***…It is highly likely that the Red-crowned Toadlet occurs in the Stage 4 area, given the close proximity to Stage 3 and the similarity in habitat present. DECCW does not regard three surveys as sufficient to exclude this possibility.***

As shown on Figure 4 and in Table 7 of Appendix F of the EA, the Red-crowned Toadlet was recorded approximately 1 km north-east of the disturbance area of the West Cliff Stage 4 Coal Wash Emplacement. The legend of Figure 5 of Appendix F of the EA incorrectly mixes up the symbols for the Red-crowned Toadlet and the Heath Monitor, and therefore is not consistent with the rest of Appendix F of the EA. The Red-crowned Toadlet has not been recorded within the disturbance area of the West Cliff Coal Wash Emplacement.

Notwithstanding the above, the species evaluation for the Red-crowned Toadlet (Section 6.2.3 of Appendix F of the EA) includes consideration of disturbance of approximately 65 ha of remnant native vegetation for the West Cliff Stage 4 Coal Wash Emplacement as a potential impact on this species.

In regard to the Koala, DECCW (2 December 2009) states:

> ***DECCW considers that the proposed Stage 4 coal wash reject emplacement contains land that could be considered as 'core habitat' for koalas under State Environmental Planning Policy No 44 – Koala Habitat Protection (SEPP 44)…***

As stated in Section 4.7 of Appendix F of the EA:

> *In respect of SEPP 44, it does not include any express provisions applying it to Part 3A projects and therefore is of no application to the carrying out of this Project.*

Notwithstanding the above, an assessment of potential impacts of the Project across the study area on core and potential koala habitat, as defined by the *State Environmental Planning Policy No. 44 (Koala Habitat Protection)* (SEPP 44) was conducted for the Terrestrial Fauna Assessment (Section 4.7 of Appendix F of the EA) in addition to a species evaluation for the Koala (Section 6.5.3 of Appendix F of the EA).

The assessment of potential impacts on core and potential koala habitat included consideration of previous assessments by Biosis Research (Biosis Research, 2001a; 2001b) as part of the Environmental Impact Statement for the Dendrobium Project, consideration of the DECCW Atlas of NSW Wildlife Database records for the study area (DECC, 2009a), and the extensive flora and fauna field work undertaken as part of this Project (Appendices E and F of the EA). The assessment determined that the Stage 4 Coal Wash Emplacement does not fall within the definition of either core or potential koala habitat (Section 4.7 of Appendix F of the EA).

In regard to translocation, DECCW (2 December 2009) states:

> ***DECCW current policy on translocation (NPWS 2001) states:***
>
> > ***"Translocation of threatened fauna should not be used as an ameliorative measure for developments where such action is proposed in lieu of in situ conservation."***

In addition, DECCW has reviewed the existing translocation policy and prepared a new draft policy that iterates this position:

> ***"Decision-makers should judge the significance of impacts on threatened species, endangered populations or protected fauna without taking proposed translocations into account as mitigation or compensatory measures. This is due to the high level of uncertainty surrounding translocations, the high potential for failure, and the long time scales required (on the order of decades or more) to gauge whether they are successful. If impacts are judged acceptable, a separate decision as to whether translocation is an appropriate salvage measure to include within consents/approvals should be taken."***

ICHPL's proposed mitigation measures are consistent with the above policies, as translocation represents only one proposed management measure among a large suite of mitigation measures, monitoring, management and offsets for the Broad-headed Snake and Southern Brown Bandicoot (Section 5.2 of Appendix F of the EA), and is proposed in conjunction with, not in lieu of, consideration of *in situ* conservation.

In addition to the above, the species evaluations for these two species (Sections 6.3.1 and 6.5.1 of Appendix F of the EA) do not rely on the success of translocation measures in the assessment of potential impacts.

In regard to Aboriginal cultural heritage near the West Cliff Coal Wash Emplacement, DECCW (2 December 2009) states:

> ***In particular some of these sites have significant cultural and archaeological value as they represent the best examples of their site type being rock shelters with art and evidence of Aboriginal occupation. In this regard the DECCW recommends that impacts must be avoided on sites 52-2-3505, 52-2-2228/3617, 52-2-1373, 52-2-3533/3613. The DECCW also recommends further consultation with DoP and the proponent on this matter.***

As stated in Section 3.8.2 of Appendix G of the EA:

> *The design of the Stage 4 Coal Wash Emplacement has resulted in avoidance of the primary impact of burial by the emplacement to three sites, including the only highly significant (both culturally and archaeologically) site (52-2-3505, West Cliff 2) identified in the area.*

Table 10 of Appendix G of the EA summaries the archaeological significance and the potential impact to the four sites identified by DECCW:

Table 10. Risk impact assessment for sites near the proposed West Cliff Stage 4 Coal Wash Emplacement

Site Number	*Site Name*	*Site Type*	*Archaeological Significance*	*Impact*
52-2-1373	*Brennans Creek 7*	*Sandstone Shelter with Art/Grinding Groove/ Engraving/Deposit*	*Moderate*	*Likely (burial)*
52-2-2228/3617	*D10*	*Sandstone Shelter with Deposit only*	*Low*	*Likely (burial)*
…				
52-2-3505	*West Cliff 2*	*Sandstone Shelter with Art/Grinding Groove/ Engraving/Deposit*	*High*	*Possible (dust)*
…				
52-2-3533/3616	*D11*	*Sandstone Shelter with Deposit Only*	*Moderate*	*Likely (burial)*

As stated in Section 9.4 of Appendix G of the EA:

> *It would not be practical to avoid all sites associated with the Stage 4 Coal Wash Emplacement area. Impacts associated with the emplacement area include burial under the coal wash emplacement and disturbance from supporting coal wash emplacement developments (haul roads, channel diversions, settling dam works); and potential dust impacts.*
>
> *For sites located within the boundaries of the proposed Stage 4 Coal Wash Emplacement area, the proposed management approach is to conduct detailed recording and where appropriate archaeological salvage of a sample of occupation deposit. This strategy is consistent with that successfully employed for the Stage 3 Coal Wash Emplacement area.*
>
> *For sites avoided by the emplacement footprint, but located in close proximity, proposed management includes conducting detailed recording of the site prior to works in the vicinity, and demarcation of the site to minimise the potential for accidental impacts from mobile machinery working in the area.*
>
> *Detail and scheduling of these management strategies should be developed in consultation with the Aboriginal community through the AHP process.*

It is noted DECCW (2 December 2009) states the following with regard to the management measures:

> ***DECCW notes the management recommendations in the ACH Assessment and supports these recommendations. Further, it is noted that the majority of the Aboriginal community responses also indicate support for these management recommendations.***

ICHPL expects that any Project Approval would include a requirement for development of a detailed management plan regarding Aboriginal heritage in consultation with DECCW.

DECCW (2 December 2009) states:

> ***…If emplacement is a key element in the proponent's coal wash reject strategy for their long term operations, the proponent should undertake an assessment of alternate locations which avoids the need to impact upon the unique values of the West Cliff site. A review of the information reveals that such an assessment of alternate emplacement sites has not been undertaken. In addition, the Socio Economic Assessment did not include any costs for any alternate method for coal wash reject disposal including alternate sites.***
>
> ***…***
>
> ***In relation to determining a suitable coal wash reject emplacement location, DECCW considers the proposed emplacement as waste disposal (application to land) and in this regard the EPA publication "Environmental Guidelines: Solid Waste Landfills" (1996) should be taken into account…***
>
> ***DECCW has undertaken a preliminary review of surrounding land within an 18km radius of the site and identified many potential areas of already disturbed land. These sites could be used for coal wash reject emplacement as part of land rehabilitation (subject to environmental assessment and approval).***

As described above, alternative emplacement sites were investigated as part of the *Application for Further Approval of West Cliff Emplacement Stage 3* (Cardno Forbes Rigby, 2007a):

> *Currently no alternative emplacement sites have been identified. Illawarra Coal has been investigating the availability of hard rock quarry sites in Dunmore and Bombo (Shellharbour, Kiama LGA's) however these sites will not be available in the near future, and if secured will involve lengthy consultation and approval processes. Discussions in this regard are continuing and Illawarra Coal is continuing to seek alternative emplacement sites.*

DECCW was consulted in March and May 2007 during the preparation of the application for the West Cliff Stage 3 Coal Wash Emplacement. This included the provision of an assessment of alternative uses.

ICHPL received a Notice of Staged Development Approval for the development of the West Cliff Stage 3 Coal Wash Emplacement on 20 December 2007. The circumstances described above in regard to alternative uses or emplacement locations for coal wash are reviewed by ICHPL as part of its ongoing commitments under the Stage 3 Staged Development Approval. To date no change in these circumstances has been identified.

As discussed in Section 7.2.2 of the EA, the coal washery rejects levy would make off-site coal wash disposal options (that are not subject to a levy exemption) more costly.

As stated in Section 2.8.5 of the EA:

> *ICHPL has however committed to, and would continue to (Cardno Forbes Rigby, 2007b):*
>
> - *research and consider alternatives to coal wash emplacement;*
> - *pursue the use of coal wash as an engineering fill material;*
> - *negotiate with owners of suitably located and available sites that could be used as alternative emplacement sites to extend the life of the West Cliff Stage 3 Coal Wash Emplacement; and*
> - *report progress of these actions to the NSW Government in the Annual Environmental Management Report (AEMR).*

If approved, this commitment would continue for Stage 4.

The conclusion that the coal wash is generally inert is supported by an *Application for Resource Recovery Exemption – Coal Wash for Land Application* prepared by ICHPL.

The *Application for Resource Recovery Exemption – Coal Wash for Land Application* prepared by ICHPL compared the coal wash from the West Cliff Washery and Dendrobium Washery with relevant EPA guidelines:

> *The trace element concentrations in the bin and beltpress streams of coal wash generated at West Cliff, as well as the Dendrobium coal wash, readily complies with the specifications for Inert Waste described in the EPA Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes. The total concentration for trace elements in coal wash generated by Illawarra Coal is at least two orders of magnitude less than the threshold criteria (SCC1) for Inert Waste. Similarly, the leachability trace element concentrations are less that the limits of detection for the elements that require testing in the EPA Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes and significantly lower than the threshold criteria (TCLP1) for Inert Waste. As such, the trace element composition of coal wash generated at West Cliff Coal Preparation Plant poses little or no contamination risk to the environment or public health.*

DECCW granted a general exemption for coal washery rejects under Part 6, Clause 51 and 51A of the *Protection of the Environment Operations (Waste) Regulation, 2005*.

In regard to the levy under section 88 of the *Protection of the Environment Operations Act, 1997*, DECCW (2 December 2009) states:

> ***…The levy will apply to all coal wash rejects that are received at the site from Dendrobium)*** **[sic]** ***and will effectively apply to all coal wash rejects that are disposed of at the site from material that is sourced from off-site (for example, from Appin).***

As stated in Section 7.2.2 of the EA:

> *The NSW State Government introduced a coal washery rejects levy in late 2008. The levy will come into force in November 2009 and relates to disposal of coal washery reject (coal wash) material at scheduled waste facilities. The levy is currently set at $15 per tonne.*
>
> *The disposal of Appin Mine and West Cliff Colliery coal wash at the West Cliff Coal Wash Emplacement (i.e. adjacent to the West Cliff Washery) would not trigger a requirement to pay the coal washery rejects levy.*

The coal washery rejects levy would not apply to the run-of-mine (ROM) coal received at the West Cliff Washery from the Appin Mine and West Cliff Washery as the coal washery rejects would be generated and disposed of at the same site, consistent with the Coal Washery Rejects Levy Operational Guidance Note (DECCW, 2009b), which states:

> *The CWR levy only applies to coal washery rejects <u>received</u> at a site. Therefore, facilities that only generate and dispose of coal washery rejects on site are not subject to the CWR levy.*

ABORIGINAL CULTURAL HERITAGE

It is noted DECCW (2 December 2009) states:

> ***…These criteria have been applied to all of the*** **[Aboriginal cultural heritage]** ***sites that are in the escarpment. DECCW considers that this adequately assesses the potential risk of impact from subsidence and notes that the depth of mining at Bulli Seam will also be a factor in the reduction of potential impact from subsidence…***
>
> ***…***
>
> ***The assessment of archaeological significance of the sites has been carried out in accordance with the Australia International Council on Monuments and Sites (ICOMOS) Burra Charter guidelines, DECCW's ACH Standards & Guidelines Kit (National Parks & Wildlife Service, 1997, draft) and DoP's Draft Guidelines for ACH Impact Assessment and Community Consultation (2005) and is considered to be adequate, as is the community consultation. The assessment of cultural significance has also been carried out in accordance with the above guidelines…***
>
> ***…***
>
> ***DECCW notes the management recommendations in the ACH Assessment and supports these recommendations. Further, it is noted that the majority of the Aboriginal community responses also indicate support for these management recommendations.***

DECCW (2 December 2009) states:

> ***…DECCW recommends that a ranking of cultural assessment is also included in the Risk Impact Assessment to allow a comprehensive analysis of the potential impacts to sites that take the cultural as well as archaeological values into account.***

Cultural significance of Aboriginal heritage sites is discussed in Section Q4.2.12 of the Aboriginal Heritage Site Risk Assessment (Appendix Q of the EA), as well as in more detail in the Aboriginal Cultural Heritage Assessment (Appendix G of the EA).

DECCW (2 December 2009) states:

> ***DECCW would like clarification of the envisaged approval process. This includes whether it is proposed to switch off requirements for other approval processes.***

As described in Section 7.1.2 of the EA:

> *Sections 75U(1) and (2) of the EP&A Act outline the authorisations that are not required for a Project approved under Part 3A. These authorisations are those ordinarily required under the following legislative provisions:*
>
> *…*
>
> - *Section 87 and 90 of the National Parks and Wildlife Act, 1974;*
>
> *…*

As described in Section 7.3.1 of the EA, ICHPL would progressively prepare Extraction Plans over the life of the Project to the satisfaction of the DoP, and in consultation with government agencies including DECCW.

As described in Section 5.10.3 of the EA:

> *An Aboriginal Heritage Plan (AHP) would be developed for the Project in consultation with the Aboriginal community and the DECC. The AHP would be active throughout the life of the Project and would incorporate the outcomes of monitoring, survey and fieldwork, analysis and consultation…The AHP would detail the statutory requirements to be met throughout the life of the Project regarding the management of Aboriginal heritage and include the mitigation measures described in the sub-sections below…*

SOCIO-ECONOMIC ASSESSMENT

In regard to the cost and benefit estimates, DECCW (2 December 2009) states:

> ***The assessment does not provide sufficient detail to assess the validity of estimated costs and benefits. For example:***
>
> ***a. Production values listed in Table 2.3 ($18.2 billion) are difficult to replicate. DECCW estimated lower production values ($17.7 billion), based on total product coal (Table 2.2), the average breakdown between coking and thermal coal provided by the proponent (94 per cent and 6 per cent respectively), and forecast coal prices (p8). In addition, the forecast values used by the proponent (p8) for coking coal ($180) and thermal coal ($97), are considerably higher than the 2009-2010 forecast values estimated using ABARE data; $140 and $79 respectively (Australian Commodities, Sept quarter, Vol 16 No 3, 2009 – Table 25 Value Exports 2 and Table 24 Volume Exports 2). More detailed data is needed (that is yearly predicted volumes of coking and thermal coal, product prices and exchange rates) to evaluate the assumptions used by the proponent to value the production benefit of the Project; which is the major benefit of the project and makes it economically efficient.***
>
> ***b. Operating costs are estimated at $6,542 million in present value terms (Table 2.3). However, using the average annual cost figure of $535 million (p6), DECCW estimates a higher present value of approximately $6,638 million. This discrepancy may be due to the timing of costs compared to averaging annual costs, but without detailed estimates this is unclear. This discrepancy ($96 million) needs to be clarified.***
>
> ***…***

d. Operational costs are aggregated with the costs of remediation activities, making it difficult to assess the appropriateness of the proponents proposed remediation. DECCW needs to assess the value of these individual contributions to ensure they are sufficient to address the likely impacts of the project. Further information is required on the cost of all remediation activities.

…

The proponent should clarify why decommissioning and rehabilitation costs have not been included at the end of the Project's life (present value over 30 years of $3.3 million).

The calculation of production values for the Project is based on the provisional production schedule in Table 2.2 of Appendix L of the EA. As described in Section 2.4.1 of Appendix L of the EA, an average of Australian Dollar (AUD) $180 for coking coal and AUD$97 for thermal coal was used in the analysis for the 30 year Project. The yearly forecast values for coal are based on ICHPL internal forecasting data and are not for release for use by third parties.

As recognised in the Socio-Economic Assessment, there is considerable uncertainty around future coal prices and hence coal prices have been subjected to sensitivity analysis (Section 2.6 of Appendix L of the EA).

An internal operating cost profile was developed by ICHPL based on likely yearly operational expenditure on mining, environmental management and monitoring, operation of the West Cliff Coal Preparation Plant and handling, administration, marketing, rail freight, port costs and sampling. The present value of operational costs has been discounted based on the yearly operating cost profile.

The cost of remediation activities has been determined based on the commitments made in the EA. The cost of remediation activities has been included in the operational cost of the Project and is considered to be conservative.

A $25M allocation for decommissioning and rehabilitation costs of the Appin Mine and West Cliff Colliery surface facilities at the end of the Project's life has been included in the operational costs.

In regard to the economic and social benefits of employment, DECCW (2 December 2009) states:

c. Economic and social benefits of employment ($870 million) are included in Table 2.3, however no values are provided to assess the economic benefits. As both economic and the social benefits are discussed it is unclear how these two benefits have been estimated. Information is required on how the social and economic value of employment ($870 million) was estimated.

…

e. The inclusion of the benefit from the Project's use of unemployed resources. As is stated in the main report: "Historically employment benefits of projects has tended to be omitted…on the implicit assumption that labour…would otherwise be employed elsewhere" (p19). The proponent states where this is not so and resources could be unemployed for a period of time, the unemployed resources should be valued at their opportunity cost. The proponent would need to justify this conclusion since it is unlikely that labour resources (skilled mining labour and on-site contractors) would be taken from the pool of unemployed resources. Hence the economic benefit of employment in the cost-benefit analysis should be excluded, unless fully and clearly justified.

f. The value a community attaches for each year the 'Project' provides 1,170 jobs. Although this approach has been used in previous studies, this approach is theoretically questionable and may lead to double counting. Respondents are asked what they are willing to pay to maintain employment when, through their consumption choices, they are likely to be already consuming the commodities produced by this employment and are thus already paying for the employment. Therefore, we seek clarification on whether these estimates of the social benefit of employment should be excluded.

As stated in Section 2.4.2 of Appendix L of the EA:

> *The community values associated with the employment provided by the Project have been estimated from the CM study at an average of $31M per year that the Project provides 1,170 jobs and have been included in the BCA.*

Adjustment of the wage rate to account for those who would otherwise be unemployed was conservatively not undertaken in the analysis. Only the existence values for employment from the Choice Modelling study were included.

Existence values for employment effects are not revealed in markets as suggested by DECCW (refer to Portney, 1994). In Australia a number of studies have included employment as an attribute in Choice Modelling studies (refer to Morrison *et al*., 1999; Mazur and Bennett, 2009; Gillespie, 2009).

DECCW (2 December 2009) states:

> ***…It is unclear why certain swamps at risk were excluded in the Cost Benefit Analysis (CBA). In addition, the Choice Modelling (CM) value placed on swamp damage is from a previous CM study and uses community Willingness to Pay (WTP) for swamps holding different biodiversity values. It is also unclear whether this value has been adjusted for inflation to make it comparable with other values in the current assessment…***

As described in Section 2.7.1 of Appendix L of the EA, all swamps predicted to experience greater than 200 millimetres (mm) valley closure were assumed to be adversely affected by cracking, erosion and changes in the types of vegetation present. Valley closure was deemed the most considerable factor in determining impacts on swamps, and Appendix L conservatively assumes that all swamps which are predicted to experience greater than 200 mm valley closure would be adversely affected.

The description of upland swamps in the Metropolitan Choice Modelling Study (Gillespie, 2009) was general (i.e. that they provide habitat for a range of plants and animals) and did not include specifics relating to vegetation. Results from this Choice Modelling study are therefore considered applicable to swamps within the Project area.

Community value estimate for upland swamps from the Metropolitan Choice Modelling study were not adjusted for inflation. Inflation between collection of the Metropolitan Coal Project Choice Modelling data and collection of the Bulli Seam Operations Choice Modelling data was less than 0.24% and would have no material impact on the analysis.

In regard to the regional economic impact assessment, DECCW (2 December 2009) states:

g. Input-output multipliers for the existing operation (Table 3.3) and the 'Project' (Table 3.4) are based on data and an augmented input-output table, neither of which are reported…Further information is required.

h. The income and employment multipliers in Table 3.4 are different from Table 3.3 even though the same region is represented. The proponent should clarify why this is the case, or amend the resulting values.

i. ***…to understand the real employment impact it is necessary to know the full-time equivalent number of direct and indirect jobs associated with the 'Project', which is probably less than the figure stated in the report because the assessment includes part-time employment in the estimate. Additionally, consumption induced employment is difficult to know for certain, which probably makes the estimated 3,296 jobs, inclusive of 1,000 consumption induced jobs, optimistic. Clarification is required on whether the I-O models used in the Environmental Assessment are sufficiently precise to predict employment impacts down to individuals.***

j. ***Section 3.2.6 (p39) discussed forward linkages (employment) associated with the 'Project'. However, to be consistent with the previous regional analysis, discussion of OneSteel in South Australia should be omitted. Also, the forward linkage employment of 7,336 for the 'Project' region (combined Illawarra Statistical Division and Outer South Western Sydney Statistical Subdivision) should be associated with all coal mining in the region, not mining activities associated with just this project. Information is required on why OneSteel in South Australia was included in the assessment.***

As described in Section 3.1 of Appendix L of the EA:

> *A 2005-06 input-output table of the regional economy (Illawarra SD and OSWS SSD) was developed using the Generation of Input-Output Tables (GRIT) procedure (Attachment E) using a 2005-06 NSW input-output table (developed by Monash University) as the parent table.*

A highly aggregated 2005-06 input-output table for the regional economy is provided in Table 3.2 of Appendix L of the EA. Section 3.2.1 of Appendix L of the EA describes how the Project sector was developed and inserted into the input-output table.

The difference in income and employment multipliers for the regional economic impacts of the existing operations and the Project (Tables 3.3 and 3.4 of Appendix L of the EA) is a result of different expenditure, income and employment profiles between the existing operations and the Project.

The regional input-output table is based on Australian Bureau of Statistics (ABS) data. Consistent with ABS data collection, the direct and indirect jobs created by the Project stated in Sections 3.2.3 and 3.3.2 of Appendix L of the EA represents a combination of full-time and part-time positions.

The discussion of forward linkages of the Project in Section 3.2.6 of Appendix L of the EA is a qualitative discussion of an aspect of the economic benefits of the Project that is not covered by the Regional Economic Impact Assessment, including an indicative list of companies that benefit from the Project. As stated in Section 3.2.6 of the EA:

> *Together direct coal mining employment associated with the Project together with forward and backward linkages in the region are estimated at 10,632.*

The number quoted in the EA (10,632) only includes forward and backward linkages within the region.

OneSteel in South Australia is a company located outside the region that relies on coal from the Project.

In regard to the Choice Modelling study, DECCW (2 December 2009) states:

- ***A stated preference study should describe a plausible public/environmental good and a relevant payment vehicle before it elicits people's valuations for the good. It is unclear what the good being evaluated by this CM study is…***
- ***Employment effects are measured through preference revealed in markets. Including "jobs provision" as an attribute of an environmental good is not valid.***

- ***Therefore, given DECCW's concerns with this CM study, to ensure that this part of the socio-economic assessment can be applied to the CBA, it may be prudent for the CM study to be subject to further peer review before its results are used in the CBA. The DECCW would be able to provide some suggestions on who could be approached for a peer review, upon request.***

The good being valued was changes in levels of the length of stream affected, number of Aboriginal sites affected, area of native vegetation cleared and length of time that the mine provides 1,170 jobs. The payment vehicle was a once-off environmental levy. The reference to royalties and levels of public services that people receive from the Government was part of the framing for the choice experiment. The frame of the Choice Modelling questionnaire design was tested at four focus groups. Respondents from the focus groups and the survey of NSW households had no difficulty understanding the frame of the questionnaire or the goods being valued.

As identified by Portney (1994), existence values may apply to employment impacts as well as environmental impacts. Existence values for employment effects are not revealed in markets as suggested by DECCW. In Australia a number of studies have included employment as an attribute in Choice Modelling studies (refer to Morrison *et al*., 1999; Mazur and Bennett, 2009; Gillespie, 2009).

The Choice Modelling study has been peer reviewed by Dr John Rolfe, an expert in Choice Modelling, whose letter states (Attachment 3 of the EA):

> *This report details the performance of a very professionally conducted choice modeling study to assess the values of state and regional populations for the potential impacts of continued coal mining operations. The survey performance shows careful attention to design and conduct, and is in line with the standard operation of choice modelling studies that are currently being performed in Australia and internationally. The analysis of results is appropriate and of high quality, and the conclusions that have been drawn are in line with the outcomes of the results. The results appear appropriate for use in subsequent benefit cost analysis.*

DECCW (2 December 2009) states:

> ***The sensitivity analysis (pp21-2 and C1) tested for a variety of changes, including changes to the implicit prices derived from the CM study in the report. However, it appears that information was not included to test for variations in environmental impacts (for example, area of vegetation disrupted, length of stream affected or number of aboriginal sites affected)…Clarification on whether this has been undertaken in the assessment is required.***

A sensitivity analysis of the Benefit Cost Analysis (BCA) was conducted for the EA (Section 2.6 and Attachment C of Appendix L of the EA). This included a sensitivity analysis of the value used for environmental impacts, which focused on the sensitivities in the unit cost of environmental impacts. For example, sensitivity testing for a 20% increase in the unit value of the impact on streams is equivalent to sensitivity testing for a 20% increase in the length of stream impacted. As stated in Section 2.6 of Appendix L of the EA:

> *In particular, significant increases in the values used for external impact such as greenhouse gas costs or environmental impacts had little impact on the overall economic desirability of the Project.*

DECCW (2 December 2009) states:

> ***The EA states that Levies are "not included in the calculation of the resource costs of operating the Project" (Appendix L Socio Economic Assessment section 2.4.1, p6). The Department requests that, the proponent should include the cost of the coal wash reject levy. This is because the coal wash reject levy represents an economic cost in the CBA and it is important for the proponent to recognise these costs as they may influence other alternate coal wash reject management options to become viable.***

As stated in Section 2.4.1 of Appendix L of the EA:

> *While royalties and levies are a cost to ICHPL they are part of the overall producer surplus benefit of the mining and processing activity that is redistributed by government. Royalties and levies are therefore not included in the calculation of the resource costs of operating the Project. Nevertheless, it should be noted that the Project would generate total royalties and levies in the order of $127M per annum (pa) with total royalties and levies over the life of the Project in the order of $3.8B.*

As discussed above, the disposal of Appin Mine and West Cliff Colliery coal wash from the West Cliff Washery at the West Cliff Coal Wash Emplacement (i.e. adjacent to the West Cliff Washery) would not trigger a requirement to pay the coal washery rejects levy (Section 7.2.2 of the EA). Coal wash received from Dendrobium Mine may be subject to the levy, however Dendrobium Mine is not a component of the Project and hence is not included in the Socio-Economic Assessment (Appendix L of the EA).

As discussed in Section 7.2.2 of the EA, the coal washery rejects levy would make off-site coal wash disposal options (that are not subject to a levy exemption) more costly.

NOISE

DECCW (2 December 2009) states:

> ***Unattended noise monitoring was undertaken at seven locations to determine the rating background noise level (RBL). The NIA notes on page I-16 that, on the basis of attended monitoring, that existing noise from the subject premises did not significantly affect the RBL measurements, with the exception of monitoring undertaken at the Appin Mine Cottages (Location L04). The attended noise monitoring results, and operator observations during the monitoring, are not reported. Additional justification that the RBLs presented do not include noise from existing operations is requested.***

As noted by the DECCW, the rating background levels (RBLs) for the receiver areas in the vicinity of the Project are reported in Section I3.1 of Appendix I of the EA, in accordance with the NSW Industrial Noise Policy (INP). The RBLs were not significantly affected by noise from the Appin Mine or West Cliff Colliery (except for site L04 as noted by the DECCW). This is evidenced by the operator's notes, which were taken during attended monitoring at the times of deployment of the noise loggers. Wilkinson Murray has provided the noise sources noted as being audible at these times as provided in Table 1:

Table 1
Audible Noise Sources during Deployment of Noise Loggers

Location and Approximate Time	Audible Noise Sources
L01 – 286 Douglas Park Drive: 12:00 pm 17 Mar 2009	Insects, occasional car on Douglas Park Drive, distant traffic on freeway
L02 –100 Ashwood Road: 1:00 pm 18 Mar 2009	Insects, faint wind in vegetation
L03 – St Mary's Tower: 12:30 pm 17 Mar 2009	Traffic on freeway, insects
L04 – Appin Mine Cottages: 11:00 am 18 Mar 2009	Appin East Pit Top, insects, traffic on Appin Road
L05 – 22 Church St: 11:30 am 18 Mar 2009	Traffic on Appin Road; insects
L06 – Cataract Scout Camp: 2:00pm 18 Mar 2009	Insects, distant traffic on Appin Road
L07 – Andoran Stud Estate, Darkes Forest Road: 2:30pm 18 Mar 2009	Distant traffic on freeway, some insects, wind in vegetation

Source: Wilkinson Murray

ICHPL is separately conducting additional noise monitoring and mitigation investigations for DECCW and the results of these investigations will be reported separately.

DECCW (2 December 2009) states:

> ***Both the noise modelling for the existing/approved and project worst case scenarios included noise reductions associated with mitigation measures that are not in place and have not been firmly committed to in terms of both implementation and time frames. Even with the incorporation of these measures into the noise modelling, a significant number of residences fall within the moderate noise management zone and noise affectation zone. Under a greenfield development scenario, this could have significant ramifications in terms of requirements in the project approval relating to noise management. The position of the proponent with respect to commitments and time frames for implementation of the modelled measures is required.***

As described in Section 7.4 of Appendix I of the EA, the Project would result in a reduction of noise levels in Appin:

- *Following analysis of modelling results for the existing/approved operations, an initial noise reduction investigation was undertaken and additional noise reduction measures were identified at Appin East pit top (operational improvements) and at the Appin No. 1 and No. 2 and the Appin No. 3 shafts (installation of quieter fans). These measures have been adopted by ICHPL and have been included in the Project noise modelling.*

…

- *These improvements in the noise emissions would result in the following predicted improvements in compliance with applicable intrusiveness and amenity noise criteria:*
  - *forty receivers that exceed the relevant amenity criteria for the existing/approved scenario would comply under the Project scenario (i.e. non-compliances reduced from approximately 113 to 73 receivers); and*
  - *fourteen receivers that exceed project specific intrusiveness noise levels for the existing/approved scenario comply under the Project scenario. In addition, some 39 residences (not specifically included as receivers) that the existing/approved contours indicate would experience marginal exceedances of project specific intrusiveness noise levels would comply for the Project. In total, the number of exceedances of intrusiveness criteria would be reduced from approximately 171 to 118 by the Project.*

ICHPL is separately conducting additional noise monitoring and mitigation investigations for DECCW and the results of these investigations will be reported separately.

DECCW (2 December 2009) states:

> ***The NIA indicates on page I-57 that : "In general accordance with the INP, ICHPL would implement a noise reduction program with the objective of identifying feasible and reasonable noise mitigation options. The noise reduction programme would build on the initial investigation undertaken by ICHPL and Wilkinson Murray (Section I4.7) and would be developed having regard to the INP," It is recommended that this investigation be brought forward, and into the project application assessment timeframe. This will enable consideration of noise emissions / levels that are achievable, and firmly committed to by the proponent as part of the project approval. This noise mitigation investigation should adopt, as a goal, the project specific noise levels. However, the Industrial Noise Policy (INP) acknowledges that this may not be feasible and reasonable especially in the context of an existing development. Particular attention should be given to reducing noise levels to residences falling into the noise affectation zone (that is, greater than 5dB(A) above the criteria).***

As described above, the Project would result in a reduction of noise levels in Appin (Section 7.4 of Appendix I of the EA).

ICHPL is separately conducting additional noise monitoring and mitigation investigations for DECCW and the results of these investigations will be reported separately.

DECCW (2 December 2009) states:

> ***DECCW has not reviewed in any detail the sI4-9 'Surface Goaf Gas Drainage Assessment Framework' as it's unclear on where and how such goaf gas drainage will be undertaken across the project area. It is recommended that any such works be assessed against the NSW INP and separately approved through the Extraction Management Planning Process.***

As noted by the DECCW, Section I4.9 of Appendix I contains a suggested noise assessment framework for noise assessments that would be included in a Surface Goaf Gas Drainage Management Plan. Potential future surface goaf gas drainage infrastructure is described in Section 2.5.5 of the EA:

> *Illawarra Coal has obtained a separate Part 3A Project Approval for the West Cliff Colliery Surface Goaf Gas Drainage Project. The Surface Goaf Gas Drainage Project involves the extraction of gas from the goaf area during and following the extraction of Longwalls 32 to 34, to ensure safe (gas concentration and outburst management) operations and maintain the rate of longwall mining operations at the West Cliff Colliery. The gas liberated via surface goaf gas drainage would be flared and/or vented to the atmosphere.*
>
> *Illawarra Coal has also separately lodged an application under Part 3A of the EP&A Act to the DoP with an accompanying Preliminary Environmental Assessment for the Appin Mine Area 7 Goaf Gas Drainage Project (Cardno Forbes Rigby, 2008b). The Appin Mine Area 7 Goaf Gas Drainage Project is currently subject to separate assessment and approval.*
>
> *…*
>
> *If required, the installation of surface goaf gas drainage boreholes and associated surface infrastructure would be subject to preparation of supplementary specialist environmental assessment studies. These studies and any associated management measures would be detailed in a Surface Goaf Gas Drainage Management Plan. The Surface Goaf Gas Drainage Management Plan would be prepared to the satisfaction of the Director-General of the DoP.*
>
> *The preparation of a Surface Goaf Gas Drainage Management Plan would include:*
>
> *…*
>
> - *Targeted noise and air quality assessments to assess compliance with applicable construction and operational noise and air quality criteria at the nearest sensitive receptors (e.g. private residences). In the event that compliance with applicable construction and operational noise and air quality criteria cannot be met at a sensitive receptor, Illawarra Coal would: reach a negotiated agreement with the interested party; or commit to additional attenuation measures to ensure compliance with the relevant criteria; and/or relocate the proposed drainage site to ensure compliance with the relevant criteria. A copy of any relevant agreements formed with interested parties would be provided to the Director-General as a component of the Surface Goaf Gas Drainage Management Plan.*
>
> *…*
>
> *The above assessment and approval approach would not be applied for any surface goaf gas drainage proposals in the Dharawal State Conservation Area. Such a proposal in the Dharawal State Conservation Area would be subject to a separate Part 3A assessment and approval process.* [emphasis added]

DECCW (2 December 2009) states:

> ***Road traffic noise level increases resulting from the project area are predicted to not exceed 2dB(A) for all road haulage and personnel routes with the exception of Douglas Park Drive and Macarthur Road. The assessment of traffic noise impacts associated with Douglas Park Drive and Macarthur Road is inadequate as it does not identify the location of, and predicted noise levels to, residential locations along the route…***

As part of the Noise Impact Assessment, the offset distances at which Environmental Criteria for Road Traffic Noise (ECRTN) criteria would be achieved were calculated for Macarthur Road and Douglas Park Drive for the existing, Year 3 and Year 10 of the Project (Section I6 of Appendix I of the EA). Some residential receivers along Douglas Park Drive were also identified near the Appin West pit top (Figure I4-1).

The residential receivers along Douglas Park Drive and Macarthur Road have been identified and are shown in Attachment A.

Predicted noise levels have been calculated for all receivers between the southern end of Macarthur Road and the freeway at the northern end of Douglas Park Drive within the critical distances for exceedance of base road traffic noise criteria presented in Appendix I of the EA. Predicted noise levels were calculated for the worst-case shift change time, for both the two-shift and three-shift options.

The ECRTN provide criteria for different types of roads in NSW. The criteria for collector roads (e.g. Macarthur Road and Douglas Park Drive) are averaged over 1 hour. Traffic noise levels at receivers that are located in close proximity to collector roads in NSW commonly exceed the ECRTN criterion, even in rural areas.

Detailed noise level results are presented in Attachment A. In some cases, residences are shielded by others in front, and in this case the resulting attenuation would be sufficient to reduce levels to within the criteria.

In summary, under the existing road traffic numbers, a total of up to 36 residences would experience traffic noise levels exceeding the ECRTN criteria. Under the Project, 57 residences would exceed the ECRTN criteria at the worst-case shift time for the three-shift option, while for the two-shift option the number would be 65. The residences concerned are indicated in Attachment A.

It should be noted that the quoted impacts occur in only two or three hours of the day, and are based on worst-case assumptions regarding traffic usage.

Options for mitigation of this impact are very limited, although clearly the three-shift option is preferable from the point of view of traffic impact on these roads. It would not be feasible to construct barriers to protect residences, as access to driveways is required, and in any case visual impact would be an issue. Re-directing mine-related traffic away from these roads is not feasible as Douglas Park Drive is the primary access routes to the Appin West Pit Top, and Macarthur Road provides access from the south to Appin West Pit Top.

DECCW (2 December 2009) states:

> ***The NIA has assessed the intrusive criteria and amenity criteria separately. The INP requires the assessment to be undertaken against the 'project specific noise level' (PSNL) which is the more stringent of the intrusive and amenity criteria. It is recommended that the proponent be required to present a summary of noise impacts, in a format similar to Tables I4-7, I4-8, I4-10 and I4-12, based on assessment against the PSNL, which is the more stringent of the intrusive and amenity assessment approaches.***

Section 2.4 of the INP requires that the project specific noise level criteria are set, immediately following the determination of intrusive and amenity criteria. However the intrusive criteria is to be achieved for a 15 minute noise assessment to protect annoyance to residents, whilst the amenity criterion relates to a long term planning objective to maintain reasonable noise levels in an area and is assessed over a day, evening or night time period and does not necessarily represent a worst case day but more of an "average" industrial noise emission.

For a noise sensitive receiver close to a constant industrial source such as a fan, the $L_{Aeq\ (15\ minute)}$ and $L_{Aeq(period)}$may be numerically equivalent, such that the most stringent criteria would be the lowest numerical value of either intrusive or amenity. However for most situations there is a numerical difference between the typical worst case $L_{Aeq\ (15\ minute)}$ and a more "average" $L_{Aeq(period)}$.

Because this difference isn't known until after the noise modelling and calculations have been complete it is not possible to know which of the intrusive and amenity criterion is the most stringent prior to modelling.

As relevantly stated in the DECCW's application notes for the INP (DEC, 2006b):

> ***Identifying which of the amenity or intrusive criteria apply***
>
> *(see INP Section 2.4)*
>
> *The INP notes that the Project-Specific Noise Levels (PSNL) are the more stringent of either the amenity or intrusive criteria. This is not necessarily just a matter of comparing the magnitude of the amenity criteria to the intrusive criteria because different time periods apply (intrusive criteria uses 15 minutes while the amenity criteria are over the day, evening or night period).*
>
> *For example, where the same number applies to both the amenity and intrusive criteria, the intrusive criteria would typically be more stringent because it is determined over a much shorter period.*
>
> *Where the predicted amenity noise level is lower than the intrusive level for the proposed development, the proponent needs to ensure that both levels will be satisfied. In this situation, noise limits specified in the licence conditions will include both the intrusive and amenity noise levels predicted to be achieved by the proposal to ensure that the community is protected from intrusive noise impacts at all times.*

For the Bulli Seam Operations Noise Impact Assessment (Appendix I of the EA), Wilkinson Murray has provided assessment of noise impacts against both the intrusive criteria and the amenity criteria for all residential receivers. This is because, given the size of the Project area and associated model domain, there are a range of intrusive criteria (range from 36 to 43 dBA $L_{Aeq(15\ minute)}$, depending on the locality) and amenity criteria (range from 40 to 55 dBA $L_{Aeq(period)}$ for residences, depending on the locality) that apply.

The approach of assessing against both the intrusive and amenity criteria is consistent with the INP Application Notes (DEC, 2006b) and provides for a conservative assessment and ensures that all possible exceedances of the criteria (i.e. whether intrusive or amenity) are reported.

Notwithstanding the above, ICHPL is separately conducting additional noise monitoring and mitigation investigations for DECCW and the results of these investigations will be reported separately. This reporting would include a summary of noise impacts as requested by DECCW.

AIR

DECCW (2 December 2009) states:

> ***…Appendix J Air Impact Assessment section 7.1 (page 27) also lists a number of proposed dust controls for the proposal. DECCW also recommends that a further SOC be sought ensuring that these measures are implemented.***

ICHPL would implement the proposed dust controls listed in the Air Quality Impact Assessment (Appendix J of the EA).

GREENHOUSE GAS ASSESSMENT

It is noted that, DECCW (2 December 2009) states:

> ***The proponent has investigated numerous energy efficiency measures and has identified as a SOC to prepare and implement an Energy Savings Action Plan (ESAP). This is supported by DECCW.***

DECCW (2 December 2009) states:

> ***…DECCW requests the proponent compare the energy efficiency of the operations with the energy efficiency of other similar NSW underground mines.***

ICHPL reviews its operational energy consumption efficiencies as a matter of normal operational cost management. Any opportunities to improve energy efficiency are considered. This includes benchmarking across BHP Billiton's operations in Australia.

RECOMMENDED STATEMENT OF COMMITMENTS

DECCW (2 December 2009) states:

> ***Aboriginal Cultural Heritage***
>
> 1. ***A program of comprehensive survey, recording, monitoring and reactive management be undertaken to protect the Aboriginal Cultural Heritage values of the area. The recording program should include, but not be limited to, activities such as spherical photography and other non-invasive recording techniques.***
>
> ***…***
>
> 3. ***A comprehensive monitoring Strategy should be established for all sites in the escarpment. This strategy must be prepared in conjunction with DECCW and opportunities must be presented to representatives of the Aboriginal community to take part in the monitoring program.***
> 4. ***The results of the monitoring programme should be reported annually. Further reporting must also take place if impacts above predicted levels occur to these sites.***

As stated in Section 5.10.3 of the EA:

> *A programme would be implemented through the AHP for the verification of Aboriginal heritage site data in the Project area including accurately recording/updating the global position system (GPS) co-ordinates of sites for which GPS co-ordinates are not available or are inaccurate. This programme would also include provision for updating condition assessments and collection of baseline monitoring data for Aboriginal heritage sites deemed to be of high or moderate archaeological significance, or of particular cultural significance.*
>
> *Updating the Aboriginal site recordings for Aboriginal sites of particular cultural significance would be prioritised where specifically requested by the Aboriginal community (e.g. sites 52-2-0281 and 52-2-1006). Obtaining more detailed information for Aboriginal sites where limited information is currently available (identified in Appendix G) would also be prioritised.*
>
> *…*
>
> *A subsidence impact monitoring programme would be implemented progressively for the study area as a component of future Extraction Plans. The monitoring programme would include all Aboriginal sites of high archaeological significance and of particular cultural significance and include a selection of other Aboriginal sites with features that would inform and refine impact assessment models currently used, where practicable. The monitoring programme would include the following:*
>
> - *A schedule for undertaking the monitoring and a protocol for determining Aboriginal stakeholder involvement.*
> - *A protocol for obtaining appropriately detailed site recordings including photographic coverage of shelters and art panels using slide and/or high resolution digital photography, showing art and panels in their wider context and in relation to each other. Photographic coverage would include the following:*
>   - *Single frame coverage of the panel or individual motifs and, if required, set distance scale photography for montage of the panel or individual motifs (digital only).*
>   - *Close-up photography of notable features of the rock art (e.g. superimposition of motifs or media) and its context (e.g. joints, cracks, seepage, mineral or organic accretions), where informative.*
>   - *Three-dimensional photographic coverage of selected Aboriginal sites using high resolution digital photography and appropriate image stitching techniques.*
>   - *Elevation plans of shelter walls recording structural and surface features including but not necessarily limited to art, graffiti, joints, bedding planes, exfoliation scars, cracks, mineral and micro-organism growth, dripline and water seepage locations.*
>   - *Identification and digital photographic recording of specific monitoring points, informed by previous work undertaken by Caryll Sefton, Kayandel Archaeological Services and Biosis Research, generally being pre-existing cracks, joints, areas of seepage located on or adjacent to art panels, or in other parts of a shelter.*
> - *Identification of subsidence impacts through detailed observation of the surrounding landscape context of sites; structural features and, if present, rock art and art panels at the sites.*
> - *A series of triggers for consideration of appropriate management responses if mining impacts are identified.*
> - *Recording and reporting Aboriginal heritage monitoring results as a component of future Extraction Plans and in the AEMR.*

ICHPL expects that any Project Approval would include a requirement for development of a detailed management plan regarding Aboriginal heritage in consultation with DECCW.

DECCW (2 December 2009) states:

Aboriginal Cultural Heritage

…

2. Further field survey of the study area be undertaken in order to comprehensively identify and accurately record all sites that may be in the study area. Any newly identified sites need to be assessed for any likely impacts that may occur as a result of mining and any activities associated with the mining process. This field survey and associated results should be included as supporting information as part of the Extraction Mine Management Plan.

DECCW (2 December 2009) states:

Aboriginal Cultural Heritage

…

5. Where it is identified that any impact has occurred, the proponent needs to examine strategies to stabilise and protect the sites. These strategies must be developed with DECCW and the Aboriginal community.

As stated in Section 5.10.3 of the EA:

The AHP would detail the process for identifying, assessing and implementing management and mitigation measures for Aboriginal heritage sites within the Project extent of longwall mining area and surrounds, including:

- *A protocol for determining whether mitigation and management actions are appropriate and practicable, in consultation with the Aboriginal community and DECC. Consideration would be given to the impact the works could have on the heritage values of the site and surrounding area, site accessibility, the level of potential damage associated with installing the measures and consideration of the appropriateness of the costs involved. Other potential impacts of mitigation works (e.g. vegetation clearing) would also be considered.*
- *A protocol for the development of site specific Conservation Plans where pre-mining mitigation works are proposed, or where post-mining mitigation and conservation works are required and have been agreed by the Aboriginal community and landholder.*
- *Potential mitigation measures that may be implemented/considered include:*
  - *Sandstone Shelter Sites – Installation of artificial driplines or diversion barriers where practicable to direct moisture away from the art panels where subsidence impacts have increased moisture flow at sandstone shelter sites with art panels. The implementation of invasive remediation (e.g. stress relief slots or stress focus notch) or archaeological salvage of sandstone shelter sites is not considered appropriate as they would likely constitute a greater impact than the potential for subsidence related impacts themselves (Appendix G).*
  - *Sandstone Platform Sites – Installation of stress relief slots or stress focus notch for sandstone platforms containing Aboriginal sites of high archaeological significance and/or of particular cultural significance. Both of these strategies aim to relieve stress over a certain area proximal to the archaeological attributes of a sandstone platform for example by increasing or focusing stress in another area. Generally stress relief slots are deeper than stress focus notches although both techniques essentially work in the same way. ICHPL has successfully used this technology in the past (at Marnhyes Hole on the Georges River) to reduce the impact to a sandstone rockbar.*

It is noted DECCW (2 December 2009) states the following with regard to the management measures:

> *DECCW notes the management recommendations in the ACH Assessment and supports these recommendations. Further, it is noted that the majority of the Aboriginal community responses also indicate support for these management recommendations.*

ICHPL expects that any Project Approval would include a requirement for development of a detailed management plan regarding Aboriginal heritage in consultation with DECCW, including a requirement to manage any newly identified sites consistent with those already recorded.

DECCW (2 December 2009) states:

> ***Air***
>
> ***6. All plant and equipment installed at the premises or used in connection with the licensed activity:***
>
> ***(a) must be maintained in a proper and efficient manner; and***
>
> ***(b) must be operated in a proper and efficient manner.***

ICHPL agrees with this DECCW recommendation.

DECCW (2 December 2009) states:

> ***Air***
>
> ***…***
>
> ***7. The licensee must not cause or permit the emission of offensive odour beyond the boundary of the premises.***
>
> ***Note: Section 129 of the Protection of the Environment Operations (POEO) Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.***

ICHPL agrees with this DECCW recommendation.

DECCW (2 December 2009) states:

> ***Air***
>
> ***…***
>
> ***8. The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.***

As described in Section 5.13.4 of the EA:

> *Air quality management measures currently implemented at the Appin Mine and West Cliff Colliery would continue to be implemented for the Project. Management measures for the Project would include, but would not necessarily be limited to:*
>
> - *compaction of moist coal wash material following emplacement in the West Cliff Coal Wash Emplacement;*
> - *progressive rehabilitation of the West Cliff Coal Wash Emplacement;*

- *watering of unsealed and some sealed haul roads;*
- *enclosure of crushing and screening processes;*
- *enclosure of transfer conveyors;*
- *water sprays at ROM and product coal stockpiles;*
- *truck wash for all heavy vehicles travelling off-site;*
- *coal covers on trucks transporting ROM coal and product coal off-site; and*
- *speed limits for all roads around the surface facilities.*

During dry and windy conditions, appropriate dust suppression measures would be implemented if necessary. Stockpile and conveyor sprays at the West Cliff and Appin East pit tops can be operated manually or automated to activate according to wind speed or direction.

….

Air Quality Management Plan

ICHPL would develop an Air Quality Management Plan (AQMP) for the Project that builds on existing site management plans (e.g. Appin Mine Airborne [Dust] Management Plan), describes mitigation and management measures and would provide a framework for the ongoing monitoring and management of air quality at the Project, complaint response protocols and reporting requirements.

DECCW (2 December 2009) states:

Air

…

9. Dust control measures must include:

(a) watering of unsealed and some sealed haul roads

(b) enclosure of crushing and screening processes

(c) enclosure of transfer conveyors

(d) water sprays at ROM and product stockpiles

(e) truck wash for all heavy vehicles travelling off-site

(f) fixed speed limits (<= 40 km/h) for all roads around the surface facilities; and

(g) all loaded trucks must have their load covered.

As stated in Section 5.13.4 of the EA:

Management measures for the Project would include, but would not necessarily be limited to:

- *compaction of moist coal wash material following emplacement in the West Cliff Coal Wash Emplacement;*
- *progressive rehabilitation of the West Cliff Coal Wash Emplacement;*
- *watering of unsealed and some sealed haul roads;*
- *enclosure of crushing and screening processes;*
- *enclosure of transfer conveyors;*
- *water sprays at ROM and product coal stockpiles;*
- *truck wash for all heavy vehicles travelling off-site;*
- *coal covers on trucks transporting ROM coal and product coal off-site; and*
- *speed limits for all roads around the surface facilities.*

DECCW (2 December 2009) states:

INVESTIGATION OF WEST CLIFF MINE DISCHARGE ON THE GEORGES RIVER

10. The proponent shall undertake a study into the discharge of the water from West Cliff Colliery into Brennans Creek and the Georges River. The study needs to consider the effects of the discharge on Water Quality and River Flows and on water users in the freshwater section of the Georges River. Where appropriate the study should make recommendations for treatment to improve the quality of discharge and for the regulation of flows from Brennans Creek Dam.

(a) The study should include but not necessarily be limited to:

- ***An assessment of the implications of the continuous West Cliff mine discharge and overflow on downstream environmental values***
- ***Examination of mitigation options in response to river health impacts from the West Cliff discharge. Mitigation options must have a full environmental risk assessment including any linked environmental issues such as river flows, social impacts, energy use, disposal of waste streams***
- ***Consideration of current Pollution Reduction Program studies at Appin, Appin West and West Cliff mines. This specifically includes Pollution Reduction Program 10 – Reduction in Salinity from Brennans Creek Dam (LDP10) on the West Cliff Environment Protection Licence number 2504***
- ***Whole of effluent characterisation***
- ***Examination of the likely effects of the predicted increase in the volume of discharge of minewater into Brennans Creek. This should characterise the quality of the discharge and describe the increased load of dissolved solids. The study should investigate the changes in the level and extent of salinity levels in the Georges River caused by the proposal. The effects of the increased discharge should be examined in terms of effects on the level of total dissolved solids and constituent chemicals. The effects of the increased discharge on river health should also be described quantitatively in terms of ecotoxicity, and changes to in-stream biota. The study should also examine the likelihood that the discharge encourages the growth of exotic algae and development of euphotic conditions***
- ***A catchment study to identify downstream users and uses (type and amount) of the discharged water. The study should determine whether the quality of discharge water affects the current use or limits potential uses of the water. The study should determine whether the discharge provides a beneficial environmental flow or other usage benefit, and whether higher quality would encourage alternative uses***
- ***The study should examine whether the discharge is having a masking effect on water loss from riverbed cracking caused by previous undermining of the Georges River. The study should consider possible arrangements for discharge or cessation of flows from West Cliff mine following eventual closure of mining operations. The environmental and social impacts of such arrangements should be broadly considered***
- ***Describe works that will be implemented to meet required discharge limits***
- ***Provide a time table for implementing the required works.***

(b) Be contained in a report to be prepared in consultation with DECCW, NOW, and Department of Industry and Investment and

(c) Be submitted to the Director General of the Department of Planning for approval by December 2010.

As described in Section 5.6.3 of the EA:

> *ICHPL is conducting ecologically based studies and trials to determine an appropriate water quality release limit for salinity from Brennans Creek Dam under dry weather flow conditions, with the intention to include this limit in EPL 2504 for the West Cliff pit top. ICHPL is scheduled to complete these assessments and trials by the end of 2009 in accordance with the current PRP under EPL 2504.*
>
> *Methods needed to achieve compliance with applicable limits (e.g. water treatment) would be the subject of a separate PRP. A plan to implement the preferred option would then follow for completion prior to July 2013 in accordance with the PRP under EPL 2504.*

On 10 December 2009, ICHPL proposed to DECCW to submit the Pollution Reduction Program (PRP) 10 Stage 1 Report by 31 March 2010. The PRP 10 Stage 1 Report was submitted to DECCW on the 30 March 2010.

As stated in Section 5.7.3 of the EA:

> *…water releases from the three pit tops are licensed and regulated by the DECC via EPLs. ICHPL would continue to operate in accordance with these EPLs (including the outcomes of the current PRPs) as part of the Project (Sections 5.6.2 and 5.6.3 and Appendices C and D).*

DECCW (2 December 2009) states:

> ***Noise***
>
> ***11. Traffic Noise Management Plan that includes provisions to ensure that the road haulage fleet represents best practice. This could include a noise level test station to audit heavy vehicles against engine noise standards (see POEO (Noise Control) Regulation 2008) and engine brake standards developed by the National Transport Commission. The objective would be to identify vehicles in the fleet that may represent outliers and hence be perceived by an impacted community as excessively noisy.***

As stated in Section 5.15.3 of the EA:

> *Notwithstanding that the Project is not predicted to significantly alter the proportion of ICHPL contribution to traffic on the majority of the public road network, ICHPL would implement the following mitigation measures as a component of a Transport Management Plan to be prepared for the Project:*
>
> - *ICHPL would work with suppliers to minimize the use of heavy vehicles to deliver small items to the West Cliff, Appin East and Appin West pit tops that could be delivered via a light vehicle or van, where practicable;*
> - *ICHPL would encourage the Project workforce to car pool and minimise work-related light vehicle movements;*
> - *all oversized vehicles would have the relevant permits, licences and escorts, as required by the regulatory authorities; and*
> - *all oversize vehicles loads would be appropriately secured and covered, where necessary.*

As described in Section 5.12.5 of the EA:

> *A Noise Management Plan (NMP) would be developed for the Project that would be implemented during construction and operation of the Project. The NMP would describe the following elements of relevance to noise monitoring:*
>
> - *applicable Project Approval noise criteria/limits;*
> - *noise monitoring to be undertaken for the Project (i.e. monitoring locations, frequencies, parameters and specifications);*

- *a summary of relevant Project noise mitigation/management measures;*
- *procedures to be followed in the event of an exceedance of applicable noise criteria should they occur; and*
- *complaint response protocols.*

The NMP would detail specific actions for responding to exceedances of Project Approval criteria and complaints should they occur. The results of monitoring conducted under the NMP would be used to optimise noise controls and validate noise modelling predictions and would be presented in the AEMR.

