Bowmans Creek Diversion

Response to Submissions

May 2010

Bowmans Creek Diversion – DA 309-11-2001 MOD6

Response to Submissions

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1 INTRODUCTION

Ashton Coal Operations Pty Limited (ACOL) is seeking approval to modify its existing development consent (DA 309-11-2001) for the Ashton Coal Project (ACP) under Section 75W of Part 3A of the Environmental Planning and Assessment Act 1979.

In September 2009, ACOL lodged an application with the NSW Department of Planning (DoP) for DA 309-11-2001 – MOD 6. An Environmental Assessment (EA) report was subsequently prepared and publicly exhibited from 11 December 2009 until 18 January 2010. Stakeholders, including government agencies and members of the public, were invited to comment on the proposed modification.

The existing consent enables ACOL to develop and operate an open cut and underground mine for a period of 21 years, to produce up to 5.2 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal from the Pikes Gully, Upper Liddell, Upper Lower Liddell and Lower Barrett Seams.

However, the conditions of consent significantly restrict ACOL's ability to develop and operate the underground mine in an area approved for mining beneath Bowmans Creek and its adjacent alluvial lands. Specifically:

- Condition 1.18 prohibits the diversion of Bowmans Creek as proposed in the original application.
- Condition 3.9 requires that the underground mine be designed to ensure no direct hydraulic connection between the Bowmans Creek alluvium and the underground workings through subsidence cracking.
- Condition 4.13 requires that all mining is conducted to minimise potential impacts on the flow and quality of alluvial groundwater and the integrity of the alluvial aquifer.

The modification application (DA 309-11-2001 – MOD 6) seeks to change these conditions to enable:

- Underground mining that may result in a direct hydraulic connection between the Bowmans Creek alluvium and the underground workings through subsidence cracking.
- The relocation of two sections of Bowmans Creek to prevent cracking and draining of water from the creek and to mitigate subsidence impacts as a result of the modification.

The modification also seeks to enable extraction of coal from the Upper Liddell Seam, Upper Lower Liddell Seam and the Lower Barrett Seams in the western most area of the approved underground mine (proposed longwall 8 – LW 8). Extraction of coal from the upper (Pikes Gully) coal seam in this area was approved as DA 309-11-2001 – MOD 4, which was approved in March 2010.

The current mine plan for Pikes Gully Seam, which has received subsidence management plan (SMP) approval, involves full longwall extraction in areas that lie outside the saturated zone of the Bowmans Creek alluvium and two 'miniwalls' in areas underlying alluvial lands. Miniwalls are narrow longwall blocks designed to minimise subsidence effects and thereby satisfy existing consent conditions in relation to cracking that could lead to a direct hydraulic connection forming between the Bowmans Creek alluvium and the underground workings.

Miniwalls have the disadvantage of being inefficient in terms of resource recovery, and the degree of subsidence that would occur as a result of their use in the lower seams in subsequent years is uncertain. Consequently, the economic viability of miniwalls is marginal and may pose significant resource recovery and operational constraints in the mining of subsequent seams (i.e., Upper Liddell, Upper Lower Liddell and Lower Barrett Seams).

Monitoring and investigation of groundwater, subsidence and surface water, since the commencement of the ACP, has improved ACOL's understanding of the Bowmans Creek alluvium and its connection with Bowmans Creek. This has given better understanding and greater certainty in relation to potential impacts of longwall mining. In particular, detailed groundwater investigations have improved ACOL's understanding of the nature, extent and groundwater quality of the Bowmans Creek alluvial aquifer and its connectivity to Bowmans Creek. Some of these outcomes are contrary

to those described in the Environmental Impact Statement (EIS) (HLA, 2001) in support of the original development consent. The more recent data and analysis shows that:

- The quality of groundwater in the alluvial aquifer is moderately saline (up to 6,400 µS/cm EC). Hence it provides only limited environmental, agricultural and economic value.
- The alluvium has relatively low hydraulic conductivity and only makes a very small baseflow contribution to Bowmans Creek.
- Prior to mining there is a natural upwards seepage of saline groundwater from the coal measures to the alluvium.
- Contrary to original predictions (HLA, 2001) there will be a decrease in Hunter River salinity post mining.
- The existing creek has been degraded as a consequence of past land use practices and the range of aquatic and riparian ecosystem services that it provides reflect this change.

The modification will provide for:

- Ongoing maintenance of a cost effective business, with sustainable capital and operating costs, thereby providing security of employment for 195 direct employees and 35 construction positions, as well as flow on effects to the regional economy.
- Access to an additional 5.3 million tonnes of ROM coal through significantly improved resource recovery, and reduced sterilisation, over the four targeted seams than would otherwise be possible under the constraints imposed by existing consent conditions.
- Approximately $80 million of additional revenue to the State and Federal Governments.
- Significantly improved flexibility to modify the mine plan within the mining footprint and certainty that mining of lower seams will be technically and economically feasible, with flow on employment and local and State economic benefits.
- Environmental benefits by way of increased and enhanced riparian vegetation along Bowmans Creek, which will provide additional connective wildlife corridors.
- Reduced salt load to Bowmans Creek and the Hunter River.

ACOL has assessed the impacts of the modification on ground and surface water to be generally less than those predicted in the 2001 EIS (HLA, 2001) which have been authorised under the existing development consent.

All other aspects of the current development consent will remain unchanged.

2 SUMMARY OF SUBMISSIONS

Twenty submissions from stakeholders were received by the DoP and forwarded to ACOL for consideration. These stakeholders included:

- Government authorities (7 submissions):
  - Hunter-Central Rivers Catchment Management Authority (CMA).
  - NSW Heritage Office, Heritage Branch.
  - NSW Dams Safety Committee (DSC).
  - NSW Roads and Traffic Authority (RTA).
  - NSW Department of Environment, Climate Change and Water (DECCW).
  - NSW Office of Water (NOW).
  - Industry & Investment NSW - Primary Industries (I&I).
- General public (8 submissions) and special interest community groups (5 submissions).

All submissions which raised issues or concerns were comprehensively reviewed and are addressed in the following sections of this report.

Table 1: Response to Submissions

Respondent	Issue	Response
Government Authority Submissions		
1. Hunter Central Rivers Catchment Management Authority.	The Hunter – Central Rivers Catchment Management Authority (HCRCMA) acknowledges that the Ashton Coal – Bowmans Creek Diversion project is being assessed under the provisions of Part 3A of the Environmental Planning and Assessment Act, 1979 and that the provisions of the Native Vegetation Act 2003 do not apply. The HCRCMA considers the principles of the Hunter – Central Rivers Catchment Action Plan (CAP) should still apply to the project with respect to such issues as Regional Significance of Native Vegetation, Vegetation Offsets, Riparian Health, Groundwater, Soil and Salinity.	The HCRCMA have developed guiding principles for mining and extractive operations. The Bowmans Creek Diversion project does incorporate most of the principles espoused within the Catchment Action Plan (CAP) for example environmental monitoring and reporting, preparation and implementation of management plans (water, subsidence, air, noise, flora/fauna, archaeology/heritage, landscape/revegetation). The Project Management and Vegetation Offset measures are detailed in ACOL's draft Statement of Commitments contained in Section 13 of the Environmental Assessment (EA) Report. A revised Statement of Commitments is provided in **Section 3**.
	Regional Significance of Native Vegetation	
	• HCRCMA considers that area away from the riparian zone was originally box gum woodland – consistent with an endangered ecological community.	• ACOL share this opinion – the area once was a box gum woodland, but was impacted by clearing and farming operations.
	• Supporting vegetation maps and vegetation data from land to be cleared should have been included in the EA Report.	• Vegetation maps are included in Volume 1 of the EA Report (figure 10.2) and in Volume 2, Appendix 9.
	• Planting of aquatic or riparian vegetation more than 20 metres away from the high bank cannot be classed as aquatic or riparian and therefore should not be considered as increasing the area of riparian vegetation.	• The 13.9 hectares of vegetation that is included within the proposed offset of 15.7 hectares is the total area of impact of the east and west diversions on pasture. These areas will be re - engineered, and revert to Aquatic and Riparian habitats as described in Section 2.8 and Section 10 and shown by Figure's 2.10 and 10.3 of Volume 1 and Appendices 9 and 10 of Volume 2 of the EA Report.
	• HCRCMA supports the establishment of local provenance River Red Gum stands and connective corridors of riparian and box gum woodland communities.	• Comments noted and concurred with.
	Offsets	
	• HCRCMA wants the Environmental Outcomes Assessment Methodology (EOAM) associated with the Native Vegetation Act, 2003 or BioBanking Methodology to be utilised to determine offsets to achieve an "improve or maintain" status.	• The project has been designed to achieve an "improve or maintain status". The Bowmans Creek Diversion project needs to be considered from a holistic, not solely from a vegetation offset point of view.
	• HCRCMA recommends that the offset strategy be consistent with DECCW's "Principles for the use of biodiversity offsets in NSW".	• ACOL considers that the project has been designed and is consistent with DECCW's "Principles for the use of biodiversity offsets in NSW". Offsets will be agreed with the DECCW prior to the impact occurring. This is a known DECCW policy.