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Bulli Seam Operations
Response to Department of Environment, Climate Change and Water Submission
(16 December 2009)

Each of the recommendations made by Department of Environment, Climate Change and Water (DECCW) (16 December 2009) (reproduced below in bold) are addressed below.

DECCW (16 December 2009) states:

> ***…DECCW recommends any approval for the mine include explicit staging so that the Eastern domains are mined after the Western domains. This is recommended due to a number of special significant features in the Appin Area 2 & 3 and North Cliff domains and the need for more survey and assessment work to be undertaken prior to mining in these areas.***

ICHPL's preferred approach is consistent with the second option presented by I&I NSW (23 December 2009):

> *If the determination is not based on a staged process, there is a need for strong mechanisms to ensure adequate consultation, feasibility studies and lead time for the development of major management strategies, that is, the Extraction Plans Stage.*

This approach is consistent with:

- the NSW planning process (see Figure 44 of the Southern Coalfield Panel Report [NSW Department of Planning (DoP), 2008]); and
- contemporary Project Approvals under Part 3A of the *Environmental Planning and Assessment Act, 1979* (e.g. Metropolitan Coal Project [08_0149]) which include the staged submission of detailed strategies, plans and programs (e.g. Subsidence Management Plans and/or Extraction Plans).

The above process includes strong consultation mechanisms, feasibility studies and long lead times (i.e. typically the lodgement of a Subsidence Management Plan six months prior to its desired approval).

DECCW (16 December 2009) states:

> ***Given the conceptual nature of the Environmental Assessment, DECCW considers that any approval should contain clear performance measures (or a pathway to achieve them), for adequate protection of natural features within the project area. ICHPL need to provide information within the Extraction Management Plan on how these performance measures will be achieved, as well as monitoring and reporting on compliance.***
>
> ***To achieve these performance measures, more detailed mine design and investigation is required. ICHPL may need to present alternative longwall layouts or consider alternative mining techniques in their Extraction Management Plan.***

Tables 5.2 and 5.3 of the EA present the preferred risk management options for stream and swamps, respectively, including impact minimisation criteria. Further, it is envisaged that any Project Approval for the Project would include Performance Measures.

Section 7.3.1 of the EA describes the proposed Extraction Plan process for the Project, including demonstration that predicted subsidence impacts and consequences are consistent with those authorised by the Project Approval (i.e. the Performance Measures):

> *Over the life of the Project, Extraction Plans would be progressively prepared as detailed mine designs are completed for each part of the Project area. The main aspects to be addressed by Project Extraction Plans would include:*
>
> - *a detailed mine plan;*
> - *plans of associated surface construction works;*
> - *a coal resource recovery plan;*
> - *final prediction of systematic (conventional) and non-systematic (non-conventional) subsidence effects;*
> - *demonstration that the predicted subsidence impacts and consequences are consistent with those authorised by the Project Approval;*
> - *a Subsidence Monitoring Programme;*
> - *a Catchment Monitoring Programme;*
> - *a Biodiversity Management Plan;*
> - *a Heritage Management Plan; and*
> - *a Built Features Management Plan.*
>
> *The Extraction Plan process provides a mechanism for the presentation of further detail regarding particular management measures for individual longwalls or mining domains. As part of the preparation of Extraction Plans, consultation would be undertaken with relevant stakeholders (e.g. relevant landholders, infrastructure owners and government authorities).*

SWAMPS

DECCW (16 December 2009) states the following:

> ***Therefore, ICHPL considers a total of 55 swamps to be at real risk of negative environmental consequences. However, there is no clear understanding of how ICHPL's derived the total of 55 swamps at risk. The following information is presented in Appendix O (p0-29); however the figures of those at risk do not add up to 55, although this may be explained by double counting swamps. With the exception of the eight swamps identified by ICHPL as being at significant risk there is no clear identification of which of the labelled swamps are at risk…***
>
> ***…***
>
> ***DECCW requires clarification of how ICHPL has applied the subsidence effects to identify those swamps that are likely to suffer negative environmental impacts.***

As stated in Section O6.5.4 of Appendix O of the EA:

> *Sections O6.5.1 to O6.5.3 identify the swamps assessed as having a real risk of negative environmental consequences as a result of Swamp Impact Mechanisms 1, 2 and 3…In summary:*
>
> - *24 swamps have depths of cover less than 385 m and predicted average tensile strains of 0.5 mm/m or greater and were assessed as having a low likelihood of interaction with the regional groundwater table.*
> - *One swamp has a depth of cover of less than 385 m and predicted average tensile strains of greater than 0.5 mm/m and was assessed as having a high likelihood of interaction with the regional groundwater table.*
> - *Eleven swamps were assessed as having a moderate risk of change in drainage line alignment.*
> - *14 swamps were assessed as having a high susceptibility to subsidence effects in terms of their erosion and scour potential.*

- *33 swamps are predicted to be subject to valley closure movements of 200 mm or greater, which is considered to have potential to result in redirected surface flow as a result of buckling or bedding shear fracturing.*

A total of 55 swamps are considered to have a real risk of negative environmental consequences as result of surface tensile cracking within the fracture zone, tilting, and/or redirected surface flow caused by the valley closure mechanism.

Some of the 55 swamps at real risk of negative environmental consequences would be affected by more than one of the mechanisms identified in NSW Planning Assessment Commission's (PAC's) Metropolitan Coal Project Review Report (PAC, 2009) (herein described as the Metropolitan PAC Report), therefore the number of swamps in each category does not reflect the total number of swamps.

Section O6.5.4 of Appendix O of the EA also identifies that eight of the 55 swamps are considered to have potential to result in significant negative environmental consequences. These eight swamps (namely, swamps CRE-S3b, CT1-S2, CT2-S7, DAC-S3, OHC-S5a, STC-S24, STC-S36 and WOR-S5a) are predicted to experience valley closure movements of greater than 200 mm and were assessed as having a high susceptibility to subsidence effects in terms of their erosion and scour potential.

The EA concludes that eight swamps have potential to result in significant negative environmental consequences and 47 swamps are at a real risk of negative environmental consequences but not significant negative environmental consequences, for a total of 55 swamps.

The swamps at real risk of negative consequences and significant negative consequences and the mechanisms they may potentially be affected by can be determined from the information provided for each swamp in Attachment OB of Appendix O of the EA and is summarised in Table 1 below.

Table 1
Exposure of Swamps to Mechanisms Identified in PAC (2009)

Number	Swamp	PAC Impact Mechanism
Swamps at Risk of Potential Significant Negative Consequences		
1	CRE-S3b	1, 2, 3
2	CT1-S2	1, 2, 3
3	CT2-S7	1, 2, 3
4	DAC-S3	2, 3
5	OHC-S5a	2, 3
6	STC-S24	1, 2, 3
7	STC-S36	1, 2, 3
8	WOR-S5a	2, 3
Swamps at Risk of Potential Negative Consequences		
1	CRE-S2	3
2	CRE-S3a	1
3	CRE-S3c	1
4	CRE-S4b	1
5	CRE-S6a	2

Table 1 (Continued)
Exposure of Swamps to Mechanisms Identified in PAC (2009)

Number	Swamp	PAC Impact Mechanism
Swamps at Risk of Potential Negative Consequences (Continued)		
6	CRE-S6d	2
7	CRI-S5a	2
8	CRI-S5c	3
9	CRI-S6a	2
10	CRI-S6f	2, 3
11	CRI-S7	3
12	CT1-S3a	1
13	CT1-S3b	1
14	CT1-S4	1, 2, 3
15	CT1-S5	1, 2, 3
16	CT1-S6	2, 3
17	CT1-S7	3
18	CT2-S1a	1, 2
19	CT2-S1b	1
20	CT2-S2	1
21	CT2-S4	1, 3
22	CT2-S5a	1
23	CT2-S5b	1
24	CT2-S5c	1
25	CT2-S6	1, 3
26	DAC-S1	3
27	DAC-S2	3
28	DAC-S4	3
29	DAC-S7b	2, 3
30	HSC-S1	2
31	ILC-S4a	1
32	OHC-S15	3
33	OHC-S20d	2
34	OHC-S21b	3
35	OHC-S6	3
36	OHC-S7a	2, 3
37	OHT-S5a	3
38	OHT-S6a	3
39	STC-S12	2
40	STC-S13	1, 3
41	STC-S15	3
42	STC-S18	2
43	STC-S23	1
44	STC-S26	3
45	STC-S34	1, 2, 3
46	STC-S35	1
47	WOR-S4	3
55	**TOTAL**	

DECCW (16 December 2009) states the following:

> ***Appendix A of the EA notes that stress predictions have been based on hogging and sagging curvatures with tensile and compressive strains calculated on the basis of a linear relationship with curvature, yet the method does not appear to use an incremental profile method where predicted peak strains should be provided rather than an average strain across an area, as used in this EA. In calculating tensile and compressive strains a simple factor of "15 times curvature" has been used based on Figure 3.4 (Appendix A p 14) and a line of best fit drawn through the data. DECCW questions the statistical significance of the linear relationship identified here (it is clearly non-liner and does not adequately capture the variation in the data) and yet this becomes the basis for calculating "average" compressive and tensile strains over the proposed mine layout.***

As described in Section 3.8 of Appendix A of the EA, the Incremental Profile Method has been used to calculate predicted hogging and sagging curvatures as a result of the extraction of longwalls.

As described in Section 3.9 of Appendix A of the EA:

> *The prediction of strain is more difficult than the prediction of subsidence, tilt and curvature. The reason for this is that strain is affected by many factors, including ground curvature and horizontal movement, as well as local variations in the near surface geology, the locations of pre-existing natural joints at bedrock, and the depth of bedrock. Survey tolerance can also represent a substantial portion of the measured strain in some cases. The profiles of observed strain can be irregular, therefore, even when the profiles of observed subsidence, tilt and curvature are relatively smooth.*
>
> *…*
>
> *In the Southern Coalfield, it has been found that applying a factor of 15 to the maximum predicted curvature provides a reasonable estimate of the average predicted strain.*

Figure 3.4 of Appendix A of the EA shows measured curvature and strain for previously extracted longwalls in the Southern Coalfield and a line based on applying a factor of 15 to the measured curvature to determine strain. This figure shows that this linear relationship provides a reasonable estimate of strain, and is particularly conservative at higher levels of hogging and sagging curvature.

Table 3.1 of Appendix A of the EA provides the probabilities of exceedance for strain for locations above the goaf:

Strain (mm/m)		***Probability of Exceedance***
Compression	*-5.0*	*1 in 500*
	-4.0	*1 in 150*
	-3.0	*1 in 60*
	-2.5	*1 in 40*
	-2.0	*1 in 20*
	-1.5	*1 in 15*
	-1.0	*1 in 7*
	-0.75	*1 in 5*
	-0.5	*1 in 4*
	-0.25	*1 in 3*
Tension	*0.25*	*1 in 3*
	0.5	*1 in 6*
	0.75	*1 in 10*
	1.0	*1 in 20*
	1.5	*1 in 70*
	2.0	*1 in 200*
	2.5	*1 in 700*
	3.0	*1 in 2,000*

Table 3.2 of Appendix A of the EA provides the probabilities of exceedance for strain for locations above the solid coal.

DECCW (16 December 2009) states the following:

> ***The subsidence prediction method used in the EA is different to that used for the Metropolitan Coal Project, despite the same subsidence consultant being used for both projects. Whilst methodologies should be improved as new information comes to hand, the Department requests a clear explanation of why the change has occurred.***

As described in Sections 4.6.3 and 5.2.2 of Appendix A of the EA, the method of prediction for upsidence and closure has been revised for streams that are not directly mined beneath anywhere along their length within a distance of one depth of cover from a goaf area. This revision removes the over-conservatism of the ACARP method for streams that have not been directly mined beneath.

As stated in Section 4.6.3 of Appendix A of the EA:

> *The ACARP Prediction Method provided one set of upsidence and closure prediction curves that was drawn over the then available upsidence and closure monitoring data. Now that the available monitoring database has been extended with many more new cases and, since the recently proposed mine plans involve extracting coal resources up to but not under the creeks and rivers, consideration has been given to the preparation of a new set of upsidence and closure prediction curves using specific "subsets" of the total database.*
>
> *As indicated in the following two plots, Fig. 4.16 and Fig. 4.17, lower values of upsidence, closure and strain have been observed within those valley monitoring sites that have not been undermined by either the current or the previously extracted longwalls (shown in blue circles), than the upsidence, closure and strain observed in those valleys that have been undermined (shown as black diamonds). Sometimes these reduction factors have been described as the "never undermined subset" factor. The red points shown on these figures are the monitoring points where there is "Known Weak Geology" in the valley base and it is clear that, wherever the geology of the bedrock in the base of the valley comprises thin highly jointed layers, the resulting upsidence and closure can be higher than where the bedrock comprises strong thick homogeneous strata layers.*

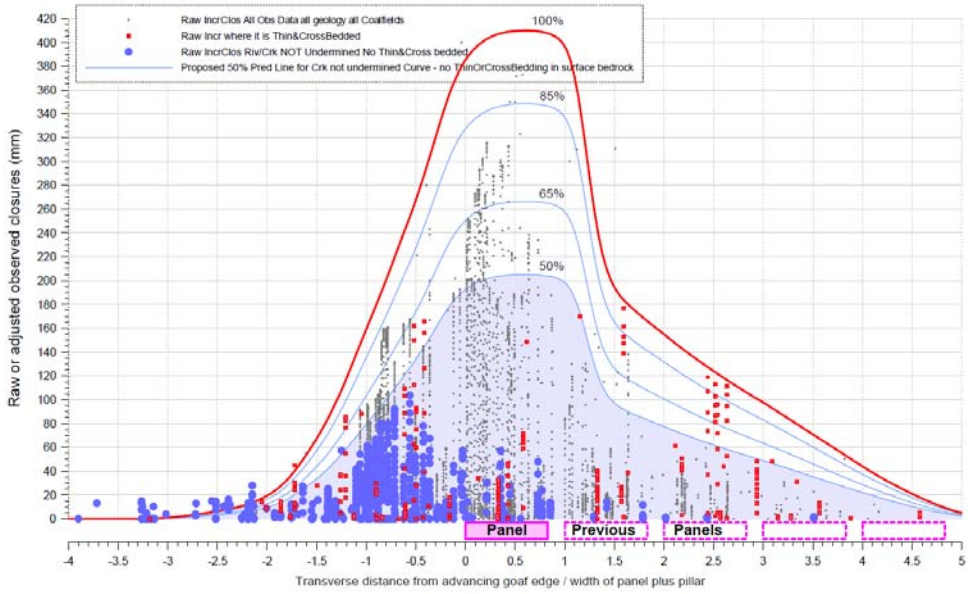

Fig. 4.16 Comparison of Raw Observed Incremental Closure versus Lateral Distances from Edges of the Incremental Panel for All Data, Valley Sites affected by Thin and Cross Bedded Bedrock Strata and Valley Sites not Undermined by Current or Previous Longwalls

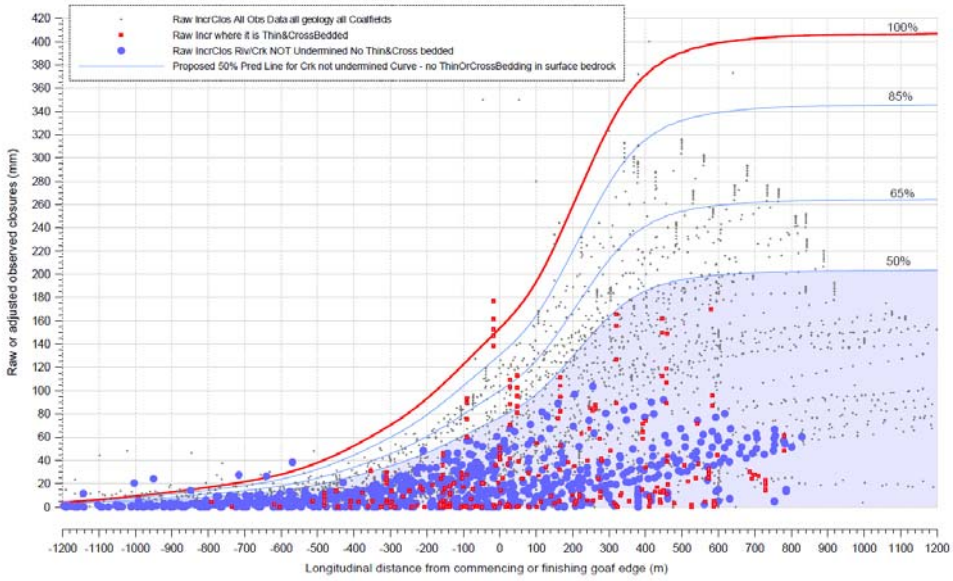

Fig. 4.17 Comparison of Raw Observed Incremental Closure versus Longitudinal Distances from Edges of the Incremental Panel for All Data, Valley Sites affected by Thin and Cross Bedded Bedrock Strata and Valley Sites not Undermined by Current or Previous Longwalls

Research is continuing in this regard, but, it is initially clear from these two figures that a reduction factor of about 0.5 could be applied when predicting upsidence and closure for those creeks or rivers that have not been undermined by the current or previous longwalls. But to be conservative, for now, a reduction factor of 0.7 has been adopted until the ongoing research proves that lower reduction factors would be appropriate.

After applying this 0.7 reduction factor, the majority of the observed closures were still less than half of those predicted and only 2% of the observed closures exceeded those predicted.

DECCW (16 December 2009) states the following:

The EA also implies that longwall mining with 310 metre longwalls has occurred under swamps without noticeable impacts. However, the EA presents no credible quantitative scientific evidence (for example piezometer and flow data, resistivity tests, flora and fauna data etc.) to support this claim…

…

The Bulli Seam EA (p0-23) specifically identifies six swamps that have been undermined which exhibited cracking and erosion in some areas [STC-S4, STC-S1c, STC-S1a, STC-S1b and STC-S2]. It is noted that only anecdotal observations are available, but nevertheless claims that "no evidence of significant environmental consequence was observed" are made despite the lack of quantitative scientific evidence (such as hydrological data). Furthermore, these swamps have been undermined by at most 200 metre wide longwalls, compared to the 310 metre longwalls proposed in the EA…

The EA does not imply that longwall mining with 310 metre longwalls has occurred under swamps without noticeable impacts. DECCW does not provide any reference to the EA where this statement or implication is made.

Section O6.4 of Appendix O of the EA describes:

> *Site inspections have been conducted of a number of swamps by ICHPL. ICHPL inspected five of the swamps listed above predicted to have been previously subject to greater than 200 mm valley closure (viz., swamps STC-S4, STC-S1a, STC-S1b, STC-S1c and STC-S2). Gilbert and Associates and FloraSearch also inspected swamps STC-S1b and STC-S2. An additional ten swamps predicted to have been previously subject to less than 200 mm valley closure were inspected by ICHPL. Photographs of swamps at neighbouring collieries (e.g. Metropolitan Colliery and Dendrobium Mine) are provided in Attachment OE.*
>
> *ICHPL inspection methods included walking the length of the swamp and recording observations of any significant negative environmental impacts or consequences, for example:*
>
> - *Significant subsidence-induced buckling/cracking.*
> - *Any significant erosion or scour.*
> - *Significant vegetation dieback on a broad scale.*
> - *Significant dessication of vegetation or peat materials on a broad scale.*
>
> *It is recognised that there are limitations associated with the assessment. As stated above, the assessment is based on back predictions of subsidence effects, as opposed to observed (i.e. monitored) subsidence effects. However, these back predictions are being compared with predictions using the same methodology for analysis within the EA, thus ensuring consistency within the comparative assessment.*
>
> *No carefully designed quantitative monitoring programme has been implemented. As such, the assessment of environmental consequences is based on anecdotal observations only. However, the information provides some background to the nature and extent of historical subsidence impacts and environmental consequences.*
>
> *Evidence of cracking and minor erosion was observed during the site inspections, however no evidence of significant environmental consequences was observed. Notwithstanding, there are swamps in the Southern Coalfield in which significant impacts have been observed, namely, swamp 18 at the Elouera Colliery and Flat Rock Swamp near the historic Darkes Forest Mine and existing Metropolitan Colliery – drained and eroded in-valley swamps.*

DECCW (16 December 2009) states the following:

> ***Therefore, Dendrobium Area 3 data (which is to include monitoring data of perched aquifers before and after undermining) should be used to inform further swamps risk assessment prior to undermining swamps in the Bulli Seam Project area. Simple 'inspections' of swamps to detect surface cracking without analysis of for example before and after mining piezometer and flow data is not considered adequate to determine the level of impact.***

It is recognised in the EA (Section O6.4 of Appendix O of the EA) that comprehensive before and after data for many of the previously undermined swamps simply does not exist. However, it was appropriate to inspect these swamps and look for signs of significant impacts. This is informative on a broad scale and supports the position that not all swamps experience significant negative consequences as a result of subsidence effects. It is reasonable to expect that such consequences would be readily identifiable by experienced environmental professionals.

Notwithstanding the above, the development of Swamp Risk Management Plans (RMPs) (Section O7.1 of Appendix O of the EA) would include consideration of all available monitoring data, including data available from Dendrobium Area 3. Section O7.7 of Appendix O of the EA describes that independent audits would be conducted to assess the implementation and effectiveness of the RMPs.

A detailed Upland Swamp Monitoring Program would be prepared to the satisfaction of DoP within a year of approval. A preliminary swamp monitoring programme has been developed based on the outcomes of the risk assessment and is presented in Section O7.5 and Table O-7 of Appendix O of the EA.

The monitoring programme described in Section O7.5 of Appendix O of the EA would commence for any particular upland swamp(s) at least two years prior to mining within the Risk Management Zone of the particular upland swamp(s).

As described in Table O-7 of Appendix O of the EA:

- *Initially (i.e. prior to the preparation of the Risk Management Plan), piezometers would be installed within a representative sample of the swamps to obtain baseline data on the local and regional groundwater systems. The swamps proposed to be monitored are:*
  - *swamp CT2-S1a (at real risk of mechanisms 1 and 2);*
  - *swamps CT2-S4, CT2-S6 and STC-S13, (at real risk of mechanisms 1 and 3);*
  - *swamps CRE-S3b, CT1-S2, CT1-S4, CT1-S5, CT2-S7, STC-S24, STC-S34 and STC-S36 (at real risk of mechanisms 1, 2 and 3); and*
  - *a selection of the remaining swamps at risk of mechanism 1.*
- *Piezometer monitoring would include shallow piezometer installations for the monitoring of groundwater levels/pressures within upland swamps. Water level measurements would be automated with daily or more frequent recording.*
- *Piezometer monitoring would also include a selection of deep piezometer installations for the monitoring of pore pressures within the natural rock strata. Pore pressure measurements would be automated with daily or more frequent recording.*
- *The need for piezometer monitoring in the remainder of the swamps considered to be at real risk of negative environmental consequences would be reviewed based on the outcomes of the fracture zone height analysis and piezometer monitoring described above.*

DECCW (16 December 2009) states the following:

> ***It is recognised that ICHPL has stated that "the groundwater model for the Bulli Seam project is limited and that piezometer monitoring would be conducted in a selection of swamps should the Project be approved" (Appendix O p0-12). However, groundwater assessment is considered a crucial element of the environmental assessment to determine the likely risk of subsidence impacts on upland swamps, as per recommendations made by the PAC (2009). DECCW strongly recommends that perched groundwater monitoring within the swamps be undertaken prior to undermining all swamps at risk of negative environmental consequences and during and post mining. The draft DECCW Upland Swamp Environmental Assessment Guidelines will provide further advice on groundwater monitoring in swamps.***

Page O-12 of Appendix O of the EA states:

> *In recognition of the limitations of the groundwater model, piezometer monitoring would be conducted in a selection of swamps should the Project be approved to confirm the location of swamps in relation to the regional groundwater table.*

An assessment of potential impacts on upland swamps (i.e. perched groundwater systems) was undertaken as part of the Upland Swamp Risk Assessment (Appendix O of the EA). This assessment was undertaken in accordance with the recommendations of the Metropolitan PAC Report (PAC, 2009), which identified three broad mechanisms by which subsidence could cause changes in swamp hydrology (pp 78-79):

1. *The bedrock below the swamp cracks as a consequence of tensile strains and water drains into the fracture zone. If the fracture zone is large enough or connected to a source of escape (e.g. a deeper aquifer or bedding shear pathway to an open hillside) then it is possible for sufficient water to drain to alter the hydrologic balance of the swamp.*
2. *Tilting of sufficient magnitude occurs to either re-concentrate runoff leading to scour and erosion, potentially allowing water to escape from the swamp margins (possibly affecting the whole swamp) or to alter water distribution in parts of the swamp, thus favouring some flora species associations over others.*
3. *Buckling and bedding shear enhances fracture connectivity in the host bedrock which promotes vertical then lateral drainage of the swamp. This mechanism is similar to redirected surface flow observed in subsidence-upsidence affected creek beds.*

The discussion of potential groundwater impacts on swamps within the Groundwater Assessment is consistent with the Metropolitan PAC Report. As described in Section 6.5.1.3 of Appendix B of the EA, there is expected to be no loss of water to depth but bed separation and tensile cracking still has the potential to occur:

> *The substantial depth of cover and the presence of a thick aquitard protect the shallow aquifers in the Hawkesbury Sandstone, which are in connection with streams and ecosystems, from transmitted effects due to reduction in groundwater pressures. Based on the analysis of the conceptual groundwater system, and modelling results, there is no expected dewatering of swamps from depressurisation at depth…*
>
> *As the free-draining fractured zone that is to be expected above a goaf zone does not extend as high as the Bald Hill Claystone, the perched water in upland swamps would not be impacted directly by vertically connected cracking. The only possibilities for impact are through bed separation or superficial tensile cracking associated with a moving subsidence trough, and that is likely to be transitory or localised.*
>
> *Very little drainage of water due to bed separation or superficial tensile cracking is expected from the perched water table in a swamp to the regional water table in the underlying sandstone, as the sandstone bedrock is massive in structure and permeability decreases with depth. Surface cracking that may occur would be superficial in nature (i.e. would be relatively shallow) and would terminate within the unsaturated part of the low permeability sandstone (MSEC, 2009). Due to the very low hydraulic gradient of the water table within a swamp, lateral movement of water through the swamp towards a crack would be very small and very slow.* [emphasis added]

Evidence supporting this position is described Section 6.5.1.3 of Appendix B of the EA:

> *…In addition, a preliminary study conducted by the SCA on the effects of borefield extraction under a swamp "clearly show no interaction between the water levels in Butler's Swamp and the water being extracted from the sandstone aquifer" (SCA, 2007). This supports the argument that the regional aquifer is hydraulically disconnected from perched water in the upland swamps.*

As also discussed in Section 2.12.2 of Appendix B of the EA:

> *Similarly, long-term pumping trials beneath Stockyard Swamp (Figure 17) and Butlers Swamp (Figure 18) at the planned Kangaloon Borefield near Robertson (about 40 km south-west) show no response in swamp perched water levels when the Hawkesbury Sandstone aquifer is depressurized (KBR, 2008). This illustrates the potential for hydraulic isolation of aquifers within the stratigraphic section when a deeper formation is depressurised.*

As described in Table O-7 of Appendix O of the EA:

- *Initially (i.e. prior to the preparation of the Risk Management Plan), piezometers would be installed within a representative sample of the swamps to obtain baseline data on the local and regional groundwater systems. The swamps proposed to be monitored are:*
  - *swamp CT2-S1a (at real risk of mechanisms 1 and 2);*
  - *swamps CT2-S4, CT2-S6 and STC-S13, (at real risk of mechanisms 1 and 3);*
  - *swamps CRE-S3b, CT1-S2, CT1-S4, CT1-S5, CT2-S7, STC-S24, STC-S34 and STC-S36 (at real risk of mechanisms 1, 2 and 3); and*
  - *a selection of the remaining swamps at risk of mechanism 1.*
- *Piezometer monitoring would include shallow piezometer installations for the monitoring of groundwater levels/pressures within upland swamps. Water level measurements would be automated with daily or more frequent recording.*
- *Piezometer monitoring would also include a selection of deep piezometer installations for the monitoring of pore pressures within the natural rock strata. Pore pressure measurements would be automated with daily or more frequent recording.*
- *The need for piezometer monitoring in the remainder of the swamps considered to be at real risk of negative environmental consequences would be reviewed based on the outcomes of the fracture zone height analysis and piezometer monitoring described above.*

The draft DECCW Upland Swamp Environmental Assessment Guidelines are not yet publically available.

DECCW (16 December 2009) states the following:

> ***DECCW has also identified a discrepancy between Table D.O2 of Appendix A, and Table OB of Appendix O. DECCW understands that the Hogging Curvature >0.033 (Table D.O2) is equivalent to a Tensile Strain of 0.5 mm/m (Table OB), used as an indicator and threshold by ICHPL for likelihood of impact in the EA. If the figure of hogging curvature > 0.033 is used as the threshold above which subsidence impacts could be potentially occur from tensile strains, then 96 are related to this figure in Table D.02 compared to 89 swamps related to > 0.5 mm/m in Table OB.***

The maximum predicted total hogging curvature for each swamp provided in Table D.02 of Appendix A of the EA and in Attachment OB of Appendix O of the EA are consistent. The estimated average tensile strains provided in Attachment OB of Appendix O of the EA have been derived based on the curvature relationship for the hogging curvatures.

The data in Table D.02 of Appendix A and Attachment OB of Appendix O of the EA show that the same 98 swamps have a hogging curvature greater than 0.0333/km and a tensile strain greater than 0.5 mm/m, not 96 and 89 swamps, respectively, as DECCW suggest.

DECCW (16 December 2009) states the following:

> ***DECCW also re-ran the risk assessment to determine 'significant negative environmental impact' based on swamps likely to experience the following combined subsidence predictions:***
>
> ***> 2 mm/m predicted incremental compressive strain due to valley closure***
> ***> 60 mm upsidence (the level measured at Waratah Rivulet rockbar WRS3 leading to severe fracturing of the bedrock)***
> ***> 0.5 mm/m systematic tensile strain.***
>
> ***…***
>
> ***It is clear that the DECCW's and ICHPL's assessment of the likely number of swamps at risk of subsidence impacts vary greatly. While it is recognised that the thresholds used by the DECCW to determine the likelihood of negative environmental impact may be conservative, they are based on industry expert data, namely the consultant used by ICHPL and the NSW Government, although the studies were undertaken in the Southern Coalfield more broadly. The difference in assessment may also be explained by DECCW not applying a combination of other effects that ICHPL may have used…***
>
> ***…***
>
> ***The disparity between DECCW's and ICHPL's risk assessment requires further investigation and discussion. Even if upsidence and valley closure were the only considerations, as per the PAC's recommended focus, DECCW's calculations are that this represents 78 swamps compared to ICHPL's 55…***

The assessment of potential impacts on upland swamps (Appendix O of the EA) was undertaken in accordance with the recommendations of the Metropolitan PAC Report (PAC, 2009), which identified three broad mechanisms by which subsidence could cause changes in swamp hydrology. The first two are caused by conventional subsidence and the third is caused by non-conventional subsidence (i.e. valley closure and upsidence) (pp 79-79):

1. *The bedrock below the swamp cracks as a consequence of tensile strains and water drains into the fracture zone. If the fracture zone is large enough or connected to a source of escape (e.g. a deeper aquifer or bedding shear pathway to an open hillside) then it is possible for sufficient water to drain to alter the hydrologic balance of the swamp.*
2. *Tilting of sufficient magnitude occurs to either re-concentrate runoff leading to scour and erosion, potentially allowing water to escape from the swamp margins (possibly affecting the whole swamp) or to alter water distribution in parts of the swamp, thus favouring some flora species associations over others.*
3. *Buckling and bedding shear enhances fracture connectivity in the host bedrock which promotes vertical then lateral drainage of the swamp. This mechanism is similar to redirected surface flow observed in subsidence-upsidence affected creek beds.*

DECCW (16 December 2009) presents no comparison or justification of how their presented risk assessment approach is consistent with the recommendations of the Metropolitan PAC Report (PAC, 2009).

As described by MSEC (Appendix A of the EA) strain is affected by many factors, including ground curvature and horizontal movement, as well as local variations in the near surface geology, the locations of pre-existing natural joints at bedrock, and the depth of bedrock. As a result it is considered more relevant to base the assessment of potential non-conventional subsidence movements on valley closure not closure strain.

In regard to potential valley closure impacts, the Metropolitan PAC Report states (pg 119):

> *…the Panel considers negligible consequence for a watercourse to mean no diversion of flow, no change in the natural drainage behaviour of pools, and minimal iron staining, and is assumed to be achieved in circumstances where predicted valley closure is less than 200mm.*

The use of the 200 mm valley closure threshold is considered to be consistent with the third mechanism identified by PAC (2009), which recognises that this mechanism is similar to redirected surface flow observed in valley closure affected creek beds.

The focus on valley closure rather than upsidence in the Upland Swamp Risk Assessment is also supported by the Southern Coalfield Panel Report (DoP, 2008) which states (pg 24):

> *…It should be noted that the level of scatter for measured upsidence as a percentage of the predicted value is greater than for valley closure, indicating that the prediction of upsidence is less reliable. Because of the problems with measuring upsidence, and hence difficulty with validating upsidence prediction, the Panel considers it more appropriate for the industry to focus prediction of valley effects on valley closure, rather than on upsidence. Further, industry should use an upper bound, or conservative, approach in predicting valley closure.*

The use of the level of upsidence measured at the Waratah Rivulet rockbar WRS3 is not valid or representative of potential impact on swamps. This is supported by the Southern Coalfield Panel Report (DoP, 2008) which states (pg 68):

> *The most detailed information available relating to the impacts of upsidence has been collected from two rock bars on the Waratah Rivulet identified as WRS 1 and WRS 3 (Galvin, 2005)…Because upsidence impacts are very site specific, behaviour at Waratah Rivulet cannot be assumed to be representative of all sites…*

The consideration of systematic tensile strain in isolation by DECCW (16 December 2009) is also not consistent with the mechanisms identified by PAC (2009). As described above, the first mechanism identified by PAC (2009) requires high tensile strains in combination with a source of escape for water within the swamp.

The Upland Swamp Risk Assessment includes consideration of a theoretical height of a fracture zone as defined by MSEC (2009), which is the theoretical height which *in situ* material may sag downwards and may potentially consequently suffer bending, fracturing, joint opening and bed separation. Within this zone, joint opening and bed separation may potentially form a source of escape from a perched aquifer (e.g. through a bedding shear pathway to an open hillside), which is consistent with PAC (2009). The theoretical height of this zone was conservatively predicted to be up to 385 m, but does not represent an increase in vertical permeability or potential for connective cracking from the surface to the mine (Section O6.5.1 of Appendix O of the EA).

Conservatively, all swamps with a depth of cover less than 385 m (i.e. with a potential to experience bending, fracturing, joint opening and bed separation) were assessed in the Upland Swamp Risk Assessment (Appendix O of the EA) as at risk of negative environmental consequences, regardless of the predicted level of tensile strain.

DECCW (16 December 2009) states the following:

> ***…ICHPL has used only one subsidence reference point per swamp (one point of reference might be acceptable for very small swamps but is not considered acceptable for large swamps) based on 'average' stress and this may lead to an underestimation of the likely risk to swamps.***

As described in Section O6.3 of Appendix O of the EA, the following subsidence predictions are provided for each swamp and are used in the assessment of potential impacts:

- *Total Maximum Subsidence (mm).*
- *Total Maximum Tilt (millimetres per metre [mm/m]).*
- *Total Maximum Curvatures (1/km).*
- *Estimated Tensile and Compressive Strains (based on a relationship of 15 times curvature).*

…

- *Maximum Predicted Upsidence (mm).*
- *Maximum Predicted Closure (mm).*
- *Maximum Observed Closure Strains (mm/m).*

The maximum subsidence predictions presented are based on the maximum subsidence effect predicted anywhere within the swamp, and therefore basing the impact assessment on these maximum subsidence effects is considered conservative.

ICHPL has not used only one subsidence reference point per swamp. Attachment OC of Appendix O of the EA provides long-sections of subsidence, tilt, grade, upsidence and closure along swamps as well as plan views of swamps showing the predicted spatial changes in topography across swamps.

DECCW (16 December 2009) states the following:

> ***Clarification is required from ICHPL regarding:***
>
> ***…***
>
> ***why 'Maximum Predicted Closure' has been used instead of 'Maximum Observed Closure Strain' and the use of the word 'observed' given it is assumed they are predictions not 'actual' strains***

As described above, the use of maximum predicted closure for assessing potential impacts on swamps is considered to be consistent with the Metropolitan PAC Report (PAC, 2009).

As described in Section 4.6.4 of Appendix A and Section O6.3 of Appendix O of the EA, 'maximum observed closure strains' (mm/m) are reported for swamps and are based on the maximum observed closure strain measured through monitoring for different equivalent valley heights (see Figure 4.20 of Appendix A of the EA).

DECCW (16 December 2009) states the following:

> ***ICHPL's identification of no swamps of 'special significance' status is highly questionable, particularly given that only a fraction of the total number of swamps in the project area were inspected or surveyed. This is a particularly significant omission given that the PAC (2009), as part of the upland swamp risk assessment approach (Section 9.4.1), recommended that all swamps in a project area should be identified, have their vegetation mapped and fauna surveyed to contribute to the identification of 'special significance'.***
>
> ***…***
>
> ***As noted, the application of the test of 'special significance for swamps as done for this EA was limited. DECCW believes that the identification of swamps of special significance needs to be based on science and data. DECCW is drafting draft Upland Swamp Environmental Assessment Guidelines to assist both the underground mining industry and the Government to further understand subsidence impacts on upland swamps in the Southern and Western coalfields. This guidance will assist with the principles of environmental protection, the assessment and monitoring of subsidence impacts on swamps and how to determine the 'special significance' status of swamps.***

In relation to 'special significance' the Metropolitan PAC Report provides the following (page 42):

> *'Special Significance Status' is based on an assessment of a natural feature that determines the feature to be so special that it warrants a level of consideration (and possibly protection) well beyond that accorded to others of its kind. It may be based on a rigorous assessment of scientific importance, archaeological and cultural importance, uniqueness, meeting a statutory threshold or some other identifiable value or combination of values.*

The Metropolitan PAC Report also recognises that in the absence of quantifiable measures and an objective threshold, conclusions about 'special significance' would be subjective (pp 75-76):

> *Upland swamps occur extensively in the Southern Coalfield and in the Project Area. The issue of 'significance' of these swamps is a vexed one. The SCI report lamented that there was a lack of guidance for Proponents on how to determine the relative significance and value of natural features where multiple examples exist within a Project Area or region. It suggested that there should be clear delineation of the priorities of both Government and the community for the protection and values of such features.*
>
> *It would certainly make it much easier for Proponents and governments to have a checklist of natural features, a value for conservation of each and then a regional scale of relative significance for each of these natural features against which the individual examples in the Project Area could be rated. However, the attainability of this is questionable.*
>
> *…*
>
> *The current position on availability of information on the conservation significance of upland swamps can be summarized as: qualitative information should be available in relation to conservation purpose, there is probably no reliable information on the proportion of swamps to be conserved, and there should be qualitative information available for 'special significance', but its interpretation will involve a substantial level of subjectivity.*
>
> *…*
>
> *The Panel notes that the task at this point is to determine significance of the natural feature and that it is only one component of the decisions concerning protection levels and the strategies to achieve them. In that context the Panel would make two observations:*
>
> *i) that 'prima facie worthy of protection' does not mean 'to be preserved at all costs'; and*
>
> *ii) that who determines the special significance threshold and where it is set could have substantial implications for mining in the Southern Coalfield, particularly if a finding of special significance translated in practice to an automatic rejection of mining in the vicinity of the swamp(s). Given the number of swamps in the Southern Coalfield and their distribution, generous interpretation of special significance could effectively see mining cease.*

As stated in Section 9.4.1 of the Metropolitan PAC Report (PAC, 2009) (pg 79):

> *If flora surveys are to be used as a basis for classifying upland swamps as either headwater or valley infill then the surveys must be adequate for this purpose. The vegetation associations found predominantly in valley infill swamps must be identified separately and the sampling intensity must be sufficient to ensure that the presence of these associations is detected. A stratified sampling approach may be required for swamps that have sections in more dissected terrain where valley infill characteristics might be encountered.*

The EA does not use the results of vegetation surveys to classify upland swamps as either headwater or valley infill swamps. This classification is not used in the Upland Swamp Risk Assessment (Appendix O of the EA).

The draft DECCW Upland Swamp Environmental Assessment Guidelines are not yet publically available.

The Metropolitan PAC Report (PAC, 2009) concluded the following with respect to information available on the special significance of swamps within the Metropolitan Coal Project area (pp 77-78):

> *Substantial material was available to the Panel on the issue of the significance of the Project Area swamps. This included the SCI Report, the EA, the submission and presentation by DECC, the supplementary submission and presentation by DECC, supplementary submission by the Proponent in response, submission and supplementary submission by Dr Ann Young, and oral examination of various experts.*

The EA for the Project provides substantially more information on swamps within the Project area than the information available for the Metropolitan PAC.

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

DECCW (16 December 2009) states the following:

> ***ICHPL considered the Giant Dragonfly unlikely to occur in the project area and therefore did not carry out targeted survey* [sic] *for the species. DECCW considers that records from surveys associated with the Dendrobium coal mine (DoP 2008b) and records from swamps within Penrose State Forest and Wingecarribee Swamp (NPWS Atlas of NSW Wildlife) clearly flag the likely absence of this species in the project area…***

As stated in Section 6.7 of the Appendix D of the EA:

> *Four threatened aquatic biota listed in the schedules of the TSC Act, FM Act or EPBC Act are known or considered to potentially occur in streams within the Project area or immediate surrounds, namely, Macquarie perch (Macquaria australasica), Sydney hawk dragonfly (Austrocordulia leonardi), Adams Emerald Dragonfly (Archaeophya adamsi) and Giant Dragonfly (Petalura gigantea).*

The Giant Dragonfly has not been recorded in the Project area as part of previous surveys considered in the EA (Section 3 of Appendix D of the EA) or surveys conducted for the Aquatic Ecology Assessment (Appendix D of the EA).

Nonetheless, the species evaluations for the Giant Dragonfly included in Section 6.7 of the Aquatic Ecology Assessment (Appendix D of the EA) conservatively assumed the presence of this species within the Project area and assess the potential impacts on this species accordingly.

DECCW (16 December 2009) states the following:

> ***…the on-ground survey effort*** **[of swamps]** ***is considered to be very low. From the information provided it seems unlikely that the 55 swamps ICHPL identified at risk of negative impact were surveyed. As a minimum the swamps at risk should have detailed surveys. As a result, DECCW does not agree with the conclusions of the combined assessment, resulting from the limited on-ground surveys and desktop assessment undertaken by ICHPL.***

As described in Section O4 of Appendix O of the EA, some 20 swamps were subject to detailed inspection during the preparation of the EA by Illawarra Coal Holdings Pty Ltd (ICHPL) and 16 of these swamps, plus an additional two swamps, were also inspected by Gilbert & Associates and FloraSearch.

In addition to the above, a significant number of additional swamp inspections have been conducted following lodgement of the EA. The observations recorded during these site inspections will be provided separately to the Bulli Seam Operations PAC Panel.

The preparation of Upland Swamp Risk Management Plans (RMPs) (Section O7 of Appendix O of the EA) would include additional inspections and monitoring of swamps within the Project area.

DECCW (16 December 2009) states the following:

> ***The size of a swamp can be used as a surrogate indicator for a swamp's contribution to the water balance in a catchment (Balek and Perry 1973). For example, large swamps may contain a greater volume and depth of peaty sediments than small swamps, which is crucial to sustaining flows of high-quality water into streams that feed water storages (Keith et al. 2006, Young 1982). To quantify this contribution to water balance, it is necessary to quantify the flow contributions of swamps and thus their contribution to catchment yield per unit area during different times of year (for example rain events and drought) and measured in a gauging station. This quantification should not only focus on instantaneous runoff from swamps after large rainfall events, as done in the Bulli Seam EA, it should also include baseflow with instantaneous runoff when calculating the catchment yield that comes from a swamp.***
>
> ***…***
>
> ***The contention that the swamps are "relatively low yielding" in terms of water needs to be tested using a better methodology for assessing the real contribution of swamps to the water catchment balance. Baseflow should be included with instantaneous runoff when calculating the catchment yield that comes from a swamp.***
>
> ***…***
>
> ***In assessing the flow contribution of swamps, The Australian Water Balance Model (AWBM) was applied to gauging stations on O'Hares Creek at Cobbong (ceased recording 1987) and Wedderburn (current) and on Stokes Creek (ceased recording 1987). The C3 store in the AWBM model was used to simulate the effects of swamps in the catchment. Based on the gauging station data, the EA stated the results indicate that swamps contribute proportionally between half and a quarter as much to catchment yield, per unit area, as the catchment average and are therefore relatively low yielding (EA Appendix C). DECCW considers this model of contribution of swamps to catchment yield as being highly flawed since it puts much of the contribution of the swamps into baseflow, thereby severely underestimating the true 'yield' of swamps in the catchment. This AWBM model has also not been validated which is a significant concern when attempting to generalize the results to real world applications.***

Section 4 of Appendix C of the EA states:

> *Based on the gauging station data, the results indicate that swamps contribute proportionally between half and a quarter as much to catchment yield, per unit area, as the catchment average and are therefore relatively low yielding.*

This is consistent with basic hydrological principles. Swamps do not generate any water within themselves. Rather, they store rainfall runoff and groundwater in the soil matrix. Because swamps have relatively low gradients compared to other parts of the catchment and have dense vegetation growth, the evapotranspiration potential is high and the rate of runoff is comparatively low. Discussion of this characteristic of swamps is in no way an attempt to downplay the ecological or hydrological attributes of swamps. It was included in the EA for informative purposes following consultation with interested stakeholders.

Section 3.3 of Appendix C of the EA examined the overall contribution that upland swamps make to the water balance of a catchment using the Australian Water Balance Model (AWBM) for three gauged catchments within the Project area, *viz.* O'Hares Creek at Cobbong (upstream) and Wedderburn (downstream) and on Stokes Creek at the Dam Site.

The AWBM was used to examine the relative hydrological significance of swamps to catchment yield comprising total flow (i.e. combined surface runoff and baseflow) and was not used to quantify the contribution of swamps to baseflow alone. In addition, the model was not used to draw conclusions on the behaviour of swamps at different times of the year.

The AWBM used rainfall records from Darkes Forest (adjusted to allow for average rainfall reduction east of the coastal ridgeline) and calculated percentages of the catchment area comprising of swamp vegetation. The AWBM was calibrated against gauging station data from O'Hares Creek at Cobbong (GS213201), O'Hares Creek at Wedderburn (GS213200) and Stokes Creek at the Dam Site (GS213204).

The AWBM is a nationally-recognised catchment-scale water balance model that estimates streamflow from rainfall and evaporation. The structure of the AWBM is illustrated in Figure 94 of Appendix C of the EA:

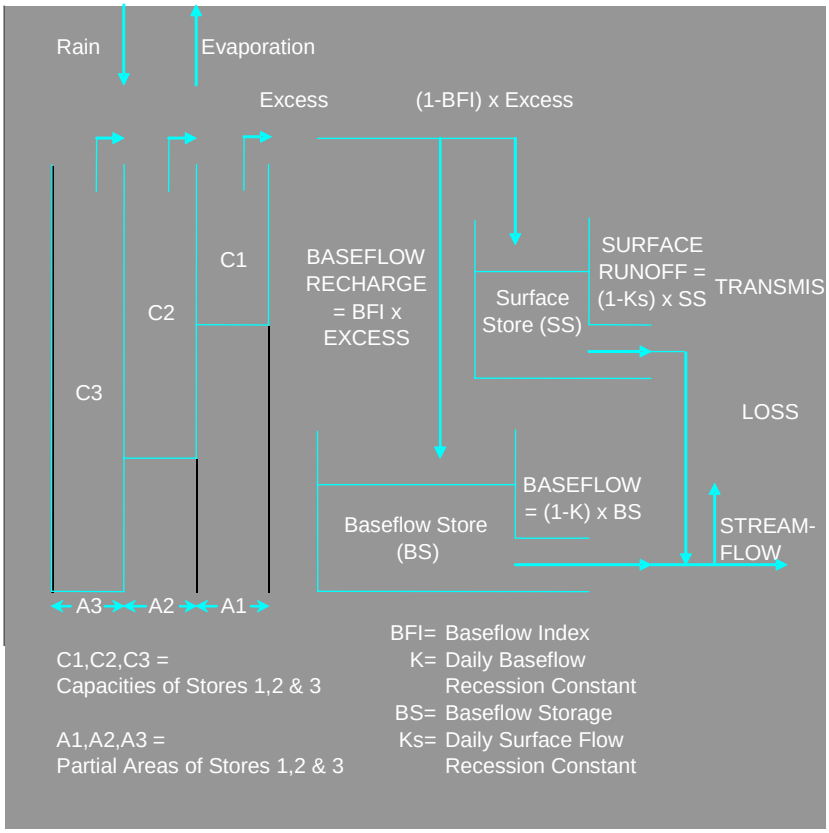

Figure 94 – AWBM Structure

DECCW's comments on the use of baseflow within the AWBM are unclear and appear inconsistent. 'Baseflow recharge' within the AWBM only occurs from the surface stores once they are filled (and spill), with a proportion reporting to the baseflow store of the catchment (in proportion to the baseflow index [BFI]) and the remainder reporting to streamflow (see figure above). The baseflow store of the catchment then slowly discharges with time. The calibration process used in the AWBM means that baseflow in the model incorporates all water which follows slow moving flow pathways in the catchment.

Within the AWBM, swamps (C3 store) only contribute significantly to direct runoff during large rainfall events. Flow contributions from swamps at other times correspond to baseflow in the model (from the baseflow store) which reflects the small slow drainage/baseflow contributions from swamps under these conditions.

The AWBM can not (and was not in the EA) extended to examine the significance of swamps to persistence of low flows, as opposed to overall flow contributions. The AWBM examines overall flow contributions over the whole year and does not examine relative changes in contributions at different times of the year.

However, the following key points can be drawn regarding the role of swamps within a catchment:

- The water balance of a swamp is more dominated by infiltration from incident rainfall and evapotranspiration compared to other parts of the catchment.
- Outflows comprising subsurface flow and surface flows from the outlets of swamps will contribute to the overall flow in a catchment.
- Swamps cannot generate water, but act as storages of water from incident rainfall within the catchment, sometimes slowly discharging baseflow from storage into the catchment.
- Direct runoff on swamps will be lower relative to other parts of the catchments due to the generally flatter topography and higher sub-surface soil moisture storage, resulting in a higher rate of infiltration.
- The movement of water out of a swamp will be slow relative to other parts of the catchment which respond rapidly to rainfall (e.g. sandstone escarpments).
- Evapotranspiration will be higher in swamps relative to other parts of the catchment due to the higher moisture availability in swamps (as a result of higher infiltration and slower movement of water) and the higher capacity of swamp vegetation to transpire the available water.
- As a result of the above (i.e. less direct runoff and higher evapotranspiration relative to other parts of the catchment), it can be concluded that the contribution of swamps to overall catchment yield would be lower relative to other parts of the catchment (e.g. sandstone escarpments).
- The above conclusions are supported by the AWBM which demonstrated that swamps contribute proportionally between half and a quarter as much to catchment yield per unit area over the year than the catchment average (Section 3.3 of Appendix C of the EA).

As described above, the model was calibrated against flow record data for three gauged catchments within the Project area and therefore is applicable to describing the overall catchment yield of swamps within the Project area.

As stated in Section 9.1.1 of Appendix C of the EA:

> *In areas where swamps would be undermined, baseline monitoring of a representative number of swamps should be conducted…In situations where surface outflows and the downstream end of the swamp are sufficiently concentrated to enable flow to be reliably measured, a low flow monitoring station (such as an instrumented V notch weir or flume) should be established.*

The monitoring of flows at the downstream end of the swamps within the Project area would be used to examine the range of hydrological behaviours in individual swamps. The baseline flow data would be used to calibrate a flow model for the swamps and examine flow behaviour prior to and following mining.

DECCW (16 December 2009) states the following:

> ***During consultation with DEWHA on these matters it has become evident to DECCW that a number of Woronora Plateau swamps may meet the definition of THPSS under the EPBC Act. DECCW urges ICHPL to contact DEWHA in relation to this significant issue.***

DECCW (16 December 2009) also states:

> ***The DECCW considers that clarification is need on whether swamps in the Bulli Seam project area are likely to meed the Commonwealth Government's definition of Temperate Highland Peat Swamps on Sandstone, an endangered ecological community.***
>
> ***…***
>
> ***The Commonwealth listing specifically identifies one of the two mapped upland swamp vegetation types from Tozer et al. (2006) found in the Woronora swamps (FRW p130) as part of THPSS. The other extensive vegetation type within the Woronora swamps is FRW p129. It is worth noting that the differences in floristic composition between FRW p129 and FRW p130 are subtle relative to the variation in floristics encompassed by the THPSS listing.***

The following response has been prepared by Dr Colin Bower (FloraSearch).

The swamps within the Project area do not represent the Temperate Highland Peat Swamps on Sandstone Endangered Ecological Community (EEC).

The *Approved Conservation Advice* for the Temperate Highland Peat Swamps on Sandstone EEC (DEWHA, 2008) describes the community as follows:

> *The Temperate Highland Peat Swamps on Sandstone ecological community comprises temporary or permanent swamps occurring on sandstone in the temperate highlands region in NSW (DEH, 2005) from around 600–1100 m above sea level. The wetter parts of the swamps are occupied by sphagnum bogs and fens, while sedge and shrub associations occur in the drier parts (TSSC, 2005). The level of waterlogging and amount of sedimentation are influenced by the location of the swamps: hanging swamps (occurring on steep valley sides) have low levels of sedimentation, and accumulate organic material slowly; valley swamps and those along watercourses have greater levels of sedimentation, and accumulate organic material more quickly (TSSC, 2005).*

The distribution of the EEC is defined in the *Approved Conservation Advice* (DEWHA, 2008) as:

> *Temperate Highland Peat Swamps on Sandstone are known from the Blue Mountains, Lithgow, Southern Highlands, and Bombala regions in NSW.*

The key features of the Temperate Highland Peat Swamps on Sandstone EEC from these definitions are:

1. An altitudinal range from 600 to 1100 m above sea level;
2. A distribution on the NSW Central and Southern Tablelands including the Blue Mountains, Lithgow, Southern Highlands and Bombala regions; and
3. The presence of sphagnum bogs.