Respondent	Issue	Response
	Riparian Health • HCRCMA opposes any diversion of Bowmans Creek and encourages rehabilitation on a catchment scale along the total frontage of Bowmans Creek.	• The development of, and operating a coal mine requires the proponent to apply for and obtain the necessary project approvals in advance of any construction and mining activities associated with the project occurring. This process enables the "weighing up" of the advantages and disadvantages associated with a project by the relevant approval authority. Any approvals issued in respect to the project would require ACOL to undertake construction and mining activities consistent with those approvals. The proponent will undertake rehabilitation of the impacted areas of Bowmans Creek as required by the relevant conditions of approval. • ACOL seeks that the application be treated on its merit.
	Groundwater • Any alteration to the groundwater and surface water regimes associated with the stand of River Red Gums with a drawdown of 0.5 metres needs further investigation as an impact.	• The small amount of draw down is not expected to have any impact on the two stands of river red gum.
	• Base flow reductions as a result of mining will impact on Bowmans and Glennies Creeks and the Hunter River. A Groundwater Management Plan should include monitoring of groundwater levels and groundwater dependent ecosystems.	• Comments noted and concurred with – please refer to ACOL's Statement of Commitments contained in Section 13 of the EA Report and revised in Section 3. ACOL is committed to a Groundwater Monitoring and Management Plan that meets the requirements of relevant government agencies.
	Soil Salinity • Bowmans Creek may incur subsidence of up to 0.5m that will increase the risk of stream bank and bed instability in a saline catchment – the HCRCMA does not support the diversion.	• The purpose of the diversions and the design is to limit the effect of subsidence upon Bowmans Creek.
2. Heritage Branch of Department of Planning.	A. No objection is raised against the Bowmans Creek Diversion project.	A. The contents of the submission are noted.
3. Dam Safety Committee.	A. The ACOL Bowmans Creek Diversion project does not significantly increase the risk to the Narama Dam.	A. The contents of the submission are noted.
4. Roads and Traffic Authority.	A. The NSW Roads and Traffic Authority (RTA) has no objection to the proposed Bowmans Creek Diversion project provided a formal Construction Traffic Management Plan (CTMP) is provided.	A. The comments and requirements of the RTA are noted. ACOL is committed to preparing and implementing a CTMP for the project consistent with RTA requirements.

Respondent	Issue	Response
5. Department of Environment Climate Change and Water.	**Aboriginal Community Consultation** A. Additional evidence is required from registered Aboriginal community stakeholders regarding the Aboriginal Cultural Heritage assessment process.	A. Since 2001, when the initial studies for the ACP began, ACOL has continued to consult with representatives from Aboriginal community stakeholder groups with an interest in the project. This includes consulting with, and involving, Aboriginal stakeholder representatives in field surveys, impact assessments and preparation of Aboriginal cultural heritage management plans where the development has involved potential cultural heritage impacts. ACOL has made every attempt to solicit feedback on the cultural heritage significance of the modification area, the impacts of the modification proposal and the development of strategies to avoid, manage and mitigate these impacts on Aboriginal cultural heritage values. In the preparation of the EA and since its exhibition ACOL has instigated facilitated consultation workshops, site walkovers and presentations on the modification with Aboriginal stakeholder representatives. These have been aimed at encouraging feedback from Aboriginal stakeholder representatives on the modification proposal and on the Aboriginal cultural heritage values of the area. In addition to requesting a written response on the Aboriginal archaeological assessment (EA Appendix 11), ACOL has sought verbal response from Aboriginal stakeholder representatives. ACOL has sought to capture the opinions of Aboriginal stakeholder representatives voiced during the workshops, site walkovers and presentations and in one-on-one face-to-face meetings and follow-up telephone conversations. It was hoped that these oral strategies would provide an alternative avenue and make it easier for Aboriginal stakeholder representatives to communicate their views on the project. Key consultation events in relation to the Bowmans Creek modification include: – **August 2009** – expression of interest from Aboriginal stakeholder representatives invited. – **Early October 2009** – registered stakeholders provided with the Aboriginal archaeological assessment (EA Appendix 11). – **13 October 2009** – 22 (of the 26 registered) Aboriginal stakeholder groups attended a meeting to discuss the modification proposal. Groups were encouraged to provide feedback either directly at the meeting or in writing. At this meeting a motion was carried for a further two-day workshop so that Aboriginal stakeholder groups could focus on the modification and provide direct feedback and information on Aboriginal cultural heritage

Respondent	Issue	Response
		issues relating to the project. Some community members expressed difficulty in understanding large volumes of written material and providing written responses. – **24 October 2009** – Workshop held for groups to provide information on Aboriginal cultural heritage issues related to the ACP and to further discuss the Bowmans Creek Diversion modification proposal and proposed management measures. All 26 groups were invited, but only 8 groups participated. Those who participated in the workshop included: – Tocomwall Pty Ltd; – Ungooroo Aboriginal Corporation; – Cacatua Culture Consultants; – Wonnarua Nation; – Hunter Valley Cultural Surveying; – Wonnarua Nations Aboriginal Corporation; – Wattaka Cultural Consultants Services; and – Lower Hunter Wonnarua Council Inc. These workshop participants proposed the following additional and amended mitigation measures to be included in the Aboriginal Cultural Heritage Management Plan (ACHMP), if the modification is approved: – Capture the oral history of the area through consultation with relevant Aboriginal stakeholders, local landowners and other sources as appropriate. – Complete a site walkover to enable stakeholders to connect with the land. – The outcomes of this process can then feed into the construction mitigation measures, where revisions may be made as necessary. – The method for salvaging Aboriginal objects shall be developed in consultation with relevant Aboriginal stakeholders, and will include: o Incorporating new information from the oral history and site walkover. o Incorporating ideas of comparing and contrasting different salvage and recovery techniques (e.g. attempting to date objects in situ, or completing some excavations at night to preserve critical dating properties of the objects, that is, prevent sunlight exposure). o Provision of learning opportunities from results gained. – Incorporate community consultation into the subsidence management plan (SMP) process, and enable the outcomes of the consultation to