Dr Colin Bower has provided the following advice regarding the potential for the THPSS EEC to occur in the Project Area:

- No swamps on the Woronora Plateau were included in the circumscription of the Temperate Highland Peat Swamps on Sandstone EEC by DEWHA in any of the documentation on the community including the very detailed community profile (DEWHA, 2009a), the Approved Conservation Advice (DEWHA, 2008) and the distribution map (DEWHA, 2009b). All coastal upland swamps on the Woronora Plateau occur below altitudes of 450 m, including all swamps in the Project area, and consequently fall outside the altitudinal range defined for the EEC. Nor does the Woronora Plateau as a whole occur within the geographical distribution defined for the EEC.
- Only the wetter swamps on the Woronora Plateau develop peat and these comprise the Cyperoid Heath and Tea Tree Thicket communities. However, if areas of these communities on the Woronora Plateau were to be included in the Temperate Highland Peat Swamps on Sandstone EEC, it would require a redefinition and renaming of the EEC. The altitudinal limits and distribution of the EEC would need to be redefined and in so doing the community would no longer be confined to the highlands.
- Comparison of the dominant flora species between Temperate Highland Peat Swamps on Sandstone EEC, as outlined in the DEWHA (2009) community profile, and Upland Swamps on the Woronora Plateau, as determined by numerous studies including Bangalay Botanical Surveys (2008), FloraSearch (Appendix E of the EA), Keith and Myerscough (1993), Keith *et al*. (2006), indicates there can be a high degree of floristic overlap between them, especially between the Woronora Plateau swamps and the highland swamps in the Blue Mountains. Despite this, there are also suites of species that occur only in either coastal upland swamps (e.g. Woronora Plateau) or highland swamps on the tablelands. A critical distinguishing feature of the Temperate Highland Peat Swamps on Sandstone EEC is the frequent and often dominant presence of sphagnum moss (*Sphagnum cristatum*) bogs, which are absent from coastal upland swamps. In addition, there are different suites of Tea-tree (*Leptospermum*) and Pea-flower (Faboideae) and *Grevillea* (Proteaceae) species, among others, in the highlands and coastal uplands.

Dr Colin Bower has concluded the above points effectively exclude peat swamps on the Woronora Plateau from the Temperate Highland Peat Swamps on Sandstone EEC.

DECCW (16 December 2009) states the following:

> ***The EA presents no assessment of the cumulative impact of its operations on swamps and therefore significantly downplays the environmental impact.***

Cumulative impacts on flora and fauna, including cumulative impacts on swamps, are discussed in Section 5.7 of Appendix E and Section 4.9 of Appendix F of the EA.

DECCW (16 December 2009) states the following:

> ***There is also overlap between the mining domains where the 600 metre risk management zones intersect between the north-eastern corner of Appin Area 2 & 3 and the south-western corner of the North Cliff domain (as demonstrated in the Appin Area 2 & 3 and North Cliff maps provided at Appendix I*** **[sic]*****). However, there is no discussion as to the potential cumulative impact on swamps that lay within this zone of 'double influence'.***

Subsidence predictions for swamps within 600 m of the edge of secondary extraction of both Appin Area 2 Extended and North Cliff include the cumulative subsidence effects from both domains.

The assessment of potential impacts to these swamps includes consideration of these cumulative subsidence predictions (as presented in Appendix O of the EA).

DECCW (16 December 2009) states the following:

> ***The socio-economic assessment (Appendix L p15) states that some 57 hectares of swamps could be affected and an impact value of $95 million over 30 years is assumed. However, DECCW disagrees with the method applied by ICHPL (Appendix L p24) to arrive at the figure of 57 hectares (57ha = proportion of 'swamp long section' with > 200mm closure"*** **[sic]** ***x "swamp area" x 50 per cent).***

As stated in Section 2.7.1 of the EA:

> *The proportion of swamp assumed impacted has been estimated based on the proportion of swamp long section predicted to experience >200 mm closure, multiplied by the area of swamp (ha), multiplied by a 50% factor to recognise that impacts are likely to be largely concentrated either side of and along the swamp invert/valley floor.*

This value is considered reasonable as:

- 200 mm of predicted valley closure has been shown to represent a level of subsidence movement where it is expected that flow diversion and pool water level impacts are unlikely to occur, and is viewed as an indicator of a low probability of flow diversion and pool water level impacts rather than an absolute threshold (Section 5 of Appendix C of the EA);
- impacts are only likely to occur for the portion of the swamp with greater than 200 mm valley closure; and
- as stated above, impacts are likely to be largely concentrated either side of and along the swamp invert/valley floor.

DECCW (16 December 2009) states the following:

> ***It should be noted however the use of the Choice Modelling value of $2 million dollars to estimate a value for environmental impact (loss) has been used inappropriately in this submission. That is, the Choice Modelling relates to the communities*** **[sic]** ***'Willingness to Pay to Avoid impacts' not their 'Willingness to Pay to Accept impacts'…***

The Choice Modelling study investigated community willingness to pay to avoid impacts of mining.

DECCW's reference to "willingness to pay to accept impacts" is unclear, however it could be reference to "willingness to accept compensation". There is extensive literature on this and willingness to accept compensation values can be higher than willingness to pay values. Willingness to pay (not willingness to accept compensation) is the accepted approach in non-market valuation (refer to Arrow *et al*., 1993; Mitchell and Carson, 1989).

DECCW (16 December 2009) states the following:

> ***ICHPL proposes a financial contribution of $250,000 toward research but provides no clear statement in regard to any offset and compensatory measures for impacts to upland swamps and streams…***

Table SOC-2 of the Statement of Commitments (Section 8 of the EA) outlines the research, offset and compensatory measures ICHPL commits to implementing throughout the Project life.

In addition to these measures, ICHPL would implement additional offset and compensatory measures if stream and swamp impact predictions are exceeded as outlined in Tables 5-2 and 5-3 of Section 5 of the EA.

DECCW (16 December 2009) states the following:

> ***…In addition to the legislative status, the assessment for NSW listed threatened species has been further refined by reference to the NSW BioBanking Assessment Methodology which describes statutory thresholds of the ability of a species to withstand loss of individuals in the Hawkesbury-Nepean CMA (DECC 2008a). This information is based on the best available knowledge for each species and has been derived through substantial expert input and peer review. It is recognised that BioBanking is a voluntary scheme, however what is advocated here is the use of part of the methodology (not necessarily the application of the entire scheme) to inform the 'special significance test' as the methodology is currently in use by the Government, provides a rule-based approach and is supported by comprehensive databases for a range of vegetation types and threatened species (DECC 2008b p1).***
>
> ***…***
>
> ***The statutory threshold special significance test (Table 1) identifies species for which upland swamps on the Woronora Plateau provide core habitat and the application of the assessment of conservation significance is based on the presence of EECs or threatened species. All species containing the EEC or species above the bold line in Table 1 are considered to be of 'special significance' and their ability to withstand loss is based on the NSW Government BioBanking methodology.***

As described above, the swamps within the Project area do not represent the Temperate Highland Peat Swamps on Sandstone EEC. Therefore DECCW's conclusion of 36 swamps of 'special significance' status on this basis is not valid.

The use of records of threatened species as proposed by DECCW (16 December 2009) is not considered appropriate, because all swamps within the Project area and across the Woronora Plateau can reasonably be expected to provide potential habitat for threatened species. Therefore, this is not a point of distinction indicating special significance. As stated in Section O4.4.5 of Appendix O of the EA:

> *…it is recognised that all swamps in the Project area provide potential habitat for a range of threatened flora and fauna species, as discussed in Section O4.4.6.*

Flora and fauna surveys were conducted for the Project and included representative sampling of swamp habitats (Section O4.4.2 of Appendix O of the EA).

The following vegetation communities and species listed by DECCW (16 December 2009) above the bold line in Table 1 were not recorded by the Project surveys:

- Temperate Highland Peat Swamps on Sandstone;
- Eastern Bristlebird;
- Green and Golden Bell Frog;

- Long-nosed Potoroo;
- *Acacia baueri*; and
- Giant Dragonfly.

DECC (2009) in its submission on the Metropolitan Coal Project provided a list of species considered to either depend on swamps for survival or have a stronghold in swamps. This list of species was considered in the EA when determining whether any swamps should be afforded 'special significance' status (Section O5.6 of Appendix O of the EA).

The following species listed by DECCW (16 December 2009) above the bold line in Table 1 were not listed previously as swamp specialist species in DECC's submission on the Metropolitan Coal Project (DECC, 2009):

- Green and Golden Bell Frog; and
- Long-nosed Potoroo.

In addition to the above, the Eastern Bristlebird and Long-nosed Potoroo (listed by DECCW [16 December 2009] above the bold line in Table 1) are not listed in the latest available BioBanking database (DECCW, 2010) as occurring within the Hawkesbury-Nepean Catchment Management Authority (CMA) sub-region.

The Giant Burrowing Frog and Littlejohn's Tree Frog were recorded by the Project surveys, but were not recorded within swamp habitat.

Two species listed by DECCW (16 December 2009) above the bold line in Table 1 were recorded within swamp habitat by the Project surveys:

- *Pultenaea aristata*; and
- Eastern Ground Parrot.

DECC (2009) lists *Pultenaea aristata* as a species with a stronghold in swamps and the Eastern Ground Parrot as a species considered dependent on swamps.

Attachment OD of Appendix O of the EA provides the following information regarding the presence of *Pultenaea aristata* within the Project area:

> *The Prickly Bush-pea (Pultenaea aristata) was found to be widely dispersed and locally common in the east of the study area (Appendix E of the EA). It occurs primarily on the margins of swamps in Restioid Heath (Community 1d), Fringing Eucalypt Woodland (Community 1f) and to a lesser extent in Banksia Thicket (Community 1d). It was also occasionally found in riparian habitats in upper catchments. It also occurs in heath and heathy woodland in the far north-east of North Cliff at high altitudes where rainfall is also higher. Pultenaea aristata is endemic to the Woronora Plateau in NSW, between Helensburgh and Mount Keira. The comprehensive targeted surveys for Pultenaea aristata conducted for the Project indicate the species is locally common and widely dispersed within the study area.*

Pultanaea aristata was also recorded in numerous swamps at the Metropolitan Colliery (FloraSearch and Western Research Institute, 2008).

The Eastern Ground Parrot was recorded during the Project surveys in two swamps within the Project area (Appendix O of the EA). The Eastern Ground Parrot was also recorded in two swamps nearby at the Metropolitan Colliery (FloraSearch and Western Research Institute, 2008).

The Metropolitan PAC Report (PAC, 2009) determined the following regarding the significance of swamps with the Metropolitan Coal Project area (including the two swamps with records of the Eastern Ground Parrot and the swamps containing *Pultenaea aristata*):

> *There is no convincing evidence before the Panel that identifies any individual swamp or group of swamps in the Project Area as being sufficiently unique or different so as to require identification as being of 'special significance' and thus requiring special consideration in a risk assessment framework.*

As concluded in Section O5.7 of Appendix O of the EA:

> *No individual swamp or group of swamps in the Project area are considered to be sufficiently unique or different so as to require identification of 'special significance' and thus requiring special consideration in a risk assessment framework.*

STREAMS

DECCW (16 December 2009) states the following:

> ***DECCW broadly considers that the following surrogate indicators can be used to identify stream with 'special significance status' in the project area:***
>
> - ***4th order and above streams on shale geology that have permanent flow***
> - ***3rd order and above streams on sandstone geology that have permanent flow***
> - ***1st and 2nd order streams associated with swamps as part of their headwaters (as an indicator of streams with permanence of flow) within the North Cliff and Appin extension areas 2 and 3.***

In relation to 'special significance' the Metropolitan PAC Report provides the following (page 42):

> *'Special Significance Status' is based on an assessment of a natural feature that determines the feature to be so special that it warrants a level of consideration (and possibly protection) well beyond that accorded to others of its kind. It may be based on a rigorous assessment of scientific importance, archaeological and cultural importance, uniqueness, meeting a statutory threshold or some other identifiable value or combination of values.*

Further, the Metropolitan PAC Report states (page 55):

> *In the current circumstances, the discussions as to significance and the appropriate protection to be afforded to a particular watercourse will come down to a case by case assessment of the values attributed to the watercourse, …*

As discussed above, the Metropolitan PAC Report also recognised that in the absence of quantifiable measures and an objective threshold, conclusions about 'special significance' would be subjective.

The EA determined that based on the Metropolitan PAC Report's description of special significance, the authorities may consider the Nepean River as a stream that warrants special significance status (Section P5 of Appendix P of the EA).

Notwithstanding the above, ICHPL has proposed stream impact minimisation for a number of streams within the Project area, as presented in Table 5-2 of the EA.

DECCW (16 December 2009) states the following:

> ***Apart from discussion on diversion of flows to the subsurface fracture network caused by subsidence/upsidence, the EA does not fully address the interconnection between groundwater and surface water systems and the potential effect mining will have on this connection.***

Section 5.2 of Appendix B of the EA describes the modelling results for simulated existing baseflow and predicted baseflow changes on a number of streams in the model area through the 30 year mining period and the subsequent 100 year recovery period. These streams included Cataract River, Cataract Reservoir, Georges River, Nepean River, O'Hares Creek, Woronora River and Woronora Reservoir.

The groundwater assessment predicts that the proposed underground mining operation would have a negligible impact on end of system stream yield (Appendix B of the EA).

As described in Section 6.1.5 of Appendix B of the EA:

> *The main role of groundwater in the shallow groundwater system of the Southern Coalfield is to provide baseflow to streams and to support ecosystem function. Longwall mining can have an effect on shallow groundwater flow paths, baseflow to streams, stream water quality, and riverine ecosystems. The effects are highly variable and site-specific.*
>
> *…*
>
> *Groundwater modelling suggests a negligible reduction in baseflow (Section 5.2). The maximum predicted reduction in groundwater baseflow over 30 years of mining operations is about 0.2 ML/day in Nepean River, which converts to 0.0002 ML/day/km^2 when the size of the catchment is taken into consideration. Hence, the impact is considered negligible.*

As described in Appendix C of the EA, longwall mining has the potential to affect a number of pools by reducing water level persistence during low flow periods. The mechanism for this is the creation of a fracture network beneath the bed of the creek as a result of the dilation effects of upsidence and shearing/compressive effects of valley closure movements. However, in regard to potential long-term changes to surface/groundwater interchange and associated low flows in significant streams, Section 5.2.1 of the EA states:

> *Stream impact minimisation criteria have been applied to a number of streams in the Project area. These criteria are summarised in Table 5-2 below.*
>
> *The EA Base Plan Longwalls have been designed to meet the stream impact minimisation criteria (Section 2.5.2).*

In addition to stream impacts minimisation criteria presented in Table 5-2 of the EA, management measures are presented that when implemented would return flow to pre-mining characteristics at all controlling rockbars in significant streams. Further, these management measures would also be applied to reaches of significant streams between controlling rockbars where technically feasible (e.g. where there was pre-mining flow).

As described in Section 5.2.1 of the EA:

> *ICHPL would prepare Stream Risk Management Plans (RMPs) for all of the streams identified in Appendix P that are situated within the extent of longwall mining area and within 600 m of the boundary of secondary extraction. The Stream RMPs would be included in future Extraction Plans for specific mining domains.*

The Stream RMPs would include consideration of stream baseflows and in particular surface/groundwater interchange of the individual stream to inform mine design to meet relevant performance criteria in any Project Approval and inform the establishment of rehabilitation success criteria.

DECCW (16 December 2009) states the following:

> ***DECCW considers there are significant concerns in the use of a rainfall runoff model that is only calibrated at a few sites in a few streams over the project area (because of the lack of river/stream gauges) and in the use of a model which has received little or no validation.***

Section 5.3 of Appendix C of the EA summarises the results of a detailed assessment of flow loss from the Waratah Rivulet catchment as part of the recent Metropolitan Coal Project Environmental Assessment (Helensburgh Coal Pty Ltd, 2008). The available data was assessed for evidence of flow loss by comparing overlapping periods of monitored flow in Waratah Rivulet downstream of historical longwall mining with contemporaneous flow records from adjacent but un-mined catchments using AWBM (Gilbert & Associates, 2008).

The AWBM model developed by Gilbert & Associates (2008) was peer reviewed by Dr Walter Boughton who stated (Attachment 3 of Helensburgh Coal Pty Ltd, 2008):

> *Gilbert & Associates calibrated the AWBM model on flows in Waratah Rivulet and O'Hares Creek. I developed the AWBM model in the early 1990s so I am familiar with its capabilities and methods of use. The model has been calibrated on hundreds of catchments in Australia and has been used in many rainfall-runoff modelling studies. The model is quite suitable for the modelling in the present study, and the calibrations by Gilbert & Associates have been properly made.*
>
> *The data available on Waratah Rivulet for the calibration is too short to calculate measures of calibration that are normally used when much longer periods of data are available. Instead, the plot in Figure 20 (Gilbert & Associates, 2008) showing recorded and modeled flows show substantial agreement, indicating that the calibration gives estimates of streamflow that are in close agreement with measured flows. I have examined the raw data used in preparing Figure 20 and can confirm that the figure gives a true indication of the results of modelling.*
>
> *The calibrated model was used to estimate inflows into Woronora Dam for the 31 years from 1977 to 2008. These estimates were compared with estimated of inflows derived from records of storage in the dam. The lack of information on water lost by unmeasured or poorly measured flows over the spillway of the dam creates uncertainty in the comparison, except for the most recent years of drought when there were no spillway losses. In this recent period, there is good agreement between the modeled inflows into the dam and inflows derived from fluctuations in reservoir levels. This is a more stringent test of the model calibration than the comparison of streamflows given the continuous streamflow data available for calibration.*
>
> *The calibrated values of parameters in the AWBM model for both Waratah Rivulet and O'Hares Creek (Table 10 of the Gilbert & Associates report) are consistent with calibrations on similar catchments in Australia. The average surface storage capacities shown in Table 10 are high by comparison with other Australian catchments but are consistent with the sandy nature of soils in the two catchments and the extensive "swamps" evident in maps of the catchment. I can see no evidence in the calibrations of the AWBM of any effect of underground mining on the streamflow in Waratah Rivulet.*

Section 3.2.4.2 of Appendix C of the EA included an assessment of the recorded flows in the Stokes Creek and O'Hares Creek catchments based on the following stream gauging data set:

Table 26 – O'Hares and Stokes Creek Gauging Station Catchments - Summary Details

Gauging Station	*Catchment Area (km^2)*	*Period of Record*		*Longest Period of Continuous Data (Days)*
		From	*To*	
GS213200 O'Hares Creek at Wedderburn	*73*	*1978*	*Present*	*1,647*
GS213201 O'Hares Creek at Cobbong	*42*	*1972*	*1987*	*1,516*
GS213204 Stokes Creek at Dam Site	*30*	*1971*	*1987*	*1,006*
GS213203 Stokes Creek at Four Mile	*13*	*1971*	*1978*	*320*

The assessment of streamflows in the Stokes Creek and O'Hares Creek catchments over the pre and post mining periods was undertaken by comparison of recorded flows using accepted statistical methods (Section 3.2.4.2 of Appendix C of the EA). This assessment did not involve the development of a rainfall-runoff model.

The assessment concluded (Section 3.2.4.2 of Appendix C of the EA):

> *Figure 90 shows the flow duration curves for Stokes and O'Hares Creeks for the period before longwall mining with an additional plot at GS213200 (Wedderburn) for the period post longwall mining in the catchment (after 1999).*
>
> *As can be seen from Figure 90, there is little real difference between the curves with, if anything, a slight increase in low flow duration at the downstream Wedderburn gauging station following mining. Any effects of longwall mining would be most likely seen in the behaviour of the flow duration curve – particularly in its low flow band.*

Section 3.2.4.2 of Appendix C of the EA states the following in regard to the applicability of the model to other streams within the Project area:

> *The flow characteristics of the other non-gauged tributary creeks are expected to be similar to Stokes Creek – i.e. with similar flow persistence and similar flow duration characteristics on a per catchment area basis.*

DECCW (16 December 2009) states the following:

> ***This species* [Adam's Emerald Dragonfly] *is not known from the project area but there is no reason to rule out its occurrence as survey effort has been limited and non-targeted (Theischinger pers comm).***

As stated in Section 6.7 of the Appendix D of the EA:

> *Four threatened aquatic biota listed in the schedules of the TSC Act, FM Act or EPBC Act are known or considered to potentially occur in streams within the Project area or immediate surrounds, namely, Macquarie perch (Macquaria australasica), Sydney hawk dragonfly (Austrocordulia leonardi), Adams Emerald Dragonfly (Archaeophya adamsi) and Giant Dragonfly (Petalura gigantea).*

Adam's Emerald Dragonfly has not been recorded in the Project area as part of previous surveys considered in the EA (Section 3 of Appendix D of the EA) or surveys conducted for the Aquatic Ecology Assessment (Appendix D of the EA).

Nonetheless, the species evaluations for the Adam's Emerald Dragonfly included in Section 6.7 of the Aquatic Ecology Assessment (Appendix D of the EA) conservatively assumes the presence of this species within the Project area and assess the potential impacts on this species accordingly.

DECCW (16 December 2009) states the following:

> ***This species* [Macquarie Perch] *was recorded during the surveys for the EA (particularly the Cataract catchment). This species is also known from a number of other streams in the area. Given the low level of survey effort for this species as part of the EA, the exact distribution of Macquarie Perch in rivers/streams over the project area cannot be ascertained and further targeted surveys are required to clarify its distribution in the area, or it should be assumed to occur in all suitable habitat.***

A significant number of aquatic surveys, monitoring reports and assessments have been undertaken across the Project area and surrounds over the past 20 years by the DPI-Fisheries, the DECC and on behalf of ICHPL (see Section 3 of Appendix D of the EA). The results of these investigations were reviewed as part of the Aquatic Ecology Assessment (Appendix D of the EA), including consideration of records and known distribution of threatened species such as the Macquarie Perch.

It is noted that Industry and Investment NSW (I&I NSW) (Fisheries Division) (15 December 2009) stated the following:

> *Consequently I&I NSW would expect a condition of approval for the following:*
>
> > *Continued monitoring of fish populations in Punchbowl, O'Hares Creek and the Georges River to determine the extent of the Macquarie Perch population and monitoring of the generation of iron floc and the potential for impacts on the breeding habitats of the Macquarie Perch population.*

ICHPL agrees with the above I&I NSW recommendation.

DECCW (16 December 2009) states the following:

> ***…ICHPL has not demonstrated adequately a variety of techniques that could be used such as detailed analysis of, for example, the use of narrower longwall panels and wider pillars to prevent negative environmental consequences.***

A detailed analysis of narrower longwall panels is provided in Section P7.3.2.1 of Appendix P of the EA, which relevantly concludes:

> *Gillespie Economics has undertaken an analysis of the relative costs and environmental benefits of narrowing the longwall panel void widths to 163 m. The analysis conducted by Gillespie Economics indicates that with the inclusion of the social community values estimated via the Choice Modelling Study, adjusting the mine parameters is not economically efficient and results in a net cost to society.*
>
> *Adopting the 163 m wide longwall panel voids would result in substantial cost and would still result in subsidence predicted to be greater than 200 mm closure. For example, MSEC in Appendix A of the EA compares the subsidence, upsidence and closure profiles obtained using the 163 m wide longwall panel voids against the subsidence, upsidence and closure profiles obtained for the base case mine layout for Dahlia Creek, Wallandoola Creek and Allens Creek. The analysis is shown in Figures P-1, P-2 and P-3, respectively.*

DECCW (16 December 2009) states the following:

> ***…ICHPL have not committed to remediation of the full length of the stream network likely to be affected by negative environmental consequences (bedrock fracturing and surface water diversion, draining of pools and decreased tributary inflows). This raises the question of exactly how much of the stream network over the area will actually be remediated and what this will mean for the long-term connectivity of the stream network in these areas.***
>
> ***…***
>
> ***The EA does not clearly identify which areas affected by the Bulli Seam Project will be remediated if fracturing occurs and which areas will not…***

Remediation commitments for streams are clearly outlined in Table 5-2 of the EA. For example, for third order streams where impact minimisation criteria have not been applied, Table 5-2 of the EA provides:

- *Implementation of stream remediation measures (i.e. grouting) on stream reaches of third order and above at controlling rockbars to return stream flow to pre-mining characteristics.*
- *Implementation of stream remediation measures on stream reaches of third order and above in stream reaches between controlling rockbars, where remediation measures are technically feasible (e.g. where there was pre-mining flow and the substrate is suitable for grouting).*

Table 5-2 of the EA also outlines contingency measures that would be implemented where remediation measures are not successful.

Attachment PG of Appendix P of the EA provides long-sections of valley closure predictions for streams within the Project area. When these long-sections are read in conjunction with the commitments provided in Table 5-2 of the EA, the remediation locations can be determined.

DHARAWAL STATE CONSERVATION AREA

DECCW (16 December 2009) states the following:

> ***Any new mining, mineral and onshore petroleum exploration and extraction within state conservation areas requires the concurrence of the Minister for the Environment.***
>
> ***Existing interests in the reserve include* [sic] *mining interests granted prior to the gazettal of the reserve are permissible in accordance with the Mining Act 1992 and the Petroleum (Onshore) Act 1991. New mining interests or the renewal or extension of any existing mining interests may be granted in Dharawal State Conservation Area with the concurrence of the Minister for the Environment. The state conservation area is reserved with no depth restriction.***

As stated in Section 7.5 of the EA:

> *As the Project includes state conservation area land* [Dharawal State Conservation Area]*, the consent of the Minister for the Environment is required in respect of the Project Application (see clause 8F of the EP&A Regulation).*

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Bulli Seam Operations
Response to NSW Office of Water
(Department Of Environment Climate Change and Water) Submission
16 November 2009

Each of the recommendations made by NSW Office of Water (NOW) (16 November 2009) (reproduced below in bold) are addressed below.

GENERAL

NOW (16 November 2009) states:

> ***Despite their variability and value for consumption use, the Project EA assesses all of these rivers in a similar manner, applying a generic single subsidence trigger (200 mm valley closure) across the project area. This approach neither recognises the variability of geomorphic condition between these rivers, nor the differing subsidence responses across the broad range of geomorphic river styles and geological conditions.***
>
> ***…***
>
> ***…The application of a single figure in considering valley closure impacts is inappropriate and should be review, based on empirical data from other subsided rivers, and physical models of strain and fracture response based on the strength and ductility of river basements, outcrop and shallow geological materials, and natural and man-made features such as rockbars and flow control weirs.***

Section 5 of Appendix C of the EA describes the basis of 200 millimetres (mm) valley closure as a reference value including:

> *MSEC (Appendix A of the EA) has developed a data base of pool and rockbar sites that have experienced mining induced upsidence and valley closure movements in the Southern Coalfield. MSEC (Appendix A of the EA) note that there have been no observed pool flow diversion and pool water level impacts observed where the predicted total valley closure was less than 200 mm. MSEC also note that there are numerous instances where pools have been subject to valley closure movements greater than, and sometimes substantially greater than, 200 mm without reports of streamflow diversion and pool level impacts.*
>
> *The 200 mm closure value has been adopted as a reference valley closure magnitude below which it is expected that flow diversion and pool water level impacts are unlikely to occur. The currently available database is however relatively small and the adoption of a 200 mm valley closure criteria is viewed as an indicator of a low probability of flow diversion and pool water level impacts rather than an absolute threshold.*

The use of an upper bound value for valley closure is consistent with the *Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield - Strategic Review* (herein described as the Southern Coalfield Panel Report) (NSW Department of Planning [DoP], 2008) (page 80):

> *Figure 38 shows two graphs of data prepared by the NSW subsidence consultant MSEC (or Mine Subsidence Engineering Consultants) using its database of actual and predicted upsidence and valley closure. These graphs show a reasonable degree of confidence in predicting upper bounds for both valley closure and upsidence. The graphs indicate that both observed upsidence and observed valley closure are generally conservative with respect to predictions by MSEC, and often are substantially less…Because of the problems with measuring upsidence, and hence difficulty with validating upsidence prediction, the Panel considers it more appropriate for the industry to focus prediction of valley effects on valley closure, rather than on upsidence. Further, industry should use an upper bound, or conservative, approach in predicting valley closure.*

The use of 200 mm valley closure as a reference value is consistent with the NSW Planning Assessment Commission's (PAC's) Metropolitan Coal Project Review Report (PAC, 2009) (herein described as the Metropolitan PAC Report) (page 119):

> *For the purposes of this review, the Panel considers negligible consequence for a watercourse to mean no diversion of flow, no change in the natural drainage behaviour of pools, and minimal iron staining, and is assumed to be achieved in circumstances where predicted valley closure is less than 200mm.*

The variability of geomorphic/geological and hydrological conditions associated with different riverine features that could be affected by subsidence movements is such that the development of any useful relationship for each of these scenarios would be probabilistically based and require a substantial local empirical data suite which is currently not available.

This reference value (200 mm valley closure) is based on data from Hawkesbury Sandstone systems and is considered more conservative in streams with geomorphic and geological conditions other than weathered sandstone (e.g. alluvial valleys in Wianamatta Group shale) as described in Section 5.2 of Appendix C of the EA:

> *The predominance of clay rich (cohesive) bed sediments in these watercourses means that subsidence induced cracks are more likely to self-seal over time when compared to streams bedded in the Hawkesbury Sandstone. As a result, there is unlikely to be any significant diversion of flow, with any localised diversion being of a temporary nature.*

This is also described in Section 5.2.8.2 of Appendix A of the EA:

> *Streams in the Wianamatta Shale areas contain relatively high sediment loads and this is often associated with increased nutrient run-off as well. In some sections of the streams these sediments may cover the sandstone bedrock and any fractures that occur within the bedrock during mining are unlikely to be visible. The sediments in the streams could also fill any mining-induced fractures that occur and reduce the rate of surface flow diversion. Longwalls at Appin and West Cliff Collieries have previously mined beneath stream beds in Wianamatta Shale. These include streams within the upstream catchments of Mallaty Creek, Rocky Ponds Creek, Simpsons Creek, Elladale Creek and Ousedale Creek. Longwalls at Tahmoor Colliery have previously mined beneath stream beds in Wianamatta Shale within the upstream catchments of Myrtle and Redbank Creeks. No surface cracking of sediments has been reported within these streams in Wianamatta Shale during mining. Where fluvial streams occur within the Wianamatta Shale areas and are not deeply incised into Hawkesbury Sandstone bedrock, the nature of the alluvium and shale substrates in these areas generally allow these sediments to be subject to subsidence movements without creating the interconnected dilation type of cracking that occurs in bedrock. Where the stream bed includes bands of Wianamatta Shale bedrock, interconnecting dilation through these bands could occur where sufficient valley closure movements result from subsidence. Where these streams are not deeply incised into the local topography it is likely that any valley closure movements would be reduced and not result in any cracking. In addition, the relatively high sediment loads in these streams could also fill any mining-induced cracking that did occur and further reduce the rate of any surface flow diversion if it were to occur. This is demonstrated by the many farm dams located within these Wianamatta Shale streams where no cracking has occurred and no loss of dam water has been reported during mining.* [emphasis added]

As described in Section 5 of Appendix C, the likelihood and level of potential impacts of subsidence on flow and water quality in overlying streams will depend on a number of specific site attributes, including scale, geology, geomorphic character and level of development. The assessments for individual watercourses in Appendix C include consideration of the above factors.

The in-stream pool scenario modelling (Section 5.4.1 of Appendix C of the EA) is used to indicate the range of flow effects that are expected based on size and depth of pools, frequency and persistence of flows, geological conditions and subsidence effects.

Appendix P (Stream Risk Assessment) of the EA included consideration of geomorphic river styles and geological conditions. In this regard, Section P4.2.3 of Appendix P of the EA states:

> *A geomorphic classification has been developed by Gilbert & Associates to characterise the geomorphic attributes of the streams. The classification scheme has been based loosely on the River Styles framework as described in the paper by Brierley et al. (2002) and is considered to be indicative only.*
>
> *The classification scheme is based on four groups of geomorphic attributes:*
>
> 1. *Valley type – confined, partially confined and alluvial.*
> 2. *Floodplain development – no floodplains, irregular floodplain and floodplain pockets less than 25% of stream fringed by floodplains; moderate floodplain development – between 25% and 75% of stream fringed by floodplains; high floodplain development – greater than 75% of stream fringed by floodplains.*
> 3. *Bed materials and mobility – bedrock comprising rock outcrop or boulderfield beds with no or minimal/infrequent mobile sediments in some sections; sand bed comprising cohesionless sandy sediments; cohesive bed comprising silty, sandy bed materials with significant cohesion and/or organic materials.*
> 4. *Physical features – pools and rockbars and chutes; cascades and waterfalls; boulderfields; pools and riffles in alluvial/mobile streams; uniform streams with no or insignificant pool development; swamps and/or chain of ponds wide shallow streams with significant in-stream vegetation and persistent swamps or wide shallow pools with ill defined channels.*
>
> *In applying the classification scheme to the stream reaches, the classification which is dominant over the full length of the stream reach has been selected.*
>
> *The geomorphic attributes of the stream reaches are classified in Attachment PB.*

NOW (16 November 2009) states:

> ***The EA does not provide adequate consideration of the water use dependence on the particular rivers, many of which have reached their limits for extractive use.***
>
> ***…***
>
> ***The EA does not consider the potential impact upon statutory water users either within the project area, or downstream reaches of the Nepean or Georges Rivers…***
>
> ***…***
>
> ***…The SWA [Surface Water Assessment] recognises statutory licence holders on the Nepean and Georges Rivers, but under-estimates the volumetric entitlements in the above rivers. NOW advises that Upper Nepean (to below Wallacia weir) and Georges Rivers support annual water account volumes to 26,080 Ml and 1,515 Ml respectively.***

Table 4 of Appendix C of the EA provides existing unregulated use volumes by purpose along Nepean River between Pheasants Nest Weir and Menangle Weir and the Georges River. These volumes were sourced from the DWE, *viz.*:

> *DWE (2009). "Stream Book – From Catchment 220000 Georges River, Stream Order 0 to 999999", April.*
>
> *DWE (2007). "Stream Book – From Catchment 252000 Nepean River, Stream Order 340 to 476", November.*

Potential water users are identified in Section 3.2 of Appendix C of the EA, including (Table 4, Section 3.2 of Appendix C of the EA):

Table 4 – Existing Unregulated Use Volumes by Purpose along Nepean River between Pheasants Nest Weir and Menangle Weir and the Georges River

Volume by Purpose	*Nepean River Unregulated Volume*	*Georges River Unregulated Volume*
Bank Revegetation	*-*	*6 ML*
Domestic	*6 ML*	*2 ML*
Farming	*10 ML*	*-*
Environment Rehabilitation	*-*	*5 ML*
Industrial	*98 ML*	*13 ML*
Industrial – Sand and Gravel	*26ML*	*-*
Irrigation	*3,792 ML*	*274 ML*
Recreation – Low Security	*-*	*4 ML*
Stock	*36 ML*	*12 ML*
Total (ML)	***3,968 ML***	***316 ML***
Total Irrigation Area (hectares)	***872.5 ha***	***84.5 ha***

Source: DWE (2007; 2009)

An analysis of stream gauging data from O'Hares Creek, Stokes Creek and Waratah Rivulet indicates that there is no evidence that there has been a material change to the yield of these catchments or loss of total stream flow as a result of mine subsidence effects (Section 5.3 of Appendix C of the EA).

As provided in Table 5-2 of the EA, there is expected to negligible diversion of water from Nepean River and Georges River (reach 2), and therefore there is expected to be negligible impact on water users from these rivers.

Section 5.6.3 of the EA describes the following mitigation measures for surface water users within the Bulli Seam Operations (the Project) area:

Riparian Use

Over the Project life, with the approval of the relevant landholders, ICHPL would:

- *Confirm, where the landholder consents, the location of stream pools that are used for stock watering and domestic supply and report these details in relevant Extraction Plans.*
- *Develop a comprehensive surface water monitoring programme to measure the actual subsidence effects of the Project (including triggers for investigation) on these sources of riparian water supply.*
- *If, in the event surface water monitoring and investigation determines that an adverse Project-induced effect on the yield from pools is occurring, implement appropriate contingency measures, for the period during which such effects continue (determined in consultation with the affected landholder), which could include:*
  - *provision of an alternative water supply, the nature of which would depend on the location of the affected landholder and the availability of nearby sources; or*
  - *if the above measures cannot be implemented, provision of compensation to the affected landholder for any loss of water supply arising from Project-induced effects.*

The contingency measures provided above would be aimed at maintaining the landholder's water supply to a standard consistent with that prior to Project related subsidence impacts.

Management measures for farm dams are further provided in Section 5.4.5 of the EA:

> *As a component of future Extraction Plans, rural buildings (e.g. sheds, garages), tanks and farm dams in the vicinity of the Project longwalls would be inspected prior to mining to assess their existing condition and to identify whether any management measures may be required.*
>
> *Visual monitoring of rural buildings, tanks and farm dams would be undertaken during the extraction of nearby longwalls, with any damage remediated as required to maintain the safety and serviceability of the structures.*

As recognised by NOW (16 December 2009) the annual water account volumes of 26,080 megalitres (ML) and 1,515 ML for Upper Nepean (to below Wallacia weir) and Georges Rivers, respectively, were not published at the time of completion of the EA. It should also be noted that the Draft *Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2010* and the Draft *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2010* are yet to be published. Notwithstanding, these annual water account volumes do not change the outcomes of the impact assessment referred to above.

NOW (16 November 2009) states:

> ***NOW does not accept the claim that riverine fracturing is proven to result in nil short or long term impacts on lower flow on rivers within, or downstream of, the project area. Further, there is concern for the adequacy of the Waratah Rivulet modelling approach, and the limited dataset upon which claims are made in two rivers in the project area (Stokes, O'Hares and Georges Rivers) that underpins the modelling work undertaken for the EA.***

The Southern Coalfield Panel Report (DoP, 2008) and the Metropolitan PAC Report (PAC, 2009) examined this issue and made recommendations regarding further investigations into the potential for mine subsidence effects to lead to catchment yield losses. The Metropolitan PAC Report (PAC, 2009) concluded that it is not beyond doubt, however:

> *… the local and regional groundwater conditions coupled with the mine parameters, would suggest that the likelihood of water being lost from the surface water system as a consequence of mining, and then by-passing Woronora Reservoir, is very low. This conclusion accords with the findings of the Southern Coalfield Inquiry, viz:*
>
> > *No evidence was presented to the Panel to support the view that subsidence impacts on rivers and significant streams, valley infill or headwater swamps, or shallow or deep aquifers have resulted in any measurable reduction in runoff to the water supply system operated by the Sydney Catchment Authority or to otherwise represent a threat to the water supply of Sydney or the Illawarra region.*[37]

Section 3.2.4.2 of Appendix C of the EA included an assessment of the recorded flows in the Stokes Creek and O'Hares Creek catchments based on the following stream gauging data set:

Table 26 – O'Hares and Stokes Creek Gauging Station Catchments - Summary Details

Gauging Station	*Catchment Area (km^2)*	*Period of Record*		*Longest Period of Continuous Data (Days)*
		From	*To*	
GS213200 O'Hares Creek at Wedderburn	*73*	*1978*	*Present*	*1,647*
GS213201 O'Hares Creek at Cobbong	*42*	*1972*	*1987*	*1,516*
GS213204 Stokes Creek at Dam Site	*30*	*1971*	*1987*	*1,006*
GS213203 Stokes Creek at Four Mile	*13*	*1971*	*1978*	*320*

The assessment concluded (Section 3.2.4.2 of Appendix C of the EA):

> *Figure 90 shows the flow duration curves for Stokes and O'Hares Creeks for the period before longwall mining with an additional plot at GS213200 (Wedderburn) for the period post longwall mining in the catchment (after 1999).*
>
> *As can be seen from Figure 90, there is little real difference between the curves with, if anything, a slight increase in low flow duration at the downstream Wedderburn gauging station following mining. Any effects of longwall mining would be most likely seen in the behaviour of the flow duration curve – particularly in its low flow band.*

The Surface Water Assessment (Appendix C of the EA) concluded the following regarding catchment flow loss (Section 5.3):

> *The assessment of recorded flow in the Stokes Creek and O'Hares Creek catchments over the pre and post mining periods indicates that there is no evidence that there has been a material change to the yield of these catchments which would suggest a loss of flow – refer Section 3.2.4.2.*

NOW (16 November 2009) states:

> ***The EA is unclear as to how significant low flows depend on groundwater inflows on any rivers in the proposal area (i.e. gaining vs. losing river systems). This information is necessary to enable adequate groundwater impact assessment for such an extensive proposal. The scale of the Project area, the applied groundwater modelling and the coarse scale of the groundwater impact assessment, diminishes the ability to adequately assess the potential subsidence impacts to water sources which may be caused by the proposal.***
>
> ***…***
>
> ***…NOW considers the groundwater impact assessment does not answer very significant questions relating to the long term changes in surface/groundwater interchange and the consequential impacts on river flows, especially in the low to critical base flow ranges in rivers within the project area.***

Section 5.2 of Appendix B of the EA describes the modelling results for simulated existing baseflow and predicted baseflow changes on a number of streams in the model area through the 30 year mining period and the subsequent 100 year recovery period. These streams included Cataract River, Cataract Reservoir, Georges River, Nepean River, O'Hares Creek, Woronora River and Woronora Reservoir.

The groundwater assessment predicts that the proposed underground mining operation would have a negligible impact on end of system stream yield (Appendix B of the EA).

As described in Section 6.1.5 of Appendix B of the EA:

> *The main role of groundwater in the shallow groundwater system of the Southern Coalfield is to provide baseflow to streams and to support ecosystem function. Longwall mining can have an effect on shallow groundwater flow paths, baseflow to streams, stream water quality, and riverine ecosystems. The effects are highly variable and site-specific.*
>
> *…*
>
> *Groundwater modelling suggests a negligible reduction in baseflow (Section 5.2). The maximum predicted reduction in groundwater baseflow over 30 years of mining operations is about 0.2 ML/day in Nepean River, which converts to 0.0002 ML/day/km^2 when the size of the catchment is taken into consideration. Hence, the impact is considered negligible.*

As described in Appendix C of the EA, longwall mining has the potential to affect a number of pools by reducing water level persistence during low flow periods. The mechanism for this is the creation of a fracture network beneath the bed of the creek as a result of the dilation effects of upsidence and shearing/compressive effects of valley closure movements. However, in regard to potential long-term changes to surface/groundwater interchange and associated low flows in significant streams, Section 5.2.1 of the EA states:

> *Stream impact minimisation criteria have been applied to a number of streams in the Project area. These criteria are summarised in Table 5-2 below.*
>
> *The EA Base Plan Longwalls have been designed to meet the stream impact minimisation criteria (Section 2.5.2).*

In addition to stream impacts minimisation criteria presented in Table 5-2 of the EA, management measures are presented that when implemented would return flow to pre-mining characteristics at all controlling rockbars in significant streams. Further, these management measures would also be applied to reaches of significant streams between controlling rockbars where technically feasible (e.g. where there was pre-mining flow).

As described in Section 5.2.1 of the EA:

> *ICHPL would prepare Stream Risk Management Plans (RMPs) for all of the streams identified in Appendix P that are situated within the extent of longwall mining area and within 600 m of the boundary of secondary extraction. The Stream RMPs would be included in future Extraction Plans for specific mining domains.*

The Stream Risk Management Plans (RMPs) would include consideration of stream baseflows in particular surface/groundwater interchange of the individual stream to inform mine design to meet relevant performance criteria in any Project Approval and inform the establishment of rehabilitation success criteria.

NOW (16 November 2009) states:

> ***NOW notes an alternative mine plan described in Appendix A – Subsidence Assessment; NOW considers that the consideration of alternate mine plans, including precautionary and adaptive mine plan layouts should have been presented in the EA, to reflect the importance of water supply and subsidence response in varying river styles and geological settings.***

As stated in Section 5.2.1 of the EA:

> *The EA Base Plan Longwalls have been designed to meet the stream impact minimisation criteria (Section 2.5.2). It should be noted that it is possible to adjust the EA Base Plan Longwalls and meet the same criteria. For example:*
>
> - *where longwalls are on both sides of the stream, longwalls can be extracted closer to one side of the stream if longwalls on the other side of the stream are set further back;*
> - *one or more longwalls can be extracted closer to a stream if other longwalls on the same side of the stream are set further back; or*
> - *it is generally the case that longwalls which approach a stream by their ends (perpendicular) rather than by their sides (parallel) result in reduced levels of subsidence movement at the stream, therefore, if mining conditions permit, some longwalls could be extracted closer by changing their orientation.*

In regard to alternative mine plans, Section 7.6.3 of the EA states:

> *In accordance with the recommendations of the Metropolitan PAC Report (Section 4.2), a number of environmental impact reduction alternatives have been considered to examine the relative costs and benefits of these alternatives. The alternatives comprise modifying the mine layout (e.g. by adjusting mining parameters or adjusting the mine plan to set back from key features) to achieve various environmental outcomes for streams and upland swamps.*
>
> *A range of alternatives to the EA Base Plan Longwalls were examined. The likely environmental benefits and economic costs of these alternative Project layouts were considered in Appendix L. A summary of the alternatives is provided in Table 7-1 and Appendices O and P.*
>
> *Analysis indicates that all of the environmental impact reduction alternatives would result in a net cost to society and would therefore be considered to be economically inefficient (Appendix L).*

Table 7-1
Summary of Project Environmental Impact Reduction Alternatives

Code	***Description***
A1	*Altering the North Cliff domain mine layout to utilise 163 m wide longwalls.*
A2	*Altering the Appin Area 2 and 3 Extended domain mine layout to utilise 163 m wide longwalls.*
A3	*Combination of A1 and A2.*
B1	*Longwall setbacks from the North Cliff domain swamps predicted to experience more than 200 mm closure.*
B2	*Longwall setbacks from the Appin Area 2 and 3 Extended domain swamps predicted to experience more than 200 mm closure.*
B3	*Combination of B1 and B2.*
B4	*Longwall setbacks from eight swamps in North Cliff and Appin Area 2 and 3 Extended that are predicted to experience more than 200 mm closure and have a high erosion index.*
C1	*Longwall setbacks from additional North Cliff domain streams 3rd order and above.*
C3	*Longwall setbacks from additional Appin Area 2 and 3 Extended domain streams 3rd order and above.*
C4	*Combination of C1 and C3.*
C9	*Longwall setbacks from additional west cliff area 5, Appin Area 7, Appin Area 9 and Appin Area 8 streams 3rd order and above.*
C10	*Combination of C4 and C9.*

Source: Appendix L.

CATCHMENT ASSESSMENT

NOW (16 November 2009) states:

> ***As the EA does not consider the cumulative impact of further undermining of the catchment to Woronora Dam, protection from undermining and fracturing of the permanently flowing 2nd order reach of the Woronora River should be considered. This consideration should also be provided to the 3rd order unnamed tributary to the Woronora River, in order to maintain continuity of flows into the Woronora River.***

As provided in Attachment PB of Appendix P of the EA, the Woronora River and the tributary to Woronora River within 600 metres (m) of the edge of secondary extraction have catchment area of 17% of the total catchment area of Woronora Dam. Section P6.4.4 of Appendix P of the EA states:

> *…the Project would not result in adverse consequences to the quantity of water reaching the Cataract Dam, Woronora Dam or Broughtons Pass Weir.*

The Southern Coalfield Panel Report (DoP, 2008) and the Metropolitan PAC Report (PAC, 2009) examined this issue and made recommendations regarding further investigations into the potential for mine subsidence effects to lead to catchment yield losses. The Metropolitan PAC Report (PAC, 2009) concluded that it is not beyond doubt, however:

> *…the local and regional groundwater conditions coupled with the mine parameters, would suggest that the likelihood of water being lost from the surface water system as a consequence of mining, and then by-passing Woronora Reservoir, is very low. This conclusion accords with the findings of the Southern Coalfield Inquiry, viz:*
>
> > *No evidence was presented to the Panel to support the view that subsidence impacts on rivers and significant streams, valley infill or headwater swamps, or shallow or deep aquifers have resulted in any measurable reduction in runoff to the water supply system operated by the Sydney Catchment Authority or to otherwise represent a threat to the water supply of Sydney or the Illawarra region.*[37]

Based on the above, it is considered that the cumulative potential for loss of water yield to Woronora reservoir remains very low.

In regard to water quality, Section P6.4.5 of Appendix P of the EA provides:

> *Potential impacts on water quality as a result of the Project subsidence impacts would be localised (e.g. localised changes in water quality in the Nepean, Georges and Woronora Rivers and their tributaries)…The Project is not expected to impact on the performance of Woronora Reservoir, Cataract Reservoir or Broughtons Pass Weir.*

It is recognised that the Sydney Catchment Authority (SCA) (16 December 2009) states the following in regard to potential impacts on Woronora Reservoir water quality:

> *The SCA is generally satisfied that the likely impacts of the Project on the quality of water entering Woronora Reservoir would be "negligible" due to the distance from the mine area to the reservoir.*

Based on the above, it is considered that the incremental changes in any cumulative potential water quality impacts to Woronora Reservoir as a result of the Project would be negligible.

NOW (16 November 2009) states:

> ***The West Cliff 5 mining domain, which is located on either side of the Georges River, is subject to existing rules within its Subsidence Management Plan to protect the Georges River from further fracturing, iron release and flow loss impacts. These protective requirements should be applied to any mining in proximity to the Georges River gorge. NOW requires this protection requirement to be extended to West Cliff Area 5, which incorporates protection zones extending 400 metres from the Georges River gorge entry, located at the maingate end limit to LW 34. No encroachment to the Georges River should be permitted within the 400 metre protection limit unless Illawarra Coal can demonstrate avoidance of further impacts upon the Georges River.***

Illawarra Coal Holdings Pty Ltd (ICHPL) would comply with all existing Subsidence Management Plan (SMP) commitments and conditions of approval for longwalls approved by Industry and Investment NSW (I&I NSW).

The stream impact minimisation criteria that would be applied to the Georges River as part of the Project are described in Table 5-2 of the EA:

- *Minor fracturing of controlling rockbars, with negligible diversion of water from associated pools.*
- *Potential for fracturing of stream bed and consequent stream flow diversion in stream reaches between controlling rockbars. The potential for this impact is considered to be low in stream reaches where the above criteria has been applied (i.e. the application of the above criteria at controlling rockbars is expected to significantly reduce potential impacts to intervening stream reaches as evidenced by the analysis of the EA Base Plan Longwalls presented in Appendix A).*
- *Localised impacts on stream water quality.*
- *Strata gas release.*

NOW (16 November 2009) states:

> ***NOW requires the Applicant to provide further explanation regarding previous fracturing consequences to the Georges River, as it has the densest network of piezometric monitoring in proximity to the river of all BHP operations. NOW is aware of recent reports of cracking in the bed of the Georges River at the end of Longwall 33. These reports must be verified and any impacts to the Georges River must be examined in terms of surface/groundwater connection and flow transmission by the PAC.***

Section 5.2.6 of Appendix A of the EA states:

> *No fracturing resulting in diversion of surface water has been observed during the mining of Longwalls 30 to 32 near the Georges River. Periodic monitoring of surface flows in the Georges River during the mining of Longwalls 5A1 to 5A4 indicate that surface flow diversions did not begin until the longwall passed directly beneath it. Water levels in pools were not observed to fall until the longwall had passed directly beneath and beyond them by 140 to 180 metres.*

As requested by NOW (16 November 2009), ICHPL will provide information on recent subsidence impacts to the Georges River to the Bulli Seam Operations PAC Panel.

Several reports describing impacts to the Georges River and management responses at the end of Longwall 33 have been previously forwarded to government agencies including NOW, with the latest report issued in November 2009. No feedback has been received from NOW in relation to these reports.

NOW (16 November 2009) states:

> ***The EA provides no assessment of tributary contributions to maintenance flows through Jordans Crossing or Broughtons Pass weirs. NOW considers the entirety of the Cataract River to the Nepean River confluence requires protection to maintain river system flow, including full protection to environmental transparency and translucency releases from Cataract Dam, through Jordans Crossing and Broughtons Pass weirs.***

Potential impacts on Jordans Crossing Weir are described in Section 6.7.2 of Appendix A of the EA. Jordans Crossing Weir is used for gauging flows and is not used for water supply. SCA (16 December 2009) relevantly states:

> *The SCA is satisfied that the Project's likely overall impacts on the wall of the* [Jordans Crossing] *weir could be minor and it would remain "safe, serviceable and repairable".*

Section P4.3.5 and Attachment PB of Appendix P of the EA describe the contributions of all tributaries in the Project area to the catchment area of Broughtons Pass Weir. As provided in Section P6.4.4 of Appendix P of the EA:

> *…the Project would not result in adverse consequences to the quantity of water reaching the Cataract Dam, Woronora Dam or Broughtons Pass Weir.*

NOW (16 November 2009) states:

> ***NOW notes that mining has occurred on both sides of the Nepean River within the Menangle weir pool, which has resulted in fracturing with undetermined impacts upon the stored waters within the weir pool. NOW considers the cumulative risk from each additional longwall panel must be considered, as there is evidence that cumulative stress distribution and consequential fracture re-activation of riverine basement (including weir pools) occurs after each additional longwall panel is extracted.***

An assessment of potential impacts on Menangle Weir structure is provided in Section 6.7.2 of Appendix A of the EA and is based on cumulative subsidence predictions from all previously and proposed longwalls. An assessment of the potential impacts on the Nepean River (including the Menangle Weir pool) based on cumulative subsidence predictions from all previously and proposed longwalls is provided in Section 5.2.5.1 of Appendix A of the EA.

Section 5.2.3.6 of Appendix A of the EA provides an assessment of potential impacts on stored water in areas controlled by downstream weirs and dams (including Menangle Weir) and relevantly states:

> *It is likely that the beds of stored waters experience fracturing and uplift as observed in other streams. However, the effect of these impacts is not noticeable on the surface as the fracturing and uplift is submerged below the permanent water level and often below impounded sediments. Provided that surface water does not flow into the mine, water merely fills the voids created by mining-induced fractures.*

In regard to potential changes in water level within the Menangle Weir pool, Section 6.7.2 of Appendix A of the EA states:

> *The water levels in the Nepean River fluctuate in response to changes in water flow rates. It is apparent from relative water level surveys that the water level in the river typically rises and falls within a range of 150 mm…The predicted uplift or subsidence movements at the weirs due to the mining of the longwalls are therefore less than the typical seasonal changes in water level.*

The predicted changes in water level are also smaller than those experienced along these rivers due to the previously extracted Tower Longwalls 16 and 17 adjacent to and directly beneath the Nepean River and Appin Longwalls 301 and 302 adjacent to the Cataract River. There were no reported impacts on the vegetation, or significant changes in desiccation or scouring of the river banks, as the result of changes in water levels after the extraction of these longwalls.

In regard to the Menangle Weir, SCA (16 December 2009) relevantly states:

The SCA is generally satisfied that the Project's likely overall impacts on the wall of the [Menangle] *weir would be minor and it would remain "safe, serviceable and repairable". Any potential impacts on the weir can be managed by the development and implementation of suitable management strategies in consultation with and to the satisfaction of SCA. This could include ground and weir movement monitoring as well as water flow and level monitoring.*

NOW (16 November 2009) states:

Rivers developed on Wianamatta Shales, including Matahill, Mallaty, Foot Onslow, Navigation, Racecourse, Upper Ousedale and Upper Carriage Creeks, are extensively dammed and/or used for basic landholder rights and stock water supply. The larger rivers, such as Navigation and Foot Onslow Creeks, are dammed downstream of the zone of subsidence to Appin Areas 7, 8 and 9. NOW recognises the different level of risk related to subsidence-induced fracture and loss of flow to these rivers, due to the increased ductility and flexure response to subsidence conditions. Research into consequential impacts on Wianamatta Shale rivers elsewhere in the Southern Coalfield indicates that pool storage and transmission may be affected under varying levels of systematic subsidence, though NOW is not aware of any research into non-systematic subsidence expression, and any consequential impacts on flow.

As described in Section 5.2.8.2 of Appendix A of the EA:

Longwalls at Appin and West Cliff Collieries have previously mined beneath stream beds in Wianamatta Shale. These include streams within the upstream catchments of Mallaty Creek, Rocky Ponds Creek, Simpsons Creek, Elladale Creek and Ousedale Creek. Longwalls at Tahmoor Colliery have previously mined beneath stream beds in Wianamatta Shale within the upstream catchments of Myrtle and Redbank Creeks. No surface cracking of sediments has been reported within these streams in Wianamatta Shale during mining.

As described in Section 5.6.3 of the EA, a Catchment Monitoring Programme would be developed that would include:

Detailed visual inspection and documentation of subsidence effects on surface water resources and features would be undertaken. These inspections would focus on conditions pre-mining, during mining and post-mining. Inspections would occur on all significant streams and draw on the stream condition mapping and associated documentation presented in Appendix P.

Subsidence impact monitoring would be targeted at providing specific information on localised flow diversion and pool water level regime change. Results of monitoring would be used to identify the need and subsequent success of remediation works necessary to restore flow conditions to specific features.

Further research would be undertaken into non-systematic subsidence expression in Wianamatta Shale streams as committed in the Statement of Commitments (Section 8 of the EA):

Streams:

- *Non-systematic subsidence effects and associated environmental consequences in significant watercourses.*
- *Techniques for remediating stream bed fracturing.*

RECOMMENDATIONS

NOW (16 November 2009) makes the following 12 recommendations in regard to any Project Approval:

1. ***Continuation of existing conditions within Subsidence Management Plan approval to all longwall panels which have been approved under the Department of Industry and Investment (DII) Subsidence Management Plan approval process.***

ICHPL agrees with this recommendation.

2. ***Adoption and demonstrated compliance with the recommendations of the Southern Coalfield Inquiry.***

The Southern Coalfield Panel Report (DoP, 2008) recommendations are not of a nature or form that renders them suitable as auditable conditions of a Project Approval. Rather, the recommendations inform government policy and the approach to environmental assessment.

The Director-General's Environmental Assessment Requirements (EARs) required the consideration of the Southern Coalfield Panel Report (DoP, 2008) in the preparation of the EA. The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

3. ***Negligible environmental impacts (i.e. nil impacts on critical baseflow transmission and pool retention) to all third order and higher rivers in incised Hawkesbury sandstone systems and upland swamps within the Cataract, Nepean and Georges Rivers and O'Hares, Stokes Creek catchments.***

ICHPL's proposed stream impact minimisation criteria are presented in Table 5-2 of the EA. ICHPL's preferred risk management option for swamps is presented in Table 5-3 of the EA.

Benefit Cost Analysis (including consideration of environmental consequences) presented in Appendix L of the EA indicates that the level of stream and swamp protection recommended by NOW (16 November 2009) is economically inefficient.

4. ***Nil subsidence and upsidence limits to below 30/60mm to weirs and pools on the Nepean and Cataract Rivers, and achievement of no consequential flow losses to the Nepean and Cataract Rivers.***

As described in Section 5.4.5 of the EA:

> *As a component of future Extraction Plans, mitigation measures, management and monitoring of subsidence impacts on SCA infrastructure would be developed and implemented by ICHPL, in consultation with the SCA. This would include consideration of mitigation measures and resulting subsidence effects on previously affected SCA infrastructure. Measures may include the development of preventative and remedial measures, monitoring programmes and TARPs to maintain infrastructure in a safe and serviceable condition.*

ICHPL's proposed stream impact minimisation criteria for the Nepean and Cataract Rivers are presented in Table 5-2 of the EA.

As stated in Section 5.2.1 of the EA:

> *…Although stream beds with exposed rock base can experience subsidence induced fracturing to a depth of 10 to 20 m, there is considered to be negligible potential for the loss of surface water to the mine due to the lack of continuity of fractures from the surface to the mine (Appendix B). A portion of surface water flows may be diverted through the rock fractures beneath the stream bed, with emergence further downstream (Appendix C). Therefore, the Project would not result in adverse consequences to the quantity of water reaching the Cataract Dam, Woronora Dam or Broughtons Pass Weir.*

5. Achievement of no consequential flow losses to nominated tributaries to the Nepean and Cataract Rivers, including Lizard Creek, Wallandoola Creek, Cascade Creek, Stringybark Creek and Allens Creek.

ICHPL's proposed stream impact minimisation criteria for Lizard Creek are presented in Table 5-2 of the EA, which includes the following criteria:

> *Minor fracturing of controlling rockbars, with negligible diversion of water from associated pools.*

Stream remediation measures (i.e. grouting) would be implemented on Wallandoola Creek, Cascade Creek, Stringybark Creek and Allens Creek at controlling rockbars to return stream flow to pre-mining characteristics.

6. Negligible environmental impacts to all agreed high priority upland swamps in accordance with DECCW wetland protection assessment methodology.

ICHPL's preferred risk management option for swamps is presented in Table 5-3 of the EA.

Benefit Cost Analysis (including consideration of environmental consequences) presented in Appendix L of the EA indicates that the level of swamp protection recommended by NOW (16 November 2009) is economically inefficient.

7. Nil loss of critical baseflows transmitted from upland swamps to rivers developed in Hawkesbury sandstone, and agreed outcomes for the maintenance of low flows and minimum baseflows to agreed points on downstream river reaches.

ICHPL's preferred risk management option for swamps is presented in Table 5-3 of the EA.

Benefit Cost Analysis (including consideration of environmental consequences) presented in Appendix L of the EA indicates that the level of swamp protection recommended by NOW (16 November 2009) is economically inefficient.

8. Quantification of critical water supply function of third, fourth and fifth order rivers discharging to the Georges, Cataract and/or Nepean Rivers and Stokes and O'Hares Creeks.

ICHPL agrees with this recommendation.

A Catchment Monitoring Programme (Section 5.6.3 of the EA) and Stream Risk Management Plans (Section 5.2.1 of the EA) would be developed for the Project.

Section 8 of the EA (Statement of Commitments) describes ICHPL's commitments to funding a number of research, offset and compensatory measures, primarily to address Project impacts on surface water resources and ecological aspects.

9. ***Nil impact on water accounts to all existing water users, including extractive users to the following end of system flow points.***
    a. ***Woronora Dam (SCA and Sydney Water) and to the tidal limit (end of system flow limit)***
    b. ***Georges River tidal limit (end of system flow limit)***
    c. ***Cataract River to the Nepean River confluence, including inflows from tributaries to the Cataract River***
    d. ***Nepean River to the Wallacia weir***

Section P6.4.4 of Appendix P of the EA states:

> *…the Project would not result in adverse consequences to the quantity of water reaching the Cataract Dam, Woronora Dam or Broughtons Pass Weir.*

ICHPL agrees to maintaining a negligible net impact on water accounts.

10. ***Further research into the role of upland swamps in the Stokes, O'Hares and Cataract catchments to contributing minimum and low flow transmission to downstream catchments.***

A Catchment Monitoring Programme (Section 5.6.3 of the EA) and Swamp Risk Management Plans (Section 5.2.2 of the EA) would be developed for the Project.

Section 8 of the EA (Statement of Commitments) describes ICHPL's commitments to funding a number of research, offset and compensatory measures, primarily to address Project impacts on surface water resources and ecological aspects.

11. ***Further research into subsidence response to watercourses developed on Wianamatta Shale, including flexure/sagging, strain capacity limits, fracture development and risk assessment related to transmission of flows over subsided watercourses.***

A Catchment Monitoring Programme (Section 5.6.3 of the EA) and Stream Risk Management Plans (Section 5.2.1 of the EA) would be developed for the Project.

Section 8 of the EA (Statement of Commitments) describes ICHPL's commitments to funding a number of research, offset and compensatory measures, primarily to address Project impacts on surface water resources and ecological aspects, specifically:

Streams:

- *Non-systematic subsidence effects and associated environmental consequences in significant watercourses.*

…

12. ***Further research into the lateral transmission of strains from longwall subsidence, and consequential impacts to natural features including results from measured direct strain (tensile and compressive), upsidence and valley closure.***

Section 8 of the EA (Statement of Commitments) describes ICHPL's commitments to funding a number of research, offset and compensatory measures, primarily to address Project impacts on surface water resources and ecological aspects.

REFERENCES

Department of Planning (2008) *Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield: Strategic Review*. State of NSW through the NSW Department of Planning.

Planning Assessment Commission (2009) *Metropolitan Coal Project Review Report*.

Sydney Catchment Authority (2009) Bulli Seam Operations Project Application Number 08_0150. Letter dated 16 December 2009.

Bulli Seam Operations
Response to Sydney Catchment Authority Submission
(16 December 2009)

It is noted that the Sydney Catchment Authority (SCA) (16 December 2009) states the following in regard to agreements with Illawarra Coal Holdings Pty Limited (ICHPL):

> *Given the significance of the Proponent's Project and its previous and ongoing activities within the SCA's operational area, the SCA established a governance framework with the Proponent. The SCA and the Proponent have been jointly working on this framework. The framework will comprise an umbrella agreement, master agreement and joint working groups which will assist with communications, access control, resolution of technical matters, identification of new science and monitoring requirements and remediation. The master agreement will address all of the Proponent's mining activities within the SCA's operational area and the following:*
>
> - *The implementation of works/measures to ensure that performance measures/outcomes for critical built and natural assets relating to the SCA that are set in any mining approvals are met.*
> - *Data and research sharing arrangements.*
> - *SCA requirements for financial assurance for undertaking mining activities and the costs of the SCA in responding to the impacts of activities.*
>
> *The SCA has initiated the above process with the two other mining companies with operations in the SCA's area of operation. The SCA has previously entered into master agreements with the Proponent.*

Each of the comments and recommendations made by the SCA (reproduced below in bold) are addressed below.

PERFORMANCE MEASURES FOR KEY ASPECTS

In regard to performance measures, SCA (16 December 2009) states:

> ***In assessing impacts the SCA has identified specific performance measures and used terms defined in the Part 3A approval for the Metropolitan Coal Project for "negligible" and "safe, serviceable and repairable".***

The table below provides ICHPL's response to each performance measure recommended by SCA.

SCA Recommended Performance Measure	ICHPL Response
<u>*Catchment Infrastructure Works*</u>	
Cataract Dam wall – Zero impact.	Mining near Cataract Dam would be conducted in accordance with necessary approvals from the Minister administering the *Mining Act, 1992* in accordance with the requirements of the *Dams Safety Act, 1978* and the Dams Safety Committee (DSC) (Section 5.4.5 of the EA). This would include maintaining Cataract Dam in a safe and serviceable condition. In this regard SCA (16 December 2009) relevantly states: *The SCA considers that these movement would have insignificant impact on the dam structure and therefore is satisfied the Project will not affect the structural integrity of Cataract Dam.*

SCA Recommended Performance Measure	ICHPL Response
Catchment Infrastructure Works (Continued)	
Upper Canal (including Nepean Tunnel and Cataract Tunnel) – "Negligible" impact and the structure is "safe and serviceable".	ICHPL commits to maintaining SCA infrastructure in a safe and serviceable condition (Section 5.4.5 of the EA).
Broughtons Pass Weir – "Negligible" impact and the structure is "safe and serviceable".	Mining near Broughtons Pass Weir would be conducted in accordance with necessary approvals from the Minister administering the *Mining Act, 1992* in accordance with the requirements of the *Dams Safety Act, 1978* and the DSC (Section 5.4.5 of the EA). This would include maintaining Broughtons Pass Weir in a safe and serviceable condition
Jordans Crossing Weir and Menangle Weir walls – "Safe, serviceable and repairable".	ICHPL commits to maintaining SCA infrastructure in a safe and serviceable condition (Section 5.4.5 of the EA). This would include limiting any potential impacts such that they would be repairable. In this regard SCA (16 December 2009) relevantly states: *…The SCA is generally satisfied that the Project's likely impacts on the wall of the* [Menangle] *weir would be minor and it would remain "safe, serviceable and repairable".* *…* *…The SCA is satisfied that the Project's likely overall impacts on the wall of the* [Jordans Crossing] *weir could be minor and it would remain "safe, serviceable and repairable". This is subject to investigations being undertaken prior to mining and any necessary preventative works being carried out.*
Douglas Park Weir and Menangle Weir fishways – "Safe, serviceable and repairable".	ICHPL commits to maintaining SCA infrastructure in a safe and serviceable condition (Section 5.4.5 of the EA). This would include limiting any potential impacts such that they would be repairable. In this regard SCA (16 December 2009) relevantly states: *…The SCA is generally satisfied the Project's likely overall impacts on the fish passages on both* [Douglas Park and Menangle] *weirs would be minor and they would remain "safe, serviceable and repairable".*
Baden Powell Drive (access road from Appin Road to Cataract Dam) – "Safe, serviceable and repairable".	ICHPL commits to maintaining SCA infrastructure in a safe and serviceable condition (Section 5.4.5 of the EA). This would include limiting any potential impacts such that they would be repairable. In this regard SCA (16 December 2009) relevantly states: *Based on past experience, the assessment, monitoring and management measures proposed with regards to impacts on SCA fire trails and four wheel drive tracks and Cataract Dam access road in the EA are considered appropriate.*

SCA Recommended Performance Measure	ICHPL Response
Catchment Infrastructure Works (Continued)	
Fire trails – "Safe, serviceable and repairable".	ICHPL commits to maintaining SCA infrastructure in a safe and serviceable condition (Section 5.4.5 of the EA). This would include limiting any potential impacts such that they would be repairable. In this regard SCA (16 December 2009) relevantly states: *Based on past experience, the assessment, monitoring and management measures proposed with regards to impacts on SCA fire trails and four wheel drive tracks and Cataract Dam access road in the EA are considered appropriate.*
Water Resources	
Catchment yield to the Cataract Reservoir – "negligible" reduction in the quality and quantity of water resources reaching Cataract Reservoir. No connective cracking between the surface and the mine.	Section P6.4.4 of Appendix P of the EA states: *…the Project would not result in adverse consequences to the quantity of water reaching the Cataract Dam, Woronora Dam or Broughtons Pass Weir.* In this regard SCA (16 December 2009) relevantly states: *…The SCA is reasonable satisfied subject to there being no significant structural geological features, that the risk of loss of water from the* [Cataract Reservoir] *storage to the mine is "negligible"…* Section P6.4.5 of Appendix P of the EA states: *…Although mine subsidence effects can result in isolated, episodic pulses in iron, manganese, aluminium and electrical conductivity, these pulses have not had any measurable effect on water quality on downstream reservoirs (Appendix C of the EA). The Project is not expected to impact on the performance of Woronora Reservoir, Cataract Reservoir or Broughtons Pass Weir.*
Cataract Reservoir – "negligible" leakage from the Cataract Reservoir. "Negligible" reduction in the water quality of Cataract Reservoir.	**ICHPL agrees with this recommended performance measure** and notes that the DSC would have a central role in defining "negligible leakage". Section P6.4.5 of Appendix P of the EA states: *…Although mine subsidence effects can result in isolated, episodic pulses in iron, manganese, aluminium and electrical conductivity, these pulses have not had any measurable effect on water quality on downstream reservoirs (Appendix C of the EA). The Project is not expected to impact on the performance of Woronora Reservoir, Cataract Reservoir or Broughtons Pass Weir.*

SCA Recommended Performance Measure	ICHPL Response
Water Resources (Continued)	
Catchment yield to the Broughtons Pass Weir pool – "negligible" reduction in the quality and quantity of water resources reaching the Broughtons Pass Weir pool. No connective cracking between the surface and the mine.	Section P6.4.4 of Appendix P of the EA states: *…the Project would not result in adverse consequences to the quantity of water reaching the Cataract Dam, Woronora Dam or Broughtons Pass Weir.* Section P6.4.5 of Appendix P of the EA states: *…Although mine subsidence effects can result in isolated, episodic pulses in iron, manganese, aluminium and electrical conductivity, these pulses have not had any measurable effect on water quality on downstream reservoirs (Appendix C of the EA). The Project is not expected to impact on the performance of Woronora Reservoir, Cataract Reservoir or Broughtons Pass Weir.*
Broughtons Pass Weir pool – "negligible" leakage from the Broughtons Pass Weir pool. "Negligible" reduction in the water quality of Broughtons Pass Weir pool.	**ICHPL agrees with this recommended performance measure** and notes that the DSC would have a central role in defining "negligible leakage". Section P6.4.5 of Appendix P of the EA states: *…Although mine subsidence effects can result in isolated, episodic pulses in iron, manganese, aluminium and electrical conductivity, these pulses have not had any measurable effect on water quality on downstream reservoirs (Appendix C of the EA). The Project is not expected to impact on the performance of Woronora Reservoir, Cataract Reservoir or Broughtons Pass Weir.*
Catchment yield to the Woronora Reservoir – "negligible" reduction in the quality and quantity of water resources reaching Woronora Reservoir.	Section P6.4.4 of Appendix P of the EA states: *…the Project would not result in adverse consequences to the quantity of water reaching the Cataract Dam, Woronora Dam or Broughtons Pass Weir.* Section P6.4.5 of Appendix P of the EA states: *…Although mine subsidence effects can result in isolated, episodic pulses in iron, manganese, aluminium and electrical conductivity, these pulses have not had any measurable effect on water quality on downstream reservoirs (Appendix C of the EA). The Project is not expected to impact on the performance of Woronora Reservoir, Cataract Reservoir or Broughtons Pass Weir.* In this regard SCA (16 December 2009) relevantly states: *The SCA is generally satisfied that the likely impact of the Project on the quality of water entering Woronora Reservoir would be "negligible" due to the distance from the mine area to the reservoir.*

SCA Recommended Performance Measure	ICHPL Response
Watercourses	
Cataract River (from the Cataract Dam wall to the full supply level of Broughton Pass Weir) – "Negligible" environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases).	ICHPL's proposed stream impact minimisation criteria for the Cataract River are presented in Table 5-2 of the EA, which include: • *Minor fracturing of controlling rockbars, with negligible diversion of water from associated pools.* • *Potential for fracturing of stream bed and consequent stream flow diversion in stream reaches between controlling rockbars. The potential for this impact is considered to be low in stream reaches where the above criteria has been applied (i.e. the application of the above criteria at controlling rockbars is expected to significantly reduce potential impacts to intervening stream reaches as evidenced by the analysis of the EA Base Plan Longwalls presented in Appendix A).* • *Localised impacts on stream water quality.* • *Strata gas release.*
Appin Falls – No rock falls at Appin Falls. The structural integrity of the waterfall, its overhang and its pool are not impacted.	As described in more detail to a response below, it is a design criteria for the Project that there are no flow diversions and pool water level impacts at the Appin Falls pool and no cliff instabilities as a result of the Project. It should be noted that rock falls occur naturally within the Southern Coalfield as a result of weathering processes, therefore ICHPL cannot commit to no rock falls occurring at Appin Falls during the Project.
Cataract Tributary 1, Lizard Creek, Wallandoola East Creek (3rd order section), Wallandoola Creek and Cascade Creek (for their full length) – "Negligible" environmental consequences (that is, no diversion of flow, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases).	ICHPL's proposed stream impact minimisation criteria for these streams are presented in Table 5-2 of the EA.
Cataract Reservoir Tributary 1 and Cataract Reservoir Tributary 2 (3rd order sections) – "Negligible" environmental consequences (that is, no diversion of flow, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases).	ICHPL's proposed stream impact minimisation criteria for these streams are presented in Table 5-2 of the EA.
Woronora Reservoir (tributary downstream of the crossing of Fire Trail 14 and adjacent to the northern end of Longwall 19 – and 3rd order tributary downstream of Longwall 18) – "Negligible" environmental consequences (that is, no diversion of flow, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases).	ICHPL's proposed stream impact minimisation criteria are presented in Table 5-2 of the EA.

SCA INFRASTRUCTURE

It is noted that SCA (16 December 2009) states the following in regard to Cataract Dam:

> ***The SCA considers that these movements would have insignificant impact on the dam structure and therefore is satisfied the Project will not affect the structural integrity of Cataract Dam.***

In regard to management measures for the Cataract Dam, SCA (16 December 2009) states:

> ***Even if the level of movement is low and the risk of damage to the dam wall is small, any potential impacts on the dam wall should be managed by the implementation of suitable management strategies because Cataract Dam is an extreme consequence category dam.***
>
> ***Risk-based management strategies developed in consultation with and to the satisfaction of SCA and Dams Safety Committee should include risk assessment on the impact of mining, detailed structural analysis of the dam wall, remediation plan, contingency plan, Trigger Action Response Plan (TARP), and monitoring plan.***

As described in Section 5.4.5 of the EA:

> *As a component of future Extraction Plans, mitigation measures, management and monitoring of subsidence impacts on SCA infrastructure would be developed and implemented by ICHPL, in consultation with the SCA. This would include consideration of mitigation measures and resulting subsidence effects on previously affected SCA infrastructure. Measures may include the development of preventative and remedial measures, monitoring programmes and TARPs to maintain infrastructure in a safe and serviceable condition.*
>
> *Section 7.3.1 describes the function of the DSC which operates under the provisions of the Dams Safety Act, 1978. Prior to mining within the Cataract and Broughtons Pass Notification Areas, ICHPL would obtain all necessary approvals from the Minister administering the Mining Act, 1992 in accordance with the requirements of the Dams Safety Act, 1978 and the DSC.*
>
> *The potential impacts on the Cataract Dam could be managed by the implementation of suitable management strategies including:*
>
> - *structural analyses of the dam wall to determine the existing stresses within the structure and the allowable differential movements which could result from mining;*
> - *the use of ground monitoring with a TARP; and*
> - *formation of a technical committee comprising ICHPL, the DSC, SCA and subsidence engineer to regularly review the movements during the mining period.*

It is noted that SCA (16 December 2009) states the following in regard to particular sections of the Upper Canal:

> ***…The SCA is generally satisfied that the Project's likely impacts on the Cataract Tunnel would be "negligible" and it would remain "safe and serviceable".***
>
> ***…***
>
> ***…The SCA is generally satisfied that the Project's likely impacts on these tunnels*** **[Devines tunnels]** ***would be "negligible" and they would remain "safe and serviceable".***
>
> ***…***

> ***…The SCA is generally satisfied that the Project's overall likely impacts on the open section of the Upper Canal north of Mallaty Creek would be "negligible" and it would remain "safe and serviceable".***
>
> ***…***
>
> ***…The SCA is generally satisfied that the Project's likely overall impacts on these aqueducts*** **[Elladale, Mallaty, Leafs Gully and Nepean aqueducts]** ***would be "negligible" and they would remain "safe and serviceable".***

In regard to the other sections of the Upper Canal, SCA (16 December 2009) states:

> ***…The SCA is not satisfied that the Project's likely overall impacts on the Nepean Tunnel would be "negligible" and that the Nepean Tunnel would remain "safe and serviceable".***
>
> ***…***
>
> ***…The SCA is not satisfied that the Project's likely overall impacts on the open section of the Upper Canal above and/or adjacent to longwalls 720 to 724 would be "negligible" and it would remain "safe and serviceable".***
>
> ***…***
>
> ***…Notwithstanding that protective works have already been implemented on Ousedale aqueduct due to earlier Westcliff Area 5 longwalls, the SCA is not satisfied that the Project's likely overall impact on Ousedale aqueduct due to direct undermining of Appin Area 7 longwalls would be "negligible" or that it would remain "safe and serviceable".***

As described in Section 5.4.5 of the EA:

> *As a component of future Extraction Plans, mitigation measures, management and monitoring of subsidence impacts on SCA infrastructure would be developed and implemented by ICHPL, in consultation with the SCA. This would include consideration of mitigation measures and resulting subsidence effects on previously affected SCA infrastructure. Measures may include the development of preventative and remedial measures, monitoring programmes and TARPs to maintain infrastructure in a safe and serviceable condition.*

ICHPL agrees to the SCA's recommended performance measure in regard to the Upper Canal (refer to table above).

ICHPL commits to maintaining SCA infrastructure in a safe and serviceable condition, through the development of a final detailed design of longwall layouts, prediction of detailed subsidence effects and development and implementation of mitigation measures, management and monitoring as a component of the Extraction Plan process.

It is noted that SCA (16 December 2009) states:

> ***The SCA is investigating the long term management of the Upper Canal with options of refurbishment and replacement being considered. It may be that scope exists for longwall mining to be phased with refurbishment or emplacement works undertaken by the SCA to address the SCA's concerns.***

ICHPL notes the above statement and will work with the SCA to explore this potential.

It is noted that SCA (16 December 2009) states the following in regard to some weirs in the Project area:

> ***…The SCA is generally satisfied that the Project's likely impacts on the wall of the*** **[Menangle]** ***weir would be minor and it would remain "safe, serviceable and repairable".***
>
> ***…***
>
> ***…The SCA is satisfied that the Project's likely overall impacts on the wall of the*** **[Jordans Crossing]** ***weir could be minor and it would remain "safe, serviceable and repairable". This is subject to investigations being undertaken prior to mining and any necessary preventative works being carried out.***
>
> ***…***
>
> ***…The SCA is generally satisfied the Project's likely overall impacts on the fish passages on both*** **[Menangle and Douglas Park]** ***weirs would be minor and they would remain "safe, serviceable and repairable".***

SCA (16 December 2009) also states:

> ***…Any potential impacts on the*** **[Menangle]** ***weir can be managed by the development and implementation of suitable management strategies in consultation with and to the satisfaction of SCA. This could include ground and weir movement monitoring as well as water flow and level monitoring.***
>
> ***…***
>
> ***Any potential impacts on the*** **[Jordans Crossing]** ***weir can be managed by the development and implementation of suitable management strategies in consultation with and to the satisfaction of SCA. This could include preventative measures, ground and weir movement monitoring as well as water flow and level monitoring.***
>
> ***…***
>
> ***…The Proponent would need to develop suitable management strategies including regular monitoring of ground movements at the*** **[Douglas Park and Menangle]** ***fish passage as well as remediation and contingency measures for the structures in consultation with and to the satisfaction of SCA.***

As described in Section 5.4.5 of the EA:

> *As a component of future Extraction Plans, mitigation measures, management and monitoring of subsidence impacts on SCA infrastructure would be developed and implemented by ICHPL, in consultation with the SCA. This would include consideration of mitigation measures and resulting subsidence effects on previously affected SCA infrastructure. Measures may include the development of preventative and remedial measures, monitoring programmes and TARPs to maintain infrastructure in a safe and serviceable condition.*

In regard to Broughtons Pass Weir, SCA (16 December 2009) states:

> ***…The SCA is not satisfied that the Project's likely overall impacts on the*** **[Broughtons Pass]** ***weir would be "negligible" and that it would remain "safe and serviceable".***

As described in Section 5.4.5 of the EA:

> *As a component of future Extraction Plans, mitigation measures, management and monitoring of subsidence impacts on SCA infrastructure would be developed and implemented by ICHPL, in consultation with the SCA. This would include consideration of mitigation measures and resulting subsidence effects on previously affected SCA infrastructure. Measures may include the development of preventative and remedial measures, monitoring programmes and TARPs to maintain infrastructure in a safe and serviceable condition.*

ICHPL commits to maintaining SCA infrastructure in a safe and serviceable condition, through the development of a final detailed design of longwall layouts, prediction of detailed subsidence effects and development and implementation of mitigation measures, management and monitoring as a component of the Extraction Plan process.

It is noted that SCA (16 December 2009) states:

> ***Based on past experience, the assessment, monitoring and management measures proposed with regards to impacts on SCA fire trails and four wheel drive tracks and Cataract Dam access road in the EA are considered appropriate.***

WATER RESOURCES

It is noted that SCA (16 December 2009) states the following in regard to surface water flows:

> ***…The SCA is reasonably satisfied subject to there being no significant structural geological features, that the risk of loss of water from the*** **[Cataract Reservoir]** ***storage to the mine is "negligible"…***
>
> ***…***
>
> ***The SCA is generally satisfied that due to the depths of cover and the characteristics of the cover that connective cracking from the ground surface to the mined seam is not expected. The SCA is therefore generally satisfied that there is "negligible" potential for the loss of surface water from fractured streams to the mine…***
>
> ***…***
>
> ***The SCA is generally satisfied that the current evidence indicates that a portion of diverted surface water flows, through the upsidence created rock fractures beneath stream beds, will re-emerge further downstream.***

In regard to the height of the fractured zone, SCA (16 December 2009) states:

> ***…there is some uncertainty in the south eastern part of the Project area due to inconsistencies in the predicted height of the fractured zone.***

SCA (16 December 2009) also states:

> ***…However, the EA states that the potential maximum height of the fractured zone above the longwalls for the Project is between 330 and 385 m above seam level. Heritage Computing expects the fractured zone to extend into the lower Bulgo Sandstone. With the Bulli Coal Seam within the Project area ranging from 300 to 850 m below the surface, the fractured zone may extend to the surface in various locations. Therefore, there is potential for fracturing to extend from the surface to the mine and for surface flows not to return to the stream.***

The Subsidence Assessment (Appendix A of the EA) adopts a geological/geomorphic definition of the fractured zone, while the Groundwater Assessment (Appendix B of the EA) adopts a hydrogeological definition. With respect to connective fracturing and any impacts to surface flows the hydrological definition is more appropriate. This is explained in Section 3.1 of Appendix B and Section 12.1.3 of Appendix A of the EA.

This issue is being investigated further by the Bulli Seam Operations Planning Assessment Commission (PAC) Panel and will be reported separately.

SCA (16 December 2009) states:

> ***The SCA considers there is evidence that all water diverted from surface flows does not return to the surface. The SCA is therefore concerned that the Project may reduce the catchment yield to Cataract Dam, Woronora Dam and Broughtons Pass Weir.***

The NSW PAC's Metropolitan Coal Project Review Report (PAC, 2009) (herein described as the Metropolitan PAC Report) examined this issue and made recommendations regarding further investigations into the potential for mine subsidence effects to lead to catchment yield losses. It concluded that it is not beyond doubt, however:

> *…the local and regional groundwater conditions coupled with the mine parameters, would suggest that the likelihood of water being lost from the surface water system as a consequence of mining, and then by-passing Woronora Reservoir, is very low. This conclusion accords with the findings of the Southern Coalfield Inquiry, viz:*
>
> > *No evidence was presented to the Panel to support the view that subsidence impacts on rivers and significant streams, valley infill or headwater swamps, or shallow or deep aquifers have resulted in any measurable reduction in runoff to the water supply system operated by the Sydney Catchment Authority or to otherwise represent a threat to the water supply of Sydney or the Illawarra region.*

As stated in Section 5.2.1 of the EA:

> *At the substantial depths of cover at the Project, connective cracking from the ground surface to the mined seam is not expected (Appendix B). Although stream beds with exposed rock base can experience subsidence induced fracturing to a depth of 10 to 20 m, there is considered to be negligible potential for the loss of surface water to the mine due to the lack of continuity of fractures from the surface to the mine (Appendix B). A portion of surface water flows may be diverted through the rock fractures beneath the stream bed, with emergence further downstream (Appendix C). Therefore, the Project would not result in adverse consequences to the quantity of water reaching the Cataract Dam, Woronora Dam or Broughtons Pass Weir.* [emphasis added]

On this basis, ICHPL agrees to the SCA's recommended performance measures in regard to catchment yield to the Cataract Dam, Woronora Dam and Broughtons Pass Weir water storages (refer to table above).

In regard to Broughtons Pass Weir, SCA (16 December 2009) states the following:

> ***The SCA in not satisfied that there would be "negligible leakage" from the Broughtons Pass Weir pool given there is the possibility of significant cracking in the vicinity of the weir.***
>
> ***…***
>
> ***The SCA is concerned that the Project would not result in a "negligible" reduction in the quality of water reaching Broughtons Pass weir pool from Cataract River when there is only environmental flows being released from Cataract Dam.***

It is noted that SCA (16 December 2009) also states the following in regard to Broughtons Pass Weir:

> ***The SCA considers there would be a "negligible" reduction in the water quality of Broughtons Pass Weir pool – because it would be transferring water from either Cataract Dam or Pheasant Nest weir to this weir pool and this would dilute any decline in water quality.***

As stated in Section 5.2.1 of the EA:

> *…the Project would not result in adverse consequences to the quantity of water reaching the Cataract Dam, Woronora Dam or Broughtons Pass Weir.*

ICHPL commits to maintaining SCA infrastructure in a safe and serviceable condition, through the development of a final detailed design of longwall layouts, prediction of detailed subsidence effects and development and implementation of mitigation measures, management and monitoring as a component of the Extraction Plan process.

Section P6.4.5 of Appendix P of the EA states:

> *…Although mine subsidence effects can result in isolated, episodic pulses in iron, manganese, aluminium and electrical conductivity, these pulses have not had any measurable effect on water quality on downstream reservoirs (Appendix C of the EA). The Project is not expected to impact on the performance of Woronora Reservoir, Cataract Reservoir or Broughtons Pass Weir.*

SCA (16 December 2009) states:

> ***The SCA considers that with the Bulli Seam Project, the issue of water loss is also not beyond reasonable doubt and therefore a specific program should be developed between the SCA and the Proponent to further investigate the existence or otherwise of catchment yield impacts. As part of this it is critical to monitor low flows.***

As described Section P7.5 of Appendix P of the EA:

> *It is proposed that a detailed monitoring programme be provided in a Catchment Monitoring Programme to be prepared to the satisfaction of the DoP. Similar to the risk assessment conducted for the Project, the Catchment Monitoring Programme would be reviewed and updated in accordance with any updated risk assessment.*

Section 8 of the EA (Statement of Commitments) describes ICHPL's commitments to funding a number of research, offset and compensatory measures, primarily to address Project impacts on surface water resources and ecological aspects, specifically:

> ***Streams:***
>
> - *Non-systematic subsidence effects and associated environmental consequences in significant watercourses.*

It is noted that SCA (16 December 2009) states:

> ***The SCA is generally satisfied that the likely impact of the Project on the quality of water entering Woronora Reservoir would be "negligible" due to the distance from the mine area to the reservoir.***
>
> ***…***
>
> ***The SCA is generally satisfied that there would be a "negligible" reduction in the water quality of Cataract Reservoir as a result of mining Appin Area 3. This is primarily due to the diluting affect* [sic] *of the stored waters in the reservoir…***

SCA (16 December 2009) states:

> ***The SCA is not satisfied that the Project would not result in a "negligible" reduction in the quality of water reaching the Cataract Reservoir from Cataract Reservoir Tributaries 1 and 2 (notwithstanding that the Proponent would carry out remediation works on sections of third order streams).***

As noted in Table 5-2 of the EA, localised impacts on stream water quality are estimated to include the extent of subsidence effects plus in the order of 600 metres (m) downstream.

Section P6.4.5 of Appendix P of the EA states:

> *…Although mine subsidence effects can result in isolated, episodic pulses in iron, manganese, aluminium and electrical conductivity, these pulses have not had any measurable effect on water quality on downstream reservoirs (Appendix C of the EA). The Project is not expected to impact on the performance of Woronora Reservoir, Cataract Reservoir or Broughtons Pass Weir.*

As noted above, SCA recognises the diluting effect of the stored waters in Cataract Reservoir.

ICHPL agrees to the SCA's recommended performance measure in regard to catchment yield to the Cataract Reservoir and Woronora Reservoir (refer to table above).

SCA (16 December 2009) states:

> ***The SCA considers that overall the Project will not have a neutral or beneficial effect on water quality in watercourses above and in the vicinity of mining area.***
>
> ***…***
>
> ***While the Drinking Water Catchments Regional Environmental Plan No 1 does not apply to the project, the SCA nevertheless considers the project should seek to achieve a neutral or beneficial test on water quality.***

The "neutral or beneficial effect" test is contained in the Drinking Water Catchments Regional Environmental Plan No. 1 (Drinking Water Catchments REP).

SCA's guidelines titled Neutral or Beneficial Effect on Water Quality Assessment Guidelines (SCA, 2006) recognise that it is not mandatory for a Project under Part 3A to comply with the test. The Guidelines relevantly state:

> *…The Minister for Planning must determine major projects, and it is at the Minister's discretion which water quality test will be applied to such projects.*

Clauses 25 and 26 of the Drinking Water Catchments REP (including the "neutral or beneficial effect" test) are addressed in Section 7.2.4 of the EA, which relevantly states:

> *The Minister may take into account clauses 25 and 26 of the Drinking Water Catchments REP in deciding whether or not to approve the Project under Part 3A.*
>
> *…*
>
> *The water quality protection measures implemented for the Project (Section 5.6) would be generally consistent with the recommended practices and performance standards of the SCA, where applicable to the protection of water quality.*
>
> *Potential impacts on water quality as a result of the Project would be localised (e.g. localised changes in water quality in the Upper Nepean, Woronora River and their tributaries). Although mine subsidence effects can result in localised, episodic elevations in concentrations/levels of iron, manganese, aluminium and EC, these events have not had any measurable effect on water quality on downstream reservoirs. The Project would not impact on the performance of Woronora Reservoir or Cataract Reservoir (Section 5.2).*

GROUNDWATER

SCA (16 December 2009) states:

> ***There are deficiencies in the distribution, duration and frequency of the groundwater monitoring data, which typically conflict with the SCI report and Metropolitan Coal Project Planning Assessment Commission report…***

Tables 1 and 2 of the Groundwater Assessment (Appendix B of the EA) demonstrate how the recommendations for monitoring in the report *Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield - Strategic Review* (herein described as the Southern Coalfield Panel Report) (NSW Department of Planning [DoP], 2008) and the Metropolitan PAC Report have been addressed.

The Director-General's Environmental Assessment Requirements (EARs) required the consideration of the Southern Coalfield Panel Report (DoP, 2008) in the preparation of the EA. The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

SCA (16 December 2009) states:

- ***Perched groundwater – There is no perched groundwater monitoring within swamps, which is considered to be a significant deficiency.***

The Groundwater Assessment (Appendix B of the EA) and Upland Swamp Risk Assessment (Appendix O of the EA) included consideration of swamp monitoring data from the Metropolitan Colliery and the SCA long-term pumping trials beneath Stockyard Swamp and Butlers Swamp at the planned Kangaloon Borefield, as well as the findings of the Southern Coalfield Panel Report (DoP, 2008) and the Metropolitan PAC Report (PAC, 2009).

As described in Section 6.2.6 of Appendix B of the EA, groundwater monitoring within upland swamps would collect a minimum of 2 years baseline data prior to mining occurring as part of the Upland Swamp Monitoring Plan. The Upland Swamp Monitoring Plan has been included in the Statement of Commitments for the Project (Section 8 of the EA).

SCA (16 December 2009) states:

- ***Shallow groundwater – The distribution of shallow piezometers is not representative of the whole Project area, as the piezometers are only concentrated near the Georges, Cataract and Nepean Rivers. There is insufficient duration of baseline data and the frequency of groundwater level measurements should be increased for all piezometers. The need for additional shallow piezometers is particularly important considering the impacts to the shallow groundwater system near the Georges, Cataract and Nepean Rivers from previous mining.***

As stated in Section 2.12.1 of Appendix B of the EA:

> *Based on the available groundwater level data and to gain an impression of the regional water table pattern, a contour map of inferred groundwater level has been prepared for groundwater levels at DWE bores or measured from shallow piezometers near the Nepean, Cataract and Georges Rivers (Figure 15). The dataset has been supplemented with surface water levels in no-data areas, assuming equivalence between surface water and groundwater levels along drainage lines.*
>
> *Apart from small changes in detail where groundwater measurements have been made, the overall patterns are insensitive to the assumption made as to the relative levels of surface water and groundwater where they interact. In all cases, the contour maps indicate the same groundwater flow pattern. As groundwater will flow perpendicular to the contours, in general (except for discrete fracture flow), the groundwater in the upper part of the Hawkesbury Sandstone will flow from the ridges to the natural surface drainages. The Nepean River is a prominent groundwater discharge feature.*

As described in Section 6.2.1 of Appendix B of the EA:

> *The existing ICPHL shallow piezometer network should be augmented to include new Project areas as mining progresses (Table 25). Shallow piezometers should be installed in the vicinity of representative streams that are third order or above and in the vicinity of significant upland swamps (defined in Appendix O of the EA) at least six months prior to mining being conducted underneath or near these areas. The network of shallow piezometers should be similar to the existing network near the Georges, Nepean and Cataract Rivers near previously mined areas (Figures 10a to 10d). The final location of shallow piezometers should be determined through the SMP process, and should include consideration of site characteristics, their location relevant to the mine plan, access and site inspection.*
>
> *Water level measurements should be automated with daily or more frequent recordings and should continue for at least two years following mining.*

SCA (16 December 2009) states:

- ***Deep groundwater – The distribution of multi-level piezometers is not representative of the whole Project area. There is insufficient duration of data from the multi-level piezometers, with approximately 2.5 to 9.0 months of groundwater level monitoring data available for incorporation into the EA for EAW5, EAW7, EAW9 and EAW18. As S1993, S1996 and S1997 were installed in mid 2009, time series data was not available and could not be incorporated into the numerical model. The monitoring duration and location of multi-level piezometers is not considered sufficient to obtain an accurate representation of the groundwater conditions within the Project area. The monitoring data is concentrated in the northwestern portion of the Project area, with no continuous monitoring available in the part of the Project area covered by the SCA's Special Areas. Additionally, not all the aquifers and aquitards overlying the Bulli Coal Seam are monitored and there is no deep groundwater quality data.***

Deep Groundwater Level Monitoring

In addition to the monitoring recognised by SCA (16 December 2009), monitoring data from two multi-level piezometers at the Metropolitan Mine (LW10 Goaf, PM02) to the east of the Project area and within the extent of the groundwater model were used in the calibration of the groundwater model (Section 2.12.3 of Appendix B of the EA).

An extensive network of piezometers in the Bulli Coal Seam across the Project area was also utilised. Additional hydrogeological information has been obtained since the completion of the EA and this process would continue throughout the Project life.

As described in Section 6.2.1 of Appendix B of the EA:

> *A multi-level piezometer network should be used to monitor pore pressures within the natural rock strata to enable description of the distribution of deep aquifer pressures. The three existing multi-level piezometers used in the groundwater model should be augmented to include piezometers distributed across the Project domains. An additional three multi-level piezometers (S1993, S1996 and S1997 [Figure 10a]) have been installed and should be included in the monitoring programme, as well as additional piezometer locations (Table 25). Water quality measurements should be taken during the installation of new multi-level piezometer bores.*
>
> *Water level measurements should be automated with daily or more frequent recordings. Monitoring at these locations should continue throughout the Project life and should be reported in the AEMR. Monitoring results from these multi-level piezometers should be used to refine the groundwater modelling results as part of the SMP process.*

As stated by Dr Frans Kalf (Kalf & Associates) in his peer review of the Project Groundwater Assessment (Attachment 3 of the EA):

> *Based on the evidence presented and the modelling conducted I concur with the report conclusions and management and mitigation measures presented.*

Deep Groundwater Quality

As stated in Section 2.8 of Appendix B of the EA:

> *The Narrabeen Group is a much poorer aquifer than the Hawkesbury Sandstone, and there is no known use of the aquifer in the Southern Coalfield. The very low permeability of the Narrabeen Group lithologies is substantiated by the common experience of "dry mines" in the Southern Coalfield. However, in the Blue Mountains to the north-west of the general Project area, the Narrabeen Group yields water for domestic and garden use. Very little is known of groundwater quality in the Narrabeen Group. In mid-upper levels (Bulgo Sandstone), KBR (2008) notes total dissolved solids (TDS) as <1500 mg/L. In lower levels (Scarborough Sandstone) Short et al. (2007) measured the electrical conductivity (EC) of six samples as 850 ± 96 microSiemens per centimeter (µS/cm).*

As described in Section 2.13 of Appendix B of the EA:

> *Although there are no deep groundwater samples available, the salinity of deeper waters is expected to be much higher in accordance with the regional pattern in Figure 13. This view is supported by two samples of Bulgo Sandstone water taken during the trial of mine water injection into the Bulgo Sandstone (Section 2.11.1) which had ECs of 4,240 and 5,510 µS/cm. Higher salinity at depth indicates separation of deeper groundwater from shallow groundwater, and longer residence time of the deeper groundwater.*

SCA (16 December 2009) states:

> ***There is insufficient discussion of the shallow groundwater quality, with only salinity discussed.***

Shallow groundwater quality monitoring results are provided graphically in Attachment B of Appendix B of the EA for electrical conductivity (EC), pH, dissolved oxygen, total dissolved solids, total aluminium, dissolved manganese, total iron, dissolved calcium, dissolved sodium, chloride and sulphate.

SCA (16 December 2009) states:

> ***Indicative hydraulic properties of the stratigraphic units were provided by Heritage Computing, based on limited tests outside the Project area, some results from modelling outside the Project area and limited packer testing of one borehole within the Project area, to the base of the Scarborough Sandstone only. For the purposes of the EA for the Project, additional testing of the hydraulic properties of the stratigraphy (each stratigraphic unit overlying, and including, the Bulli Coal Seam) would have ensured a better representation of the actual stratigraphic properties. There are also modelling approaches which could have aided in determining these properties such as FLAC and UDEC/3DEC and which would have been particularly useful for identifying the hydraulic properties for the mining scenario given the lack of actual measurements.***

There are two main techniques for permeability assessment in groundwater modelling:

- measurement of groundwater levels *in situ*; and
- packer tests and/or measurement of core permeability in a laboratory.

With the groundwater level approach, permeabilities are inferred through model calibration. Such permeabilities will satisfy the necessary condition of honouring observed hydraulic responses to mining and climate stresses within a quantified margin of error. Vertical hydraulic profiles will give information on vertical permeability *in situ*, particularly of value close to fractured zones as mining approaches the monitoring site.

Unlike core measurements, a single water level measurement contains information on the groundwater regime well beyond the point of measurement. For the core testing approach, permeabilities are measured under an artificial laboratory stress regime on samples that are likely to be biased to more intact sections. It is a measure of permeability on a micro scale and does not represent main hydrogeological characteristics that are dominated by natural bedding of different material types, discontinuities and faulting/structures.

Packer testing has the advantage of being an *in situ* measurement under the true stress regime, and will have a wider radius of investigation. However, permeabilities derived from core or packer tests give no guarantee that they will satisfy the necessary condition of honouring observed hydraulic responses to mining and climate stresses.

The extent of groundwater level information used in the development of the hydrogeological model for the Project Groundwater Assessment (Appendix B of the EA) is considered adequate for permeability assessment of the Project area.

As stated by Dr Frans Kalf (Kalf & Associates) in his peer review of the Project Groundwater Assessment (Attachment 3 of the EA):

> *Based on the evidence presented and the modelling conducted I concur with the report conclusions and management and mitigation measures presented.*

Further, as stated in Section 3.2 of the Groundwater Assessment (Appendix B of the EA):

> *Indicative permeabilities for the various stratigraphic units, summarised in Table 7, are informed by SCA pumping tests, model calibration at Kangaloon (KBR, 2008), model calibration at Mangrove Mountain (Alkhatib and Merrick, 2006), model estimates at Dendrobium Mine (GHD Geotechnics, 2007), and core measurements with model calibration at Metropolitan Colliery (Heritage Computing, 2008). At Metropolitan, core measurements were made on Hawkesbury Sandstone, Bald Hill Claystone and Bulgo Sandstone samples.*
> *…*
> *In addition for the Project, packer tests have been conducted at hole EAW5 to the base of the Scarborough Sandstone; readings varied from 10^{-9} metres per second (m/s) (~10^{-4} m/d) to 10^{-6} m/s (~0.1 m/d) in the Hawkesbury Sandstone, with one outlier of 10^{-3} m/s (~100 m/d); in the Narrabeen Group readings ranged from 10^{-9} m/s (~10^{-4} m/d) to 2x10^{-8} m/s (~0.002 m/d), with one outlier of 10^{-7} m/s (~0.01 m/d).*

Further, as described in Section 6.2.4 of Appendix B of the EA:

> *Core sampling and testing should be conducted during the drilling of new multi-level piezometers and other appropriate ICHPL drilling within the Project area, where practicable, to determine aquifer properties within the natural rock strata (e.g. porosity and permeability). ICHPL should create a database of testing data throughout the Project area, which should be used to validate modelling prediction and future groundwater assessments undertaken as part of the SMP process.*

Notwithstanding the above, additional core testing was undertaken for the Bulli Seam Operations PAC Panel and will be reported separately.

SCA (16 December 2009) states:

> ***Additionally, the majority of the initial vertical permeabilities adopted for the numerical model are not based on any previous studies and many of the initial horizontal permeabilities for the numerical model varied from the indicative hydraulic properties based on hydraulic testing and modelling.***
>
> ***…***

In addition to MODFLOW-SURFACT that was used for numerical groundwater modelling, FEFLOW could be used to simulate the groundwater conditions above a longwall mine, and may be superior to MODFLOW-SURFACT. For both model codes, it is recommended that a finer grid/mesh be used in the mine areas with the coarser grid/mesh at a distance from the mine areas. It is expected that the surface and rib zones were not incorporated in the model due to the large model cells, yet incorporating the increased permeabilities is important for determining any reduction in baseflow discharge, which is a major concern for the SCA and potentially a major consequence of the proposed Project.

…Heritage Computing used a time slice of 2 years, which is considered to too large a time slice to appropriately represent the changing hydraulic properties. A time slice of every six months is considered more appropriate.

…

The deficiencies with the increasing permeability for the various zones (fractured, surface and rib) are expected to result in potentially significant impacts that have not been adequately assessed and underestimated, particularly relating to baseflows, the overlying upland swamps and streams.

…

The calibration performance, when compared to the vertical head profiles, does not appear to be a good fit.

The use of the numerical modelling software MODFLOW-SURFACT in the Groundwater Assessment is consistent with the recommendations of the Southern Coalfield Panel Report (DoP, 2008) and the Metropolitan PAC Report (PAC, 2009) (Tables 1 and 2 of Appendix B of the EA).

As described in Section 4.1 of Appendix B of the EA:

Numerical modelling has been undertaken using the Groundwater Vistas (Version 5.33) software interface (Environmental Simulations Inc, 2009) in conjunction with MODFLOW-SURFACT (Version 3) distributed commercially by Hydrogeologic, Inc. (Virginia, USA). MODFLOW-SURFACT is an advanced version of the popular MODFLOW code developed by the United States Geological Survey (McDonald and Harbaugh, 1988). MODFLOW is the most widely used code for groundwater modelling and is presently considered an industry standard. However, it has deficiencies in proper simulation of the near-field effects of underground mining; that is, those effects that occur close to the mine workings.

MODFLOW-SURFACT is a three-dimensional model able to simulate variably saturated flow and can handle desaturation and resaturation of multiple aquifers without the "dry cell" problems of Standard-MODFLOW. This is pertinent to the depressurisation that occurs in the caved zone and fractured zone above mined coal panels, and to possible dewatering of the uppermost model layer(s)…

As stated in Section 4.1 of Appendix B of the EA:

The model complexity used is considered adequate to simulate contrasts in hydraulic properties and hydraulic gradients that may be associated with changes to the groundwater system as a result of the Project.

The model complexity is limited by computational time, with lengthy computational times limiting the practicality of the model. This is a relevant consideration under the principles of groundwater modelling.

As stated by Dr Frans Kalf (Kalf & Associates) in his peer review of the Project Groundwater Assessment (Attachment 3 of the EA):

> *Based on the evidence presented and the modelling conducted I concur with the report conclusions and management and mitigation measures presented.*

In regard to perched groundwater systems, SCA (16 December 2009) states:

> ***Although MODFLOW-SURFACT has the capability of modelling perched conditions, it was not undertaken…***

SCA (16 December 2009) also states:

> ***Heritage Computing states that it is unlikely that there will be a loss of baseflow from perched water tables due to the isolation between perched and regional water tables. However, since perched water tables were not assessed and mining can cause the fracturing of the low permeability base of perched systems, the statement by Heritage Computing is unfounded.***

An assessment of potential impacts on upland swamps (i.e. perched groundwater systems) was undertaken as part of the Upland Swamp Risk Assessment (Appendix O of the EA). This assessment was undertaken in accordance with the recommendations of the Metropolitan PAC Report, which identified three broad mechanisms by which subsidence could cause changes in swamp hydrology (pages 78-79):

1. *The bedrock below the swamp cracks as a consequence of tensile strains and water drains into the fracture zone. If the fracture zone is large enough or connected to a source of escape (e.g. a deeper aquifer or bedding shear pathway to an open hillside) then it is possible for sufficient water to drain to alter the hydrologic balance of the swamp.*
2. *Tilting of sufficient magnitude occurs to either re-concentrate runoff leading to scour and erosion, potentially allowing water to escape from the swamp margins (possibly affecting the whole swamp) or to alter water distribution in parts of the swamp, thus favouring some flora species associations over others.*
3. *Buckling and bedding shear enhances fracture connectivity in the host bedrock which promotes vertical then lateral drainage of the swamp. This mechanism is similar to redirected surface flow observed in subsidence-upsidence affected creek beds.*

The discussion of potential groundwater impacts on swamps within the Groundwater Assessment is consistent with the Metropolitan PAC Report. As described in Section 6.5.1.3 of Appendix B of the EA, there is expected to be no loss of water to depth but bed separation and tensile cracking still has the potential to occur:

> *The substantial depth of cover and the presence of a thick aquitard protect the shallow aquifers in the Hawkesbury Sandstone, which are in connection with streams and ecosystems, from transmitted effects due to reduction in groundwater pressures. Based on the analysis of the conceptual groundwater system, and modelling results, there is no expected dewatering of swamps from depressurisation at depth…*
>
> *As the free-draining fractured zone that is to be expected above a goaf zone does not extend as high as the Bald Hill Claystone, the perched water in upland swamps would not be impacted directly by vertically connected cracking. The only possibilities for impact are through bed separation or superficial tensile cracking associated with a moving subsidence trough, and that is likely to be transitory or localised.*

> *Very little drainage of water due to bed separation or superficial tensile cracking is expected from the perched water table in a swamp to the regional water table in the underlying sandstone, as the sandstone bedrock is massive in structure and permeability decreases with depth. Surface cracking that may occur would be superficial in nature (i.e. would be relatively shallow) and would terminate within the unsaturated part of the low permeability sandstone (MSEC, 2009). Due to the very low hydraulic gradient of the water table within a swamp, lateral movement of water through the swamp towards a crack would be very small and very slow.*

Evidence supporting this position is described Section 6.5.1.3 of Appendix B of the EA:

> *…In addition, a preliminary study conducted by the SCA on the effects of borefield extraction under a swamp "clearly show no interaction between the water levels in Butler's Swamp and the water being extracted from the sandstone aquifer" (SCA, 2007). This supports the argument that the regional aquifer is hydraulically disconnected from perched water in the upland swamps.*

As also discussed in Section 2.12.2 of Appendix B of the EA:

> *Similarly, long-term pumping trials beneath Stockyard Swamp (Figure 17) and Butlers Swamp (Figure 18) at the planned Kangaloon Borefield near Robertson (about 40 km south-west) show no response in swamp perched water levels when the Hawkesbury Sandstone aquifer is depressurized (KBR, 2008). This illustrates the potential for hydraulic isolation of aquifers within the stratigraphic section when a deeper formation is depressurised.*

SCA (16 December 2009) states:

> ***…the model did not include structural features, although faults and dykes have the potential to affect the groundwater systems and longwall mining operations.***

ICHPL currently undertakes surface based exploration to detect major discontinuities (structural and igneous) as a basis for mine planning. The exploration activities are undertaken on a regional basis to define major structures that define mining domains and subsequently infilled. ICHPL uses 2D and 3D seismic, magnetic surveys and boreholes to test in conjunction with surface mapping, lineament analysis, modelling etc. The surface based exploration activities can define structural features with displacements as small as 3 to 5 m. ICHPL uses the exploration to develop mine plans which avoid faults with displacements nominally greater than the seam thickness and sills within the proposed longwalls.

Exploration at the Appin Mine and West Cliff Colliery has intersected numerous geological structures in the workings and in-seam boreholes. However, the Appin Mine (in over 40 years of mining) and West Cliff Colliery (in over 30 years of mining) have never encountered a hydraulically charged structure.

In-seam drilling is conducted through standpipes and stuffing boxes that are engineered to manage the in-seam gas pressures which are comparable to hydrostatic pressure. If a hydraulically charged structure were encountered, the drill rods would be withdrawn and the hole sealed. The pressure in the hole and the water quality sampling would be used to identify the source of the water. Encountering a hydraulically charged structure would also be a significant safety issue and would be reported under requirements of the *Coal Mine Health and Safety Regulation, 2006*.

ICHPL exploration is based on identifying major geological structures (whether they are hydraulically charged or not) in order that the features can be avoided, primarily because major structures would disrupt ICHPL's operations.