Respondent	Issue	Response
		dynamically feed into the SMP. – ACOL to commit to consultation with Aboriginal stakeholders, pre-construction, during construction and post construction. – Any new or additional infrastructure, activities or disturbance that are proposed by ACOL should be treated and assessed separately (this may include for example, new stockpiles, or excavations, or monitoring points for subsidence). ACOL will implement these measures in its AHCMP. In addition, the Aboriginal stakeholders requested further information regarding aquatic impacts, and the subsidence impacts of longwalls that have been approved or are subject to separate assessments. – **4 November 2009** – A copy of the Workshop Minutes were sent to the Aboriginal stakeholder groups who participated in the facilitated workshop for review and comment. – **1 December 2009** – There were no comments noted on the draft and the final minutes were sent out to all (26) registered Aboriginal stakeholder groups for comment. – **30 March and 1 April** – Following the outcomes of the facilitated workshop on 24th October 2009, further consultation days and site walkovers were offered for the week commencing 29th March. The aim was to capture more of the oral history of the area and feed this into the development of mitigation measures for the modification, should it be approved. Consultation in the form of a meeting and site walkover was undertaken on the 30th March and 1 April. Of the 26 registered Aboriginal stakeholder groups only 6 groups participated. These participants proposed that the ACHMP should include pre-construction investigative works, the method for salvaging Aboriginal objects and a schedule for ongoing consultation. Detailed discussion was also held in relation to better defining the significance of the area. The key point of the discussion was that the area was highly significant but that these matters were of a spiritual nature and could not be discussed with non – indigenous community. It was agreed that all ACOL could note in its reports in relation to significance was that the area was of high significance. ACOL requested that the groups provide further feedback on the project, for inclusion in the assessment. Despite follow-up phone calls, ACOL has not received any written correspondence from Aboriginal stakeholder groups on the modification proposal or Aboriginal cultural significance since the walk over.

Respondent	Issue	Response
		The key outcomes of this consultation to be considered in developing a management strategy for Aboriginal cultural heritage for the modification include: – Bowmans Creek is considered by Aboriginal stakeholder groups to be located in a highly significant area. – Oral history indicates potential burials in the area. – Oral history indicates use of fish traps in Bowmans Creek. – Wonnarua occupation of the area post-European settlement. – Issues regarding the sharing of sensitive information outside the community regarding the are – Geophysiscal testing and targeted subsurface probing, – Monitoring in a bulk works environment. Ensuring no impacts on the waterhole site. Improved fencing of the waterhole site to avoid impacts was generally acceptable.
	Archaeological and Cultural Heritage Management Plan B. Additional details of the ACHMP should be provided.	B. ACOL currently manages Aboriginal cultural heritage sites in accordance with an approved ACHMP. This plan was developed in consultation with local Aboriginal Community and the DECCW (NPWS) and defines the measures to be undertaken to manage and mitigate the Aboriginal cultural heritage values of the site. Since its initial approval, the ACHMP has been revised to include areas subject to mine subsidence from underground mining. Consultation with Aboriginal community stakeholder groups has been undertaken for each revision of the ACHMP. As new Aboriginal community stakeholders have indicated their interest in the ACP (through the development assessment process), ACOL has accommodated these in the consultation process. Since approval of the ACP, the number of Aboriginal stakeholder groups ACOL consults with has grown from 7 to 26. Should the Bowmans Creek Diversion modification be approved, ACOL will update the approved ACHMP to take account of the impact of the modification. This will be done in consultation with the 26 registered Aboriginal stakeholder groups. However, while every effort will be made to consult with the 26 registered Aboriginal stakeholder groups in revising the ACHMP, ACOL does not have the ability to control the level of response received from these groups.
	Cultural Significance Assessment C. The Aboriginal Cultural Heritage assessment has not satisfactorily addressed the cultural significance of the Aboriginal Cultural Heritage	C. ACOL has undertaken extensive consultation with Aboriginal community stakeholders in an effort to ascertain the significance of the Aboriginal Cultural

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	values of the project area.	Heritage values of the modification project area. ACOL undertook targeted consultation through facilitated workshops and site walkovers in October 2009 and March and April 2010 in relation to the Bowmans Creek Diversion modification proposal. These workshops and walkovers were specifically designed to gain further understanding and written or verbal confirmation from registered Aboriginal stakeholder groups on the cultural significance of the project area. Aboriginal stakeholder participants were asked to contribute (if and where appropriate) on oral history and or specific values upon which the significance of the area is based. Aboriginal stakeholder participants indicated that the specific cultural heritage values that make the area significant to them is private and confidential and will not be shared with the non-indigenous community. Aboriginal stakeholder participants also indicated that much of the cultural significance of the area relates to continued occupation into the historic period. Without specific information on Aboriginal cultural heritage significance and to ensure that the significance of the area is not underrated in the documentation, ACOL has assumed the modification area is 'culturally significant' or of 'high cultural significance'. This approach has been formally supported by all Aboriginal stakeholder participants of the site walkovers.
6. NSW Office of Water.	A. NOW disputes that predictions in the 2001 EIS provided for impacts on water in Bowmans Creek and its connected alluvium, which is now administered under the HURAWSP. The modification is contrary to NOW's position on take of water under the Water Management Act 2000 (WMA) and management of fully accounted water sources administered under water sharing plans.	A. The groundwater studies carried out in support of the authorisation of the existing development consent (309-11-2001) predicted that groundwater inflows into underground mine workings would comprise alluvial groundwater from the Bowmans Creek alluvium, whether direct hydraulic connection occurred or not (HLA, 2001). The 2001 EIS states on page ii of the Executive Summary of Appendix H: *"Drawdowns in the coal measures aquifers will induce leakage from the overlying alluvial aquifers surrounding the Ashton Project. Modelling predicts the maximum leakage rates due to the Ashton Project will be 0.3 ML/day from the Hunter River alluvium; 0.4 ML/day from the Bowmans Creek alluvium (**without subsidence fracture connection**); and 0.6 ML/day from the Glennies Creek alluvium"* [emphasis added]. And again in Section 5.3 on page 18 of Appendix H: *"Seepage from Bowmans Creek alluvium reaches a maximum of around 0.4 ML/day for the latter half of the mine life. **This result assumes that goaf cracking and surface tension cracking in the coal measures under the alluvium do not connect, and that no cracking occurs in the alluvium"**.* [emphasis added]. Development Application 309-11-2001 was for State Significant Development

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		and Integrated Development under Part 4 of the Environmental Planning and Assessment Act 1979, as the proposal required additional approvals under other Acts, including the *Water Act 1912*. In granting consent, the Minister for Planning required ACOL to (condition 4.10 to Schedule 2): *"obtain a licence from DLWC under Part 5 of the Water Act 1912 for the bores and wells which intersect the ground watertable, including monitoring bores, dewatering bores, longwalls, and other excavations which intersect the groundwater table".* In accordance with this condition, ACOL lodged a Part 5 Water Act licence application with the administering water authority (previously DLWC, currently NOW) to enable dewatering of the open cut and underground mines. This application was for 693.5ML/annum (comprising 73.5ML/annum for open cut and 620ML/annum for underground mines), being the maximum total volume of predicted groundwater inflows for the mine development (HLA, 2001). Of this inflow volume, 146ML/annum was predicted to comprise losses from the Bowmans Creek alluvium (<u>without subsidence fracture connection</u>), including contributions from losses in surface flow, aquifer storage and recharge. The application for the Part 5 Water Act licence was made before the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources (HURAWSP) was enacted. ACOL maintains that the Part 5 Water Act licence application for the total volume of groundwater required to be dewatered was consistent with the EIS predictions and the conditions of the development consent. To date, only 110ML/annum of the total 693.5ML/annum licence application has been granted. Further, ACOL maintains that the proposed modification and predicted consequential loss of alluvial groundwater and flows in Bowmans Creek should be considered in the context of the 2001 EIS impact predictions and the requirement on ACOL to secure a Part 5 Water Act licence for the total volume of predicted mine inflows. ACOL will consult with NOW regarding water licensing for the Bowmans Creek Diversion Project. ACOL has proposed to offset predicted base flow losses to Bowmans Creek using excising water licence allocations.
	B. NOW regards the conditions of the development consent should be maintained to protect the surface/ground water connectivity of Bowmans Creek alluvium. It also regards the cracking and draining of rivers and connected alluvium to be inconsistent with the Principles of the WMA and contrary to the water sharing and account protection requirements of the HURAWSP.	B. ACOL has proposed diverting two sections of Bowmans Creek to prevent cracking and draining of water from the creek as a result of the modification. This will disconnect the creek from the alluvium (in the areas of the diversions) and result in predicted baseflow losses of about 0.13ML/day (47.5ML/annum) due to groundwater inflow into the underground mine. The implementation of the diversions, consequential isolation of two sections of the creek from the alluvium and improved hydrogeological understanding (EA Appendix 5) mean that predicted losses from the Bowmans Creek alluvial

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<tr><th>Respondent</th><th>Issue</th><th>Response</th></tr>
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aquifer as a result of the modification will be significantly less than those predicted in the 2001 EIS (HLA, 2001), which form the basis of the current consent (309-11-2001). A comparison of predicted impacts on Bowmans Creek alluvial groundwater from 2001 and 2009 studies are summarised in the Table 2 (Wells, 2010).

Table 2: Comparison of 2001 and 2009 predicted hydrogeological impacts
<table>
<tr><th>Impact</th><th>2001 EIS Predictions</th><th>2009 EA Predictions</th></tr>
<tr><td>Total groundwater inflow to mine workings.</td><td>Maximum inflows of 1.7ML/d, or 620ML/annum, predicted into the underground mine.</td><td>Maximum inflows of 1.6ML/d, or 584ML/annum, predicted into the underground mine.</td></tr>
<tr><td>Loss of water from the Bowmans Creek alluvium.