As stated in Section 2.7 of Appendix B of the EA:

> *In the year ending June 2009, Appin Mine and West Cliff Colliery had drilled 194,819m (89,634m and 105,185m respectively) of in-seam holes and this is typical of the level of drilling undertaken each year in advance of ICHPL's operations. As a result of the surface and in-seam drilling there is negligible risk of intersecting hydraulically charged geological structures in the workings. The longwalls are designed around geological structures, where the displacement is greater than ~5 m.*

SCA (16 December 2009) states:

> ***Calibration for the steady state model of current conditions was based on numerous groundwater levels within the Hawkesbury Sandstone, yet the location of all piezometers monitoring this unit, a significant stratigraphic unit for the SCA's operations, was not provided and expected to be deficient within the SCA's Special Areas…***

Figures 14 and 15 of Appendix B of the EA show the locations of monitoring bores used for the calibration of the model.

As stated in Section 2.12.1 of Appendix B of the EA:

> *Based on the available groundwater level data and to gain an impression of the regional water table pattern, a contour map of inferred groundwater level has been prepared for groundwater levels at DWE bores or measured from shallow piezometers near the Nepean, Cataract and Georges Rivers (Figure 15). The dataset has been supplemented with surface water levels in no-data areas, assuming equivalence between surface water and groundwater levels along drainage lines.*
>
> *Apart from small changes in detail where groundwater measurements have been made, the overall patterns are insensitive to the assumption made as to the relative levels of surface water and groundwater where they interact. In all cases, the contour maps indicate the same groundwater flow pattern. As groundwater will flow perpendicular to the contours, in general (except for discrete fracture flow), the groundwater in the upper part of the Hawkesbury Sandstone will flow from the ridges to the natural surface drainages. The Nepean River is a prominent groundwater discharge feature.*

SCA (16 December 2009) states:

> ***Different horizontal hydraulic conductivities and vertical hydraulic conductivities were given to layers 6 to 13 (Lower Bulgo Sandstone to the layer below the Bulli Coal Seam), to allow for the fractured zone above and below the mining operations. A constrained zone was defined for the Upper Bulgo Sandstone. Due to the large variation in the depth to the coal seam, from 300 to 850 m, defining the fractured and constrained zones based on stratigraphic unit is not deemed appropriate.***

The variation in depth to the coal seam is mostly due to the thickness and/or presence of the higher stratigraphic units (i.e. Wianamatta Shale and Hawkesbury Sandstone).

As shown in Figures 1 and 2 respectively, the thickness of the fractured and constrained zones across the Project area generally varies within 50 m.

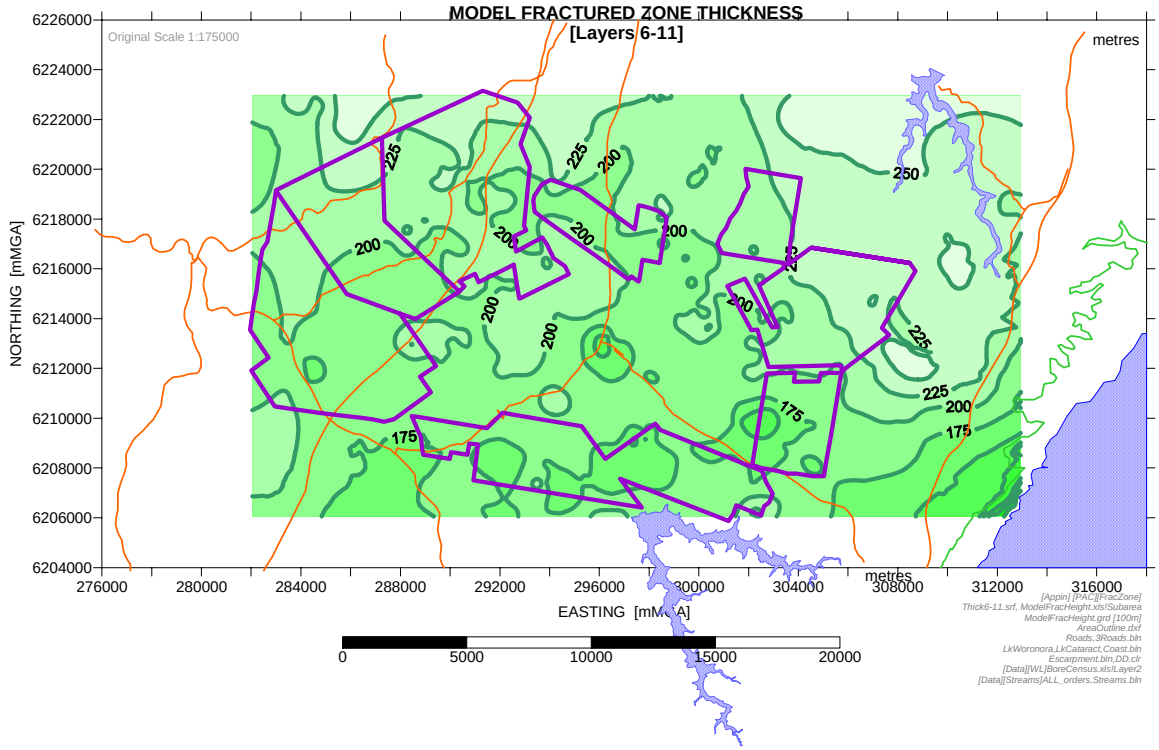


Figure 1 – Thickness of Fractured Zone in Groundwater Model

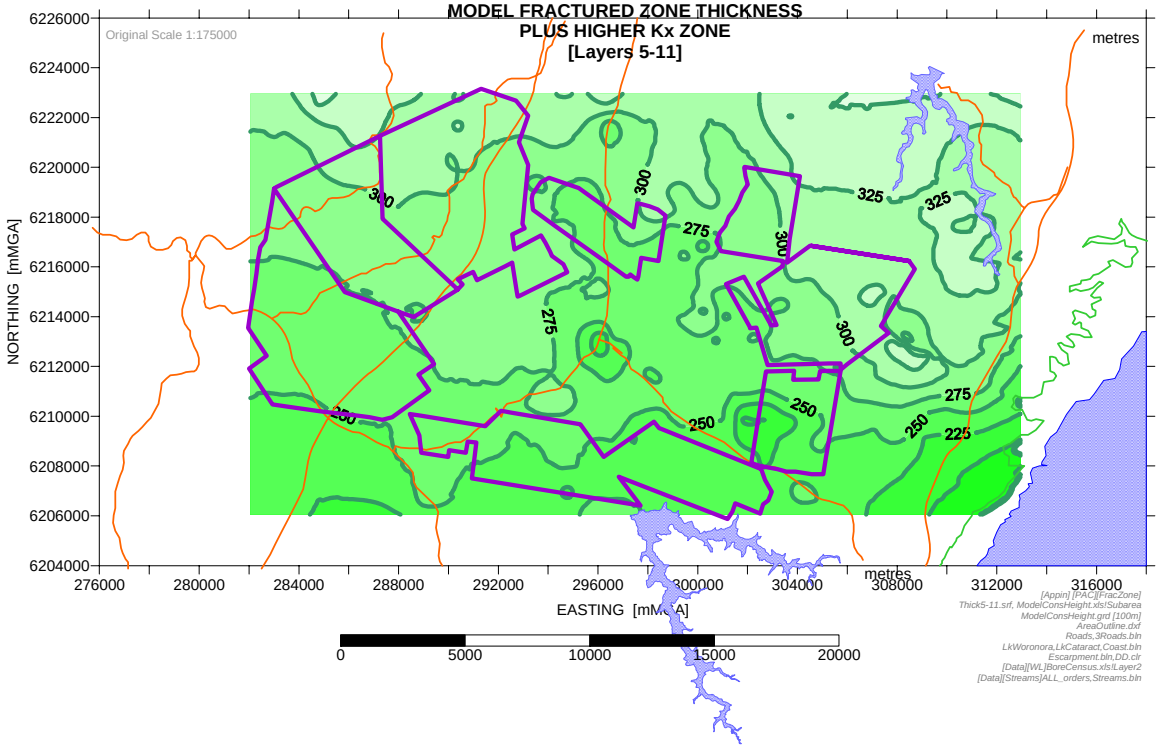


Figure 2 – Combined Thickness of Fractured and Constrained Zones in Groundwater Model

ENVIRONMENTAL CONSEQUENCES

SCA (16 December 2009) states:

> ***The SCA is not satisfied that the Project would result in "negligible" environmental consequences for the section of Cataract River from the Cataract Dam to Broughtons Pass Weir…***
>
> ***The SCA is not satisfied that the project would result in "negligible" environmental consequences for Lizard Creek.***
>
> ***The SCA is not satisfied that the Project would have "negligible environmental consequence for Wallandoola East Creek, Wallandoola Creek and Cascade Creek…***
>
> ***The SCA is not satisfied that the Project would have "negligible" environmental consequences for Woronora River (tributary downstream of the crossing of Fire Trail 14 and adjacent to the northern end of Longwall 19 – and 3rd order tributary downstream of Longwall 18).***

Table 5-2 of the EA summarises the stream impact minimisation criteria and management measures that would be applied for the above streams and the contingencies that would be implemented for predictions that are exceeded.

Attachment PG of Appendix P of the EA includes stream long-sections which provide graphical representations of predicted subsidence effects based on the implementation of the stream impact minimisation criteria.

As described in Section 5.2.1 of the EA:

> *ICHPL would prepare Stream Risk Management Plans (RMPs) for all of the streams identified in Appendix P that are situated within the extent of longwall mining area and within 600 m of the boundary of secondary extraction. The Stream RMPs would be included in future Extraction Plans for specific mining domains.*
>
> *The Stream Risk Assessment (Appendix P) would be reviewed and an updated risk assessment would be included in the RMPs based on the final mine plan (which would be consistent with any Project Approval conditions) and informed by relevant monitoring data.*

In regard to Cataract River, SCA (16 December 2009) states:

> ***…The SCA considers the Cataract River between Cataract Dam and Broughtons Pass weir is also of special significance…***

As described in Section P5 of Appendix P of the EA:

> *In relation to 'special significance' the Metropolitan PAC Report provides the following (page 42):*
>
> > *'Special Significance Status' is based on an assessment of a natural feature that determines the feature to be so special that it warrants a level of consideration (and possibly protection) well beyond that accorded to others of its kind. It may be based on a rigorous assessment of scientific importance, archaeological and cultural importance, uniqueness, meeting a statutory threshold or some other identifiable value or combination of values.*
>
> *Further, the Metropolitan PAC Report states (page 55):*
>
> > *In the current circumstances, the discussions as to significance and the appropriate protection to be afforded to a particular watercourse will come down to a case by case assessment of the values attributed to the watercourse, …*
>
> *The Metropolitan PAC Report also recognised that in the absence of quantifiable measures and an objective threshold, conclusions about 'special significance' would be subjective.*

Table 5-2
Summary of Preferred Risk Management Options - Streams

Streams	***Stream Impact Minimisation Criteria[1]***	***Management Measures[1]***	***Exceeding Prediction***	***Contingency***
• *…* • *Cataract River.* • *Lizard Creek.* • *…*	• *Minor fracturing of controlling rockbars, with negligible diversion of water from associated pools.* • *Potential for fracturing of stream bed and consequent stream flow diversion in stream reaches between controlling rockbars. The potential for this impact is considered to be low in stream reaches where the above criteria has been applied (i.e. the application of the above criteria at controlling rockbars is expected to significantly reduce potential impacts to intervening stream reaches as evidenced by the analysis of the EA Base Plan Longwalls presented in Appendix A).* • *Localised[3] impacts on stream water quality.* • *Strata gas release.*	• *Longwall layout design to achieve a maximum predicted closure of 200 mm at controlling rockbars.* • *Implementation of stream remediation measures on rivers and stream reaches of third order and above where subsidence results in the diversion of stream flow in stream reaches between controlling rockbars, and where the stream features are such that the remediation measures are considered technically feasible (e.g. where there was pre-mining flow and the substrate is suitable for grouting). The need for and the effort required for successful remediation is expected to be significantly less than that required for streams without setbacks.*	• *Fracturing of controlling rockbar resulting in increased leakage from associated pools.* • *Remediation measures implemented are not successful.* • *Impacts on stream water quality more than localised.*	• *Implementation of additional stream remediation measures.* • *Implementation of offset and compensatory measures.*
• *…* • *Woronora River (perennial[2] reaches) – includes perennial[2] reaches that are less than 3rd order.*	• *Fracturing of controlling rockbars and/or stream bed, resulting in the diversion of some stream flow, however to a reduced degree when compared to streams with full extraction.* • *Localised[3] impacts on stream water quality.* • *Strata gas release.*	• *Stream not directly undermined.* • *Implementation of stream remediation measures (i.e. grouting) at controlling rockbars to return stream flow to pre-mining characteristics. The need for and the effort required for successful remediation is expected to be significantly less than that required for streams without setbacks.* • *Implementation of stream remediation measures in stream reaches between controlling rockbars where remediation measures are technically feasible (e.g. where there was pre-mining flow and the substrate is suitable for grouting).*	• *Remediation measures implemented are not successful.* • *Impacts on stream water quality more than localised.*	• *Implementation of additional stream remediation measures.* • *Implementation of offset and compensatory measures.*
…	*…*	*…*	*…*	*…*

Table 5-2 (Continued)
Summary of Preferred Risk Management Options - Streams

Streams	***Stream Impact Minimisation Criteria[1]***	***Management Measures[1]***	***Exceeding Prediction***	***Contingency***
• *All other streams.* [Wallandoola East Creek, Wallandoola Creek and Cascade Creek, 3rd order tributary to Woronora River]	• *Fracturing of controlling rockbars and/or stream bed, resulting in the diversion of some stream flow, including increased leakage from pools.* • *Localised[3] impacts on stream water quality.* • *Strata gas release.*	• *Implementation of stream remediation measures (i.e. grouting) on stream reaches of third order and above at controlling rockbars to return stream flow to pre-mining characteristics.* • *Implementation of stream remediation measures on stream reaches of third order and above in stream reaches between controlling rockbars, where remediation measures are technically feasible (e.g. where there was pre-mining flow and the substrate is suitable for grouting).*	• *Remediation measures implemented are not successful.* • *Impacts on stream water quality more than localised.*	• *Implementation of additional stream remediation measures.* • *Implementation of offset and compensatory measures.*

[1] *Controlling rockbars on each stream are identified on stream mapping provided in Appendix P.*

[2] *As mapped on 1:25,000 topographic mapping (Lands Department, 2000).*

[3] *Estimated to include the extent of subsidence effects plus in the order of 600 m downstream (after HCPL, 2008).*

Recommendation 12 of the Southern Coalfield Panel Report states:

> *Government should provide improved guidance to both the mining industry and the community on significance and value for natural and other environmental features to inform company risk management processes, community expectations and Government approvals. This guidance should reflect the recognition that approved mining would be expected to have environmental impacts.*

ICHPL has applied the following stream impact minimisation criteria to the Cataract River (Table 5-2 of the EA):

- *Minor fracturing of controlling rockbars, with negligible diversion of water from associated pools.*
- *Potential for fracturing of stream bed and consequent stream flow diversion in stream reaches between controlling rockbars. The potential for this impact is considered to be low in stream reaches where the above criteria has been applied (i.e. the application of the above criteria at controlling rockbars is expected to significantly reduce potential impacts to intervening stream reaches as evidenced by the analysis of the EA Base Plan Longwalls presented in Appendix A).*
- *Localised impacts on stream water quality.*
- *Strata gas release.*

In regard to Appin Falls, SCA (16 December 2009) states:

> ***…The SCA is not yet able to determine whether the Project would affect the structural integrity of the waterfall, its overhang and its pool because of insufficient data presented.***

Drawing MSEC404-213 of Appendix A of the EA shows that Appin Falls is represented by cliffs A3_0400 to A3_0460. Attachment RA of Appendix R of the EA shows that the total maximum predicted subsidence for these cliff lines is <20 millimetres (mm), the total maximum predicted tilt is <0.2 millimetres per metre (mm/m) and the estimated average tensile and compressive strains are <0.2 mm/m.

The EA Base Plan Longwalls would not mine directly beneath the Appin Falls as a consequence of applying the stream risk minimisation criteria described in the Stream Risk Assessment (Appendix P of the EA). As stated in Section R6.4.1 of Appendix R of the EA:

> *Although very minor rock falls have been observed over solid coal outside the extracted goaf areas of longwall mining in the Southern Coalfield, there have been no recorded cliff instabilities outside the extracted goaf areas of longwall mining in the Southern Coalfield.*

Figure 200-19 of Attachment PG of Appendix P of the EA shows that the maximum predicted closure at Appin Falls is significantly less than 200 mm (approximately 30 mm predicted valley closure). As a result, there is predicted to be no flow diversion and pool water level impacts at the Appin Falls pool as a result of the Project.

In regard to the SCA's recommended performance measures for the Appin Falls that there are no flow diversions and pool water level impacts at the Appin Falls pool and no cliff instabilities as a result of the Project, it should be noted that rock falls occur naturally within the Southern Coalfield as a result of weathering processes, therefore ICHPL cannot commit to no rock falls occurring at Appin Falls during the Project.

SCA (16 December 2009) states:

> ***The Proponent's stream impact minimisation criteria for Cataract River and Lizard Creek is a lesser standard than the SCA's performance measures of "negligible" environmental consequences. The SCA's performance measure of "negligible" equates to that specified for sections of Waratah Rivulet and the Eastern Tributary by the Minister for Planning in her approval for the Metropolitan Coal Project. It is a higher standard than that proposed by the Proponent for any watercourse.***

ICHPL's preferred risk management option for streams is presented in Table 5-2 of the EA.

SCA (16 December 2009) states:

> ***For each of the Proponents 3 groups the EA states there will be localised impacts on stream water quality. While this may be the case for where longwall design aims to achieve a maximum predicted closure of 200mm at controlling rockbars, the SCA does not consider it would be the case where streams are directly undermined. In these cases the likely impacts on water quality would be similar to those experienced at the Metropolitan Colliery in the sections of the Waratah Rivulet which were directly undermined (the impacts locally were significant and extended downstream beyond the mining area).***

As stated in the Metropolitan PAC Report (PAC, 2009) (page 60):

> *The Panel notes that surface water monitoring undertaken by the Proponent suggests such water quality impacts appear to be both localised and transient, with negligible downstream impacts on the water quality of Woronora Reservoir stored waters. SCA supports this contention…*

As described in Table 5-2 of the EA, localised impacts on stream water quality are:

> *Estimated to include the extent of subsidence effects plus in the order of 600 m downstream (after HCPL, 2008).*

SCA (16 December 2009) states:

> ***Remediation is proposed in a number of cases where it is "technically feasible". It is unclear from the EA as to what the term "technically feasible" means and consequently the SCA does not understand the potential spatial scope of the remediation.***

ICHPL considers "feasible" to be consistent with the definition included in the Project Approval for the Metropolitan Coal Project (08_0149):

> *Feasible relates to engineering considerations and what is practical to build.*

This definition can be applied to the implementation of remediation works. As described in Appendices O and P of the EA, contingency and offset measures would be implemented where remediation measures are not successful or predictions are exceeded.

SCA'S RECOMMENDATIONS

SCA (16 December 2009) states:

> ***…In particular the SCA considers conditions must be included which require the applicant to:***
>
> - ***Provide evidence on the issues the SCA has identified above.***
> - ***For identified risks detail the risks and measures to be put in place to monitor the potential risks.***
> - ***Provide agreed actions to address the risks if they materialise before mining occurs in each mining domain.***
> - ***Meet all costs associated with preventing, minimising and rehabilitating impacts and compensate the SCA if it suffers an economic loss due to a reduction in the quantity and/or quality of water entering the Cataract and Woronora storages and Broughtons Pass weir pool arising from the Project.***

As described in Section 5.2.1 of the EA:

> *ICHPL would prepare Stream Risk Management Plans (RMPs) for all of the streams identified in Appendix P that are situated within the extent of longwall mining area and within 600 m of the boundary of secondary extraction. The Stream RMPs would be included in future Extraction Plans for specific mining domains.*

ICHPL commits to maintaining SCA infrastructure in a safe and serviceable condition (Section 5.4.5 of the EA). ICHPL also agrees to the SCA's recommended performance measures in regard to catchment yield to and the storage water quality of the Cataract Dam, Woronora Dam and Broughtons Pass Weir water storages (refer to table above).

ICHPL would meet all costs associated with Project-related remediation works and impacts on SCA storages and structures that are not met by the NSW Mine Subsidence Board.

SCA (16 December 2009) states:

> ***Requirements with regard to the following should be included in the approval conditions:***
>
> - ***Performance measures – the SCA expects the approval to include a schedule of performance measures for water resources, watercourses and built features. It is important that specified performance measures are measureable and compliance testable.***

ICHPL agrees with the above SCA recommendation.

SCA (16 December 2009) states:

> ***Requirements with regard to the following should be included in the approval conditions:***
>
> ***…***
>
> - ***Catchment Monitoring Program – prepared in consultation with and to the satisfaction of the SCA for those parts applying to the Metropolitan and Woronora Special Areas. The program must be approved prior to the Proponent carrying out any second workings in the Metropolitan or Woronora Special Areas.***

As stated in Section 5.2.1 of the EA:

> *It is proposed that a detailed monitoring programme be provided in a Catchment Monitoring Programme to be prepared to the satisfaction of the DoP. Similar to the risk assessment conducted for the Project, the Catchment Monitoring Programme would be reviewed and updated in accordance with any updated risk assessment.*

ICHPL agrees to consult with SCA throughout the preparation of the Catchment Monitoring Program for those parts applying to the Metropolitan and Woronora Special Areas.

SCA (16 December 2009) states:

> ***Requirements with regard to the following should be included in the approval conditions:***
>
> ***…***
>
> - ***Extraction Plan – the SCA expects the approval to include a requirement for extraction plans similar to that specified in the Metropolitan Coal Project approval (Schedule 3 – condition 6) – but with the exception that for those parts within the Metropolitan and Woronora Special Areas, the water management plan, land management plan and built features management plan are to be prepared in consultation with and to the satisfaction of the SCA. Where the Extraction Plans affect any part of the Upper Canal (including the Nepean and Cataract Tunnels) or Menangle and Jordans Crossing weirs, the built features management plan shall be prepared in consultation with and to the satisfaction of the SCA.***

As stated in Section 7.3.1 of the EA:

> *Over the life of the Project, Extraction Plans would be progressively prepared as detailed mine designs are completed for each part of the Project area. The main aspects to be addressed by Project Extraction Plans would include:*
>
> - *a detailed mine plan;*
> - *plans of associated surface construction works;*
> - *a coal resource recovery plan;*
> - *final prediction of systematic (conventional) and non-systematic (non-conventional) subsidence effects;*
> - *demonstration that the predicted subsidence impacts and consequences are consistent with those authorised by the Project Approval;*
> - *a Subsidence Monitoring Programme;*
> - *a Catchment Monitoring Programme;*
> - *a Biodiversity Management Plan;*
> - *a Heritage Management Plan; and*
> - *a Built Features Management Plan.*
>
> *The Extraction Plan process provides a mechanism for the presentation of further detail regarding particular management measures for individual longwalls or mining domains. As part of the preparation of Extraction Plans, consultation would be undertaken with relevant stakeholders (e.g. relevant landholders, infrastructure owners and government authorities).*

As described in Section 5.4.5 of the EA:

> *As a component of future Extraction Plans, mitigation measures, management and monitoring of subsidence impacts on SCA infrastructure would be developed and implemented by ICHPL, in consultation with the SCA. This would include consideration of mitigation measures and resulting subsidence effects on previously affected SCA infrastructure. Measures may include the development of preventative and remedial measures, monitoring programmes and TARPs to maintain infrastructure in a safe and serviceable condition.*

SCA (16 December 2009) states:

> ***Requirements with regard to the following should be included in the approval conditions:***
>
> ***…***
>
> - ***Rehabilitation Objectives – the Proponent shall achieve the following rehabilitation objectives:***
>   - ***For all SCA catchment infrastructure works – repair/restore to pre-mining condition or equivalent;***
>   - ***For all 3rd order watercourses and above located within the Metropolitan and Woronora Special Areas – restore surface flow and pool holding capacity as soon as reasonable practicable to pre-mining levels.***

ICHPL generally agrees with the above SCA recommendations.

As described in Section 5.4.5 of the EA, ICHPL will maintain SCA infrastructure in a safe and serviceable condition.

Table 5-2 of the EA describes the proposed stream remediation measures that would be implemented on stream reaches of third order and above and at associated controlling rockbars to return stream flow to pre-mining characteristics.

SCA (16 December 2009) states:

> ***Requirements with regard to the following should be included in the approval conditions:***
>
> ***…***
>
> - ***Environmental Offsets – should be required to compensate for either predicted or non-predicted impacts on natural features, where such impacts as non-remediable.***

Tables 5-2 and 5-3 of the EA provide contingency measures for streams and swamps, respectively, where predictions are exceeded.

Table SOC-2 of Section 8 (Statement of Commitments) of the EA provides a summary of research, offset and compensatory measures that would be implemented for the Project.

SCA (16 December 2009) states:

> ***The SCA supports the recommendation by the Department of Environment, Climate Change and Water (DECCW) that any approval of the Project includes explicit staging of the mining, so that the Eastern domains be delayed until the science of predicting environmental consequences and developing preventative and remedial measures is improved in this more challenging environment and that a 10 year review process be included in the approval.***

ICHPL's preferred approach is consistent with the second option presented by Industry & Investment NSW (I&I NSW) (23 December 2009):

> *If the determination is not based on a staged process, there is a need for strong mechanisms to ensure adequate consultation, feasibility studies and lead time for the development of major management strategies, that is, the Extraction Plans Stage.*

This approach is consistent with:

- the NSW planning process (see Figure 44 of the Southern Coalfield Panel Report [DoP, 2008]); and
- contemporary Project Approvals under Part 3A of the *Environmental Planning and Assessment Act, 1979* (e.g. Metropolitan Coal Project [08_0149]) which include the staged submission of detailed strategies, plans and programs (e.g. Subsidence Management Plans and/or Extraction Plans).

The above process includes strong consultation mechanisms, feasibility studies and long lead times (i.e. typically the lodgement of a Subsidence Management Plan six months prior to its desired approval).

REFERENCES

Department of Planning (2008) *Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield: Strategic Review*. State of NSW through the NSW Department of Planning.

Industry and Investment NSW (2009) Bulli Seam Operations Project Environmental Assessment 08_0150. Letter dated 23 December 2009.

Planning Assessment Commission (2009) *Metropolitan Coal Project Review Report*.

Sydney Catchment Authority (2006) *Neutral or Beneficial Effect on Water Quality Assessment Guidelines.*

Bulli Seam Operations
Response to Roads and Traffic Authority Submission

Each of the recommendations made by Roads and Traffic Authority (RTA) (2009) (reproduced below in bold) are addressed below.

In regard to consultation, RTA (2009) states:

> ***The RTA notes that the application does not appear to have been referred to the RTA previously.***

As described in Section 3.1.2 of the EA:

> *ICHPL met with the RTA on 9 July 2008 to present a description of the Project and confirm the existing RTA infrastructure (e.g. roads) located within the extent of longwall mining area. Further information is provided in Appendix A (Subsidence Assessment). A subsequent letter from ICHPL describing the Project assessment and approvals process was provided to the RTA on 22 July 2008.*

A copy of the EA for adequacy assessment was provided to the RTA and comments received on this version on 2 October 2009.

In regard to potential subsidence impacts on State roads RTA (2009) states:

> ***The Proposal has the potential to impact on a number of highly significant State Classified Roads which are maintained by the RTA. These roads are the Hume Highway (HW2), Picton Road (MR95/MR612) and Appin Road (MR177). The RTA considers that the proponent must ensure that the Proposal does not in any way compromise functionality of these roads, the infrastructure itself or road safety.***

As stated in Section 5.4.5 of the EA:

> *The Road Technical Committee would develop management measures to ensure the safe operation of the highway during mining and would review the performance of the management measures following the mining of each longwall.*

In this regard RTA (2009) also states:

> ***Formation of a Steering Committee with executive representation from relevant stakeholders including the proponent, the RTA, the MSB, Department of Primary Industries and if appropriate, the Department of Planning.***
>
> ***Formation of a Technical Working Party with representation as for the steering committee, to develop recommendations for monitoring, mitigation, remediation and management measures. The body would provide technical input to the Steering Committee.***

Illawarra Coal Holdings Pty Ltd (ICHPL) agrees with the above RTA requirement and has worked under the same regime successfully with the RTA in the past.

As stated in Section 5.4.5 of the EA:

> *The development of management measures would involve input from a Road Technical Committee, which would include representatives from RTA, ICHPL, DPI, MSB and specialist consultants, as required, in the fields of geotechnical engineering, pavements, bridges, traffic management, mine subsidence, risk assessment, modelling and project management.*

The Road Technical Committee would develop management measures to ensure the safe operation of the highway during mining and would review the performance of the management measures following the mining of each longwall.

In this regard RTA (2009) also states:

…it should be noted that the RTA will not accept any subsidence from mining directly affecting any bridges on any of the above State roads.

As described in Section 5.4.5, ICHPL commits to maintaining all bridges in a safe, serviceable and repairable condition throughout the mining period. Management plans would be developed for each bridge on State roads in consultation with the RTA.

Section 5.4.5 and Appendix A of the EA outline management measures for each bridge within the Project area.

In this regard RTA (2009) also states:

…the RTA considers that any future mining that has the potential to impact on the Hume Highway (or other State roads) must be subject to an assessment of the findings from the Area 7 experience and review.

ICHPL agrees with the above RTA requirement. Future Extraction Plans for mining in the vicinity of State roads would be informed by the current mining of Longwalls 703 and 704.

As stated in Section 5.4.5 of the EA:

The Road Technical Committee would develop management measures to ensure the safe operation of the highway during mining and would review the performance of the management measures following the mining of each longwall.

RTA (2009) also states:

Whilst Section 4 of the Road Transport Assessment outlines additional vehicles generated by the proposal, the RTA considers that a table should be provided clearly stating the additional haulage volumes generated on the proposal on the routes identifies in Table 13.

A table with total ICHPL Vehicle Movements (Table 13 of Appendix K of the EA) broken down into vehicle classes (including haulage volumes) has been prepared and is presented below and will be forwarded to the RTA separately.

It should be noted these are predicted total future ICHPL vehicle movements per weekday, not additional movements, and comparisons to determine additional haulage volumes should be made with Table 7 in the Road Transport Assessment (Appendix K of the EA).

Total Future ICHPL Vehicle Movements (per Weekday)

Site	Road and Location	Courier/Deliveries		Coal Product Transport	Employee/ Contractors	Total ICHPL Vehicle Movements		
		Light	Heavy	Heavy	Light	Light	Heavy	Total
To/from PKCT								
1	Bulli-Appin Road, Appin near Kings Fall Bridge	96	3	927	787	883	930	1,813
2	Appin Road north of Princes Highway	197	13	1,585	864	1,060	1,598	2,658
3	Mount Ousley Road at Mount Pleasant	74	6	1,585	239	313	1,591	1,904
4	F6 Southern Freeway north of Princes Highway Interchange at West Wollongong	74	6	1,585	239	313	1,591	1,904
5	F6 Southern Freeway south of Princes Highway near Footbridge	74	6	1,585	239	313	1,591	1,904
6	Masters Road at Mount St. Thomas	0	0	1,585	0	0	1,585	1,585
7	Springhill Road at Coniston	0	0	1,264	0	0	1,264	1,264
To/from BlueScope Steelworks and DCPP								
8	Springhill Road north of Five Islands Road	0	0	674	0	0	674	674
Route to/from Corimal								
-	Northern Distributor, Towradgi, south of Towradgi Road	0	0	17	0	0	17	17
Route to/from Coalcliff								
-	F6 Freeway (North)	21	5	17	48	69	22	91
10	Lawrence Hargrave Drive east of Old Princes Highway	0	0	17	0	0	17	17
Local Roads								
12	Princes Highway at Bulli Pass	102	6	0	577	679	6	685
13	Princes Highway north of Bellambi Lane, Russell Vale	102	6	0	577	679	6	685
14	Narellan-Appin Road north of Appin township, south of Brian Road	30	2	0	192	222	2	224
15	Remembrance Driveway north of Finns Road	15	5	0	48	63	5	67
16	Menangle Road at Nepean River Bridge	15	5	0	48	63	5	67
17	Remembrance Driveway 0.5 km north of Regreme Road	15	5	0	48	63	5	67
18	Menangle Road east of Picton-Oakdale Road	15	5	0	48	63	5	67
19	Picton Road at Nepean River Bridge	44	14	0	144	188	14	202
20	Remembrance Driveway 0.8 km south of Tahmoor Post Office	15	5	0	48	63	5	67
21	Picton Road west of Mount Keira Road	29	26	0	722	751	26	777
22	Wilton Road at Clements Creek	44	14	0	144	188	14	202

Note: Totals may have minor discrepancies due to rounding.

In this regard RTA (2009) also states:

> ***Clarification needs to be provided on how weekday predicted vehicles were converted to peak hour volumes for the purposes of the intersection analysis undertaken using SIDRA. All assumptions should be clearly stated and justified.***

Section 3.3 of the Road Transport Assessment (Appendix K of the EA) describes how the daily volume traffic growth rates are used to estimate future peak hour movements based on surveyed peak hour movements.

Average weekday future delivery/visitor vehicle movements were converted to peak hour movements assuming 10% of the predicted daily movements would occur during the peak hours. Traffix Pty Ltd (specialist road traffic engineers) states that it is a recognised standard approach to use 10% of the predicted annual average daily traffic (AADT) to calculate peak hour movements where more detailed information (i.e. 24 hour counts) is not available. Traffix Pty Ltd indicates that this relationship is based on data from numerous survey locations in residential/industrial developments for traffic studies in NSW.

Section 4.1.3 of Appendix K of the EA describes the assumptions regarding distribution of employee movements during the peak hour periods. Section 4.1.3 of Appendix K of the EA also describes the distribution of road haulage movements during the day and night periods.

Peak hour road haulage movements were calculated by dividing the daytime road haulage movements by the number of hours in the 'day' period (as defined in Section 4.1.3 of Appendix K of the EA).

In this regard RTA (2009) also states:

> ***Electronic copies of all SIDRA modelling undertaken must be forwarded to the RTA for assessment and verification.***

Electronic copies of all SIDRA modelling will be forwarded to the RTA separately.

Bulli Seam Operations
Response to Dams Safety Committee Submission
11 November 2009

Each of the recommendations made by the Dams Safety Committee (11 November 2009) (reproduced below in bold) are addressed below.

Dams Safety Committee (11 November 2009) states:

> ***The company's lease conditions require it to apply to the DSC for endorsement to mine within notification areas.***

As stated in Section 7.3.1 of the EA:

> *Prior to the commencement of mining within a Notification Area, ICHPL must receive the consent of the Minister administering the Mining Act, 1992. The DSC advises the Minister administering the Mining Act, 1992 on the extent and type of mining to be permitted, and on any special conditions which should apply.*
>
> *ICHPL has consulted with the DSC during the preparation of this EA (Section 3.1.2). Within the Cataract and Broughtons Pass Notification Areas, the mine layout would be designed to conform with the requirements of the DSC (Section 2.5), with reference to the DSC guideline Mining in Notification Areas of Prescribed Dams (DSC, 1998).*
>
> *Prior to mining within the Cataract and Broughtons Pass Notification Areas, ICHPL would obtain all necessary approvals from the Minister administering the Mining Act, 1992 in accordance with the requirements of the Dams Safety Act, 1978 and the DSC.*

Dams Safety Committee (11 November 2009) states:

> ***Regardless of the current state of prescription or otherwise of individual dams, the Committee will continue to require dam owners to undertake appropriate levels of dam surveillance, and to ensure that mining operations do not compromise the safety of dams or their storages.***

Illawarra Coal Holdings Pty Ltd (ICHPL) recognises the Dam Safety Committee's requirements and would continue to work with relevant dam owners in this regard.

In accordance with Dams Safety Committee guidelines, ICHPL would continue to undertake the following for Brennans Creek Dam:

- proper operation and maintenance of Brennans Creek Dam using trained personnel;
- regular dam surveillance using trained personnel;
- implementation of appropriate dam safety emergency plans;
- ongoing assessment of dam behaviour on the basis of surveillance information;
- periodic review of Brennan Creek Dam's compliance with current DSC requirements;
- review of all dam information and assessments by experienced personnel; and
- actions, in response to dam assessments, to ensure that Brennans Creek Dam is maintained in a safe condition.

Bulli Seam Operations
Response to Sydney Metropolitan Catchment Management Authority Submission
3 March 2010

Each of the comments made by the Sydney Metropolitan Catchment Management Authority (3 March 2010) (reproduced below in bold) are addressed below.

Sydney Metropolitan Catchment Management Authority (3 March 2010) states:

> ***…the SMCMA is very concerned that consequences of the underground mining operations are likely to cause uncontrolled and unmanageable ground cracking that will permanently drain, and hence destroy, some upland swamps.***

As described in Section 6.1.5.3 of Appendix B of the EA:

> *The substantial depth of cover and the presence of a thick aquitard protect the shallow aquifers in the Hawkesbury Sandstone, which are in connection with streams and ecosystems, from transmitted effects due to reduction in groundwater pressures. Based on the analysis of the conceptual groundwater system, and modelling results, there is no expected dewatering of swamps from depressurisation at depth. In addition, a preliminary study conducted by the SCA on the effects of borefield extraction under a swamp "clearly show no interaction between the water levels in Butler's Swamp and the water being extracted from the sandstone aquifer" (SCA, 2007). This supports the argument that the regional aquifer is hydraulically disconnected from perched water in the upland swamps.*
>
> *As the free-draining fractured zone that is to be expected above a goaf zone does not extend as high as the Bald Hill Claystone, the perched water in upland swamps would not be impacted directly by vertically connected cracking. The only possibilities for impact are through bed separation or superficial tensile cracking associated with a moving subsidence trough, and that is likely to be transitory or localised.*
>
> *Very little drainage of water due to bed separation or superficial tensile cracking is expected from the perched water table in a swamp to the regional water table in the underlying sandstone, as the sandstone bedrock is massive in structure and permeability decreases with depth. Surface cracking that may occur would be superficial in nature (i.e. would be relatively shallow) and would terminate within the unsaturated part of the low permeability sandstone (MSEC, 2009). Due to the very low hydraulic gradient of the water table within a swamp, lateral movement of water through the swamp towards a crack would be very small and very slow.*

Sydney Metropolitan Catchment Management Authority (3 March 2010) states:

> ***Similarly, the SMCMA is also concerned that such cracking will affect river beds that will directly cause the significant loss of river flows into those cracks. This will affect aquatic biodiversity and reduce the amount of high quality water available for downstream users (both human and environmental).***

The NSW Planning Assessment Commission's (PAC's) *Metropolitan Coal Project Review Report* (PAC, 2009) (the Metropolitan PAC Report) examined the issue of flow loss and made recommendations regarding further investigations into the potential for mine subsidence effects to lead to catchment yield losses. It concluded that it is not beyond doubt, however:

> *…the local and regional groundwater conditions coupled with the mine parameters, would suggest that the likelihood of water being lost from the surface water system as a consequence of mining, and then by-passing Woronora Reservoir, is very low. This conclusion accords with the findings of the Southern Coalfield Inquiry, viz:*

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

Sections 3.2.4.2 and 5.3 of Appendix C of the EA present an assessment of recorded flow in Stokes Creek, O'Hares Creek and Waratah Rivulet catchments over the pre and post-mining periods and determined there is no evidence that there has been a material change to the yield of these catchments which would suggest a loss of flow.

Section 5.2.1 of the EA states the following regarding changes in water quality:

> *Although mine subsidence effects can result in isolated, episodic pulses in iron, manganese, aluminium and electrical conductivity (EC), these pulses have not had any measurable effect on water quality in downstream reservoirs (Appendix C). The Project is not expected to impact on the performance of Woronora Reservoir, Cataract Reservoir or Broughtons Pass Weir.*

As noted in Table 5-2 of the EA, localised impacts on stream water quality are estimated to include the extent of subsidence effects plus in the order of 600 metres (m) downstream.

Section 5.7.2 of the EA provides an assessment of the likely impacts of the Project on aquatic ecosystems, including subsidence impacts and potential flow diversion, as follows:

> *Based on the predicted impacts to aquatic habitats (e.g. stream flow, pool levels, connectivity and water quality) described in Section 5.6.2 and Appendix C and the abundance and diversity of macrophytes in the streams, the Project is considered unlikely to have a significant impact on the composition or distribution of aquatic macrophytes (Appendix D).*
>
> *…*
>
> *… Furthermore, changes in the structure of assemblages of plants and animals are commonly observed as the geomorphology of streams naturally change as they progress from their upper to lower reaches (Williams, 1980; Moss, 1988). Upstream and downstream differences can also occur because of obstructions (both human-made and natural). Natural variability in the richness and abundance of assemblages of macroinvertebrates can be related to their species-specific reproductive strategies as well as type of habitat including prevailing flow regimes.*
>
> *…*
>
> *… If however, adverse impacts on macroinvertebrates were to occur at pool specific locations, the remaining intact pools (acting concurrently as refugia pools), would likely rapidly seed macroinvertebrate re-establishment within the impacted pool, as and when water levels return (Appendix D).*
> *…*
>
> *Application of the stream impact minimisation criteria and proposed remediation measures would reduce the spatial and temporal extent of Project potential impacts on macroinvertebrate assemblages and their habitats.*

Sydney Metropolitan Catchment Management Authority (3 March 2010) states:

> ***The SMCMA is not convinced that cracking under upland swamps and in river beds can be controlled or even adequately managed to mitigate deleterious effects…***

Tables 5-2 and 5-3 of the EA summarises the stream impact minimisation criteria and management measures that would be applied for streams and swamps, respectively.

In relation to remediation, Recommendation 34 of the Metropolitan PAC Report (PAC, 2009) states (page 147):

> ***Recommendation 34***
>
> *The Panel recommends that remediation be required where subsidence impacts cause diversion of flows or drainage of pools with the objective of restoring flows and pool holding capacity to pre-mining levels as quickly as possible. The Panel notes that more than one remedial effort may be required at an individual feature (eg a rock bar) given that the total impacts are expected to be associated with successive longwalls. The Panel recommends that approval conditions should require close monitoring of impacts from all longwalls likely to affect such key features.*

Sydney Metropolitan Catchment Management Authority (3 March 2010) states:

> ***The SMCMA strongly recommends the Commission to stipulate that there are suitable mining setbacks and/or exclusions that will protect vulnerable upland swamps, watercourses, cliff and Aboriginal sites to ensure that these are not damaged.***

Tables 5.2 and 5.3 of the EA present the preferred risk management options for stream and swamps, respectively, including impact minimisation criteria. Further, it is envisaged that any Project Approval for the Project would include Performance Measures for natural features.

Section 7.3.1 of the EA describes the proposed Extraction Plan process for the Project, including demonstration that predicted subsidence impacts and consequences are consistent with those authorised by the Project Approval (i.e. the Performance Measures):

> *Over the life of the Project, Extraction Plans would be progressively prepared as detailed mine designs are completed for each part of the Project area. The main aspects to be addressed by Project Extraction Plans would include:*
>
> - *a detailed mine plan;*
> - *plans of associated surface construction works;*
> - *a coal resource recovery plan;*
> - *final prediction of systematic (conventional) and non-systematic (non-conventional) subsidence effects;*
> - *demonstration that the predicted subsidence impacts and consequences are consistent with those authorised by the Project Approval;*
> - *a Subsidence Monitoring Programme;*
> - *a Catchment Monitoring Programme;*
> - *a Biodiversity Management Plan;*
> - *a Heritage Management Plan; and*
> - *a Built Features Management Plan.*
>
> *The Extraction Plan process provides a mechanism for the presentation of further detail regarding particular management measures for individual longwalls or mining domains. As part of the preparation of Extraction Plans, consultation would be undertaken with relevant stakeholders (e.g. relevant landholders, infrastructure owners and government authorities).*

REFERENCES

Planning Assessment Commission (2009) *Metropolitan Coal Project Review Report*.

Bulli Seam Operations
Response to Campbelltown City Council Submission
18 December 2009

Each of the recommendations made by Campbelltown City Council (18 December 2009) (reproduced below in bold) are addressed below.

Campbelltown City Council (18 December 2009) states:

> ***…Council requests the Department not provide an approval for up to 30 years and alternatively provide a series of staged approvals and applications under Part 3A of the Environmental Planning and Assessment Act 1979 (EPAA 1979) for the proposed development based on either individual or appropriate clusters of mining domain areas. It is considered this approval process is viable given the nature of longwall mining operations and would allow more rigorous monitoring of the project, the provision of definitive timeframes and the application of consent conditions based on updated policies, legislation and research. The staged approval process would also allow for precise details to be provided by ICH in regard to items such as location of service boreholes, finalised longwall design plans and site specific environmental mitigation measures.***

Illawarra Coal Holdings Pty Ltd's (ICHPL's) preferred approach is consistent with the second option presented by Industry & Investment NSW (I&I NSW) (23 December 2009):

> *If the determination is not based on a staged process, there is a need for strong mechanisms to ensure adequate consultation, feasibility studies and lead time for the development of major management strategies, that is, the Extraction Plans Stage.*

This approach is consistent with:

- the NSW planning process (see Figure 44 of the Southern Coalfield Panel Report [NSW Department of Planning (DoP), 2008]); and
- contemporary Project Approvals under Part 3A of the *Environmental Planning and Assessment Act, 1979* (e.g. Metropolitan Coal Project [08_0149]) which include the staged submission of detailed strategies, plans and programs (e.g. Subsidence Management Plans and/or Extraction Plans).

The above process includes strong consultation mechanisms, feasibility studies and long lead times (i.e. typically the lodgement of a Subsidence Management Plan six months prior to its desired approval).

The preparation of Extraction Plans over the life of the Project is described in Section 7.3.1 of the EA:

> *Over the life of the Project, Extraction Plans would be progressively prepared as detailed mine designs are completed for each part of the Project area. The main aspects to be addressed by Project Extraction Plans would include:*
>
> - *a detailed mine plan;*
> - *plans of associated surface construction works;*
> - *a coal resource recovery plan;*
> - *final prediction of systematic (conventional) and non-systematic (non-conventional) subsidence effects;*
> - *demonstration that the predicted subsidence impacts and consequences are consistent with those authorised by the Project Approval;*
> - *a Subsidence Monitoring Programme;*

- *a Catchment Monitoring Programme;*
- *a Biodiversity Management Plan;*
- *a Heritage Management Plan; and*
- *a Built Features Management Plan.*

The Extraction Plan process provides a mechanism for the presentation of further detail regarding particular management measures for individual longwalls or mining domains. As part of the preparation of Extraction Plans, consultation would be undertaken with relevant stakeholders (e.g. relevant landholders, infrastructure owners and government authorities).

Campbelltown City Council (18 December 2009) states:

Please note that the Wedderburn district has been identified as having high natural and cultural significance including an active koala population. The district is also located in the upper reaches of the Georges River and is an important component of Council's draft Strategic Environmental Management Plan for the Upper Georges River, which is nearing completion. In addition, the Wedderburn district is not classified as a Mine Subsidence District. As such, it is highly likely that no existing buildings or dwellings would be designed to withstand any subsidence impacts associated with underground mining. The granting of the exploration licence has raised considerable concern amongst local residents based on these factors. In this regards, it is considered local residents maybe* [sic] *largely unaware of the project application applying to this portion of the southern part of the district given the absence of a targeted community consultation meeting organised by ICH during the public exhibition period of the EA.

In light of the above factors, Council at this point in time, objects to the inclusion of the southern portion of the Wedderburn district in the project application. It therefore requests that the Department require a separate EA with site specific DG Requirements for any application involving underground mining in the Wedderburn district and that it require extensive and targeted consultation with local residents during the preparation of this EA. Council would further request that it be consulted as part of the preparation of the DG Requirements.

As shown on Figure 2-8 of the EA, part of Longwalls 5E1 to 5E3 in West Cliff Area 5 would extend into the southern portion of Wedderburn within Exploration Lease (EL) 7249. This area would be subject to a Mining Lease Application as described in Section 1.1.4 of the EA.

The potential impacts on flora and fauna (including Koala populations) are described in Appendices D, E and F of the EA.

The houses in the vicinity of Longwalls 5E1 to 5E3 are shown on Map 15 of Appendix A of the EA and subsidence predictions for each of these houses are presented in Table D.05 of Appendix A of the EA. Under the *Mine Subsidence Compensation Act, 1961*, compensation from the Mine Subsidence Board (MSB) is available for damage to improvements for all land owners, regardless of whether or not they are located within a Mine Subsidence District (Section 7.3.1 of the EA). ICHPL will also undertake pre-mining mitigation works where required, as described in the EA.

Project newsletters were disseminated during the preparation of the EA to inform the local community of the Project Application and status updates (Section 3.1.6 of the EA).

ICHPL also takes a pro-active position with local media with media releases regularly provided to local media outlets through newspapers (e.g. Macarthur Chronicle, Wollondilly Advertiser, Illawarra Mercury, Campbelltown-Macarthur Advertiser and Camden Advertiser), radio (I98 FM, Wave FM, C91.3 FM and ABC Radio 97.3 FM) and television (WIN) (Section 3.2.8 of the EA).

Notice of the exhibition of the EA was provided in the Macarthur Chronicle (20 October and 10 November 2009) and the Illawarra Mercury (20 October 2009). The EA was publically available on both the DoP and BHP Billiton websites.

Given that only a portion of three longwalls extend into the Wedderburn district, it is not considered reasonable or practical to assess this part of the Project as a separate Part 3A approval.

Despite the above, additional assessment and consultation would be conducted as a component of future Extraction Plans. This would include consultation with local residents during the preparation of Built Features Management Plans prior to mining (Section 5.4.5 of the EA).

Campbelltown City Council (18 December 2009) states:

> ***In welcoming the incorporation of recommendations of the Inquiry, the inclusion of a table summarising the response to each applicable recommendation of the final report of the Inquiry (SCPR) would enhance the EA.***

As stated in Section 4.1 of the EA, the key issues raised in the *Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield - Strategic Review* (herein described as the Southern Coalfield Panel Report) and the findings and recommendations of the Southern Coalfield Inquiry Panel, as described in the Southern Coalfield Panel Report, have been considered and addressed in the EA.

A summary table comparison to each recommendation in the Southern Coalfield Panel Report was not included in the EA as several had been effectively superseded by the Metropolitan Planning Assessment Commission (PAC) Report which states:

> *The Panel considers that it would be desirable if future proposals for mining in the Southern Coalfield were required to take account of the SCI recommendations as modified by this report in preparing the Project Application and the subsequent EA...*

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

Campbelltown City Council (18 December 2009) states:

> ***While recognizing that the EA contains extensive baseline data, the timeframe of the monitoring is noted to be less than the minimum two years recommended by the Final Report of the Inquiry as being necessary to obtain accurate assessment of impacts associated with mining operations on key natural features. Given the timeframe of the project, Council suggests that the collection of the two year period of baseline data could be achieved as part of the staged (recommended by Council) Part 3A application/approval process.***

Substantial baseline data was collected for the EA and in most cases extends for a period of over two years.

The preparation of future Extraction Plans would include consideration of baseline data of an extensive period in excess of two years.

Campbelltown City Council (18 December 2009) states:

> ***Council considers that the EA has not addressed the issue of implications of mining for future urban development (including associated infrastructure) within the Menangle Urban Release Area (URA) (located on the northern boundary of Appin 7) as well as implications associated with any future development that may occur within the Macarthur South region.***
>
> ***...***

> ***Consequently, in view of the above and to avoid uncertainty, Council would request the Department to require an amendment to the mapping within the EA to depict the project boundary to remain on the southern side of the Nepean River and to ensure that no subsidence impacts occur within the release area…***

A discussion of potential land use conflicts between mining and the South West Subregion Draft Subregional Strategy (including the Macarthur South region) is provided in Section 7.2.8 of the EA. It should be noted that in 2009 the NSW Government decided to cease and defer further investigation of Macarthur South as a land release area due to factors including the infrastructure cost of servicing the area, the economic value of coal and agricultural resources in the Macarthur South area and the status of land supply in the south-west.

The Menangle Park Urban Release Area is located north-east of the Nepean River. The EA Base Plan Longwalls (Figures 2-8 to 2-11 of the EA) do not extend to this area. Notwithstanding this, the Menangle Park Urban Release Area is located within the South Campbelltown Mine Subsidence District and any new development within this area would require approval from the MSB.

Currently only three houses are located north of the Nepean River within 600 metres (m) of the extent of longwall mining (Map 5 of Appendix A of the EA). The probability of impact at these houses is less than 6%, with the probability of extensive repair requiring re-build less than 0.1% (Table D.05 of Appendix A of the EA). Therefore, there is considered to be no justification to modify the proposed Project boundaries.

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

Campbelltown City Council (18 December 2009) states:

> ***In this regard, whilst noting that the EA includes an assessment of 'cumulative water quality impacts', this assessment is considered to be restricted to the context of other developments within the vicinity of the project area rather than within an overall catchment context. Consequently, Council requests the Department to require ICH to amend the applicable section of the EA to assess cumulative water quality impacts on the overall health of the Georges and Nepean Catchments in accordance with the applicable item of the DG's Requirements for the project.***

The Surface Water Assessment (Appendix C of the EA) includes a cumulative assessment of potential surface water impacts including within and upstream of 600 m from the extent of longwall mining area.

The Metropolitan PAC Report (PAC, 2009) examined the issue of flow loss and made recommendations regarding further investigations into the potential for mine subsidence effects to lead to catchment yield losses. It concluded that it is not beyond doubt, however:

> *…the local and regional groundwater conditions coupled with the mine parameters, would suggest that the likelihood of water being lost from the surface water system as a consequence of mining, and then by-passing Woronora Reservoir, is very low. This conclusion accords with the findings of the Southern Coalfield Inquiry, viz:*
>
> > *No evidence was presented to the Panel to support the view that subsidence impacts on rivers and significant streams, valley infill or headwater swamps, or shallow or deep aquifers have resulted in any measurable reduction in runoff to the water supply system operated by the Sydney Catchment Authority or to otherwise represent a threat to the water supply of Sydney or the Illawarra region.*

As described in Section 5.2.1 of the EA, mine subsidence effects can result in localised and transient changes in water quality, which are estimated to include the extent of subsidence effects plus in the order of 600 m downstream.

As there is not expected to be water quality or catchment yield impacts greater than 600 m downstream of the Project area, the assessment of cumulative surface water impacts in the Surface Water Assessment (Appendix C of the EA) is considered adequate.

Campbelltown City Council (18 December 2009) states:

> ***Consequently, the current approach of disposing of 'coal wash' waste at the Brennans Creek facility is not considered by Council to be a long-term viable option given the location of the facility on a major tributary of the Georges River and potential for significant environmental impacts. The statement in the EA that 'it is in the commercial interests of the Applicant to obtain alternative uses for the coal wash waste' is acknowledged. In addition, while the intentions regarding the use of alternative use* [sic] *of the 'coal wash' waste is understood, Council would request the Department require the investigation and implementation of alternative uses (acceptable to Council and the DECCW).***

As stated in Section 2.8.5 of the EA:

> *ICHPL has however committed to, and would continue to (Cardno Forbes Rigby, 2007b):*
>
> - *research and consider alternatives to coal wash emplacement;*
> - *pursue the use of coal wash as an engineering fill material;*
> - *negotiate with owners of suitably located and available sites that could be used as alternative emplacement sites to extend the life of the West Cliff Stage 3 Coal Wash Emplacement; and*
> - *report progress of these actions to the NSW Government in the Annual Environmental Management Report (AEMR).*

If approved, this commitment would continue for Stage 4.