(Note: Bowmans Creek and its connected alluvium form part of the Jerrys water source under the HURAWSP).</td><td>Expected losses from the alluvium, which includes drainage from the creek, loss of storage and loss of recharge, totalled 146ML/annum

Note: this figure was based on (modelling that did not include connective cracking, so is consistent with the final approval).*</td><td>Expected baseflow losses to Bowmans Creek reach a maximum of 47.5ML/annum.

Storage lost from the alluvium equals 251ML over 14 years of operation, or 18ML/annum. However, much of this will be replaced in the long term.</td></tr>
</table>
*The lack of connective cracking within the impact assessment modelling is clearly stated in the modelling description provided in Section 5.3 and the Executive Summary of Appendix H of the 2001 EIS.

Table 2 shows that the total predicted groundwater inflows to the underground mine, including losses from the Bowmans Creek alluvial aquifer, are less for the proposed modification than the impacts authorised under the existing development consent.

Apart from the fact that direct hydraulic connection is predicted between longwall goaf and the alluvium, the impact mechanisms for the proposed modification in relation to ground and surface water and licensing are effectively the same as that supported in the 2001 EIS and authorised under the existing development consent.

ACOL will consult with NOW regarding water licencing for the Bowmans Creek Diversion Project. ACOL has proposed to offset predicted base flow losses to Bowmans Creek using water licence allocations.
</td></tr>
</table>

Respondent	Issue	Response
	C. Conversion of a single licence to permit the fracture drainage of a connected alluvial water source, and relocation of a river so as to isolate it from its connected alluvium does not comply with the requirements of the HURAWSP and the WMA. Ashton must demonstrate its operations will not impact upon minimum baseflows in Bowmans Creek.	C. In addition to the 693.5ML/annum Part 5 Water Act licence application submitted in accordance with the development consent to enable dewatering of the open cut and underground mines, ACOL also holds a 366ML licence (licence 20SL044434), which permits the extraction of surface water from Bowmans Creek (Lot 701 DP828294) for the purposes of irrigation (361ML/annum) and farming (5ML/annum). ACOL has proposed to use part of this licence as an environmental offset for the impacts of the project on the surface flows within Bowmans Creek. ACOL is currently consulting with NOW on the status of its unresolved licence applications, existing water licenses and water licence conditions.
	D. NOW regards the two identified river red gum (*Eucalyptus camaldulensis*) galleries on the lower reaches of Bowmans Creek to be high priority groundwater dependent ecosystems.	D. The groundwater assessment for the EA considered *Eucalyptus camaldulensis* as being groundwater dependent. The two stands of *Eucalyptus camaldulensis* occur at least 1km downstream from the proposed western diversion and outside the mining lease area. The EA predicts a reduction of less than 0.5m in the water table level in the general area of the two river red gum stands, but due to their location, within the slopes of the terraces adjacent to the creek, the minor water table reduction will not be sufficient to adversly affect the river red gums (EA Section 7.4.7). Since exhibiting the EA, the NSW Scientific Committee has determined that Hunter Floodplain Red Gum Woodland is an endangered ecological community (EEC). *Eucalyptus camaldulensis* forms part of the assemblage of this EEC. ACOL's rehabilitation strategy includes improving the condition of these river red gum stands and increasing the number of river red gum trees along Bowmans Creek through targeted planting and regeneration. This will ensure the long-term survival of this species in the general area.
	E. Stricter conditions on flow regimes are scheduled to be implemented in year 6 (2015–2016) of the HURAWSP. Any modification to the existing development consent must be consistent with the HURAWSP, including scheduled changes to flow regimes, and State policy relating to protection of minimum baseflows and surface/groundwater connectivity.	ACOL acknowledges the intent of the review and implementation of water licence conditions to protect critical minimum flow, environmental water accounts and to ensure equitable sharing of water for all users of the Bowmans Creek component of the Jerrys water source. ACOL believes that the provision of an offset is a suitable mechanism to ensure these conditions will be met.
7. Industry and Investment New South Wales.	**Rehabilitation and Final Landform** A. It is recognised that there are no existing comparable creek diversion examples in the Hunter Valley which seek to recreate a natural creek system. Whilst Ashton Coal has supplied additional information regarding the use of geosynthetic liners in the document "Bowmans Creek Diversion-Response to Planning Letter" dated February 2010, the Department notes	A. Examples of successful river rehabilitation can be found locally, for example the Upper Hunter River Rehabilitation Initiative (UHRRI) project on the Hunter River near Muswellbrook (Hunter-Central Rivers CMA, 2010). This project is being managed by the Hunter-Central Rivers CMA, in partnership with a range of government agencies and corporations, including the NSW Department of