Campbelltown City Council (18 December 2009) states:

> ***Further, it is noted a stated commitment of the project is the 'conducting of a coal wash underground emplacement trial'. In this regard, Council understands that the Department has recently required that ICH conduct such a trial as a condition of consent for the Metropolitan Coal project near Helensburgh. Council would therefore request that the Department impose a similar condition of consent requiring a similar trial within a nominated time frame for completion in regard to the Bulli Seam Project without such interventions by the Department; Council cannot accept the proposal as it currently stands.***

ICHPL does not own or operate the Metropolitan Mine.

As stated in the Statement of Commitments (Section 8) of the EA:

> *Within five years of the grant of Project Approval, ICHPL will fund and commence development of a pilot-scale research and development trial for underground coal wash emplacement technology at the Project. The trial will draw upon available information/technical data from similar investigations and trials in the Southern Coalfield and internationally.*

The results of the trial will be used to inform a value analysis of the feasibility of a portion of the coal wash being emplaced underground at the Project. The value analysis will include consideration of aspects such as:

- *practical application and mine safety for underground emplacement at the Project design volumes/rates;*
- *infrastructure requirements (including supporting equipment) for underground emplacement;*
- *water and other materials consumption/use requirements; and*
- *consideration of benefits/costs of underground emplacement versus ongoing surface emplacement at the West Cliff pit top.*

As described in Section 2.8.4 of the EA:

Infrastructure required for the pilot-scale trial would be subject to future separate approvals. The future underground emplacement of coal wash would also be subject to future separate approvals should the value analysis warrant its further development.

Campbelltown City Council (18 December 2009) states:

It is noted the Stage 4 expansion of the Coal Wash Emplacement Area will increase the height of the facility to approximately 88 metres above ground level, at the conclusion of the intended life of the project. In this regard, the EA is not considered to have adequately assessed potential impacts associated with surface runoff that will occur from the expanded facility on both the terrestrial and aquatic environment as well as any potential implications for aircraft movements associated with the nearby NSW Sports Aircraft Club.

Assessments of potential impacts on terrestrial and aquatic environments as a result of releases from Brennans Creek Dam are included in Appendices D, E and F of the EA.

Stage 4 of the West Cliff Coal Wash Emplacement would be constructed within a valley and the maximum height of the final emplacement landform (365 m Australian Height Datum [AHD]) (Section 5.19.1 of the EA) would be similar to the surrounding ridgelines (between 310 and 366 m AHD). Therefore, there is expected to be little potential for implications on aircraft movements.

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

In regard to Stage 4 of the West Cliff Coal Wash Emplacement, Campbelltown City Council (18 December 2009) states:

…it is considered the EA has not adequately assessed visual, dist* [sic] *or breeze obstruction issues.

An assessment of the potential visual impacts of the West Cliff Coal Wash Emplacement is included in Section 5.19 of the EA.

The Air Quality Assessment included an assessment of potential dust impacts and included dust emissions from the West Cliff Coal Wash Emplacement.

As described above, Stage 4 of the West Cliff Coal Wash Emplacement would be constructed within a valley and the maximum height of the final emplacement landform (365 m AHD) would be similar to the surrounding ridgelines (between 310 and 366 m AHD). The West Cliff Coal Wash Emplacement is also surrounded by mature vegetation. Therefore, Stage 4 of the West Cliff Coal Wash Emplacement is not expected to result in significant breeze obstruction issues.

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

Campbelltown City Council (18 December 2009) states:

> ***Section 2.5 of the EA outlines a range of development activity* [sic] *contained in the project application relating to supporting infrastructure such as the construction of new remote servicing sites and upgrading of the existing Coal Preparation Plant. The necessity for this infrastructure is recognised as is the dependence of their precise location on the finalised longwall mining plans and outcomes of in-seam drilling activities. However, as service boreholes and associated infrastructure are now defined as 'underground mining' in the amended 'Mining (Infrastructure) State Environment Planning Policy', the assessment of potential impacts associated with these activities is considered particularly important by Council. The undertaking of this assessment as part of the recommended staged Part 3A application/approval process is considered important.***

Upgrades to the West Cliff Coal Preparation Plant would not involve any additional vegetation clearance. Other impacts as a result of these upgrades were assessed as part of the EA.

Section 5.8.2 of the EA states:

> *In addition to clearing for the Stage 4 Coal Wash Emplacement, it is estimated that the Project would involve approximately 37 ha of other vegetation clearance activities primarily associated with ongoing surface exploration activities, the upgrade and extension of surface infrastructure (e.g. gas wells and service boreholes), access tracks, environmental monitoring and management activities (e.g. installation of monitoring equipment), potential stream restoration activities and other localised Project-related surface activities. The specific locations of these vegetation clearance activities would be detailed in the relevant Extraction Plans as required by the DoP.*

An assessment of this vegetation clearance is included in Appendix E of the EA, and an assessment of potential impacts on fauna is included in Appendix F of the EA.

Section 5.8.3 of the EA describes management measures for clearance outside of the West Cliff Stage 4 Coal Wash Emplacement area, including:

> *Clearing of EECs would be avoided apart from some minor clearing in the widely distributed Shale/Sandstone Transition Forest EEC and the Moist Shale Woodland in the Sydney Basin Bioregion EEC (mapped as p2 – Cumberland Shale Sandstone Transition Forest and p514 - Cumberland Moist Shale Woodland, respectively, on Figures 5-13 to 5-17) in which clearing would be kept to a maximum of 9 ha and 3 ha, respectively.*
>
> *…*
>
> *Vegetation clearance would not take place in upland swamps, except for very minor clearing for environmental monitoring purposes or mitigation measures.*

Further assessment of the potential impacts of additional supporting infrastructure would be included as a component of the Extraction Plan process.

Campbelltown City Council (18 December 2009) states:

> ***The need for minor variations in response to factors such as the outcomes of in-seam exploration activities is recognised. However, Council considers the pathway of the longwalls should be clearly defined in a Part 3A approval rather than alternate approval mechanisms such as the requirement for preparation of 'Extraction Plans' by the Department as an approval condition.***

The requirement for the preparation of Extraction Plans is consistent with:

- the NSW planning process (see Figure 44 of the Southern Coalfield Panel Report [DoP, 2008]); and
- contemporary Project Approvals under Part 3A of the *Environmental Planning and Assessment Act, 1979* (e.g. Metropolitan Coal Project [08_0149]) which include the staged submission of detailed strategies, plans and programs (e.g. Subsidence Management Plans and/or Extraction Plans).

As stated in Section 2.5.2 of the EA:

> *The longwall layouts shown on Figures 2-8 to 2-11 are herein referred to as the EA Base Plan Longwalls. The longwall layout shown on Figures 2- 8 to 2-11 has been designed to meet specific impact minimisation criteria for streams, cliffs and major infrastructure items. The objectives of these impact minimisation criteria are further described below.*
>
> *There are a number of alternative longwall layouts which may also meet these design objectives. Sensitivity analyses of alternative longwall layouts are included in the Subsidence Assessment (Appendix A). The final detailed design of the longwall layouts would be subject to review and approval as a component of future Extraction Plans developed in consultation with the relevant authorities and to the satisfaction of the Director-General of the DoP (Section 7.3.1).* [emphasis added]

The final detailed design of longwall layouts would be subject to the impact minimisation criteria described in the EA (for example see Sections 2.5.2, 5.2 and 5.11 of the EA) and any additional impact minimisation criteria or Performance Measures included in the Project Approval.

Consequential changes in impacts and consequences for natural and man-made features in the Project area will only be permitted by the Director-General of the DoP, in consultation with relevant regulators, if the Extraction Plan demonstrates general accordance with EA predicted impacts and strict compliance with Performance Measures in the Project Approval.

The future assessment and approval mechanisms for changes to the EA Base Plan Longwalls would include the following:

- Extraction Plan process – if changes to the EA Base Plan Longwalls are demonstrated to be in general accordance with the EA predicted impacts and strict compliance with Performance Measures in the Project Approval.
- Modification to Part 3A Project Approval – if there is some variance from the EA predicted impacts and Performance Measures in the Project Approval.
- Separate Part 3A Project Approval – if there is significant variation from the EA predicted impacts and compliance with Performance Measures in the Project Approval can not be achieved.

Campbelltown City Council (18 December 2009) states:

> ***…That is, there is considered potential for downstream higher order streams to be impacted by subsidence related impacts such as alteration of flow within small tributaries or feeders of these rivers. Council would therefore request the Department require that detailed risk management assessments and appropriate mitigation measures to be conducted for all classes of watercourses as part of the recommended (by Council) staged Part 3A application/approval process.***

The EA included a detailed assessment of potential impacts on rivers and significant streams consistent with the recommendations of the Southern Coalfield Panel Report (DoP, 2008) and the Metropolitan PAC Report (PAC, 2009). The SCPR recommended that Environmental Assessments for project applications lodged under Part 3A of the *Environmental Planning and Assessment Act, 1979* identify and assess significant natural features located within 600 m of the edge of secondary extraction (Southern Coalfield Panel Report Recommendation 4).

In relation to significant watercourses, the Southern Coalfield Panel Report states:

> *The Southern Coalfield's significant natural features include rivers and higher order streams,*
>
> *…*
>
> *RMZs for watercourses should be applied to all streams of 3rd order or above, in the Strahler stream classification.*

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

Campbelltown City Council (18 December 2009) states:

> ***…In this regard Council would oppose any mining beneath any section of the Georges River given its significance and would request that both the entire Georges River and Nepean Rivers* [sic] *be provided with exclusion areas to provide consistency…***

ICHPL's proposed stream impact minimisation criteria for the Georges River are presented in Table 5-2 of the EA. This includes designing the longwalls to achieve a maximum closure of 200 millimetres (mm) at controlling rockbars for Georges River (reach 2) within West Cliff Area 5 and not directly undermining the Georges River (reach 1) (including perennial reaches that are less than 3rd order) near Appin Area 2 Extended.

ICHPL's proposed stream impact minimisation criteria for the Nepean River are also presented in Table 5-2 of the EA.

Campbelltown City Council (18 December 2009) states:

> ***Please note that previous correspondence to the Department has advised that it is the preferred view of Council that mining set-back areas be established within 600 metres of watercourses based on the findings of the Independent Inquiry in to Mining in the Southern Coalfields* [sic]*. In this regard, at its meeting in December 2008 Council resolved to adopt the preferred view that exclusion areas be established and maintained within 600 metres of all watercourses, 3rd order or above within the project area…***

The Southern Coalfield Panel Report (DoP, 2008) included the following recommendation (page 122):

> *4) Environmental assessments for project applications lodged under Part 3A should be subject to the following improvements in the way in which they address subsidence effects, impacts and consequences:*
>
> *…*
>
> - *identification and assessment of significance for all natural features located within 600 m of the edge of secondary extraction;*
>
> *…*

- *key aspects of the subsidence assessment (particularly in respect of predicted impacts on significant natural features and their consequences) should be subject to independent scientific peer review and/or use of expert opinion in the assessment process; and*
- *increased use of net benefit reviews by both mining proponents and regulatory agencies in assessing applications.*

The Southern Coalfield Panel Report (DoP, 2008) does not recommend set-back areas within 600 m of watercourses.

ICHPL's proposed stream impact minimisation criteria are presented in Table 5-2 of the EA.

Benefit Cost Analysis (including consideration of environmental consequences) presented in Appendix L of the EA indicates that the level of stream protection recommended by Campbelltown City Council (18 December 2009) is economically inefficient.

In regard to streams, Campbelltown City Council (18 December 2009) states:

> ***It is noted the EA in adopting a recommendation of this Assessment*** **[Southern Coalfield Panel Report]** ***states the 'tolerable risk' of impacts on waterways as defined in this report will be the responsibility of the Department of Planning'. Council considers that this risk should be identified in the EA and would therefore request the Department require ICH to amend the EA to define the 'tolerable risks' and in a suitable format (e.g. mapping) indicate the sections of waterways where it identifies potential impacts associated with the proposed development to be acceptable/unacceptable.***

The Southern Coalfield Panel Report (DoP, 2008) defines 'tolerable risk' as (page viii):

> *risk which is accepted in a given context based on the current values of society.*

The Southern Coalfield Panel Report (DoP, 2008) also states the following regarding 'tolerable risk' (pages 107-108):

> *There is also a lack of clear up-front guidance given to industry on just what risks and impacts are acceptable to Government. The industry's responsibility to interpret both explicit and unstated policy requirements to identify 'tolerable' risks in an operational planning sense is therefore a limitation to more robust subsidence management.*

ICHPL does not consider it reasonable or practical for it to be expected to determine what is considered a 'tolerable' risk to society.

However, the EA does present the results of a Choice Modelling study (Appendix L of the EA) and contains adequate information on potential impacts on streams (Appendix P of the EA) for DoP and the Minister for Planning to form a judgement on the risk they believe would be 'tolerable' to society.

Notwithstanding the above, it should be noted that Section P6.4 of Appendix P of the EA states the following with respect to potential impacts on flow and pools within streams in the Project area:

> *The 200 mm closure value has been adopted as a reference valley closure magnitude below which it is expected that flow diversion and pool water level impacts are unlikely to occur. The currently available database is however relatively small and the adoption of a 200 mm valley closure criteria is viewed as an indicator of low probability of flow diversion and pool level impacts.*

Long-sections showing the lengths of each stream predicted to experience greater than 200 mm valley closure are provided in Attachment PG of Appendix P of the EA.

Campbelltown City Council (18 December 2009) states:

> ***The EA identifies that the road bridge over the Nepean River at Menangle Park may be subject to a maximum predicted total subsidence of 120mm. In this regard, it is noted the EA states 'the predicted closure movements could result in the development of stresses in the bridge deck and abutments, if the expansion joints do not have sufficient capacity for these movements'. It is therefore requested that the Department require that ICH in consultation with Council develop monitoring and management measures to ensure that the bridge remains safe and serviceable throughout and after the mining period. Council further recommends that the measures incorporate options identified by structural and geotechnical and mine subsidence engineers including:***
>
> - ***Increasing the capacity of the bridge expansion joints to accommodate the closure movements;***
> - ***Installation of a monitoring system, which includes, among other things, the monitoring of ground movements and bridge movements;***
> - ***Adjusting the mine plan to provide further offsets from the bridge, if it is found that mitigation measures are not sufficient to reduce the impact to the bridge to acceptable levels;***
> - ***Regular visual inspections of the bridge; and***
> - ***Implementation of planned responses if triggered by monitoring and inspections.***
>
> ***Council would also request that the Department require that ICH be burdened with the responsibility of meeting the cost of implementing any identified remediation works on the bridge.***

ICHPL agrees with the above Campbelltown City Council recommendation.

As stated in Section 6.4.4 of Appendix A of the EA:

> *It is recommended, therefore, that ICHPL, in consultation with the local council, study the potential for impacts on the bridge and develop management measures to ensure that the bridge remains safe and serviceable throughout the mining period. The study would require input from structural and geotechnical and mine subsidence engineers. The management measures may include a combination of:-*
>
> - *Increase the capacity of the bridge expansion joints to accommodate the closure movements,*
> - *Installation of a monitoring system, which includes, among other things, the monitoring of ground movements and bridge movements,*
> - *Adjust the mine plan to provide further offsets from the bridge, if it is found that mitigation measures are not sufficient to reduce the risk of impact to the bridge to acceptable levels,*
> - *Conduct regular visual inspections of the bridge, and*
> - *Implement planned responses if triggered by monitoring and inspections.*

Campbelltown City Council (18 December 2009) states:

> ***The assessment of potential impacts on major roads by the EA is considered to be comprehensive and in accordance with the applicable items of the DG's Requirements. However, it is noted that approximately 3.2 kilometres of local roads within the Wedderburn district have not been subject to a detailed analysis by the EA. Consequently, Council has concerns regarding potential adverse impacts on the condition of these roads given it is responsible for their maintenance. Therefore, Council would request the Department require the undertaking of similar modelling to that conducted for the major roads by the EA for other all* [sic] *local roads within the project area proposed to be undermined as part of the recommended (by Council) staged Part 3A application/approval process.***

Section 6.4.3 of Appendix A of the EA describes the potential impacts on all local roads within the Project area:

> *The predicted systematic subsidence, curvatures and strains for the local roads within the Study Area are of a similar order of magnitude to those observed and predicted along the local roads which have been mined directly beneath by previously extracted longwalls in the Southern Coalfield. The overall levels of impact on the local roads in the Study Area are, therefore, expected to be similar to those observed in the past. It is expected, therefore, that the local roads can be maintained in a safe and serviceable condition throughout the mining period using normal road maintenance techniques.*
>
> *The predicted maximum tilts along the local roads in the Study Area represent a maximum change in gradient in the order of 1 %. The natural grades along the alignments of these roads vary across the Study Area, with natural grades up to 3 % or more in some locations.*
>
> *The predicted maximum changes in grade along the local roads are small when compared to the natural grades and, therefore, are unlikely to result in any significant impacts on the serviceability of these roads. If any additional ponding or adverse changes to the grades were to occur, as the result of mining, the roads could be remediated using normal road maintenance techniques.*

Detailed subsidence predictions for major local roads within the Project area, including incremental and total subsidence profiles, are included in Section 6.4.2 of Appendix A of the EA. Detailed subsidence predictions of other local roads would be calculated as a component of the Extraction Plan process.

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

Campbelltown City Council (18 December 2009) states:

> ***…It is noted the groundwater assessment has utilised evaporation figures (approximately 1300 mm/year) as baseline data, which is considered unlikely to be representative of the project area given its proximity to the coastline.***

The evaporation data in Section 2.1 of the Groundwater Assessment (Appendix B of the EA) is presented as an indication of climate data within and surrounding the Project area.

The recharge to the groundwater system (i.e. which incorporates a loss through evaporation) is used as a calibration parameter for the groundwater model. The groundwater model was calibrated against groundwater levels observed across the Project area.

Campbelltown City Council (18 December 2009) states:

> ***…Council would request that monitoring sites be established at suitable downstream sites that would allow for analysis and determination of any correlation between variations in water quality and mining operations.***

As described in Table P-6 of Appendix P of the EA, the following water quality monitoring programme would be developed for the Project:

- *The mine area specific water quality monitoring would be developed progressively over the Project life.*
- *Water quality monitoring would be conducted at all flow monitoring sites and at pool level monitoring sites.*
- *Water quality monitoring would provide at least two years of data prior to the commencement of extraction within each catchment.*

- *Sampling intensity would be selected to characterise the expected variability in water quality with a nominal minimum monthly sampling frequency.*
- *Water samples would be analysed by an appropriately accredited laboratory for the standard suite of parameters.*

As also stated in Table P-6 of Appendix P of the EA:

- *Where stream conditions allow (e.g. existence of a suitable control site), gauging stations would be established both upstream and downstream of the main subsidence impact zones. Where this is not practicable, monitoring stations would be established as close to these locations as practicable.*

Campbelltown City Council (18 December 2009) states:

> ***Accordingly, Council would request the Department require the EA to include a detailed assessment of the long-term impacts of the proposed development on the habitat and water quality for each watercourse that directly flows into either the Georges and* [sic] *Nepean Rivers. Council would further request that the EA assess the interactions between surface and groundwaters or mining cavities for each of these waterways.***

The EA included a detailed assessment of potential impacts on rivers and significant streams consistent with the recommendations of the Southern Coalfield Panel Report (DoP, 2008) and the Metropolitan PAC Report (PAC, 2009). This included consideration of long-term impacts.

The Groundwater Assessment included an assessment of long-term impacts on surface water and groundwater interactions (including baseflow) (Sections 5.6 and 6.1.5 of Appendix B of the EA).

Campbelltown City Council (18 December 2009) states:

> ***The methodology of the flora and fauna surveys contained within the EA is considered largely to be in accordance with the relevant DECCW guidelines. However, in noting that surveys were conducted in Spring and Autumn, Council would request that the Department require surveys in alternative periods of the year…***

As stated in Section 3.2 of the Terrestrial Flora Assessment (Appendix E of the EA):

> *Field surveys were conducted over 42 days spread between 5 May 2008 and 15 May 2009 with the objective of sampling during the flowering periods of as many species as possible.*

As stated in Section 2.1 of the Terrestrial Fauna Assessment (Appendix F of the EA):

> *Fauna surveys were conducted in the study area in March/April/May 2008 (autumn), September/October 2008 (spring) and March/April/May 2009 (autumn) by Biosphere Environmental Consultants Pty Ltd.*

The timing and extent of flora and fauna surveys was considered adequate to identify the presence of threatened flora and fauna species within the Project area, therefore additional surveys are not considered warranted.

The flora and fauna surveys (as a component of the Terrestrial Flora Assessment and Terrestrial Fauna Assessment) were peer reviewed by Dr David Goldney whose letter states (Attachment 3 of the EA):

> *I consider the surveys and assessments presented in the above mentioned studies to be adequate and concur with the findings of the studies.*

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

Campbelltown City Council (18 December 2009) states:

> ***…In addition, in noting that a comprehensive flora and fauna survey has not been conducted within the northern portion of the Wedderburn district within the project area, Council would request the Department require such a survey prior to any approval being granted in relation to this district, and as a part of a separate project application process.***

The flora and fauna survey sites were considered representative of the Project area and adequate to identify the vegetation and fauna species present within the area.

The flora and fauna surveys (as a component of the Terrestrial Flora Assessment and Terrestrial Fauna Assessment) were peer reviewed by Dr David Goldney whose letter states (Attachment 3 of the EA):

> *I consider the surveys and assessments presented in the above mentioned studies to be adequate and concur with the findings of the studies.*

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

Campbelltown City Council (18 December 2009) states:

> ***…the EA is considered to have not sufficiently assessed potential impacts of the proposed development on the condition of identified habitat corridors and associated potential impacts on the movement of fauna species. In this regard, the Department should note that Council's Biodiversity Study has identified that the vegetation within the project area forms part of important local and regional habitat corridors. In this regard, Council has concerns over the potential implications of the proposed development on the condition of these identified areas of conservation significance and consequence implementation of land use planning strategies. Council would therefore request the Department to require this issue to be assessed at least as part of the recommended staged (by Council) Part 3A application/approval process.***

Section 4.8 of Appendix F of the EA includes an assessment of potential impacts on habitat connectivity:

> *Connectivity is the "linkages of habitats … communities and ecological processes at multiple spatial and temporal scales" (Noss, 1991 in Lindenmayer and Burgman, 2005). Landscapes which retain more connections between remnant habitats are assumed to be more likely to maintain populations of species (Lindenmayer and Burgman, 2005). Connectivity is species-specific because it depends on a number of life history factors of the species (including dispersal behaviour and mode of movement) and their interaction with landscape patterns (ibid.). Indeed, not all species use corridors and the suitability of a corridor may depend on several factors including the ecology of the species and the physical attributes of the corridor (Lindenmayer and Burgman, 2005).*
>
> *Habitats located in relatively uncleared vegetation (e.g. habitats in the eastern and southern portion of the Project area including those associated with the Woronora Plateau) are considered to have high internal and external habitat connectivity. The northern and western portion of the Project area (i.e. predominantly cleared agricultural land) can be described as having lower external habitat connectivity due to past and current urban and agricultural practices including clearing, pasture improvement techniques, introduction of livestock and subsequent invasion of weed plant species. Notwithstanding, a moderate level of connectivity in these areas is maintained in association with the riparian vegetation flanking the Nepean, Georges and Cataract Rivers.*

> *Alteration of habitat can sometimes result in isolation of habitat through creation of barriers to movement between populations (i.e. disruption to habitat connectivity). The potential impacts of subsidence associated with the Project are unlikely to cause any changes to connectivity to habitats within the Project area. The vegetation clearance proposed to be undertaken for the West Cliff Stage 4 Coal Wash Emplacement is not expected to significantly disrupt connectivity for most fauna species (including threatened species that were recorded in close proximity to Stage 4 such as the Grey-headed Flying-fox, Gang-gang Cockatoo and Southern Brown Bandicoot [eastern]). Species could continue to move in a north-south direction through the retained vegetated corridor to the north of the Stage 4 Coal Wash Emplacement. In addition, the construction of Stage 4 is progressive over the life of the Project with active rehabilitation of previous emplacement areas (i.e. Stages 1 to 3) occurring at the same time.*

The Terrestrial Fauna Assessment was peer reviewed by Dr David Goldney whose letter states (Attachment 3 of the EA):

> *I consider the surveys and assessments presented in the above mentioned studies to be adequate and concur with the findings of the studies.*

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

Campbelltown City Council (18 December 2009) states:

> ***In addition, the EA indicates no disturbance to existing vegetation will occur within the Campbelltown LGA. However it is noted the EA does not provide precise detail regarding the location of any service or gas drainage bores, which would likely involve disturbance to vegetation within the Campbelltown LGA. Consequently, Council would request that the Department ensure that any disturbance to vegetation be assessed in full compliance with the DECCW guidelines and that this occurs as part of the recommended (by Council) staged Part 3A application/approval process.***

The EA does not indicate that no disturbance to existing vegetation would occur within the Campbelltown Local Government Area (LGA).

As described in Section 5.8.2 of the EA, in addition to clearing for the Stage 4 Coal Wash Emplacement, the Project would involve approximately 37 ha of vegetation clearance activities.

Site inspections would be conducted in proposed disturbance areas in order to identify sections where vegetation clearance would be avoided or limited, for example, within upland swamps (disturbance avoided), Endangered Ecological Communities (EECs) (disturbance limited) and populations of threatened flora species (disturbance avoided). The assessment of potential impacts on threatened fauna species conservatively assumed that this vegetation clearance would occur solely within their habitat.

Vegetation clearance activities would also be identified and assessed as a component of the Extraction Plan process.

Campbelltown City Council (18 December 2009) states:

> ***However, it is considered the EA does not comply with the item of the DG's Requirements item requiring an accurate assessment of any vegetation clearance based on the following statement in Section 5.8.2 of the EA:***
>
> > ***'It is estimated that the project would involve approximately 37ha of vegetation clearance (other than that at the Brennans Creek Coal Emplacement Area) and that specific locations of these clearance areas would be provided as required by the Department'.***

Consequently, Council would request the Department to require that a comprehensive assessment be conducted (by independent consultants) to determine the extent, significance and impact of any vegetation proposed to be removed in accordance with the DECCW guidelines. Note it is the preferred view of Council that proposed plans be modified to avoid impacts to threatened communities of species rather than be off-set through planting or other means.

Section 5.8.2 of the EA states:

In addition to clearing for the Stage 4 Coal Wash Emplacement, it is estimated that the Project would involve approximately 37 ha of other vegetation clearance activities primarily associated with ongoing surface exploration activities, the upgrade and extension of surface infrastructure (e.g. gas wells and service boreholes), access tracks, environmental monitoring and management activities (e.g. installation of monitoring equipment), potential stream restoration activities and other localised Project-related surface activities. The specific locations of these vegetation clearance activities would be detailed in the relevant Extraction Plans as required by the DoP.

Section 6.2 of Appendix E of the EA describes the management measures that would be implemented during this vegetation clearance including:

Clearance Outside of the Stage 4 Coal Wash Emplacement

Potential areas for surface disturbance would be surveyed for threatened flora species and EECs. If any threatened flora species are identified, the proposed site would be relocated so as to avoid any associated impacts.

Clearing of EECs would be avoided apart from some minor clearing in the widely distributed Shale/Sandstone Transition Forest EEC (Vegetation Community 6) and the Moist Shale Woodland in the Sydney Basin Bioregion EEC (Vegetation Community 9c) (mapped as p2 – Cumberland Shale Sandstone Transition Forest and p514 – Cumberland Moist Shale Woodland, respectively on Figures 4, 5, 7, 8 and 9) in which clearing would be kept to a maximum of 9 ha and 3 ha respectively. To minimise impacts to these two EECs, the Biodiversity Management Plan would include the following measures:

- *On-site validation that the vegetation present represents the relevant EEC as mapped.*
- *Re-location of infrastructure to avoid validated EECs, wherever possible within the technical constraints of the necessary surface activities.*
- *Location of infrastructure along existing landowner access tracks or existing disturbed portions of validated EEC's wherever possible within the technical constraints of the necessary surface activities.*
- *If clearing is required, implementation of appropriate management measures (e.g. pre-clearance surveys of the specific location to be cleared, demarcation of clearance zone to constrain clearance to a minimum, implementation of erosion and sediment control works and progressive rehabilitation works).*

Vegetation clearance would not take place in upland swamps, except for very minor clearing associated with environmental monitoring purposes.

The assessment of potential impacts on threatened fauna species conservatively assumed that this vegetation clearance would occur solely within their habitat.

As described in Section 5.8.2 of the EA, vegetation clearance activities would also be identified and assessed as a component of the Extraction Plan process.

Campbelltown City Council (18 December 2009) states:

> ***In addition, the EA states an Aquatic Ecology Monitoring Program will be established following project approval as part of the preparation of a Biodiversity Management Plan. As part of this program, Council would request the Department require ICH to conduct on-going monitoring over the life of the project to ensure the integrity and function of aquatic ecosystems are not compromised as a result of any impacts associated with mining operations. Council would further request that details of this Plan be provided to the Department in a format that can be readily implemented upon approval as part of the recommended staged Part 3A application/approval process.***

As described in Section 5.7.3 of the EA:

> *Consistent with the recommendations of the SCPR (DoP, 2008), the aquatic ecology monitoring programme would be designed to:*
>
> *(i) monitor subsidence-induced impacts on aquatic ecology; and*
>
> *(ii) monitor the response of aquatic ecosystems to the implementation of stream remediation and management works.*
>
> *The aquatic ecology monitoring programme would be described in detail in the Biodiversity Management Plan and would:*
>
> - *include monitoring at an appropriate frequency and scale for a period prior to, during, and following the completion of mining;*
> - *include monitoring at an appropriate frequency and scale prior to, during, and following the implementation of stream remediation and management activities;*
> - *take into account the seasonality and inter-annual variability of the systems under study;*
> - *target the collection of a minimum of two years pre-mining data, where practicable;*
> - *include sites situated within the Project extent of longwall mining area, as well as control sites situated in comparable unmined locations (the location of sampling sites would be determined in consideration of the aquatic habitat characteristics, their location relevant to the mine plan and access constraints);*
> - *include the use of quantitative sampling techniques;*
> - *be designed to comprise appropriate sampling replication;*
> - *be designed consistent with best practice impact monitoring (e.g. the use of an experimental design that allows advanced statistical analyses techniques to be employed such as Before, After, Control, Impact [BACI]/Beyond BACI designed studies);*
> - *be co-ordinated with other monitoring programmes as practicable to assist with determinations of causal relationships (e.g. monitoring of pool water levels, stream flow, groundwater levels and subsidence);*
> - *be developed in consideration of their potential contribution to regional and cumulative data sets on aquatic ecosystems consistent with Recommendation 21 of the SCPR; and*
> - *be peer reviewed by an appropriately qualified specialist.*
>
> *The approach to monitoring described above is consistent with the NSW Fisheries (1999) Policy and Guidelines for Aquatic Habitat Management and Fish Conservation which supports the use of a scientifically rigorous monitoring programme to assess impacts on aquatic ecology and the effectiveness of environmental mitigation, and to facilitate the implementation of adaptive management.*

As described in Section 5.7.3 of the EA, the aquatic ecology components of the Biodiversity Management Plan would be developed in consultation with the NSW Fisheries and other relevant authorities and to the satisfaction of DoP.

Campbelltown City Council (18 December 2009) states:

> ***…In this regard, there is considered insufficient reference in the draft EA to the identification of the Macarthur region as an area of 'high pollution levels' due primarily to factors such as the influence of local terrain on the distribution of pollutants within the Sydney Basin. The identification was also supported by an Inquiry conducted by the New South Wales Parliament into the 'Health Impacts of Air Pollution within the Sydney Basin' in 2006. A copy of the submission prepared by the Macarthur Regional Organisation of Councils on the Final Report of this Inquiry can be provided to the Department upon request. Accordingly, Council considers the EA has not complied with DG's Requirement for the assessment of 'all cumulative impacts associated with the proposed development, including air quality'.***

As described in Section 4 of Appendix J of the EA, monitoring data from Macarthur was used in determining background concentration levels of Total Suspended Particulates (TSP), PM_{10} and nitrogen dioxide as part of the assessment of potential air quality impacts of the Project.

As described in Sections 4.1, 4.2 and 6 of Appendix J of the EA, meteorology and local topography has been included in the model to account for air dispersion patterns.

Therefore, it is considered that the EA included assessment of cumulative air quality impacts including background pollution levels in Macarthur.

Campbelltown City Council (18 December 2009) states:

> ***In addition, the EA has also not included emissions associated with the recently approved Leaf Gully Power Station located within the project area in the calculations of total nitrogen dioxide background levels within the region over the intended duration of the proposed development. A specialist report obtained by Council as part of its review of the Environmental Assessment for this Power Station advised that its operation will be likely to result in an increase in background levels of nitrogen oxides and ozone.***

Section 7.4 of Appendix J of the EA describes the assessment of potential nitrogen dioxide impacts:

> *The maximum 1-hour average NO_2 concentrations from WestVAMP are presented in Figure C.9 in Attachment C. It can be observed from Figure C.9 in Attachment C that the maximum 1-hour average NO_2 concentrations are of the order of 10 µg/m³. Background concentrations have been measured up to 117 µg/m³ (Section 4.3.1) which, when added to 10 µg/m³, gives 127 µg/m³. The modelling therefore demonstrates compliance with the 246 µg/m³ criterion of Table 3.1.*
>
> *Figure C.10 in Attachment C shows the predicted annual average NO_2 concentrations. The predicted annual average NO_2 concentrations are approximately 0.5 µg/m³. Annual average measured background concentration is 29 µg/m³ (Section 4.3.1). With background, the cumulative annual average NO_2 concentrations are approximately 29.5 µg/m³, which complies with DECC criterion of 62 µg/m³.*
>
> *As discussed in Section 5.2, the Appin-Tower Power Project is owned and operated by EDL. The potential for cumulative NO_2 impacts with the Appin-Tower Power Project has also been considered. The Appin-Tower Power Project infrastructure is located at the Appin No 1 and 2 Shafts and at the Appin West Pit Top.*
>
> *Given the low NO_2 concentrations predicted for WestVAMP, and that WestVAMP is located at the West Cliff Pit Top and is remote (some 6 km) from any Appin-Tower Power Project infrastructure, it is not expected that the Project would result in any cumulative exceedances of NO_2 criteria with the approved operation of the Appin-Tower Power Project.*

The Leafs Gully Power Project was approved in August 2009. Given that the Leafs Gully Power Project is remote (approximately 6 km) from WestVAMP it is not expected that the Project would result in any cumulative exceedances of nitrogen dioxide with the Leafs Gully Power Project when it is operational.

In addition to the above, the Leafs Gully Power Project Environmental Assessment (AGL, 2009) determined that the Project would result in a maximum 1-hour average nitrogen dioxide concentration of 29.6 micrograms per cubic metre (µg/m³) and maximum annual average concentration of 0.2 µg/m³. There would not be an exceedance of cumulative 1-hour average or annual average criteria for nitrogen dioxide, even when the maximum predicted concentrations from the Leafs Gully Power Project are conservatively combined with the maximum concentrations from the Project and estimated background levels.

Campbelltown City Council (18 December 2009) states:

> ***Further, Council also considers the EA should include a reference for the potential for the background air pollutant levels to be further elevated as a consequence of any development that may occur within the Macarthur South Region over the intended 30 year duration of the project.***

Cumulative air quality impact assessment has been undertaken using background air quality data sourced from Macarthur and also included consideration of the Appin-Tower Power Project. Further cumulative assessment of potential unapproved development would be highly speculative without the full details of the relevant development (as approved) and is not considered appropriate.

Campbelltown City Council (18 December 2009) states:

> ***…It is further noted with concern the EA has not referred to the potential for particulate matter generated from the Brennans Creek Coal Emplacement Area to be transported to the Wedderburn district, located approximately 5 kilometres north west of the facility…***
>
> ***…It would further request that the Department require a detailed assessment of potential impacts of dust generation (including potential impact on flora and fauna species and their habitat) within the Wedderburn district as part of the requested (by Council) staged Part 3A application/approval process.***

The dust modelling conducted for the Air Quality Assessment (Appendix J of the EA) included the emission of dust (including particulate matter) from the West Cliff Coal Wash Emplacement. This included generation of particulate matter from dumping of coal wash at the emplacement, movement of dozers, excavators, graders and rollers on the coal wash emplacement, and wind erosion from the emplacement area.

The Air Quality Impact Assessment predicted that the Project contribution to annual average PM_{10} concentration at Wedderburn would be less than 2 µg/m³ (Figure C.3 of Appendix J of the EA). The cumulative PM_{10} concentration at Wedderburn was predicted to be approximately 16 µg/m³ (Figure C.6 of Appendix J of the EA), and therefore would be within the DECCW criteria of 30 µg/m³.

An assessment of potential dust impacts on vegetation and flora species is provided in Section 5.6 of Appendix E of the EA.

Recent observations of areas around the rehabilitating coal wash emplacements (i.e. Stages 1 and 2) by FloraSearch could find no evidence of dust deposition on plants located immediately adjacent to past and current disturbance areas. Therefore, it is highly unlikely that this would occur in Wedderburn as a result of the West Cliff Coal Wash Emplacement.

Dust problems are unlikely to reach dangerous levels for vegetation near the West Cliff Coal Wash Emplacement or at Wedderburn as a result of the Project for the following reasons:

- The typical moisture content of coal wash from the West Cliff Washery is between 7.2% (coal wash bin) and 33.8% (coal wash belt) (Table 2.4 in the EA) such that there is expected to be little dust generated.
- The moisture content of the material to be emplaced is often high, requiring measures to dry the material until suitable moisture content for compaction is achieved (West Cliff Coal Preparation Plan Stage 3 Coal Wash Emplacement Management Plan [Cardno Forbes Rigby, 2007]).
- The rainfall at West Cliff is relatively high so that any dust deposited on the surrounding vegetation would be washed off at regular intervals.
- The strict dust control measures currently implemented at west Cliff and proposed to continue (Section 5.13.4 of the EA).

Campbelltown City Council (18 December 2009) states:

> ***The EA is considered to comply with the Interim Consultation Guidelines produced by the DECCW. However, whilst recognising that Council's officers are not qualified Archaeologists; the Archaeological Assessment contained within the EA is considered to be largely restricted to a site by site basis analysis rather than a landscape context…***

Section 3 of the Aboriginal Cultural Heritage Assessment (Appendix G of the EA) describes the environmental context of the study area. An assessment of the cultural landscape values and significance is described in Section 7.2.3 of Appendix G of the EA:

> *The principle behind a cultural landscape is that 'the significance of individual features is derived from their inter-relatedness within the cultural landscape' (DECC n.d.: 5-6). This means that sites or places cannot be 'assessed in isolation' but must be considered as parts of a wider context of features with cultural and social value. Hence the site or place may possibly have values derived from its association with other sites and places, and its context within the physical landscape. By investigating the associations between sites, places, and (for example) natural resources in the cultural landscape the stories behind the features can be told. The context of the cultural landscape can unlock 'better understanding of the cultural meaning and importance' of sites and places (DECC n.d.: 5).*
>
> *….*
>
> *Taken as a whole the site types present—sandstone shelters and platforms, open stone artefacts sites, grinding groove sites, scarred tree sites—combine with the landscapes of the Woronora Plateau and Cumberland Plain to provide a detailed record of Aboriginal use of the study area prior to European arrival in the region. In addition, the presence of many sites on the Cumberland Plain and Woronora Plateau is well known amongst local Aboriginal communities. This gives the landscape value as a well known and highly visible cultural resource for the local Aboriginal communities. The rugged sandstone bushland of the Woronora Plateau and its numerous sites are in many ways a touchstone of identity for Aboriginal people of the Illawarra, whilst the rolling hills of the Cumberland Plain preserve an important history of occupation of the plains prior to their current development. For the reasons described above the study area must be considered to have high value as a cultural landscape.*

Campbelltown City Council (18 December 2009) states:

> ***The EA states that comments were not received from Council regarding the intended Aboriginal Heritage Assessment methodology despite a submission being sent to ICH in October 2008 that recommended the adoption of the landscape approach…***

The statement referred to in the above comment by Campbelltown City Council (18 December 2009) is referring specifically to registered Aboriginal stakeholders (groups, individuals and Local Aboriginal Land Councils) rather than Local Government stakeholders. As described in Section 2.1.5 of Appendix G of the EA:

> *An invitation to participate in the Aboriginal Cultural Heritage Assessment fieldwork program was extended to all registered Aboriginal stakeholders. A commitment to inform the registered Local Government stakeholders (i.e. Wollondilly Shire Council and Campbelltown City Council) of the results of the Aboriginal Cultural Heritage Assessment was made.*

The Department of Environment, Climate Change and Water (DECCW) (2 December 2009) provided the following comments regarding the Aboriginal Cultural Heritage Assessment (Appendix G of the EA):

> *The assessment of archaeological significance of the sites has been carried out in accordance with the Australia International Council on Monuments and Sites (ICOMOS) Burra Charter guidelines, DECCW's ACH Standards & Guidelines Kit (National Parks & Wildlife Service, 1997, draft) and DoP's Draft Guidelines for ACH Impact Assessment and Community Consultation (2005) and is considered to be adequate, as is the community consultation…*

Notwithstanding the above, all of the issues raised by Campbelltown City Council in their letter dated 2 October 2008 were addressed in the Aboriginal Cultural Heritage Assessment (Appendix G of the EA), including a landscape approach described in the response above.

Campbelltown City Council (18 December 2009) states:

> ***Therefore, whilst recognising the protection of Aboriginal heritage is a matter for the DECCW and local Aboriginal groups, Council would request that the EA include more detailed assessment of potential impacts on the identified likely subsurface archaeological deposits. Accordingly, Council would request the Department to require ICH to consult with the DECCW regarding appropriate means of protective these deposits and amend the EA accordingly. It would also request that it notify local Aboriginal groups and Council of the outcome of this consultation.***

Potential impacts on Aboriginal heritage as a result of general surface activities are described in Section 8.3.1 of Appendix G of the EA:

> *The issue requiring management in the west and north domains is the presence of stone artefact sites, which often occur as buried or sub-surface deposits. Stone artefacts can occur anywhere within the landscape (Biosis Research 2006a, Navin Officer Heritage Consultants 2003). However their frequency and density is often related to landscape variables influencing the deposition of artefacts (favourable places for the traditional Aboriginal population to camp or undertake other activities) and preservation of artefacts and sites (suitable aggrading landforms). The predictive model presented in Section 4.5 suggests that the size and density of the open sites is related to their proximity to watercourses, and generally they are found on well drained ground with low slope gradients. Other than these concentrations of artefacts, isolated stone artefacts occur in a low density throughout the study area, including on the ridge-tops of the Razorback Range and associated hills. Activities such as seismic lines and drilling locations have the potential to impact open Aboriginal sites, although these activities are often conducted in areas of low slope gradient and favourable deposition and preservation conditions, where larger Aboriginal sites may be present.*
>
> *The surface development activities would be ongoing throughout the life of the Project and their planning would be subject to ongoing considerations for their placement and exact nature. This being the case, specific assessment of the potential impacts on individual sites cannot be made. Nevertheless, given the anticipated small scale of the surface works across the entire study area, the flexibility of precise locations for these works and the considerations above, the surface works do not pose the risk of a significant impact to the cultural heritage of the study area.*

Management and mitigation measures for Aboriginal heritage during general surface activities are described in Section 9.3 of Appendix G of the EA:

> *The principal management strategy in the case of the surface developments would be to conduct appropriate pre-clearance surveys prior to the surface development (if the proposed disturbance area has not been subject to a detailed survey previously) on an ongoing basis throughout the life of the Project. Avoidance of impact to archaeological and cultural heritage sites through design of the development is the primary management strategy, and should be implemented where practicable.*
>
> *In determining whether a pre-clearance survey is required and in siting new surface infrastructure, the following would be key considerations:*
>
> - *presence of existing known sites (as mapped in this report, and added to throughout the Project life) in the proposed development area;*
> - *known sites should be avoided wherever practicable; and*
> - *location in the landscape and assessment against the predictive model presented in Section 4.5.*
>
> *Appropriate pre-clearance surveys are recommended for all surface developments outside of existing developed areas (e.g. existing pit tops and vent shafts) to identify appropriate locations for surface development activities and to minimise potential impacts on identified Aboriginal sites, where practicable.*

A draft report of the Aboriginal Cultural Heritage Assessment was provided to registered stakeholders and their comments were incorporated into the final report (Appendix G of the EA).

DECCW (2 December 2009) provided the following comments regarding the Aboriginal Cultural Heritage Assessment (Appendix G of the EA):

> *The assessment of archaeological significance of the sites has been carried out in accordance with the Australia International Council on Monuments and Sites (ICOMOS) Burra Charter guidelines, DECCW's ACH Standards & Guidelines Kit (National Parks & Wildlife Service, 1997, draft) and DoP's Draft Guidelines for ACH Impact Assessment and Community Consultation (2005) and is considered to be adequate, as is the community consultation…*
>
> *…*
>
> *DECCW notes the management recommendations in the ACH Assessment and supports these recommendations. Further, it is noted that the majority of the Aboriginal community responses also indicate support for these management recommendations.*

Campbelltown City Council (18 December 2009) states:

> ***…it is noted the EA indicates that Menangle Road, of which a section is located in the Campbelltown LGA)*** **[sic]*****, may experience a slight increase in employee car movements between Campbelltown and the Appin and Westcliff*** **[sic]** ***Collieries. In this regard, Council would request the Department require that ICH monitor traffic volumes as a condition of any approval for the proposed development in association with the Roads and Traffic Authority.***

The Project would result in an increase of approximately 24 movements (two movements equates to one round trip) on Menangle Road per weekday. The ICHPL contribution to traffic on Menangle Road in 2013 would be approximately 0.9% of total traffic movements.

The requirement for monitoring of traffic volumes is not consistent with contemporary Project Approvals, particularly given the small contribution of ICHPL traffic movements to this road.

Menangle Road is managed by the local councils, therefore the responsibility for monitoring traffic volumes should be that of the local council, not ICHPL or the Roads and Traffic Authority (RTA).

REFERENCES

AGL (2009) *AGL Leafs Gully Power Project Environmental Assessment*.

Cardno Forbes Rigby (2007) *West Cliff Stage 3 Coal Wash Emplacement Management Plan.*

Department of Environment, Climate Change and Water (2009) First Submission – Environmental Assessment Bulli Seam Operations Project Application Number: 08_0150. Letter dated 2 December 2009.

Department of Planning (2008) *Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield: Strategic Review*. State of NSW through the NSW Department of Planning.

Industry and Investment NSW (2009) Bulli Seam Operations Project Environmental Assessment 08_0150. Letter dated 23 December 2009.

Planning Assessment Commission (2009) *Metropolitan Coal Project Review Report*.

Bulli Seam Operations
Response to Wollondilly Shire Council Submission
23 December 2009

Each of the recommendations made by Wollondilly Shire Council (23 December 2009) (reproduced below in bold) are addressed below.

PRODUCTION STATISTICS

Wollondilly Shire Council (23 December 2009) states:

> ***Council questions the production statistics reported in the EA. Page 2-13 states that the maximum recoverable coal reserve is 306 Mt ROM coal (accounting for geological anomalies and structures). Page ES-5 base Longwall Plan reduces the reserve by 72.5Mt (at a value of $9.8 billion) based on a revised longwall plan to reduce environmental impacts. Therefore the net amount extracted should be 233.5 Mt. However, Page 2-24 and Page 7 of Appendix L Table 2.2 reports the total ROM coal extracted to be 306.4 Mt. The Benefit Cost Analysis (BCA) refers to 306.4 MT ROM coal extracted. This may result in an overestimation of the "Benefit" from the sale value of coal by approximately $4,331 Million.***

There are no errors or inconsistencies in the statistics presented in the EA regarding coal reserves. As stated in Section 2.2 of the EA:

> *The recoverable coal reserve for the Project based on the planned maximum production rate is approximately 306 Mt of ROM coal.*

The 'Project' is as described in Section 2 of the EA incorporating the longwall layout design objectives (including stream impact minimisation criteria) described in Section 2.5.2 of the EA.

As stated in Section 7.6.3 of the EA:

> *The EA Base Plan Longwalls incorporate an estimated reduction of the mining reserve by approximately 72.5 Mt of ROM coal…*
>
> *These changes have resulted from adopting the stream impact minimisation criteria described in Section 2.5.2 and by adopting setbacks from some key major infrastructure.*

The recoverable coal reserve for the Project incorporates this voluntary reduction in coal reserve (i.e. the 306 Million tonnes [Mt] is already nett of the 72.5 Mt referred to above). The Benefit Cost Analysis in Appendix L of the EA is consistent with the EA and includes consideration of production of 306 Mt of run-of-mine (ROM) coal.

SUBSIDENCE IMPACTS AND THE NATURAL ENVIRONMENT

Wollondilly Shire Council (23 December 2009) states:

> ***The EA makes the following comments on the issue of surface water loss as follows:***
> ***"there is no evidence that there has been a material change to the yield of these catchments or loss of total stream flow as a result of mining"' and***
> ***"It is undisputed that, at a local scale, flow can be diverted downstream via fracture networks along the stream alignment". The EA also refers to the Metropolitan PAC Report conclusion that "the likelihood of water being lost from the surface water system as a consequence of mining, and then by-passing Woronora Reservoir, is very low."***

These statements can not then be used to conclude that there is unlikely to be a net loss of stream flow and water from the local catchment within the project area. The Metropolitan case is smaller in land area and mining does not occur beneath the majority of the reservoir and therefore there is a 'control-point' to the local catchment (ie. A point at which impacts of subsidence cease).

The same can not be applied to the project area. Subsidence impacts shall progressively occur throughout the project area, cumulatively impacting on 100 kilometres of watercourses. This is not a "local scale" and there are no 'control points' (such as reservoirs) beyond which mining may cease in the future.

The NSW Planning Assessment Commission (PAC's) Metropolitan Coal Project Review Report (PAC, 2009) (herein described as the Metropolitan PAC Report) examined the issue of flow loss and made recommendations regarding further investigations into the potential for mine subsidence effects to lead to catchment yield losses. It concluded that it is not beyond doubt, however:

…the local and regional groundwater conditions coupled with the mine parameters, would suggest that the likelihood of water being lost from the surface water system as a consequence of mining, and then by-passing Woronora Reservoir, is very low. This conclusion accords with the findings of the Southern Coalfield Inquiry, viz:

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

As stated in Section 5.2.1 of the EA:

At the substantial depths of cover at the Project, connective cracking from the ground surface to the mined seam is not expected (Appendix B). Although stream beds with exposed rock base can experience subsidence induced fracturing to a depth of 10 to 20 m, there is considered to be negligible potential for the loss of surface water to the mine due to the lack of continuity of fractures from the surface to the mine (Appendix B). A portion of surface water flows may be diverted through the rock fractures beneath the stream bed, with emergence further downstream (Appendix C). Therefore, the Project would not result in adverse consequences to the quantity of water reaching the Cataract Dam, Woronora Dam or Broughtons Pass Weir.

Section 3.2.4.2 of Appendix C of the EA presents an assessment of recorded flow in Stokes Creek, O'Hares Creek catchments over the pre and post-mining periods and determined that there is no evidence that there has been a material change to the yield of these catchments which would suggest a loss of flow. These catchments do not have a downstream reservoir.

Wollondilly Shire Council's position that a downstream dam provides a control point to limit the extent of subsidence related surface water quantity impacts does not appear to be founded on any sound hydrological principles nor that of the findings of the Southern Coalfield Inquiry (NSW Department of Planning [DoP], 2008) or the Metropolitan PAC (PAC, 2009).

As noted by Wollondilly Shire Council above, potential impacts on streams will occur progressively throughout the Project life. Remediation (as described in Table 5-2 of the EA) would also be undertaken progressively.

The EA includes assessment of potential cumulative impacts on watercourses.

Wollondilly Shire Council (23 December 2009) states:

> ***There is no evidence to prove that:***
> ***(i) surface flows diverted through stream bed fractures remerge* [sic] *further downstream; and***
> ***(ii) water can be guaranteed to re-emerge downstream; and***
> ***(iii) if water does re-emerge it is the same water that was lost from further upstream (eg. The water may come from shallow ground water sources or other supplementary sourced* [sic] *such as upstream dams); and***
> ***(iv) if water does remerge* [sic] *downstream it is of the same quality.***

The Metropolitan PAC Report (PAC, 2009) examined the issue of flow loss and made recommendations regarding further investigations into the potential for mine subsidence effects to lead to catchment yield losses. It concluded that it is not beyond doubt, however:

> *…the local and regional groundwater conditions coupled with the mine parameters, would suggest that the likelihood of water being lost from the surface water system as a consequence of mining, and then by-passing Woronora Reservoir, is very low. This conclusion accords with the findings of the Southern Coalfield Inquiry, viz:*
>
> > *No evidence was presented to the Panel to support the view that subsidence impacts on rivers and significant streams, valley infill or headwater swamps, or shallow or deep aquifers have resulted in any measurable reduction in runoff to the water supply system operated by the Sydney Catchment Authority or to otherwise represent a threat to the water supply of Sydney or the Illawarra region.*

Sections 3.2.4.2 and 5.3 of Appendix C of the EA present an assessment of recorded flow in Stokes Creek, O'Hares Creek and Waratah Rivulet catchments over the pre and post-mining periods and determined that there is no evidence that there has been a material change to the yield of these catchments which would suggest a loss of flow.

Section 5.2.1 of the EA states the following regarding changes in water quality:

> *Although mine subsidence effects can result in isolated, episodic pulses in iron, manganese, aluminium and electrical conductivity (EC), these pulses have not had any measurable effect on water quality in downstream reservoirs (Appendix C). The Project is not expected to impact on the performance of Woronora Reservoir, Cataract Reservoir or Broughtons Pass Weir.*

As noted in Table 5-2 of the EA, localised impacts on stream water quality are estimated to include the extent of subsidence effects plus in the order of 600 metres (m) downstream.

Wollondilly Shire Council (23 December 2009) states:

> ***Stream management and remediation measures will be implemented if they are "considered technically feasible". Who determines whether measures are technically feasible?***

Illawarra Coal Holdings Pty Ltd (ICHPL) considers "feasible" to be consistent with the definition included in the Project Approval for the Metropolitan Coal Project (08_0149):

> *Feasible relates to engineering considerations and what is practical to build.*

This definition can be applied to the implementation of remediation works. Stream remediation would be implemented at controlling rockbars to return stream flow to pre-mining characteristics and in stream reaches between controlling rockbars where remediation measures are technically feasible (e.g. when there was pre-mining flow).

As described in Appendices O and P of the EA, contingency and offset measures would be implemented where remediation measures are not successful or predictions are exceeded.

Wollondilly Shire Council (23 December 2009) states:

> ***Watercourses should be valued in at least the same way as constructed assets. For example, Menangle Weir and road and rail bridges across the Nepean River are to be granted a minimum setback distance of 35 degree angle of draw to maintain structural integrity. The same setbacks should be applied to the Nepean River, Georges River, Cataract Creek*** **[sic]*, O'Hares Creek, Stokes Creek and Lizard Creek.***

As described in Table 5-2 of the EA, the criteria for the Nepean River (reach 1), Georges River (reach 2), Cataract River, O'Hares Creek, Stokes Creek (reaches 1 and 2) and Lizard Creek are based on achieving less than 200 millimetres (mm) of predicted closure at controlling rockbars.

The setbacks to achieve less than 200 mm of predicted closure on streams can be greater than a 35 degree angle of draw, and is a more appropriate criterion as it relates directly to minimising potential impacts on streams (i.e. actual environmental performance) rather than providing an arbitrary barrier.

In addition to the above recommendation, Wollondilly Shire Council (23 December 2009) also states:

> ***Again, (see Management Measures in Table 5-2) if a minimum acceptable setback distance of 35 degree angle of draw is considered satisfactory for the protection of significant infrastructure (Douglas Park Weir, road and rail bridges across the Nepean River) then Council considers the same standards for setbacks should apply to all watercourse*** **[sic]** ***of 3rd Order or higher and all watercourse*** **[sic]** ***of Special Significance.***

As described in Table 5-2 of the EA, the criteria for the Nepean River (reach 1), Georges River (reach 2), Cataract River, O'Hares Creek, Stokes Creek (reaches 1 and 2) and Lizard Creek are based on achieving less than 200 mm of predicted closure at controlling rockbars.