Respondent	Issue	Response
	that this information relates to examples of engineered channels and dams, not reconstructed natural creek systems.	Natural Resources, NSW Department of Primary Industries, the Hunter-Central Rivers CMA, NSW Department of Lands, Newcastle Ports Corporation, Mt Arthur Coal, Bengalla Mining Company and Macquarie Generation. A description of Bengalla's involvement can be found at Rio Tinto (2010). The UHRRI is focusing on two aspects that were also the focus of the Bowman's Creek diversion design: physical habitat and riparian vegetation. The Morwell River Diversion Project in the Latrobe Valley (Yallourn Power Station) is an example of a similar project. The project includes 13 million m^3 of engineered fill, 3.5km of river channel realignment together with revegetation with up to 40,000 plants. Whilst on a large scale the Morwell River Diversion Project has significant similarities to the Bowmans Creek Diversion Project: – community concerns with respect to noise and dust; – environmental issues including flora, fauna, aquatic degradation and fish passage; – Aboriginal archaeology; – geotechnical stability relating to building the foundations on unconsolidated overburden material of low strength (similarities to subsidence); – use of a non-dispersive clay liner material to ensure river integrity; – flood design criteria; and geomorphic design that included low flow channel, rehabilitation criteria, woody debris for fish, rock riffles and bank protection in low flow channel, together with ongoing monitoring. A presentation on the Morwell River Diversion presented as part of the 2006 Australian Construction Achievement Awards is attached in **Appendix 1** together with a technical paper in **Appendix 2.** Engineered Geosynthetic Clay Liners (GCL's) have been used as hydraulic barriers both within Australia and internationally for projects such as landfills stormwater/wetlands irrigation channel and for canals to cater for commercial barges. The GCL is proposed for the Bowmans Creek Diversion to preserve the flow functions of the diverted creek. Examples of application of GCL similar to the proposed Bowmans Creek include: – Sealing of the Rocklands irrigation channel (Victoria) – GCL used in water conveyance application subject to wetting and drying – Webbelin Canal (Germany) – GCL used to seal a major waterway. – Elbe River (Germany) – GCL used to seal flood protection levees subject to variable water level and potentially scouring flood flows

Respondent	Issue	Response
	B. The applicant to date has not provided sufficient information to allow for assessment of the adequacy of measures for the rehabilitation of the Bowmans Creek diversions taking into account the complexities and uncertainties associated with recreating the geomorphology and habitat of a natural water course. The EA does not provide measurable completion criteria for the various phases of the rehabilitation process. The EA does not include contingency strategies in the event key elements of the rehabilitation fail to meet design. Risks identified include geosynthetic liner failure, major tunnel erosion, weed invasion and the effect of drought on native vegetation establishment. To address risks associated with the proposal, the EA should contain a comprehensive list of conceptual completion criteria for each phase of the rehabilitation process (ie. landform establishment, growth medium development, ecosystem establishment and ecosystem development). This should also include tolerance levels and contingency measures in the event that completion criteria may not be achieved. It would be helpful to identify individual functional domains associated with the project to assign clear criteria for each of the rehabilitation phases to facilitate this process.	– Appin Colliery (NSW) – GCL used to seal sediment control dam constructed in porous sandstone environment B. ACOL has revised its rehabilitation strategy to include measureable completion criteria. The rehabilitation strategy is included as **Appendix 3.** The science of river rehabilitation is very well advanced. The beginning of this field of science in modern times was probably marked by the publication of Jim Gore's text in 1985, The Restoration of Rivers and Streams: Theories and Experience. Since then thousands of river restoration projects have been undertaken worldwide, and thousands of scientific articles have been published on this topic. In 2004, Steve Ormerod (2004) wrote that restoration science was in a "golden age". A review of stream rehabilitation efforts in eastern Australia was recently published by Cottingham et al. (2005). The scientist who undertook the analysis and natural channel design for the Bowman's Creek Diversion project proposal (Dr Chris Gippel) has been involved in this field for 15 years, as evidenced by publications (deWaal et al, 1995; Gippel and Fukutome, 1998; Gippel and Collier, 1998; Gippel, 1999, Gippel and White, 2000; Rutherfurd and Gippel, 2001). In 2004 Chris Gippel wrote an entire chapter dedicated to the topic of river rehabilitation for the international text book, Stream Hydrology, An Introduction for Ecologists (Gordon et al., 2004). In 1996, Brookes and Shields (1996) wrote that: *"….abiotic end points such as physical quality and water quality are appropriate targets for restoration rather than biological endpoints such as density, diversity or production of certain species." And* *If natural hydrology and morphology are recreated, with careful consideration given to hydraulic aspects, then there is every possibility that natural ecological recovery will follow."* This essentially means that a focus on restoring the geomorphology will provide a sound basis for ecological restoration. In the case of Bowman's Creek, the approach was to copy the geomorphology and hydraulics of the existing creek into the design of the creek diversion. In this way, there would be minimal change to geomorphology and physical habitat provision. The design went a step further, by recommending increased large woody debris density and complexity, as this was viewed to be at less than natural levels in the existing creek. Furthermore, the proposal aims for a major restoration of the riparian and floodplain vegetation community, which was deemed to be distant from reference condition in the existing creek. *"…..As indicated in A above, examples of successful river rehabilitation can be found locally, (UHRRI project on the Hunter River near Muswellbrook) The UHRRI is focusing on two aspects that*