The setbacks to achieve less than 200 mm of predicted closure on streams can be greater than a 35 degree angle of draw, and is a more appropriate criterion as it relates directly to minimising potential impacts on streams (i.e. actual environmental performance) rather than providing an arbitrary barrier.

The Benefit Cost Analysis (including consideration of environmental consequences) presented in Appendix L of the EA indicates that applying this level of protection to all streams of 3rd order and above is economically inefficient.

In addition to the previous recommendations, Wollondilly Shire Council (23 December 2009) states:

> ***…Councill*** **[sic]** ***considers the Georges River, Cataract River, Stokes Creek, Lizard Creek and O'Hares Creek as fitting the description of 'special significance'. Therefore all these watercourses should be subject to the same 'Stream Impact Minimisation Criteria' as the Nepean River (reaches 2 and 3) as detaild*** **[sic]** ***in Table 5-2 of the EA.***

The criteria for the Georges River (reach 2), Cataract River, O'Hares Creek, Stokes Creek (reaches 1 and 2) and Lizard Creek are based on achieving less than 200 mm of predicted closure at controlling rockbars, and are therefore more stringent than the criteria for the Nepean River (reaches 2 and 3). The stream impact minimisation criteria for the Nepean River (reaches 2 and 3) (Table 5-2 of the EA) allows mining closer to the stream than applying a criteria of less than 200 mm of predicted closure, as these sections of the Nepean River are inundated and less susceptible to stream flow diversion as a result of subsidence. As discussed above, these commitments are based on actual environmental performance objectives.

Wollondilly Shire Council (23 December 2009) states:

> ***In the same Table 5-2 Council is critical of the Management Measures proposed. Firstly, the Management Measures assume that remediation can successfully restore a watercourse. As stated previously there is no evidence to demonstrate that such remediation has been 'successful' and such techniques should not be relied upon to repair damage. Secondly, it is stated that remediation measures will be implemented where they "are technically feasible (e.g where there was pre-mining flow and the substrate is suitable for grouting)". There is insufficient base data collected on watercourse*** **[sic]** ***to determine 'pre-mining flow' and there has been no evidence presented as to what percentage of stream beds are likely to present features which make the proposed forms of remediation 'technically feasible'. Therefore a decision can not be made as to the relative potential success of Management Measures which propose remediation of stream beds and rock bars.***

As described in Section P7.3.2.3 of Appendix P of the EA:

> *ICHPL has successfully remediated a series of impacted pools on the Georges River. Stream remediation measures have also been implemented at the Metropolitan Colliery on Waratah Rivulet (Helensburgh Coal Pty Ltd [HCPL], 2008).*

In relation to remediation, the Metropolitan PAC Report (PAC, 2009) states (page 38):

> *There are a variety of remediation options available to respond to subsidence impacts.*
>
> *These include backfilling and/or grouting of cracks and fracture networks, stabilisation of slopes and drainage and erosion control measures. Fractures may also infill naturally in watercourses that have a moderate to high sediment load; otherwise they may have to be grouted.*
>
> *Grout can be either cement-based or composed of various plastics or resins (e.g. polyurethane) and is injected under pressure into fracture networks. The degree of success of grouting is dependent on the accessibility of the site, on the type of grouting materials which are used and on timing.*
>
> *In the case of watercourses, it is not yet feasible to remediate an entire upsidence fracture network. Hence, remediation efforts in the Southern Coalfield have to date focused on sealing the fracture network at strategic locations, such as rock bars. At these sites, the fracture network can extend some distance laterally under the toe of valleys and be overlain by talus. It can also be covered by boulder beds within watercourses. These types of settings restrict access for grout injection equipment. If the site of fracturing is affected by a number of mining panels, several episodes of grouting may be required over a number of years. In the interim, mitigation measures are required to sustain surface water flows if the local ecology is not to be impacted.*

Recommendation 34 of the Metropolitan PAC Report (PAC, 2009) states (page 147):

> ***Recommendation 34***
>
> *The Panel recommends that remediation be required where subsidence impacts cause diversion of flows or drainage of pools with the objective of restoring flows and pool holding capacity to pre-mining levels as quickly as possible. The Panel notes that more than one remedial effort may be required at an individual feature (eg a rock bar) given that the total impacts are expected to be associated with successive longwalls. The Panel recommends that approval conditions should require close monitoring of impacts from all longwalls likely to affect such key features.*

As described in Appendix P of the EA, contingency and offset measures would be implemented where remediation measures are not successful or predictions are exceeded.

Table P-6 of Appendix P of the EA describes the proposed surface water flow monitoring for the Project:

- *The mine area specific flow monitoring would be developed progressively over the Project life.*
- *Gauging stations would be established at least two years prior to the commencement of extraction within each catchment.*
- *Where stream conditions allow (e.g. existence of a suitable control site), gauging stations would be established both upstream and downstream of the main subsidence impact zones. Where this is not practicable, monitoring stations would be established as close to these locations as practicable.*
- *Gauging stations would be designed and constructed to provide suitable minimum low flow resolution and accuracy. Interim targets of ± 0.1 megalitres per day (ML/day) resolution and ± 10% accuracy in flow rate over the flow range 0.5 to 10 ML/day are proposed.*
- *Flow monitoring would contribute to the quantitative understanding of the pre-mine catchment via the use of baseline models and inform the success criteria for remediation works.*
- *Additional pluviometers would be established as the monitoring network expands to provide reliable rainfall information required to interpret and model the dynamics of catchments.*
- *Specific monitoring, aimed at quantifying local flow diversion phenomena, would also be established. The monitoring results would be used to identify the need and subsequent success of remediation measures.*

The establishment of gauging stations at least 2 years prior to the commencement of extraction within each catchment is considered sufficient base data to determine the characteristics of pre-mining flows to a degree to establish specific rehabilitation success criteria for the relevant stream reach.

Wollondilly Shire Council (23 December 2009) states:

> ***In the same Table 5-2 Council believes the Contingency factors should include a commitment to revise the mine layout plan and extraction methods based on feedback from monitoring. Mine layouts and extraction methods should be revised to reduce the potential impacts of subsidence if those impacts are found to exceed predictions and / or if remediation is found to be 'not technically feasible'.***

ICHPL is committed to an adaptive management approach. If impact predictions are exceeded the consequential environmental impacts will be remediated and/or appropriate offsets provided.

The data sets obtained from this process will then be used to inform subsequent mine planning processes such that similar exceedances are avoided in the future. The detailed mine design process will always be informed by existing data sets so as to achieve ICHPL's environmental commitments and the performance criteria set by relevant approvals (e.g. Project Approval).

Wollondilly Shire Council (23 December 2009) states:

> ***More evidence is needed before any assessment can be made as to the role of shallow and deeper ground water on:***
> - ***baseflow and recharge of watercourses***
> - ***supporting ecosystems***
> - ***water levels (including deep water storage) in reservoirs and dams***
> - ***groundwater resources and the movement of water in ways not yet fully understood***

Wollondilly Shire Council does not expand on the above regarding specific additional information required on shallow and deep groundwater systems.

Quantification of baseflow to watercourses within the Project area is provided in Section 5.2 of Appendix B of the EA. An assessment of potential impacts on upland swamps (i.e. supporting ecosystems) is provided in the Upland Swamp Risk Assessment (Appendix O of the EA). Potential impacts on surface water bodies (including reservoirs and dams) are provided in Section 6.1.5 of Appendix B of the EA.

The long-term impacts on groundwater are discussed in Sections 6.1.2, 6.1.3 and 6.1.4 of Appendix B of the EA.

The Groundwater Assessment (Appendix B of the EA) was peer reviewed by Dr Frans Kalf (Attachment 3 of the EA).

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

Wollondilly Shire Council (23 December 2009) states:

> ***Page 5-19 and Appendix O state "No individual swamp or group of swamps in the Project area are considered to be sufficiently unique or different so as to require identification of 'special significance' and thus requiring special consideration in a risk assessment framework." Council does not agree with this statement. No comparisons have been made on a wider scale as to the characteristics of swamps elsewhere. Research notes that upland swamps have value to each other as a network for processes such as seed dispersal and movement / refuges for fauna. Therefore the significance of the network and the importance of each swamp within the network needs* [sic] *to be evaluated.***

In relation to 'special significance' the Metropolitan PAC Report provides the following (page 42):

> *'Special Significance Status' is based on an assessment of a natural feature that determines the feature to be so special that it warrants a level of consideration (and possibly protection) well beyond that accorded to others of its kind. It may be based on a rigorous assessment of scientific importance, archaeological and cultural importance, uniqueness, meeting a statutory threshold or some other identifiable value or combination of values.*

The Metropolitan PAC Report also recognises that in the absence of quantifiable measures and an objective threshold, conclusions about 'special significance' would be subjective (pp 75-76):

> *Upland swamps occur extensively in the Southern Coalfield and in the Project Area. The issue of 'significance' of these swamps is a vexed one. The SCI report lamented that there was a lack of guidance for Proponents on how to determine the relative significance and value of natural features where multiple examples exist within a Project Area or region. It suggested that there should be clear delineation of the priorities of both Government and the community for the protection and values of such features.*

> *It would certainly make it much easier for Proponents and governments to have a checklist of natural features, a value for conservation of each and then a regional scale of relative significance for each of these natural features against which the individual examples in the Project Area could be rated. However, the attainability of this is questionable.*
>
> *…*
>
> *The Panel notes that the task at this point is to determine significance of the natural feature and that it is only one component of the decisions concerning protection levels and the strategies to achieve them. In that context the Panel would make two observations:*
>
> *i) that 'prima facie worthy of protection' does not mean 'to be preserved at all costs'; and*
>
> *ii) that who determines the special significance threshold and where it is set could have substantial implications for mining in the Southern Coalfield, particularly if a finding of special significance translated in practice to an automatic rejection of mining in the vicinity of the swamp(s). Given the number of swamps in the Southern Coalfield and their distribution, generous interpretation of special significance could effectively see mining cease.*

Wollondilly Shire Council (23 December 2009) does not present an alternative approach to determining the special significance of swamps within the Project area.

The Upland Swamp Risk Assessment compares swamps within the Project area to other swamps on the Woronora Plateau and elsewhere (e.g. Maddens Plains) in its assessment of special significance (Section O5 of Appendix O of the EA).

Wollondilly Shire Council (23 December 2009) states:

> ***There are no baseline studies which determine the 'natural' incidence of cliff collapse therefore no judgement can be made on how significantly mining will change this probability. An estimated 3 to 5% of total length to demonstrate rock falls, instabilities and collapse.***
>
> ***The percentage of cliff lines is not the only measure required. The change in the incidence of instability and collapse compared to the non-mining scenario is required to estimate the impacts.***

Rock falls occur naturally as a result of natural weathering processes. Subsidence has the potential to further reduce the stability of features (e.g. cliffs and overhangs) and increase the incidence of rock fall. As described in Section R6.4.1 of Appendix R of the EA:

> *It is extremely difficult to assess the likelihood of cliff instabilities at any one location based upon predicted ground movements. The likelihood of a cliff line becoming unstable is dependent on a number of factors which are difficult to fully quantify. These include jointing, inclusions, weaknesses within the rockmass and water pressure and seepage flow behind the rockface. Even if these factors could be determined, it would still be difficult to quantify the extent to which these factors may influence the stability of a cliff naturally or when it is exposed to mine subsidence movements. It is therefore possible that cliff instabilities may occur during mining that may be attributable to either natural causes, mine subsidence or both.*

It is not possible to ascertain the frequency of natural cliff collapses and rock falls. The frequency of such events is not a constant. It would vary based on rock weathering processes, climatic conditions, seismic events and other factors. Any baseline study would only record a snap-shot in time. Instead, ICHPL proposed a monitoring programme prior to, during and following its mining areas (e.g. within 600 m of the active longwall operation).

WATER MANAGEMENT

Wollondilly Shire Council (23 December 2009) states:

> ***Surface Water release and runoff listed in Table 2.3 Benefit Cost Analysis in Appendix L states that surface water release and runoff costs are "negligible" for the project. However, the costs of Environmental Protection Licences and progressive review of applicable standards and the upgrades and augmentations are estimated by Council to cost at least an amount worth acknowledging in the table.***

The costs of Environment Protection Licences (EPLs) and progressive review of applicable standards represents an operational cost and is not an environmental externality.

The Benefit Cost Analysis includes operational costs for the Project, including costs associated with EPLs.

MONITORING AND REHABILITATION

Wollondilly Shire Council (23 December 2009) states:

> ***The EA proposes contingency planning by independent audit to determine whether actual impacts are exceeding predictions. This is proposed to be conducted annually for two years and then every five years thereafter. Council considers the auditing should continue to occur annually for the life of the project. Furthermore monitoring should continue over all watercourses before and after mining for the full life of the project. This is necessary as the impacts of subsidence may continue to occur well after extraction has been completed. The auditing programme can also be used to collect baseline data prior to mining and will also be capable of identifying and evaluating cumulative impacts and correlating with weather conditions. The overall process will assist in recognising a threshold at which point mine layout needs to be revised.***

The contingency plan process is described in Section P7.6 of Appendix P of the EA:

> *The monitoring programme described in Section P7.5 would facilitate the implementation of contingency measures, where actual subsidence impacts for streams exceed predictions. Table P-5 outlines the preferred risk management options and associated contingency measures should impacts exceed predictions.*
>
> *The contingency plan process would involve:*
>
> - *Implementation of the TARP described in Section P7.5, specifically:*
> - *Implementation of the stream monitoring programme.*
> - *Collection of monitoring data.*
> - *Analysis of results, including:*
> - *Assessment against monitoring triggers described in a tarp developed for streams in the mining domain and included in relevant Extraction Plans.*
> - *Assessment of any trends in the data that may indicate changes are occurring.*
> - *Assessment of any impacts against predictions.*
> - *Root cause analysis of any change or impact.*
> - *Specialist input to analysis of results, as required.*
> - *Reporting.*
> - *Where subsidence impacts or environmental consequences are found to be consistent with predictions, implementation of risk management options described in the RMPs.*

- *Where subsidence impacts or environmental consequences are found to exceed predictions, identification of options for management, mitigation and/or offset, developed in consultation with stakeholders. The options include:*
  - *mitigation measures such as those described in Section P7.3.2; or*
  - *offset options such as those described in Section P7.3.4.*
- *Implementation of chosen management options.*
- *Monitoring to assess effectiveness of contingency measures implemented.*
- *Identification of any required changes to RMPs.*
- *Consultation with regulatory authorities and landholders.*

The contingency plan process is separate to the auditing process described in Section P7.7 of Appendix P of the EA. The contingency plan process would occur continuously throughout the mine life.

The auditing process would include the following (Section P7.7 of Appendix P of the EA):

- *be conducted by a suitably qualified, experienced, and independent person whose appointment has been endorsed by the DoP;*
- *assess the performance of the RMP;*
- *review the adequacy of the RMP management options and monitoring programmes; and*
- *if necessary, recommend actions or measures to improve the performance of the RMP and the adequacy of the RMP management options and monitoring programmes.*

The role of the auditing process is not to collect or analyse data, but to assess the performance of the Risk Management Plans (RMPs). The RMPs would include requirements for data collection and analysis as described in Section P7 of Appendix P of the EA.

ITEMS AND PLACES OF ABORIGINAL SIGNIFICANCE

Wollondilly Shire Council (23 December 2009) states:

> ***Items and places of High Aboriginal significance should be valued in at least the same way as constructed assets. Eg. Menangle Weir and road and rail bridges across the Nepean River are to be granted a minimum setback of 35 degrees angle of draw to maintain structural integrity. This is especially so for items and places of moderate to high level of significance which are at moderate or higher level of risk (being approximately 7 sites).***

The Metropolitan PAC Report indicates (page 7):

> *Aboriginal heritage sites are most at risk of subsidence impacts where they are located in cliff lines and/or rock overhangs. The SCI Panel was not made aware of any significant impacts having occurred on Aboriginal heritage features in the Southern Coalfield since the 1980s.*

Section 8.2.2 of Appendix G of the EA describes the risk of impact categories used for Aboriginal heritage sites:

> *…generally impacts to sites are rare (occurring in approximately 11% of monitored cases which have focused on sites with higher risk of impact) and that when impacts have been recorded they have been relatively minor (rarely impacting art surfaces for example). Hence the category moderate means impacts are possible, but likely to occur in less than 10% of cases.*

Section Q6.6.2 of Appendix Q of the EA describes the results of the Aboriginal Heritage Site Risk Assessment:

> *Attachment QA indicates that of the 76 sites of moderate or high archaeological significance or sites of particular cultural significance, 26 (34%) sites were assessed as having a Negligible risk, 31 (41%) sites a Very Low risk, 12 (16%) sites a Low risk and 7 (9%) sites a Moderate risk. No sites were assessed as having a High risk. This is consistent with previous observations within the Southern Coalfield during monitoring programmes (Appendix G of the EA). Although considered highly unlikely, the complete collapse of a shelter of high archaeological significance or particular cultural significance could be considered as a significant impact. The evidence at hand suggests that Project related subsidence does not pose a significant risk of impact to Aboriginal heritage sites within the study area.*

A minimum setback of 35 degree angle of draw has been applied to the Menangle Weir and road and rail bridges across the Nepean River to maintain the structural integrity of these infrastructure items. The potential impacts on Aboriginal heritage sites are predicted to be rare and relatively minor.

Based on the above, a setback of 35 degrees is not considered warranted for these sites.

BUILT STRUCTURES AND ASSETS

Wollondilly Shire Council (23 December 2009) states:

> ***Council considers Structural Adequacy Assessments are required prior to granting consent and should be subject to public exhibition and comment for major infrastructure items. Structural Adequacy Assessments are required to determine whether they will remain serviceable during and after mining…***

As stated in Section 7.3.1 of the EA:

> *Over the life of the Project, Extraction Plans would be progressively prepared as detailed mine designs are completed for each part of the Project area. The main aspects to be addressed by Project Extraction Plans would include:*
>
> - *a detailed mine plan;*
> - *plans of associated surface construction works;*
> - *a coal resource recovery plan;*
> - *final prediction of systematic (conventional) and non-systematic (non-conventional) subsidence effects;*
> - *demonstration that the predicted subsidence impacts and consequences are consistent with those authorised by the Project Approval;*
> - *a Subsidence Monitoring Programme;*
> - *a Catchment Monitoring Programme;*
> - *a Biodiversity Management Plan;*
> - *a Heritage Management Plan; and*
> - *a Built Features Management Plan.*
>
> *The Extraction Plan process provides a mechanism for the presentation of further detail regarding particular management measures for individual longwalls or mining domains. As part of the preparation of Extraction Plans, consultation would be undertaken with relevant stakeholders (e.g. relevant landholders, infrastructure owners and government authorities).* [emphasis added]

The preparation of Built Features Management Plans would include an assessment of whether the infrastructure will remain safe and serviceable throughout the mining period.

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

Wollondilly Shire Council (23 December 2009) states:

> ***…If Structural Adequacy Assessments conclude that any infrastructure item is likely to be out of service as a result of subsidence impacts, then that infrastructure must be replaced or suitably treated to ensure service levels are maintained during and after mining. Repairs or replacement works should occur prior to mining impacts to ensure that service routes suffer minimal interruption.***
>
> ***The alternative is that damage to infrastructure may be caused during mining and the infrastructure can be repaired post subsidence. This could result in major infrastructure being out of action at short notice and for an indefinitely* [sic] *time frame. This comment applies to all railway bridges Menangle Rail Bridge, Picton road overbridge at Maldon and Moreton Park Overbridge),* [sic] *Menangle railway station and all major roads and road bridges (including the Twin Bridges over the Nepean River at Douglas Park, Twin bridges at Pheasants Nest, Menangle Road and Picton road bridges over the Nepean River and other road bridges).***
>
> ***Council acknowledge that this approach has been implemented for Blades Bridge which has been replaced with a structure that is expected to adequately withstand subsidence and remain serviceable during and after subsidence.***

As described in Section 5.4.5 of the EA, the safety and serviceability of all major infrastructure items would be maintained throughout the mining period.

ICHPL, in consultation with Roads and Traffic Authority (RTA), Australian Rail Track Corporation (ARTC) and/or local council, would develop Built Feature Management Plans for the above listed infrastructure items for inclusion in future Extraction Plans.

Management measures for these infrastructure items are included in Section 5.4.5 of the EA, for example:

> *Monitoring and management measures for bridges would, where relevant, include:*
>
> - *implementation of mitigation measures prior to mining (e.g. increase the capacity of bridge expansion joints to accommodate closure movements), where relevant;*
> - *adjustment of the mine plan to provide further offsets from the bridge, if it is found that practical mitigation measures are not sufficient to reduce the risk of impact to the bridge to acceptable levels;*
> - *installation of a monitoring programme, which would include, but not necessarily be limited to, the monitoring of ground movements and bridge movements;*
> - *regular visual inspections of the bridge;*
> - *regular review on subsidence monitoring data;*
> - *implementation of planned responses if triggered by monitoring and inspections; and*
> - *implementation of a reporting and communications plan.*

Wollondilly Shire Council (23 December 2009) states:

> ***…Council requests information to determine when Mine Subsidence Area boundaries will be adjusted to include additional properties and what compensation will be made available to land owners.***

The boundaries of Mine Subsidence Districts are shown on Figure 5-8 of the EA. Under Section 15(1) of the *Mine Subsidence Compensation Act, 1961* (MSC Act), mine subsidence districts must be proclaimed by the Governor and published in the Gazette.

As described in Section 7.3.1 of the EA, the MSC Act provides for compensation or repair services where property improvements are damaged by mine subsidence resulting from the underground extraction of coal. Land owner entitlements to compensation or repair services for damage by mine subsidence is the same regardless of whether their land is located within a Mine Subsidence District or not.

GOAF GAS DRAINAGE

Wollondilly Shire Council (23 December 2009) states:

> ***The EA proposes a generic Surface Goaf Gas Drainage Management Plan with the intention that there be no separate development consent required for Goaf gas drainage in the future (with the exception of separate approvals for any goaf gas drainage in the Dhawaral SCA). This is proposed as the specific location of boreholes and temporary surface infrastructure will not be known until more detailed mine planning is completed.***
>
> ***A generic plan is a commendable start but it is not acceptable as a substitute for separate development applications which need to take into consideration the full details of each borehole and surface facility works.***

The Surface Goaf Gas Drainage Management Plans that may be prepared over the Project life would not be generic and would include site-specific assessments. As described in Section 2.5.5:

> *If required, the installation of surface goaf gas drainage boreholes and associated surface infrastructure would be subject to preparation of supplementary specialist environmental assessment studies. These studies and any associated management measures would be detailed in a Surface Goaf Gas Drainage Management Plan. The Surface Goaf Gas Drainage Management Plan would be prepared to the satisfaction of the Director-General of the DoP.*
>
> *The preparation of a Surface Goaf Gas Drainage Management Plan would include:*
>
> - *Obtaining suitable landholder agreement or easements over land (where required) for the gas drainage sites, surface infrastructure and associated vehicular access.*
> - *Targeted noise and air quality assessments to assess compliance with applicable construction and operational noise and air quality criteria at the nearest sensitive receptors (e.g. private residences). In the event that compliance with applicable construction and operational noise and air quality criteria cannot be met at a sensitive receptor, Illawarra Coal would: reach a negotiated agreement with the interested party; or commit to additional attenuation measures to ensure compliance with the relevant criteria; and/or relocate the proposed drainage site to ensure compliance with the relevant criteria. A copy of any relevant agreements formed with interested parties would be provided to the Director-General as a component of the Surface Goaf Gas Drainage Management Plan.*
> - *Targeted visual impact assessment, and where required, implementation of management measures to minimise visual impacts at nearby affected sensitive receptors.*
> - *A Vegetation Management Protocol that minimises any potential disturbance of natural vegetation. Surveys would be conducted of potential drainage sites for threatened flora species and endangered ecological communities (EECs). If any threatened flora species are identified, the proposed drainage site would be relocated so as to avoid any associated impacts. Clearing of EECs would be avoided apart from some minor clearing in the widely distributed Shale/Sandstone Transition Forest EEC and the Moist Shale Woodland in the Sydney Basin Bioregion EEC (mapped as P2 – Cumberland Shale Sandstone Transition Forest and P514 – Cumberland Moist Shale Woodland respectively, in Section 5) in which clearing would be kept to a minimum of 9 hectares (ha) and 3 ha, respectively. To minimise impacts to these two EECs, the Vegetation Management Protocol would include the following measures:*
>   - *On-site validation that the vegetation present represents the relevant EEC mapped.*
>   - *Consideration of re-locating infrastructure to avoid validated EECs, where practicable.*

  - *Consideration of locating infrastructure along existing landholder access tracks or existing disturbed portions of validated EECs.*
  - *If clearing is required, implement appropriate management measures (e.g. pre-clearance surveys, demarcation of clearance zone to constrain clearance to a minimum, implementation of erosion and sediment control works, progressive rehabilitation works, etc.).*
- *Design of erosion and sediment control and site water management measures in accordance with applicable guidelines.*
- *Site-specific Aboriginal and non-Aboriginal heritage inspections, and if required, relocation of the proposed drainage sites so as to avoid known Aboriginal and non-Aboriginal heritage sites.*
- *Progressive rehabilitation of the surface goaf gas drainage disturbance areas, such that only a practical minimum area is disturbed at any one time.*

Following the DoP approval of a Surface Goaf Gas Drainage Management Plan, suitable surface mining leases or easements over the surface would be obtained from the DPI-MR (where required) for the drainage sites and associated vehicular access.

Where required, gas drainage infrastructure would continue to be installed over operational areas and consist of a gas extraction plant (including generator and fuel tank), gas flares, compressors as well as drill rigs and trailer to install the infrastructure.

The above assessment and approval approach would not be applied for any surface goaf gas drainage proposals in the Dharawal State Conservation Area. Such a proposal in the Dharawal State Conservation Area would be subject to a separate Part 3A assessment and approval process.

In portions of the Project area where the above requirements are not satisfied, mining would proceed without the implementation of this surface goaf gas drainage technology and/or separate environmental assessment and approval process would be embarked upon.

The Surface Goaf Gas Drainage Management Plan would specifically address each surface goaf gas drainage borehole. ICHPL would be required to act in accordance with the provisions of the Surface Goaf Gas Drainage Management Plan, including any management measures developed to the satisfaction of DoP.

COAL WASH EMPLACEMENT

Wollondilly Shire Council (23 December 2009) states:

The EA proposed to commence a 'pilot-scale' research and development trial to investigate alternative uses for coal wash within five years of granting of consent. This is not acceptable to Council. The research and development trial should commence immediately upon acting on any consent and can be a continuation of the current investigations required in accordance with the conditions of development consent for Dendrobium Mine (DA 60-03-2001)…

The Statement of Commitments (Section 8 of the EA) states:

Within five years of the grant of Project Approval, ICHPL will fund and commence development of a pilot-scale research and development trial for underground coal wash emplacement technology at the Project. The trial will draw upon available information/technical data from similar investigations and trials in the Southern Coalfield and internationally.

The results of the trial will be used to inform a value analysis of the feasibility of a portion of the coal wash being emplaced underground at the Project. The value analysis will include consideration of aspects such as:

- *practical application and mine safety for underground emplacement at the Project design volumes/rates;*
- *infrastructure requirements (including supporting equipment) for underground emplacement;*

- *water and other materials consumption/use requirements; and*
- *consideration of benefits/costs of underground emplacement versus ongoing surface emplacement at the West Cliff pit top.*

ICHPL considers that the timeframe for this commitment (i.e. within five years of granting of consent) is appropriate for such a trial.

Section 2.8.5 of the EA describes the commitments made as part of Stage 3 of the West Cliff Coal Wash Emplacement:

> *ICHPL has however committed to, and would continue to (Cardno Forbes Rigby, 2007b):*
>
> - *research and consider alternatives to coal wash emplacement;*
> - *pursue the use of coal wash as an engineering fill material;*
> - *negotiate with owners of suitably located and available sites that could be used as alternative emplacement sites to extend the life of the West Cliff Stage 3 Coal Wash Emplacement; and*
> - *report progress of these actions to the NSW Government in the Annual Environmental Management Report (AEMR).*

If approved, this commitment would continue for Stage 4.

Wollondilly Shire Council (23 December 2009) states:

> ***Council requests annual independent auditing of the rehabilitation of emplacement areas to determine an estimate for the time required to continue working on the emplacement area after cessation of underground mining. The audit shall identify to a state where the vegetation cover shall be self-supporting (and whether this is possible). The intention is to restore the vegetation to a state that is compatible with the existing surrounding vegetation. However, Council requests that an independent audit be regularly conducted to determine if this is feasible and realistic.***

Under the *Mining Act, 1992*, environmental protection and rehabilitation are regulated by conditions included in all Mining Leases, including requirements for submission of Mining Operation Plans (MOPs) and Annual Environmental Management Reports (AEMRs). Collectively, the MOP and AEMR constitute the Mining, Rehabilitation and Environmental Management Process (MREMP). As Project rehabilitation activities would be undertaken progressively, the MREMP framework would be used throughout the Project life to both plan and track the performance of these activities as they are carried out.

As described in Section 6.2 of the EA, a monitoring programme would be developed and included in the West Cliff Stage 4 Coal Wash Emplacement Management Plan. The monitoring programme would include monitoring of groundwater, temperature, emplacement settlement, compaction and combustibility, sub-surface drainage including flow rate and water quality, water quality in water management structures, erosion and sediment controls, vegetation, fauna habitats and dust generation (Section 6.2 of the EA). The results of the monitoring programme would be reported in the AEMR.

The requirement for annual independent audits of rehabilitation is not consistent with contemporary Project Approvals.

ICHPL has an incentive to ensure that site rehabilitation is progressing towards a self sustaining state so that it can ultimately achieve lease relinquishment. The process for lease relinquishment is described in Section 6.5 of the EA:

> *Upon cessation of mining operations, it would be expected that tenure of the mining and coal leases would be maintained by ICHPL until such time as lease relinquishment criteria were satisfied. These criteria would be formulated and prescribed in consultation with relevant authorities and stakeholders.*
>
> *It is anticipated that mine relinquishment criteria would include, but not necessarily be limited to the following:*
>
> - *removal of infrastructure, where appropriate and required;*
> - *landform stability and public safety;*
> - *maintenance of downstream water quality;*
> - *establishment of self-sustaining vegetation in previously cleared areas; and*
> - *fulfilment of mining and coal lease and other statutory approval conditions.*
>
> *Lease relinquishment criteria would be detailed in Mine Closure Plans.*

The rehabilitation and decommissioning of the West Cliff pit top would need be completed to the satisfaction of Industry and Investment NSW (I&I NSW) in accordance with the MREMP framework.

ROAD TRANSPORT

Wollondilly Shire Council (23 December 2009) states:

> ***The Traffic Assessment in Appendix K is lacking data from 2009 during which time there has been a significant increase in heavy vehicles using Appin and Picton Roads associated with the haulage of cars from Port Kembla harbour. This activity was estimated to increase heavy vehicle traffic on Picton and Appin Roads by approximately 11% on average and needs to be considered in a revision of Appendix K.***

As described in Section 2.10 of Appendix K of the EA, a number of peak hour turning count surveys were undertaken on Thursday 9th April 2009 in order to determine the performance of critical intersections that are likely to be impacted upon by the Project. The EA was lodged with DoP for adequacy assessment on 7 September 2009.

Notwithstanding the above, the Road Transport Assessment incorporates a background traffic growth factor (Section 3.2 of Appendix K of the EA). This growth factor is based on the Sydney-Wollongong Corridor Strategy, RTA data, the Port Kembla Coal Terminal (PKCT) Traffic Study and other local major traffic assessments.

REHABILITATION

Wollondilly Shire Council (23 December 2009) states:

> ***Insufficient information has been provided to discuss the potential impacts of the closure of the mine and cessation of releases from Brennans Creek Dam and water releases from Appin West and Appin East pit tops.***

As stated in Section 2.10.1 of the EA:

> *The surface facilities which support the underground mining operations at the Appin Mine and West Cliff Colliery are subject to three existing Environment Protection Licences (EPLs):*
>
> - *EPL 2504 (West Cliff pit top);*
> - *EPL 758 (Appin East pit top); and*
> - *EPL 398 (Appin West pit top).*

As stated in Section 5.7.2 of the EA:

> *…water releases from the three pit tops are licensed and regulated by the DECC via EPLs. ICHPL would continue to operate in accordance with these EPLs (including the outcomes of the current PRPs) as part of the Project (Sections 5.6.2 and 5.6.3 and Appendices C and D).*

The process for lease relinquishment, including downstream water quality, is described in Section 6.5 of the EA:

> *Upon cessation of mining operations, it would be expected that tenure of the mining and coal leases would be maintained by ICHPL until such time as lease relinquishment criteria were satisfied. These criteria would be formulated and prescribed in consultation with relevant authorities and stakeholders.*
>
> *It is anticipated that mine relinquishment criteria would include, but not necessarily be limited to the following:*
>
> - *removal of infrastructure, where appropriate and required;*
> - *landform stability and public safety;*
> - *maintenance of downstream water quality;*
> - *establishment of self-sustaining vegetation in previously cleared areas; and*
> - *fulfilment of mining and coal lease and other statutory approval conditions.*
>
> *Lease relinquishment criteria would be detailed in Mine Closure Plans.*

The rehabilitation and decommissioning of the West Cliff, Appin East and Appin West pit tops would be completed to the satisfaction of I&I NSW in accordance with the MREMP framework.

ICHPL must continue to comply with the requirements of EPLs 398, 758, and 2504 until such time as formal relinquishment is achieved (i.e. until such time that the relevant authorities are satisfied that without ongoing intervention the potential downstream impacts are considered acceptable).

Wollondilly Shire Council (23 December 2009) states:

> ***Coal wash emplacement areas are proposed to be rehabilitated. Insufficient detail has been provided on rehabilitation including the expected 'end-state' of vegetation, soils and water availability over the entire emplacement area and the means by which progress towards the end state shall be monitored and evaluated. Rehabilitation (current and proposed) should be subject to annual independent auditing and an 'end-state' identified with a management plan detailing how the end state is to be achieved with an estimated timeframe for completion (which is likely to be some time after cessation of mining).***

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

As stated in Section 6.2 of the EA:

> *The West Cliff Stage 4 Coal Wash Emplacement Management Plan would include the following measures applicable to rehabilitation of the Coal Wash Emplacement:*
>
> - *native seed would be harvested from areas of land proposed to be cleared for the Coal Wash Emplacement and used in the rehabilitation of completed emplacement areas;*
> - *vegetative material would be harvested from areas of land proposed to be cleared for the Coal Wash Emplacement and used as mulch or brush matting in the rehabilitation of completed emplacement areas;*
> - *soil would be stripped from areas of land proposed to be cleared for the Coal Wash Emplacement and used in the rehabilitation of completed emplacement areas;*
> - *the completed emplacement surface would be shaped to even grades and to mimic micro-topographic features (e.g. slopes and contours for drainage) prior to the spread of topsoil;*
> - *stripped soil would be applied over completed areas of the emplacement. Seed rich topsoil would be re-used as quickly as possible;*
> - *where practicable, soil stockpiling would be avoided, with stripped soil layers being immediately re-distributed to completed emplacement areas following stripping. However, it is noted that when the emplacement is progressing to its final stages, particular attention would be paid to stockpiling the necessary volumes of soil to achieve adequate soil cover of the final landform;*
> - *erosion and sediment control measures would be installed, where appropriate;*
> - *cultivated endemic plant species using flora species characteristic of the previously disturbed vegetation communities would be planted;*
> - *propagated P. hirsuta plants would be planted in the rehabilitation of the Stage 4 Coal Wash Emplacement on suitable topsoiled areas;*
> - *habitat features would be established for potential use by native fauna (e.g. addition of logs and other woody debris, reconstruction of rocky outcrops, etc.);*
> - *the management strategies outlined in the Broad-headed Snake Management Plan (Biosis Research, 2007e) would be implemented for the Stage 4 Coal Wash Emplacement; and*
> - *potentially suitable habitat for the Southern Brown Bandicoot would be established (e.g. a dense and contiguous understorey of vegetation) to provide potential cover for the bandicoots to forage and potential nesting materials for shelter.*
>
> *A monitoring programme would be developed and included in the West Cliff Stage 4 Coal Wash Emplacement Management Plan. Consistent to those measures included in the West Cliff Stage 3 Coal Wash Emplacement Management Plan (Cardno Forbes Rigby, 2007a), the monitoring programme would include monitoring of groundwater, temperature, emplacement settlement, compaction and combustibility, sub-surface drainage including flow rate and water quality, water quality in water management structures, erosion and sediment controls, vegetation, fauna habitats and dust generation.*

As described above, the requirement for annual independent audits of rehabilitation is not consistent with contemporary Project Approvals.

As described in Section 6.1.1 of the EA, the Mine Closure Plan for the West Cliff pit top would be reviewed and revised throughout the Project and be finalised prior to mine closure. ICHPL would also continue to operate within the MREMP framework.

Wollondilly Shire Council (23 December 2009) states:

> ***The future costs of rehabilitation are not included in the Benefit Cost Analysis.***

The cost of remediation activities has been determined based on the commitments made in the EA. The cost of remediation activities has been included in the operational cost of the Project (see Section 2.5.1 of Appendix L of the EA).

A $25M allocation for decommissioning and rehabilitation costs at the end of the Project's life has been included in the operational costs (Section 2.5.1 of Appendix L of the EA).

ECONOMIC IMPACTS

Wollondilly Shire Council (23 December 2009) states:

> ***Council request additional information to determine how much 'overlap' is reported in the amounts listed for input-output analysis contributed to the local economy and the State economy.***

As described in Section 3.3 of Appendix L of the EA:

> *The State economic impacts of the Project operation were assessed in the same manner as for estimation of the regional impacts…The primary difference from the sector identified for the regional economy was that all direct employment and contractors employed were assumed to reside in NSW and a greater level of expenditure was captured by the NSW economy compared to the regional economy.*
>
> *…*
>
> *The impacts on the NSW economy are substantially greater than for the regional economy, as the NSW economy is able to capture more mine and household expenditure, and there is a greater level of intersectoral linkages in the larger NSW economy.*

All of the estimated contributions of the Project to the regional economy are therefore also captured in the contributions of the Project to the NSW economy.

Wollondilly Shire Council (23 December 2009) states:

> ***Council is critical of the comments made in the final paragraph of Page ES-3 to Appendix L. This paragraph places the responsibility on "regional authorities and leaders" to use the money generated from the project to control the economy to ensure alternative employment and business prospects are positive at the time of project completion. Regional authorities and leaders do not and can not control the economy and job prospects to ensure future employment prospects. Council requests that BHPIC commit to form a trust or otherwise to dedicate approximately $30,000 per employee to be made available to every employee at the time at which jobs are no longer available. This money is to be provided as compensation and assistance for finding alternative employment. This equates to $35 Mil and should be included in the Benefit Cost Analysis (BCA).***

As described in the Executive Summary of the EA, over the life of the Project, it is estimated that in total the Appin Mine and West Cliff Colliery would contribute over $3 billion in royalties and some $274M in employee and contractor payroll tax to the State of NSW.

It is considered reasonable to expect that the Government would use a portion of this money, as it does all of its income, to implement policies and programmes to stimulate the economy and encourage regional employment.

Employees will be paid redundancy benefits as stipulated by their work contracts and/or arrangements. The above suggestion by Wollondilly Shire Council is not consistent with contemporary Project Approvals.

Assistance to people seeking employment is currently provided by the Commonwealth Government.

Wollondilly Shire Council (23 December 2009) states:

> ***Council considers the costs of Community Partnership Projects and / or Section 94 Contributions should be included in the BCA.***

The cost of Community Partnerships Program and Section 94 contributions represent a component of operational costs.

Operational costs have been included in the Benefit Cost Analysis (Section 2.4.1 of Appendix L of the EA).

Wollondilly Shire Council (23 December 2009) states:

> ***It is not clear whether the Waste Levy has been included in the BCA (at current rates it is estimated to be approximately $400mil). Although this will vary depending on whether PKCT capacity is limited and more ROM coal is sent to be washed at Dendrobium to avoid the capacity limit relating to products received from public roads.***

As stated in Section 7.2.2 of the EA:

> *The NSW State Government introduced a coal washery rejects levy in late 2008. The levy will come into force in November 2009 and relates to disposal of coal washery reject (coal wash) material at scheduled waste facilities. The levy is currently set at $15 per tonne.*
>
> *The disposal of Appin Mine and West Cliff Colliery coal wash at the West Cliff Coal Wash Emplacement (i.e. adjacent to the West Cliff Washery) would not trigger a requirement to pay the coal washery rejects levy.*

The coal washery rejects levy would not apply to the ROM coal received at the West Cliff Washery from the Appin Mine and West Cliff Washery as the coal washery rejects would be generated and disposed of at the same site, consistent with the Coal Washery Rejects Levy Operational Guidance Note (Department of Environment, Climate Change and Water [DECCW], 2009), which states:

> *The CWR levy only applies to coal washery rejects <u>received</u> at a site. Therefore, facilities that only generate and dispose of coal washery rejects on site are not subject to the CWR levy.*

RELATIONSHIP TO THE OPERATION OF THE PORT KEMBLA COAL TERMINAL

Wollondilly Shire Council (23 December 2009) states:

> ***The current approval for the Port Kembla Coal Terminal (PKCT) includes a condition which limits the operations to receive no more than 7.5 Mt of coal and other bulk products per annum by public road. If this project is approved there is potential for product coal from this project to monopolise the full capacity of the PKCT.***
>
> ***The EA does not state the percentage of coal which is expected to be transported to the Dendrobium Washery and then to the PKCT…***

As described in Section 5.15.2 of the EA:

> *In June 2009, the PKCT Project was approved under Part 3A of the EP&A Act by the Minister for Planning. Condition 6 of Schedule 2 of the PKCT Project Approval states:*
>
> > *6. The Proponent shall not receive more than 7.5 million tonnes of coal and bulk products at the site by public road in any calendar year without the written approval of the Director-General. In seeking this approval, the Proponent shall submit a report to the Director-General that:*
> > *reviews the transport related impacts associated with the trucks being used to deliver coal and bulk products to the terminal;*
> >
> > *(a) demonstrates that these impacts are generally consistent with the predicted and/or approved impacts; and*
> >
> > *(b) examines whether there any other reasonable and feasible measures that could be implemented to minimise these impacts.*
> >
> > *Once this approval has been obtained, the Proponent shall not receive more than 10 million tonnes of coal and bulk products at the site by public road in any calendar year.*
>
> *If approved, the Project would take cumulative public road deliveries to PKCT over the 7.5 Mtpa limit detailed in the PKCT Project Approval Schedule 2, Condition 6. PKCT public road delivery capacity would need to be approved at 10 Mtpa in accordance with Condition 6 for the Project to reach full production capacity.*

As stated in Section 5.15.2 of the EA:

> *Delivery of coal to PKCT and BlueScope Steelworks would be up to approximately 7.5 Mtpa and 4 Mtpa, respectively. Coal deliveries to Corrimal and Coalcliff Coke Works would be up to 0.2 Mtpa (combined), and delivery of coal to Dendrobium Washery would be up to 0.5 Mtpa. Peak Project coal delivery would not be more than 9.4 Mtpa.* [emphasis added]

As described in Section 2.7 of the EA:

> *Minor quantities of product coal from the Dendrobium Washery would continue to be transported by internal road to the PKCT.* [emphasis added]

REFERENCES

Department of Environment, Climate Change and Water (2009) *Coal Washery Rejects Levy Operational Guidance Note.*

Department of Planning (2008) *Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield: Strategic Review*. State of NSW through the NSW Department of Planning.

Industry and Investment NSW (2009) Bulli Seam Operations Project Environmental Assessment 08_0150. Letters dated 15 and 23 December 2009.

Planning Assessment Commission (2009) *Metropolitan Coal Project Review Report*.

Bulli Seam Operations
Response to Additional Issues Raised in the Wollondilly Shire Council Submission to the Planning Assessment Commission
12 February 2010

Wollondilly Shire Council (12 February 2010) states:

> ***…Council's 'consultations' were limited to Power Point presentations with no technical detail and no involvement of technically specialised staff (Executive and Councillors only).***

ICHPL met with Wollondilly Shire Council on four occasions (5 December 2007, 31 March 2008, 24 November 2008 and 1 October 2009) during preparation of the EA. In addition, a Wollondilly Shire Council representative attended ICHPL's Interagency Consultation Day workshop (5 March 2008) which included a presentation in relation to the Project.

ICHPL presented to Wollondilly Shire Council and the Wollondilly Healthy Catchments Committee on 31 March 2008 on the Project and development of the EA. At this meeting ICHPL offered to contribute on an ongoing basis to Wollondilly Shire Council's Healthy Catchment Committee. Wollondilly Shire Council advised on 4 April 2008 that the committee had resolved that ICHPL could not participate on an ongoing basis but the Committee would rather ICHPL be an occasional invitee to the committee as required. ICHPL's offer to contribute has not yet been taken up.

ICHPL consulted with Wollondilly Shire Council in March/April 2009 in relation to traffic data for the Douglas Park/Wilton area. While initially the response was positive, Wollondilly Shire Council advised that the data would not be provided for inclusion in the EA.

ICHPL consulted with Wollondilly Shire Council on 23 October 2009 in relation to the full copy of the EA provided to Wollondilly Shire Council and to request suitable date/s and topics for a briefing session to council staff. ICHPL offered to provide any additional assistance required. No response or request was received from Wollondilly Shire Council in this regard.

Letters were sent to all councillors and the General Manager of Wollondilly Shire Council in October 2009 prior to public exhibition of the EA providing briefing material and notification of Community Information sessions.

ICHPL regularly attends Development Application and Rezoning Liaison Committee meetings where local Councils are represented, including Wollondilly Shire Council. At these meeting updates on mining operations (including information about the Project) are given and questions and feedback sought. A specific presentation on the Project was given on 19 December 2009.

In addition to the above, the Wollondilly Shire Council has had the following opportunities to review and make comment on the EA:

- Wollondilly Shire Council was provided with a full copy of the EA in the week commencing 7 September 2009 as part of the adequacy review. Other councils and agencies made comment over a period of several weeks. No comments from Wollondilly Shire Council regarding adequacy were provided to DoP.
- Wollondilly Shire Council was provided with a copy of the final EA (including minimal changes from DoP's adequacy review) on 19 October 2009 and given a further 6 weeks to make comment.
- Wollondilly Shire Council has had the opportunity to make submissions to the PAC up until 17 February 2010.

It is at the discretion of Wollondilly Shire Council which representatives attend meetings with ICHPL.

Wollondilly Shire Council (12 February 2010) states:

> ***…Council recommends a conditional consent be limited to a maximum of 10 years. Council recommends this consent to include conditions for annual auditing of:***
> ***- data collection; and***
> ***- research and analysis of consequences and outcomes as detailed in Part 2.***

ICHPL's preferred approach is consistent with the second option presented by Industry & Investment (I&I NSW) (23 December 2009):

> *If the determination is not based on a staged process, there is a need for strong mechanisms to ensure adequate consultation, feasibility studies and lead time for the development of major management strategies, that is, the Extraction Plans Stage.*

This approach is consistent with:

- the NSW planning process (see Figure 44 of the Southern Coalfield Panel Report [DoP, 2008]); and
- contemporary Project Approvals under Part 3A of the *Environmental Planning and Assessment Act, 1979* (e.g. Metropolitan Coal Project [08_0149]) which include the staged submission of detailed strategies, plans and programs (e.g. Subsidence Management Plans and/or Extraction Plans).

The above process includes strong consultation mechanisms, feasibility studies and long lead times (i.e. typically the lodgement of a Subsidence Management Plan six months prior to its desired approval).

It is envisaged that any Project Approval that is determined by the Minister for Planning for the Project would include a condition of similar nature to that included in the recent Metropolitan Coal Project Part 3A Project Approval (Application Number 08_0149, 22 June 2009), *viz.*:

> *8. By end of December 2011, and every 3 years thereafter, unless the Director-General directs otherwise, the Proponent shall commission and pay the full cost of an Independent Environmental Audit of the project. This audit must:*
>
> *(a) be conducted by suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Director-General;*
> *(b) include consultation with the relevant agencies;*
> *(c) assess the environmental performance of the project and assess whether it is complying with the relevant requirements in this approval and any relevant EPL or Mining Lease (including any assessment, plan or program required under these approvals);*
> *(d) review the adequacy of strategies, plans or programs required under these approvals; and, if appropriate; and*
> *(e) recommend measures or actions to improve the environmental performance of the project, and/or any assessment, plan or program required under these approvals.*
>
> *Note: This audit team must be led by a suitably qualified auditor and include experts in any fields specified by the Director-General.*

Wollondilly Shire Council (12 February 2010) states:

As explained in Point 39 to Part 2 of this submission, the EA makes a case that;
- refusal of the application; or
- a consent which reduces the Project yield
would result in a politically unfavorable situation.

The situation would be unfavorable because:
- an environmental levy / tax will be imposed and / or;
- State government revenue will be reduced through lower Royalty income.

If the EA is accepted in its current form and such a case potentially existed then the State Government and the Minister for Planning could be perceived as having a pecuniary interest in assessing and determining the application with a bias to support the Project in its current form. The perception of pecuniary interest arises in that any decision other than consent to the EA in its current form would result in a politically undesirable scenario.

The issue of pecuniary interest is a Government matter. However it should be noted that, the State government receives revenue from every mining project and business entity in NSW. Revenue to the State from the Project is a relevant inclusion in the economic assessment.

This Project is subject to review from the PAC thus receiving more independent scrutiny than the majority of other major projects in the State.

Wollondilly Shire Council (12 February 2010) states:

…Council considers it inappropriate that the public exhibition period allowed only six (6) weeks for public scrutiny and comment…

…Council considers the time available for public exhibition to have been inadequate.

The public exhibition period is a matter for DoP and the Minister for Planning.

However, it should be noted that the finalised EA went on public exhibition on 19 October 2009 and the EA was still publically available from the DoP website and DoP were still accepting public submissions in March 2010.

The PAC hearings on 16 and 17 February 2010 allowed for further public scrutiny and comment and the PAC Panel advised they would still accept further individual information and submissions until 26 February 2010.

Under Part 3A of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) the Director-General only has to make the EA publically available for a minimum of 30 days.

Wollondilly Shire Council (12 February 2010) states:

Council acknowledges that the members of the PAC have experience in mining-related and environmental fields. However, there is information within the EA which is outside the fields of expertise covered by the Panel members. The matters of particular concern to Council are:

- surface and ground water assessment
- biobanking / offsets.
- road transport assessment;
- socio-economic impacts;
- human research (Choice Modelling); and
- visual character assessment.

The appointment of Panel members is a matter for the Minister for Planning.

However, the PAC Panel for the Project includes:

- Dr Col Mackie – included on the PAC as a recognised groundwater expert.
- Dr John Tilleard – included on the PAC as a recognised surface water expert.
- Professor Jeffrey Bennett – included on the PAC as a nationally recognised socio-economic and Choice Modelling expert.

Wollondilly Shire Council (12 February 2010) states:

> ***The EA does not mention what will happen to the surface water flows for streams currently receiving dam water after the cessation of mining. The EA does not examine the potential impacts and consequences that this loss of water may have on the riparian environment. The costs of such impacts and consequences are also not included in the Benefit Cost Analysis (BCA) and this makes the socio-economic impact assessment unreliable in its current form.***

As described in the EA, it is proposed to continue to operate Brennans Creek Dam in accordance with EPL 2504. As described in Section 5.6.3 of the EA:

> *ICHPL is conducting ecologically based studies and trials to determine an appropriate water quality release limit for salinity from Brennans Creek Dam under dry weather flow conditions, with the intention to include this limit in EPL 2504 for the West Cliff pit top. ICHPL is scheduled to complete these assessments and trials by the end of 2009 in accordance with the current PRP under EPL 2504.*
>
> *Methods needed to achieve compliance with applicable limits (e.g. water treatment) would be the subject of a separate PRP. A plan to implement the preferred option would then follow for completion prior to July 2013 in accordance with the PRP under EPL 2504.*

On 10 December 2009, ICHPL proposed to DECCW to submit the PRP 10 Stage 1 Report by 31 March 2010. The PRP 10 Stage 1 Report was submitted to DECCW on the 30 March 2010.

The process for lease relinquishment is described in Section 6.5 of the EA:

> *Upon cessation of mining operations, it would be expected that tenure of the mining and coal leases would be maintained by ICHPL until such time as lease relinquishment criteria were satisfied. These criteria would be formulated and prescribed in consultation with relevant authorities and stakeholders.*
>
> *It is anticipated that mine relinquishment criteria would include, but not necessarily be limited to the following:*
>
> - *removal of infrastructure, where appropriate and required;*
> - *landform stability and public safety;*
> - *maintenance of downstream water quality;*
> - *establishment of self-sustaining vegetation in previously cleared areas; and*
> - *fulfilment of mining and coal lease and other statutory approval conditions.*
>
> *Lease relinquishment criteria would be detailed in Mine Closure Plans.*

The rehabilitation and decommissioning of the West Cliff pit top would be completed to the satisfaction of I&I NSW in accordance with the MREMP framework.

ICHPL must continue to comply with the requirements of EPL 2504 and PRP 10 (including the operation of Brennans Creek Dam) until such time as formal relinquishment is achieved (i.e. until such time that the relevant authorities are satisfied that without ongoing intervention the potential downstream impacts are considered acceptable).

Wollondilly Shire Council (12 February 2010) states:

> ***Council's concern on this matter extends further to the costs quoted in the Benefit Cost Analysis (BCA) allocated for 'Operations Externalities' and 'Underground Mining Externalities'. Insufficient detail has been provided on how these costs have been determined. Peer review letters do not make comments on the reliability of these estimates…***

Section 2.4.2 of Appendix L of the EA clearly explains how the cost for each surface operations externality and Project underground mining externality is determined.

The Benefit Cost Analysis (as a component of the Socio-Economic Assessment) was peer reviewed by Dr John Rolfe whose letter states (Attachment 3 of the EA):

> *The benefit cost analysis is thorough and appropriate. As normal with these types of applications, the focus is on the most significant impacts, with additional sensitivity testing to check whether there are particular treatments of the data that would lead changed findings. The report is extremely thorough in terms of (a) the attention to identifying and analysing the different impacts that might be involved, (b) the use of the choice modelling technique to assess values for key environmental and social impacts and (c) the use of sensitivity analysis to demonstrate that results are robust to a variety of different treatments and underlying assumptions.*

A sensitivity analysis was conducted to determine the potential changes to the results of the Benefit Cost Analysis with varying externality costs. Upper and lower 95% confidence limit values were also presented in the EA (Attachment C of Appendix L of the EA). Section 2.6 of Appendix L of the EA concluded:

> *This analysis indicated (Attachment C) that the results of the BCA are not sensitive to reasonable changes in assumptions regarding any of these variables. In particular, significant increases in the values used for external impact such as greenhouse gas costs or environmental impacts had little impact on the overall economic desirability of the Project.*
>
> *..*
>
> *Varying the implicit prices derived from the CM study to upper and lower 95% confidence limit values in the BCA only has a moderate impact, and the net benefits of the Project would remain strongly positive (Attachment C).*

Wollondilly Shire Council (12 February 2010) states:

> ***Council also requests that any application made in accordance with Section 90 to the National Parks and Wildlife Act, 1974 be assessed in consultation with Council's Aboriginal Liaison Committee. The Committee has been specifically formed to bring together representatives of the Aboriginal community in a manner which allows equity of participation. Council considers such equity has been lacking in previous assessments of applications under Section 90.***

As stated in Section 7.1.2 of the EA, authorisations under section 87 and section 90 of the *National Parks and Wildlife Act, 1974* are not required for a project approved under Part 3A of the EP&A Act.

Wollondilly Shire Council (12 February 2010) states:

> ***Insufficient road accident data has been provided. The Road Transport Assessment provides accident statistics to December 2007. The Assessment should be revised with records from 2008 and 2009 included.***

The Road Transport Assessment (Appendix K of the EA) used the available traffic data from the RTA at the time of completion of the report, which included five years of road accident statistics (January 2003 to December 2007).

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

Wollondilly Shire Council (12 February 2010) states:

> ***This data indicates large increases in the volumes of material transported which is directly proportional to the number of heavy vehicles as all materials movements require heavy vehicle transport. Even a scenario of the proposed average 10.5Mt per annum for the life of the project would double the 2007 peak records. This fact is not mentioned in the Road Transport Assessment and is not examined in terms of the potential impacts on existing cumulative traffic movements.***

The Road Transport Assessment included consideration and assessment of the additional heavy vehicles generated by the increase in coal haulage (Section 4.1.1 of Appendix K of the EA). These increases in heavy vehicles movements were assessed in terms of the potential cumulative impacts with existing traffic movements and background growth.

Wollondilly Shire Council (12 February 2010) states:

> ***Table 7 includes the existing average weekday vehicle movements associated with Illawarra Coal Holdings Operations as total numbers of vehicle trips and as a percentage of the total traffic on the surveyed routes. Table 10 and Table 13 includes the same information with slightly different figures. The Road Transport Assessment does not appear to provide an explanation for the difference.***

Table 7 of Appendix K of the EA presents estimated recent movements based on traffic survey data (as presented in Table 3 of Appendix K of the EA).

The 'existing' scenario for the Road Transport Assessment was assumed to be 2009. Existing movements presented in Tables 10 and 13 of Appendix K of the EA have been adjusted from the raw traffic survey data to account for background traffic growth.

Wollondilly Shire Council (12 February 2010) states:

> ***The specific impact of heavy vehicles on DOS and LOS is not discussed. The increase in traffic is mostly heavy vehicles. There is no discussion nor interpretation specific to the impact of heavy (loaded) vehicles on the DOS and LOS of intersections and roads. However, the impact of heavy vehicles is very important in driver behaviour and perception of DOS and LOS.***

The calculation of Degree of Saturation (DOS) and Level of Service (LOS) using the SIDRA computer program and the assessment of potential traffic impacts includes consideration of vehicle class (i.e. recognises the larger size and likely waiting time of heavy vehicles at intersections).

Wollondilly Shire Council (12 February 2010) states:

> ***In particular, Section 2.9.4 states "no additional truck trips would be required as a result of coal wash haulage from Dendrobium Washery". This may be true in that there are no additional number or trips but the volume of coal wash is likely to increase and the percentage of trips that are back loading will increase by 20%. The impact on DOS and LOS should be discussed especially where those backloading trips require trucks to ascend steep grades and negotiate intersections.***

Section 2.9.4 of Appendix K of the EA is part of a description of existing road conditions and states:

> *During the life of the Project, Dendrobium Washery would produce in the order of up to 27.2 Mt of coal wash (Cardno Forbes Rigby, 2008) which would require emplacement at the West Cliff Coal Wash Emplacement. Trucks delivering coal to PKCT/BlueScope Steelworks would continue to backhaul coal wash to the West Cliff Coal Wash Emplacement and as such, no additional truck trips would be required as a result of coal wash haulage from Dendrobium Washery.*

As the haulage of coal wash from the Dendrobium Washery is part of existing road conditions, assessment of its potential impact on road conditions is not considered necessary.

Wollondilly Shire Council (12 February 2010) states:

> ***Section 2.10 states that peak hour turning count surveys were conducted on Thursday 9 April 2009. This day was the last day of Term 1 of NSW public school holidays* [sic] *and the day prior to Good Friday and the Easter Holidays. Traffic was not likely to be representative of typical weekday traffic movements (particularly the afternoon peak) with traffic likely to include a significant number of holiday-related trips and the relative percentage of heavy vehicles is likely to have been less than a typical weekday.***

The peak hour turning count surveys were not undertaken on a public holiday or during NSW school holidays, therefore traffic data was considered to be representative of typical weekday traffic movements.

The EA was deemed adequate by the Director-General of the DoP on 13 October 2009.

Wollondilly Shire Council (12 February 2010) states:

> ***Intersection D in Figure 5 is outdated. This intersection has been redesigned to accommodate a new tourist information and refreshment room facility at Bulli Tops. The increased number of loaded and unloaded heavy vehicles at this new intersection needs to be re-counted / surveyed and re-examined in a newer version of the Road Transport Assessment.***

As described in Table 8 of Appendix K of the EA, intersection D is the intersection between Appin Road and the Princes Highway off-ramp. The design of the intersection used in the SIDRA analysis and shown on Figure 5 is consistent with the existing design.

The intersection at Bulli Tops is located south of intersection D in the Road Transport Assessment (Appendix K of the EA).

Wollondilly Shire Council (12 February 2010) states:

> ***Insufficient attention to detail has been given to factors such as the load limit at Broughton Pass (15 tonne) and the fact that coal and coal wash related movements only occur for Appin East and Westcliff* [sic] *sites.***

As stated in Section 2.4 of Appendix K of the EA:

> *Broughtons Pass Weir is located on Wilton Road. Heavy vehicle access at Broughtons Pass Weir crossing is restricted, therefore heavy vehicle traffic only accesses the Appin West pit top from Picton Road to the west.*

Further to the above, Section 4.1.3 of Appendix K of the EA states:

> *Due to access for heavy vehicles travelling to Appin West pit top being restricted by Broughtons Pass Weir, it is assumed that all heavy vehicles travelling to Appin West pit top from Wollongong gain access via Picton Road west of Mount Keira Road, approaching Appin West pit top from south-east of Wilton. Heavy vehicles from the north (e.g. Campbelltown) would use the F5 South Western Freeway and Picton Road. Due to travel distances, light vehicles from Wollongong (south of Fairy Meadow) are also assumed to gain access to the Appin West pit top via Picton Road, west of Mount Keira Road.*

As stated in Section 1.3 of the Road Transport Assessment (Appendix K of the EA):

> *The main activities associated with the development of the Project would include:*
>
> *…*
>
> - *continued road transport of ROM coal from the Appin East pit top to the West Cliff Washery;*
> - *continued road transport of ROM coal from Appin East pit top and West Cliff pit top via the public road network to the Dendrobium Washery at Port Kembla;*
> - *continued road transport of product coal from the West Cliff Washery via the public road network to BlueScope Steelworks, PKCT, Corrimal and Coalcliff Coke Works and other customers;*
>
> *…*

The Road Transport Assessment (Appendix K of the EA) considered the transport of ROM coal and product coal from the Appin East and West Cliff pit tops.

Wollondilly Shire Council (12 February 2010) states:

> ***Page 42 of the Road Transport Assessment states that consideration should be given to undertaking another project-specific traffic assessment after 10 years when vehicle movement patterns are expected to be increasingly focussed on the West Cliff site. Therefore, any development consent should include conditions which require separate assessment and determination of such a Traffic Assessment prior to continuing the project. The condition should allow at least 12 months for assessment and determination of the predicted changes to traffic conditions and hence a separate Traffic Assessment should be submitted to the relevant consent authority at least 12 month prior to the proposed change in traffic movement patterns.***

Section 3.2 of Appendix K of the EA states:

> *Given the high likelihood of changes to the road network beyond the next 10 years, it is not considered appropriate to forecast traffic conditions more than 10 years in advance. As the existing traffic contributions would remain static and background traffic would continue to rise, the relative contribution of the Appin Mine and West Cliff Colliery traffic would continue to fall over time. The operation of the road network is more appropriately assessed based on the performance of key intersections in the locality, as discussed in section 3.3.*

…

It should be noted that depending on the mine development sequence over the life of the Project (as described in Section 2 in the Main Report of the EA), there may be a period toward the end of the Project life (i.e. post 2030) when the Project underground workforce and deliveries are centred around the West Cliff pit top. As this scenario is not expected to occur within the next 10 years, a specific assessment has not been undertaken at this time given the variability in predicted future traffic growth. Consideration should be given to conducting a specific traffic assessment, should this scenario occur later in the Project life…

Wollondilly Shire Council (12 February 2010) states:

…No conditions of consent can bind the Project to yield $3 billion in Royalties to the State Government…

ICHPL is required to pay royalties on the value of production of coal extracted under the *Mining Act, 1992.*

Wollondilly Shire Council (12 February 2010) states:

Page 21 of Appendix L states "the major environmental externality (greenhouse gas emissions) that has been included in Table 2.3 above would be internalised through the purchase of required carbon pollution permits once the Commonwealth Government's proposed Carbon Pollution Reduction Scheme is implemented." This statement clearly commits BHPIC to bear the cost of greenhouse gas emissions. The Choice Modelling survey is deliberately misleading as it includes a carbon price. The alternative mine plans with 'Potential Environmental Benefits' are deliberately misleading as they include "a carbon price" (Page 28 to Appendix L). Appendix L does not include an explanation as to how the carbon price is included in the alternative mine plans. It is misleading to 'internalise' a cost in the BCA and then 'externalise' a cost in the alternative plans and Choice Modelling.

Section 2.4.2 of Appendix L of the EA

For this analysis a shadow price of carbon of AUS$30/t CO2-e was used, with sensitivity testing from AUS$8/t CO_2-e to AUS$40/t CO_2-e. Attachment B provides a summary of these issues and explains how these values were derived.

As stated in Section 2.5 of Appendix L of the EA:

ICHPL is undertaking measures to minimise external environmental costs, including:

- *progressively reducing noise emissions at the Appin Mine surface facilities as a component of the Project upgrades;*
- *implementing stream restoration works over the Project life; and*
- *implementing swamp restoration works over the Project life.*

Furthermore, the major environmental externality (greenhouse gas emissions) that has been included in Table 2.3 above would be internalised through the purchase of required carbon pollution permits once the Commonwealth Government's proposed Carbon Pollution Reduction Scheme is implemented.

The Benefit Cost Analysis is unable to include the potential cost of greenhouse gas emissions as an internal cost based on proposed legislation which is not in force. However, as stated above the Socio-Economic Assessment (Appendix L of the EA) recognises this proposed legislation.

Furthermore, internalising the cost of greenhouse gas emissions would not affect the overall economic efficiency of the Project.

Wollondilly Shire Council (12 February 2010) states:

> ***Example 5: Notably absent from the Socio-economic assessment is a discussion of the probability of coal prices varying in the longer term and what this would mean for the BCA and Input-Output analysis and overall decisions of the applicant to continue with the Project. This is an important factor in the socio-economic assessment which is relevant to the entire Project.***

Section 2.4.1 of Appendix L of the EA includes a discussion of potential coal prices:

> *Demand for thermal coal in 2009 will be driven by industrialisation and urbanisation in China and India which will account for half of the new coal plants.*
>
> *Commonwealth Securities expects: "thermal demand to hold up better than coking coal demand. The majority of Australia's thermal coal exports are some of the highest quality available in the seaborne market, with high energy content, low sulphur, moisture and impurities. These qualities will shield demand somewhat as certain power stations require high quality inputs for effective operation."*
>
> *Thermal or steam coal is expected to fall from the 2008 level of US$125/t FOB to between US$75 and $105 in 2009 and by 2015 to be between US$70 and $80/t, approximately 50 percent above the 2007 level (Barnett, 2009).*
>
> *Having regard to the above forecasts, an average of Australian Dollar (AUD) $180 for coking coal and AUD$97 for thermal coal was used in this analysis.*
>
> *There is obviously considerable uncertainty around future coal prices and hence coal prices have been subjected to sensitivity analysis (Section 2.6).*

Section 2.6 of Appendix L of the EA describes the results of the sensitivity analysis and concludes that within the 95% confidence limit the net benefits of the Project would be positive:

> *The results were most sensitive to decreases in the sale value of coal, although substantial (45%) and sustained reductions in assumed coal prices would be required to make the Project undesirable from an economic efficiency perspective.*
>
> *…*
>
> *Varying the implicit prices derived from the CM study to upper and lower 95% confidence limit values in the BCA only has a moderate impact, and the net benefits of the Project would remain strongly positive (Attachment C).*

Wollondilly Shire Council (12 February 2010) states:

> ***Council strongly objects to the 'threat' of an environmental levy mentioned in the introduction to the Choice Modelling Survey. Without doubt this introduction has biased responses in favour of the Project. Information was provided in the survey which amounted to a threat that respondents (and all households in NSW) should expect to pay an environmental levy if the State Government received less royalties than those predicted from the Project.***

The EA does not threaten to introduce an environmental levy if the Project is not approved.

The Choice Modeling and Benefit Cost Analysis explained that if the Project was rejected, to replace the forfeited revenue, the government would need to apply a levy or increase in tax. Alternatively, the people of NSW would need to accept a lower level of public services. This is basic economics and an essential factor in a trade-off analysis (i.e. 'Choice' Modelling by definition is a choice between options).

Wollondilly Shire Council (12 February 2010) states:

> ***The do-nothing / failure to get approval scenario is incorrectly reported in the EA and in the Choice Modelling Survey. Mining will not cease in 2010. Current approvals for Longwalls 701 and 705 in Appin Area 7 (Douglas) remains valid for extraction to at least 2015. And there are proposals for a further 14 more longwalls in this area after LW705 subject to SMP's. Therefore mining will not cease in 2010 and the "base case" scenario reported in Section 2.2 of the Socio-Economic Impact Assessment is misleading and biases the survey in favour of the Project.***

The Appin Mine and West Cliff Colliery are required to gain approval under Part 3A of the EP&A Act by December 2010 to facilitate ongoing operations. Although the SMP approvals are valid until 2015, this does not preclude the requirement to gain approval under Part 3A by December 2010.

Wollondilly Shire Council (12 February 2010) states:

> ***The 'Project case" has also been incorrectly reported in the Introduction to the Choice Modelling Survey by stating that the Project includes:***
>
> ***(i) "upgrade of the existing West Cliff Washery to support the increased ROM coal production". The upgrade of the West cliff Washery shall be subject to a separate development consent and is not included in the EA for this Part 3A application; and***
> ***(ii) "continued generation of electricity by the existing Appin-Tower Power Project …." The continued operation of this project is not completely dependent upon the current Part 3A project. The plant can function from mains gas supply and / or from gas extracted from the Bulli seam without the need to remove the coal.***
>
> ***This misinformation further erodes the credibility of the survey and its outcomes.***

The above "quotes" stated by Wollondilly Shire Council are not contained within the Choice Modelling survey.

The upgrade of the existing West Cliff Washery to support the increased ROM coal production is included as part of the Project and is described in Section 2 of the EA.

The Project would also involve continued generation of electricity by the existing Appin-Tower Power Project (owned and operated by EDL) utilising coal bed methane drained from the underground mine workings (Section 2 of the EA). The use of alternative gas sources by the Appin-Tower Power Project is not anticipated and would involve redesign and the development of additional infrastructure.

Wollondilly Shire Council (12 February 2010) states:

> ***Council recommends Bonds or Bank Guarantees be held by relevant government authorities to cover the cost of potential management, repair, rehabilitation and compensation for the consequences to the environment should the proponent (for whatever reason) be unable to undertake such works after consent is issued. Bonds / Bank Guarantees may be partially released over time but incurred as an initial upfront cost.***

Under the *Mining Act, 1992* a proponent must lodge a security bond to cover the likely costs of rehabilitation and compliance with other lease conditions prior to the grant of a mining lease.

Security bonds would be payable on the Mining Lease Application areas shown on Figure 1-2 of the EA.

Wollondilly Shire Council (12 February 2010) states:

> ***The BCA lists rehabilitation costs as a 'Benefit' because it is considered to be a saving while mining continues and rehabilitation is delayed until the end of the Project. However, rehabilitation is also a cost for two reasons:***
> ***- firstly BHPIC is required to pay a Bond up front to the Department of Industry and Investment to cover the cost of rehabilitation;***
> ***- secondly, BHPIC is required to spend money on rehabilitation at the cessation of the Project and, although this work occurs at the end of the Project, it is still a cost incurred as a result of the full life cycle of the Project.***

The payment of security bonds is described above. No additional bonds are anticipated for the West Cliff Coal Wash Emplacement.

The cost of rehabilitation at the cessation of the Project is recognised in the Benefit Cost Analysis, in addition to the savings associated with delayed final rehabilitation and decommissioning:

> ***Economic Costs***
>
> *…*
>
> *With the Project, the Appin Mine and West Cliff Colliery surface facilities would be decommissioned and rehabilitated at cessation of Project mining at a cost in the order of $25M.*
>
> ***Economic Benefits***
>
> *…*
>
> *Under the base case the Appin and West Cliff surface facilities would be decommissioned and rehabilitated in 2010 at a cost in the order of $25M. With the Project, this decommissioning cost would not occur until approximately 2041. The cost of decommissioning in 2010 under the "without" scenario is therefore avoided and hence is a benefit of the Project.*

REFERENCES

Department of Planning (2008) *Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield: Strategic Review*. State of NSW through the NSW Department of Planning.

Bulli Seam Operations
Response to Hurstville City Council Submission
2 December 2009

Each of the comments made by the Hurstville City Council (2 December 2009) (reproduced below in bold) are addressed below.

Hurstville City Council (2 December 2009) states:

> ***More specifically, Council is questioning the:***
>
> ***1. possible irreparable damage to the considerable number of upland swamps of the headwaters;***
>
> ***…***

An Upland Swamp Risk Assessment (Appendix O of the EA) was conducted for the Project consistent with the steps described in Section 9.4.1 of NSW Planning Assessment Commission's (PAC's) *Metropolitan Coal Project Review Report* (PAC, 2009) (the Metropolitan PAC Report).

As described in Section 5.2.2 of the EA:

> *In summary, a total of 55 swamps are considered to have a real risk of negative environmental consequences as a result of Swamp Impact Mechanisms 1, 2 and 3…*
>
> *Of the 55 swamps, eight swamps (namely, swamps CRE-S3b, CT1-S2, CT2-S7, DAC-S3, OHC-S5a, STC-S24, STC-S36 and WOR-S5a) are predicted to experience valley closure movements of greater than 200 mm and are assessed as having a high susceptibility to subsidence effects in terms of their erosion and scour potential. These swamps are considered to have potential to result in significant negative environmental consequences (Figures 5-5 to 5-7).*
>
> *…*
>
> *ICHPL's currently preferred risk management options for swamps based on consideration of the risk assessment of environmental consequences, the potential management options and proposed monitoring programme are:*
>
> - *Implementation of maintenance responses (knick point control, water spreading, sealing of bedrock fractures and/or injection grouting) to maintain the physical state and function of a swamp that experiences subsidence impacts.*
> - *Implementation of the monitoring programme described in Appendix O to obtain additional baseline information to further inform the assessment of risk of subsidence impacts and environmental consequences.*
> - *Implementation of offset measures (Section 8).*
>
> *…*
>
> *Consistent with Section 6.2 of the Metropolitan PAC Report, ICHPL would prepare Upland Swamp RMPs as a component of future Extraction Plans. The RMPs would be prepared to manage the 226 swamps identified in the Project area, including:*
>
> - *the 171 swamps considered to have a low likelihood of negative environmental consequences;*
> - *the 55 swamps considered to have a real risk of negative environmental consequences; and*
> - *of the 55 swamps, eight swamps considered to have the potential to result in significant negative environmental consequences.*

The Upland Swamp Risk Assessment (Appendix O) would be reviewed and an updated risk assessment would be included in the RMPs. The updated risk assessment would be based on the final mine plan (which would be consistent with any Project Approval conditions) and relevant monitoring data (discussed below).

Hurstville City Council (2 December 2009) states:

More specifically, Council is questioning the:

…

2. potential cracking of the many feeder streams to the Georges River

…

The Metropolitan PAC Report (PAC, 2009) examined the issue of flow loss and made recommendations regarding further investigations into the potential for mine subsidence effects to lead to catchment yield losses. It concluded that it is not beyond doubt, however:

…the local and regional groundwater conditions coupled with the mine parameters, would suggest that the likelihood of water being lost from the surface water system as a consequence of mining, and then by-passing Woronora Reservoir, is very low. This conclusion accords with the findings of the Southern Coalfield Inquiry, viz:

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

Sections 3.2.4.2 and 5.3 of Appendix C of the EA present an assessment of recorded flow in Stokes Creek, O'Hares Creek and Waratah Rivulet catchments over the pre and post-mining periods and determined that there is no evidence that there has been a material change to the yield of these catchments which would suggest a loss of flow.

Section 5.2.1 of the EA states the following regarding changes in water quality:

Although mine subsidence effects can result in isolated, episodic pulses in iron, manganese, aluminium and electrical conductivity (EC), these pulses have not had any measurable effect on water quality in downstream reservoirs (Appendix C).

In regard to the Georges River in West Cliff Area 5, Section 6.1.1 of Appendix C of the EA states the following:

> *Based on the predicted levels of subsidence movement, the potential impacts would be expected to be limited to iron staining and transient spikes in water quality parameters such as iron due to minor fracturing of bedrock. Based on past experience it is likely that strata gas releases would be observed in some pools.*

As noted in Table 5-2 of the EA, localised impacts on stream water quality are estimated to include the extent of subsidence effects plus in the order of 600 metres (m) downstream.

Hurstville City Council (2 December 2009) states:

> ***More specifically, Council is questioning the:***
>
> ***…***
>
> ***3. expansion of the Brennens* [sic] *Creek emplacement site, given the increasing quantity of waste coal now produced;***
>
> ***…***

The Stage 4 Coal Wash Emplacement has been designed to avoid disturbance to over ninety percent of the local *Persoonia hirsuta* population (Section 6.2 of Appendix E of the EA) and burial of three Aboriginal heritage sites including the only highly significant (both culturally and archaeologically) site (52-2-3505) identified in the area.

As described in Section 7.6.6 of the EA:

> *At present, it is considered neither technically or economically feasible to emplace the annual Project and Dendrobium Mine coal wash production (i.e. up to 3.4 Mtpa) underground. However, over the Project life underground emplacement technologies may provide an opportunity to emplace a proportion of the coal wash produced by the Project underground, and hence reduce the area required at the surface for coal wash emplacement.*
>
> *Within five years of the grant of Project Approval, ICHPL would fund and commence development of a pilot-scale research and development trial for underground coal wash emplacement technology at the Project. The trial would draw upon available information/technical data from similar investigations and trials in the Southern Coalfield and internationally.*
>
> *…*
>
> *ICHPL would also continue to:*
>
> - *research and consider alternatives to coal wash emplacement;*
> - *pursue the use of coal wash as an engineering fill material;*
> - *negotiate with owners of suitably located and available sites that could be used as alternative emplacement sites (subject to economic feasibility in the context of the coal washery reject levy); and*
> - *report progress of these actions to the NSW Government via AEMRs.*

Hurstville City Council (2 December 2009) states:

> ***More specifically, Council is questioning the:***
>
> ***…***
>
> ***4. poor quality of water leaching from Brennens* [sic] *Creek Dam, especially at time of overflow.***

As stated in Section 2.10.1 of the EA:

> *The surface facilities which support the underground mining operations at the Appin Mine and West Cliff Colliery are subject to three existing Environment Protection Licences (EPLs):*
>
> - *EPL 2504 (West Cliff pit top);*
> - *EPL 758 (Appin East pit top); and*
> - *EPL 398 (Appin West pit top).*

As stated in Section 5.7.2 of the EA:

> *…water releases from the three pit tops are licensed and regulated by the DECC via EPLs. ICHPL would continue to operate in accordance with these EPLs (including the outcomes of the current PRPs) as part of the Project (Sections 5.6.2 and 5.6.3 and Appendices C and D).*

As described in Section 5.6.3 of the EA:

> *ICHPL is conducting ecologically based studies and trials to determine an appropriate water quality release limit for salinity from Brennans Creek Dam under dry weather flow conditions, with the intention to include this limit in EPL 2504 for the West Cliff pit top. ICHPL is scheduled to complete these assessments and trials by the end of 2009 in accordance with the current PRP under EPL 2504.*
>
> *Methods needed to achieve compliance with applicable limits (e.g. water treatment) would be the subject of a separate PRP. A plan to implement the preferred option would then follow for completion prior to July 2013 in accordance with the PRP under EPL 2504.*

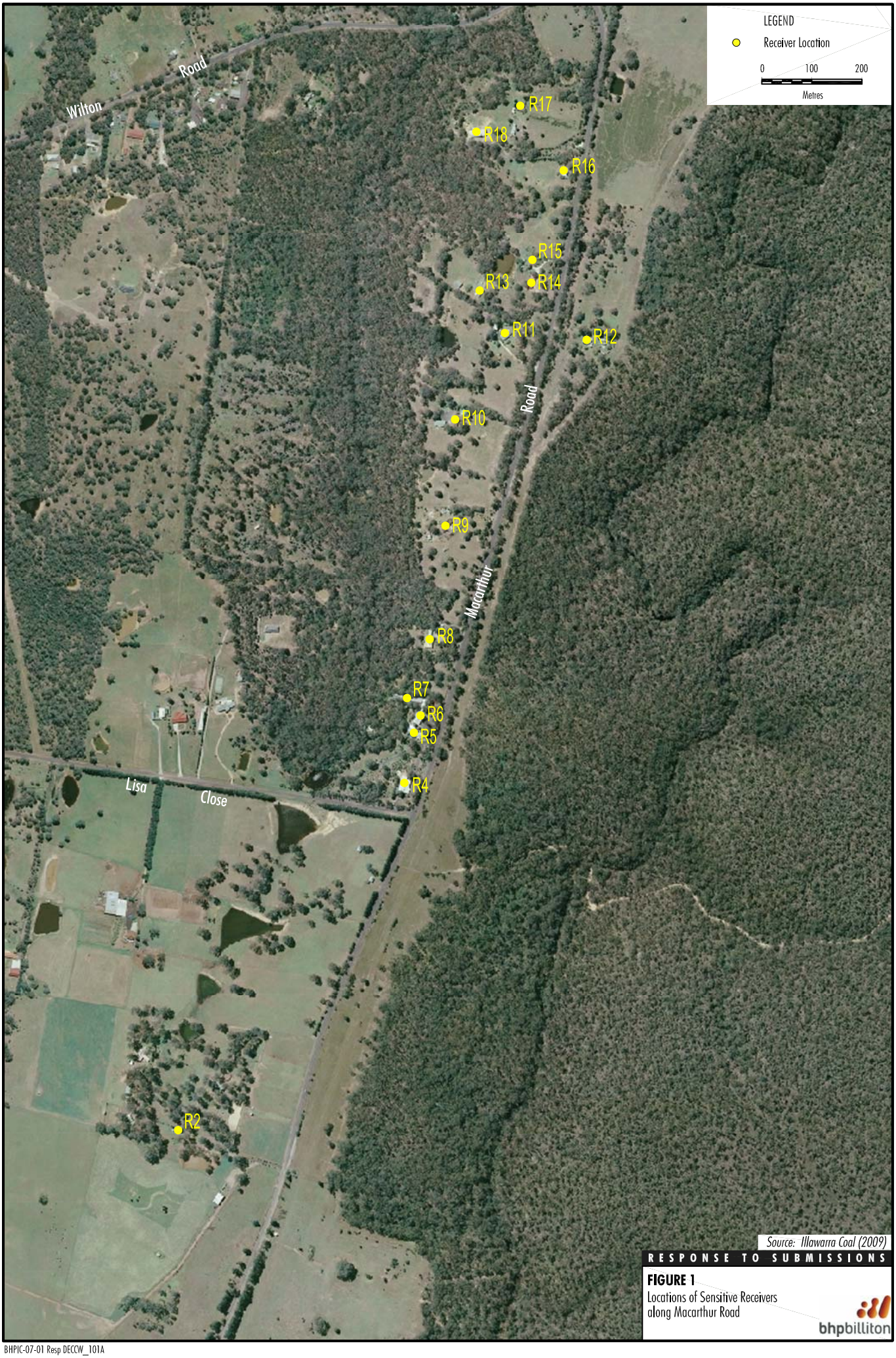
On 10 December 2009, Illawarra Coal Holdings Pty Ltd (ICHPL) proposed to the Department of Climate, Change and Water (DECCW) to submit the Pollution Reduction Program (PRP) 10 Stage 1 Report by 31 March 2010. The PRP 10 Stage 1 Report was submitted to DECCW on the 30 March 2010.

REFERENCES

Planning Assessment Commission (2009) *Metropolitan Coal Project Review Report*.

ATTACHMENT A

PREDICTED NOISE LEVELS ALONG DOUGLAS PARK DRIVE AND MACARTHUR ROAD

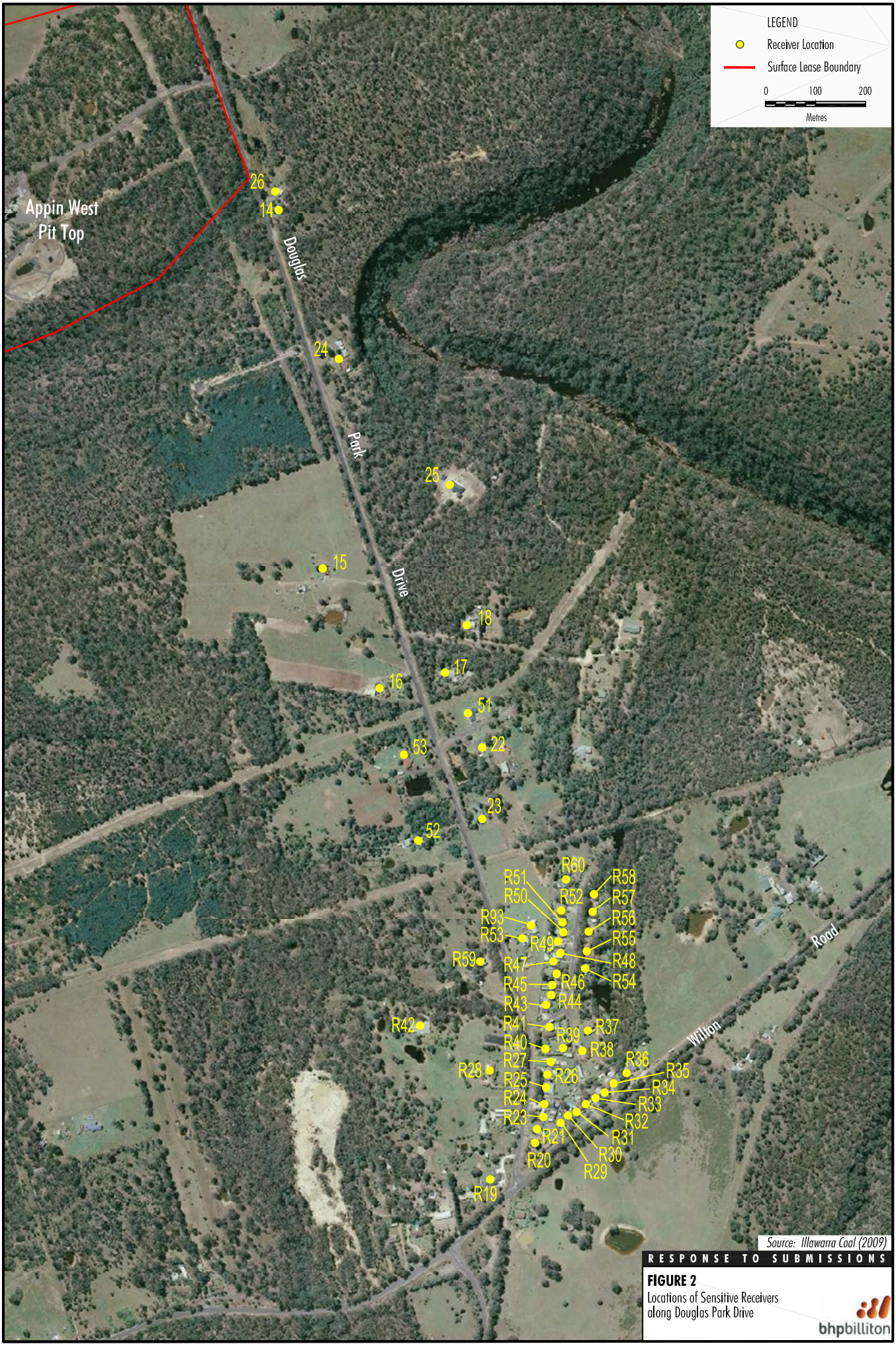


RESPONSE TO SUBMISSIONS

FIGURE 1
Locations of Sensitive Receivers along Macarthur Road

bhpbilliton

BHPIC-07-01 Resp DECCW_101A



Source: Illawarra Coal (2009)

RESPONSE TO SUBMISSIONS

FIGURE 2

Locations of Sensitive Receivers along Douglas Park Drive

bhpbilliton

BHPIC-07-01 Resp DECCW_101A

Receiver	Road	Shielded	Distance (m)	Shift Changes, 3-Shift									Shift Changes, 2-Shift						Exceeds 3-Shift		Exceeds 2-Shift	
				7.00 am to 8.00 am			3.00 pm to 4.00 pm			11.00 pm to 12.00 am			4.00am to 5.00 am			5.00 pm to 6.00 pm						
				Existing	Project	Criterion	Existing	Project	Criterion	Existing	Project	Criterion	Existing	Project	Criterion	Existing	Project	Criterion	Existing	Project	Existing	Project
14	Douglas Park Dr	N	51	60.3	62.3	60.0	60.7	62.5	60.0	51.3	57.9	55.0	52.9	59.3	55.0	61.0	63.1	60.0	Yes	Yes	Yes	Yes
15	Douglas Park Dr	N	89	58.1	60.3	60.0	58.5	60.3	60.0	49.1	55.7	55.0	50.7	57.1	55.0	58.8	60.9	60.0	No	Yes	No	Yes
16	Douglas Park Dr	N	55	60.0	62.1	60.0	60.3	62.1	60.0	50.9	57.5	55.0	52.5	59.0	55.0	60.6	62.7	60.0	Yes	Yes	Yes	Yes
17	Douglas Park Dr	N	79	58.6	60.8	60.0	59.0	60.8	60.0	49.6	56.2	55.0	51.2	57.6	55.0	59.3	61.4	60.0	No	Yes	No	Yes
18	Douglas Park Dr	N	150	56.0	58.2	60.0	56.3	58.2	60.0	46.9	53.6	55.0	48.5	55.0	55.0	56.6	58.7	60.0	No	No	No	Yes
22	Douglas Park Dr	N	103	57.5	59.7	60.0	57.9	59.7	60.0	48.5	55.1	55.0	50.1	56.6	55.0	58.2	60.3	60.0	No	Yes	No	Yes
23	Douglas Park Dr	N	59	59.8	61.9	60.0	60.1	61.9	60.0	50.7	57.3	55.0	52.3	58.8	55.0	60.4	62.5	60.0	Yes	Yes	Yes	Yes
24	Douglas Park Dr	N	73	58.9	61.1	60.0	59.3	61.1	60.0	49.9	56.5	55.0	51.5	57.9	55.0	59.6	61.7	60.0	No	Yes	No	Yes
25	Douglas Park Dr	N	205	54.7	56.8	60.0	55.0	56.8	60.0	45.6	52.2	55.0	47.2	53.7	55.0	55.3	57.4	60.0	No	No	No	No
26	Douglas Park Dr	N	55	60.0	62.1	60.0	60.3	62.1	60.0	50.9	57.5	55.0	52.5	59.0	55.0	60.6	62.7	60.0	Yes	Yes	Yes	Yes
27	Douglas Park Dr	N	81	58.5	60.6	60.0	58.8	60.6	60.0	49.4	56.0	55.0	51.0	57.5	55.0	59.1	61.2	60.0	No	Yes	No	Yes
28	Douglas Park Dr	N	120	56.9	59.1	60.0	57.3	59.1	60.0	47.9	54.5	55.0	49.5	55.9	55.0	57.6	59.7	60.0	No	No	No	Yes
29	Douglas Park Dr	N	183	55.2	57.3	60.0	55.5	57.3	60.0	46.1	52.7	55.0	47.7	54.2	55.0	55.8	57.9	60.0	No	No	No	No
30	Douglas Park Dr	N	73	58.9	61.0	60.0	59.2	61.0	60.0	49.8	56.5	55.0	51.4	57.9	55.0	59.5	61.6	60.0	No	Yes	No	Yes
31	Douglas Park Dr	N	45	60.8	62.9	60.0	61.1	62.9	60.0	51.7	58.3	55.0	53.3	59.8	55.0	61.4	63.5	60.0	Yes	Yes	Yes	Yes
32	Douglas Park Dr	N	83	58.4	60.6	60.0	58.7	60.6	60.0	49.3	56.0	55.0	50.9	57.4	55.0	59.1	61.1	60.0	No	Yes	No	Yes
33	Douglas Park Dr	N	86	58.3	60.4	60.0	58.6	60.4	60.0	49.2	55.8	55.0	50.8	57.3	55.0	58.9	61.0	60.0	No	Yes	No	Yes
34	Douglas Park Dr	N	63	59.5	61.6	60.0	60.0	61.6	60.0	50.4	57.0	55.0	52.0	58.5	55.0	60.1	62.2	60.0	Yes	Yes	Yes	Yes
35	Douglas Park Dr	N	41	61.1	63.2	60.0	61.4	63.2	60.0	52.0	58.6	55.0	53.6	60.1	55.0	61.7	63.8	60.0	Yes	Yes	Yes	Yes
36	Douglas Park Dr	N	58	59.8	62.0	60.0	60.1	62.0	60.0	50.7	57.4	55.0	52.4	58.8	55.0	60.5	62.5	60.0	Yes	Yes	Yes	Yes
37	Douglas Park Dr	N	49	60.4	62.6	60.0	60.8	62.6	60.0	51.4	58.0	55.0	53.0	59.5	55.0	61.1	63.2	60.0	Yes	Yes	Yes	Yes
38	Douglas Park Dr	N	79	58.6	60.8	60.0	59.0	60.8	60.0	49.5	56.2	55.0	51.2	57.6	55.0	59.3	61.4	60.0	No	Yes	No	Yes
39	Douglas Park Dr	N	87	58.2	60.4	60.0	58.5	60.4	60.0	49.1	55.8	55.0	50.8	57.2	55.0	58.9	61.0	60.0	No	Yes	No	Yes
40	Douglas Park Dr	Y	140	51.3	53.4	60.0	51.6	53.4	60.0	42.2	48.8	55.0	43.8	50.3	55.0	51.9	54.0	60.0	No	No	No	No
41	Douglas Park Dr	N	56	59.9	62.1	60.0	60.3	62.1	60.0	50.9	57.5	55.0	52.5	59.0	55.0	60.6	62.7	60.0	Yes	Yes	Yes	Yes
42	Douglas Park Dr	N	56	59.9	62.1	60.0	60.3	62.1	60.0	50.8	57.5	55.0	52.5	58.9	55.0	60.6	62.7	60.0	Yes	Yes	Yes	Yes
43	Douglas Park Dr	N	58	59.8	61.9	60.0	60.1	61.9	60.0	50.7	57.4	55.0	52.3	58.8	55.0	60.4	62.5	60.0	Yes	Yes	Yes	Yes
44	Douglas Park Dr	N	56	60.0	62.1	60.0	60.3	62.1	60.0	50.9	57.5	55.0	52.5	59.0	55.0	60.6	62.7	60.0	Yes	Yes	Yes	Yes
45	Douglas Park Dr	N	54	60.1	62.2	60.0	60.4	62.2	60.0	51.0	57.6	55.0	52.6	59.1	55.0	60.7	62.8	60.0	Yes	Yes	Yes	Yes
46	Douglas Park Dr	N	79	58.6	60.8	60.0	58.9	60.8	60.0	49.5	56.2	55.0	51.1	57.6	55.0	59.2	61.3	60.0	No	Yes	No	Yes
47	Douglas Park Dr	Y	145	51.1	53.3	60.0	51.5	53.3	60.0	42.1	48.7	55.0	43.7	50.2	55.0	51.8	53.9	60.0	No	No	No	No
48	Douglas Park Dr	Y	237	49.1	51.2	60.0	49.4	51.2	60.0	40.0	46.6	55.0	41.6	48.1	55.0	49.7	51.8	60.0	No	No	No	No
50	Douglas Park Dr	N	40	61.2	63.4	60.0	61.5	63.4	60.0	52.1	58.8	55.0	53.7	60.2	55.0	61.8	63.9	60.0	Yes	Yes	Yes	Yes
51	Douglas Park Dr	N	97	57.8	59.9	60.0	58.1	59.9	60.0	48.7	55.3	55.0	50.3	56.8	55.0	58.4	60.5	60.0	No	Yes	No	Yes
52	Douglas Park Dr	N	76	58.7	60.9	60.0	59.1	60.9	60.0	49.7	56.3	55.0	51.3	57.7	55.0	59.4	61.5	60.0	No	Yes	No	Yes
53	Douglas Park Dr	N	50	60.3	62.5	60.0	60.7	62.5	60.0	51.3	57.9	55.0	52.9	59.3	55.0	61.0	63.1	60.0	Yes	Yes	Yes	Yes
R2	Macarthur Road	N	213	53.8	54.9	60.0	54.2	54.9	60.0	44.5	48.8	55.0	46.0	50.2	55.0	54.2	55.2	60.0	No	No	No	No
R4	Macarthur Road	N	28	61.7	62.8	60.0	62.1	62.8	60.0	52.4	56.7	55.0	53.9	58.1	55.0	62.1	63.1	60.0	Yes	Yes	Yes	Yes
R5	Macarthur Road	N	36	60.8	61.9	60.0	61.2	61.9	60.0	51.5	55.8	55.0	53.0	57.2	55.0	61.2	62.2	60.0	Yes	Yes	Yes	Yes
R6	Macarthur Road	N	32	61.2	62.3	60.0	61.6	62.3	60.0	51.9	56.2	55.0	53.4	57.6	55.0	61.6	62.6	60.0	Yes	Yes	Yes	Yes
R7	Macarthur Road	N	67	58.5	59.6	60.0	58.9	59.6	60.0	49.2	53.5	55.0	50.7	54.9	55.0	58.9	59.9	60.0	No	No	No	No
R8	Macarthur Road	N	55	59.3	60.3	60.0	59.7	60.3	60.0	50.0	54.3	55.0	51.4	55.7	55.0	59.7	60.7	60.0	No	Yes	No	Yes
R9	Macarthur Road	N	84	57.6	58.7	60.0	58.0	58.7	60.0	48.3	52.6	55.0	49.8	54.0	55.0	58.0	59.0	60.0	No	No	No	No
R10	Macarthur Road	N	122	56.1	57.2	60.0	56.5	57.2	60.0	46.8	51.1	55.0	48.3	52.5	55.0	56.5	57.5	60.0	No	No	No	No
R11	Macarthur Road	N	71	58.2	59.3	60.0	58.6	59.3	60.0	48.9	53.2	55.0	50.4	54.6	55.0	58.6	59.6	60.0	No	No	No	No
R12	Macarthur Road	N	90	57.3	58.4	60.0	57.7	58.4	60.0	48.0	52.3	55.0	49.5	53.7	55.0	57.7	58.7	60.0	No	No	No	No
R13	Macarthur Road	N	139	55.6	56.6	60.0	56.0	56.6	60.0	46.3	50.6	55.0	47.7	52.0	55.0	56.0	57.0	60.0	No	No	No	No
R14	Macarthur Road	N	40	60.4	61.5	60.0	60.8	61.5	60.0	51.1	55.4	55.0	52.6	56.8	55.0	60.8	61.8	60.0	Yes	Yes	Yes	Yes
R15	Macarthur Road	N	47	59.9	61.0	60.0	60.3	61.0	60.0	50.6	54.9	55.0	52.1	56.3	55.0	60.3	61.3	60.0	Yes	Yes	Yes	Yes
R16	Macarthur Road	N	17	63.4	64.5	60.0	63.8	64.5	60.0	54.1	58.4	55.0	55.6	59.8	55.0	63.8	64.8	60.0	Yes	Yes	Yes	Yes
R17	Macarthur Road	N	123	56.1	57.1	60.0	56.4	57.1	60.0	46.8	51.1	55.0	48.2	52.5	55.0	56.4	57.5	60.0	No	No	No	No
R18	Macarthur Road	N	201	54.0	55.1	60.0	54.4	55.1	60.0	44.7	49.0	55.0	46.2	50.4	55.0	54.4	55.4	60.0	No	No	No	No
R19	Douglas Park Dr	N	37	61.5	63.7	60.0	61.9	63.7	60.0	52.5	59.1	55.0	54.1	60.5	55.0	62.2	64.3	60.0	Yes	Yes	Yes	Yes
R20	Douglas Park Dr	N	45	60.8	62.9	60.0	61.1	62.9	60.0	51.7	58.3	55.0	53.3	59.8	55.0	61.4	63.5	60.0	Yes	Yes	Yes	Yes
R21	Douglas Park Dr	N	44	60.9	63.0	60.0	61.2	63.0	60.0	51.8	58.4	55.0	53.4	59.9	55.0	61.5	63.6	60.0	Yes	Yes	Yes	Yes
R23	Douglas Park Dr	N	52	60.2	62.3	60.0	60.5	62.3	60.0	51.1	57.7	55.0	52.7	59.2	55.0	60.8	62.9	60.0	Yes	Yes	Yes	Yes
R24	Douglas Park Dr	N	50	60.4	62.5	60.0	60.7	62.5	60.0	51.3	57.9	55.0	52.9	59.4	55.0	61.0	63.1	60.0	Yes	Yes	Yes	Yes
R25	Douglas Park Dr	N	48	60.5	62.6	60.0	60.8	62.6	60.0	51.4	58.0	55.0	53.0	59.5	55.0	61.1	63.2	60.0	Yes	Yes	Yes	Yes

Receiver	Road	Shielded	Distance (m)	Shift Changes, 3-Shift									Shift Changes, 2-Shift						Exceeds 3-Shift		Exceeds 2-Shift	
				7.00 am to 8.00 am			3.00 pm to 4.00 pm			11.00 pm to 12.00 am			4.00am to 5.00 am			5.00 pm to 6.00 pm						
				Existing	Project	Criterion	Existing	Project	Criterion	Existing	Project	Criterion	Existing	Project	Criterion	Existing	Project	Criterion	Existing	Project	Existing	Project
R26	Douglas Park Dr	N	50	60.4	62.5	60.0	60.7	62.5	60.0	51.3	57.9	55.0	52.9	59.4	55.0	61.0	63.1	60.0	Yes	Yes	Yes	Yes
R27	Douglas Park Dr	N	55	60.0	62.2	60.0	60.4	62.2	60.0	51.0	57.6	55.0	52.6	59.0	55.0	60.7	62.8	60.0	Yes	Yes	Yes	Yes
R28	Douglas Park Dr	N	66	59.3	61.4	60.0	59.6	61.4	60.0	50.2	56.8	55.0	51.8	58.3	55.0	59.9	62.0	60.0	No	Yes	No	Yes
R29	Douglas Park Dr	Y	88	53.1	55.3	60.0	53.5	55.3	60.0	44.1	50.7	55.0	45.7	52.2	55.0	53.8	55.9	60.0	No	No	No	No
R30	Douglas Park Dr	Y	101	52.6	54.8	60.0	53.0	54.8	60.0	43.6	50.2	55.0	45.2	51.6	55.0	53.3	55.4	60.0	No	No	No	No
R31	Douglas Park Dr	Y	117	52.0	54.2	60.0	52.4	54.2	60.0	43.0	49.6	55.0	44.6	51.0	55.0	52.7	54.8	60.0	No	No	No	No
R32	Douglas Park Dr	Y	132	51.5	53.7	60.0	51.8	53.7	60.0	42.4	49.1	55.0	44.1	50.5	55.0	52.2	54.3	60.0	No	No	No	No
R33	Douglas Park Dr	Y	149	51.0	53.2	60.0	51.3	53.2	60.0	41.9	48.6	55.0	43.6	50.0	55.0	51.7	53.8	60.0	No	No	No	No
R34	Douglas Park Dr	Y	166	50.6	52.7	60.0	50.9	52.7	60.0	41.5	48.1	55.0	43.1	49.6	55.0	51.2	53.3	60.0	No	No	No	No
R35	Douglas Park Dr	Y	183	50.2	52.3	60.0	50.5	52.3	60.0	41.1	47.7	55.0	42.7	49.2	55.0	50.8	52.9	60.0	No	No	No	No
R36	Douglas Park Dr	Y	207	49.6	51.8	60.0	50.0	51.8	60.0	40.6	47.2	55.0	42.2	48.7	55.0	50.3	52.4	60.0	No	No	No	No
R37	Douglas Park Dr	Y	136	51.4	53.6	60.0	51.7	53.6	60.0	42.3	49.0	55.0	44.0	50.4	55.0	52.1	54.2	60.0	No	No	No	No
R38	Douglas Park Dr	Y	118	52.0	54.1	60.0	52.3	54.1	60.0	42.9	49.5	55.0	44.5	51.0	55.0	52.6	54.7	60.0	No	No	No	No
R39	Douglas Park Dr	Y	81	53.5	55.6	60.0	53.8	55.6	60.0	44.4	51.0	55.0	46.0	52.5	55.0	54.1	56.2	60.0	No	No	No	No
R40	Douglas Park Dr	N	46	60.7	62.8	60.0	61.0	62.8	60.0	51.6	58.2	55.0	53.2	59.7	55.0	61.3	63.4	60.0	Yes	Yes	Yes	Yes
R41	Douglas Park Dr	N	61	59.6	61.8	60.0	60.0	61.8	60.0	50.6	57.2	55.0	52.2	58.6	55.0	60.3	62.4	60.0	Yes	Yes	Yes	Yes
R42	Douglas Park Dr	N	187	55.1	57.2	60.0	55.4	57.2	60.0	46.0	52.6	55.0	47.6	54.1	55.0	55.7	57.8	60.0	No	No	No	No
R43	Douglas Park Dr	N	65	59.4	61.5	60.0	60.0	61.5	60.0	50.3	56.9	55.0	51.9	58.4	55.0	60.0	62.1	60.0	Yes	Yes	Yes	Yes
R44	Douglas Park Dr	N	81	58.5	60.6	60.0	58.8	60.6	60.0	49.4	56.0	55.0	51.0	57.5	55.0	59.1	61.2	60.0	No	Yes	No	Yes
R45	Douglas Park Dr	N	89	58.1	60.3	60.0	58.4	60.3	60.0	49.0	55.7	55.0	50.7	57.1	55.0	58.8	60.9	60.0	No	Yes	No	Yes
R46	Douglas Park Dr	N	104	57.5	59.6	60.0	57.8	59.6	60.0	48.4	55.0	55.0	50.0	56.5	55.0	58.1	60.2	60.0	No	Yes	No	Yes
R47	Douglas Park Dr	N	106	57.4	59.6	60.0	57.8	59.6	60.0	48.4	55.0	55.0	50.0	56.4	55.0	58.1	60.2	60.0	No	No	No	Yes
R48	Douglas Park Dr	N	124	56.8	58.9	60.0	57.1	58.9	60.0	47.7	54.3	55.0	49.3	55.8	55.0	57.4	59.5	60.0	No	No	No	Yes
R49	Douglas Park Dr	N	127	56.7	58.8	60.0	57.0	58.8	60.0	47.6	54.2	55.0	49.2	55.7	55.0	57.3	59.4	60.0	No	No	No	Yes
R50	Douglas Park Dr	N	143	56.2	58.3	60.0	56.5	58.3	60.0	47.1	53.7	55.0	48.7	55.2	55.0	56.8	58.9	60.0	No	No	No	Yes
R51	Douglas Park Dr	N	147	56.1	58.2	60.0	56.4	58.2	60.0	47.0	53.6	55.0	48.6	55.1	55.0	56.7	58.8	60.0	No	No	No	Yes
R52	Douglas Park Dr	N	152	55.9	58.1	60.0	56.3	58.1	60.0	46.9	53.5	55.0	48.5	54.9	55.0	56.6	58.7	60.0	No	No	No	No
R53	Douglas Park Dr	N	61	59.6	61.7	60.0	60.0	61.7	60.0	50.5	57.2	55.0	52.1	58.6	55.0	60.2	62.3	60.0	Yes	Yes	Yes	Yes
R54	Douglas Park Dr	Y	162	50.7	52.8	60.0	51.0	52.8	60.0	41.6	48.2	55.0	43.2	49.7	55.0	51.3	53.4	60.0	No	No	No	No
R55	Douglas Park Dr	Y	176	50.3	52.5	60.0	50.7	52.5	60.0	41.3	47.9	55.0	42.9	49.3	55.0	51.0	53.1	60.0	No	No	No	No
R56	Douglas Park Dr	Y	191	50.0	52.1	60.0	50.3	52.1	60.0	40.9	47.5	55.0	42.5	49.0	55.0	50.6	52.7	60.0	No	No	No	No
R57	Douglas Park Dr	Y	211	49.6	51.7	60.0	49.9	51.7	60.0	40.5	47.1	55.0	42.1	48.6	55.0	50.2	52.3	60.0	No	No	No	No
R58	Douglas Park Dr	Y	225	49.3	51.5	60.0	49.6	51.5	60.0	40.2	46.9	55.0	41.9	48.3	55.0	50.0	52.0	60.0	No	No	No	No
R59	Douglas Park Dr	N	33	61.9	64.0	60.0	62.2	64.0	60.0	52.8	59.4	55.0	54.4	60.9	55.0	62.5	64.6	60.0	Yes	Yes	Yes	Yes
R60	Douglas Park Dr	N	180	55.2	57.4	60.0	55.6	57.4	60.0	46.2	52.8	55.0	47.8	54.2	55.0	55.9	58.0	60.0	No	No	No	No
R61	Douglas Park Dr	N	178	55.3	57.4	60.0	55.6	57.4	60.0	46.2	52.8	55.0	47.8	54.3	55.0	55.9	58.0	60.0	No	No	No	No
R62	Douglas Park Dr	N	55	60.0	62.2	60.0	60.4	62.2	60.0	51.0	57.6	55.0	52.6	59.0	55.0	60.7	62.8	60.0	Yes	Yes	Yes	Yes
R63	Douglas Park Dr	N	182	55.2	57.3	60.0	55.5	57.3	60.0	46.1	52.8	55.0	47.7	54.2	55.0	55.8	57.9	60.0	No	No	No	No
R64	Douglas Park Dr	N	90	58.1	60.2	60.0	58.4	60.2	60.0	49.0	55.6	55.0	50.6	57.1	55.0	58.7	60.8	60.0	No	Yes	No	Yes
R65	Douglas Park Dr	N	92	58.0	60.1	60.0	58.3	60.1	60.0	48.9	55.5	55.0	50.5	57.0	55.0	58.6	60.7	60.0	No	Yes	No	Yes
R66	Douglas Park Dr	N	149	56.0	58.2	60.0	56.3	58.2	60.0	46.9	53.6	55.0	48.6	55.0	55.0	56.7	58.7	60.0	No	No	No	Yes
R67	Douglas Park Dr	N	186	55.1	57.2	60.0	55.4	57.2	60.0	46.0	52.6	55.0	47.6	54.1	55.0	55.7	57.8	60.0	No	No	No	No
R68	Douglas Park Dr	N	222	54.4	56.5	60.0	54.7	56.5	60.0	45.3	51.9	55.0	46.9	53.4	55.0	55.0	57.1	60.0	No	No	No	No
R69	Douglas Park Dr	N	249	53.9	56.0	60.0	54.2	56.0	60.0	44.8	51.4	55.0	46.4	52.9	55.0	54.5	56.6	60.0	No	No	No	No
R70	Douglas Park Dr	N	459	51.3	53.4	60.0	51.6	53.4	60.0	42.2	48.8	55.0	43.8	50.3	55.0	51.9	54.0	60.0	No	No	No	No
R93	Douglas Park Dr	N	85	58.3	60.4	60.0	58.6	60.4	60.0	49.2	55.8	55.0	50.8	57.3	55.0	58.9	61.0	60.0	No	Yes	No	Yes
																		TOTALS	**36**	**57**	**36**	**65**