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		were also the focus of the Bowman's Creek diversion design: physical habitat and riparian vegetation.
	C. The EA does not provide sufficient detail regarding the management and final rehabilitation of the spoil/topsoil stockpiles proposed to be emplaced adjacent to the creek realignments. The EA does not adequately describe the final proposed landform in the area affected by the stockpiles. This area will be affected by ongoing subsidence over several years as multi-level underground mining takes place. Subsidence in some areas may be expected to exceed 8 metres under worst case conditions. The EA does not provide a prediction of final contours or cross sectional information to adequately allow the Department to assess the acceptability of final landform for the intended post-mining land use. The Department requires this information in the form of a final landform plan.	C. ACOL is preparing final landform plans for the project. Indicative final land form plans are attached as Annexure A to the revised Rehabilitation Strategy included as **Appendix 3** and include: – A contour plan of subsidence and stockpiles after mining the Lower Barrett (the location of the section lines are also included – Four (4) Cross-Sections – A 3-D perspective showing, final landform after subsidence, diversions and stockpiles A 3-D perspective showing a photo draped over the final landform after subsidence, diversions and stockpiles – Note: The indicative final landform plans do not include spreading of stockpiles or possible surface works to create free draining landscape as the final level of subsidence from mining of the four seams has not yet been predicted.
	Subsidence and Creek Diversions	
	D. Based on the information in the EA the proposed Bowmans Creek diversion will be situated above solid coal or areas of limited extraction.	D. I&I's understanding is correct.
	E. I&I NSW consider that is should be feasible to design and construct the proposed Bowmans Creek diversion channels that maintain creek flow and avoid drainage of flows to the proposed mine workings.	E. ACOL concur with I&I.
	F. It is critical that the creek diversion design and construction be implemented taking into adequate consideration the effects of multiple seam mining at the site, as the "stacked longwall arrangement", currently proposed by the proponent, may potentially lead to severe surface deformations. Longwall layout(s) alternative to "stacked arrangement" should be considered if it is practically possible for the site.	F. ACOL is considering alternate mine layouts to the "Stacked Arrangement". Discussion on the Mining Layout occurs in Section 2.3 and 2.4 of Volume 1. In Section 2.4.3 of Volume 1 the EA describes how mine planning is an iterative process that will be managed by the SMP process. *"The proposed mine plan for the Pikes Gully seam is shown in Figure 2.4. The final extraction design of each subsequent seam below the Pikes Gully would be subject to the results of subsidence and monitoring from the preceding seam and would be detailed in a SMP consistent with the current SMP approval process.* *For the purpose of assessment of the subsidence impacts described in this EA the longwall panels in each successive seam are stacked vertically beneath, the one above. The stacked multi-seam panel layout presents the worst case subsidence impacts compared to the possible alternative "offset" multi-seam panel layout. Mine planning has been, and will continue to be, an iterative process that takes into account a variety of parameters including; monitoring*

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		and interpretation of the previously extracted panels; developments in understanding of subsidence within the industry; and the economics of the mining operation. Modification of the mine plan for subsequent seams may include modifying aspects of the design such as; offsetting longwall blocks; optimising pillar dimensions; changing longwall widths based on geotechnical or equipment requirements; and modifying the start and end points of a panel." The mine plan for the Upper Liddell (ULD) seam is currently in the final stages of being reviewed as a precursor to accessing the ULD seam. The study is reviewing Stacked and Offset layouts with particular reference to geotechnical and subsidence modelling, surface water and groundwater impacts, ventilation design and other mine planning parameters. The studies are also looking beyond the ULD seam to the lower seams as well, albeit In less detail. The layout for the ULD seam will be presented as part of the ULD LW 1-4 SMP process.
	G. Impacts to the environmental functions of Bowmans Creek need to be addressed by relevant specialists.	G. Specialists have addressed these issues in the EA Report.
	Alluvial Aquifer	
	H. I&I NSW consider that, based on the current industry knowledge, hydraulic connection between the proposed mine workings and the Bowmans Creek alluvium due to subsidence is likely to occur, resulting in drainage of the alluvial aquifers. This is contrary to the requirements of Ashton's current Development Consent, in particular Condition 3.9.	H. As a result of extensive studies and monitoring carried out since the grant of the 2002 development consent, ACOL has formed the opinion that longwall mining of the four (4) seams may result in a direct hydraulic connection between the Bowmans Creek alluvium and the underground workings due to subsidence cracking. To comply with the conditions of the 2002 development consent, ACOL could leave coal in situ and not mine the seams in the vicinity of Bowmans Creek, or continue to mine via a continuation of costly mini walls and leaving coal in situ. Under these scenario's the life of the mining operation and continued employment of underground mine workers is put at risk. ACOL seeks to maintain a cost effective business which provides significant regional benefits by its continuation of underground mining of the four coal seams. ACOL is seeking a modification to the 2002 development consent based on a revised understanding of the environment in which it is mining to permit a direct hydraulic connection between Bowmans Creek alluvium and the underground workings due to subsidence cracking. The construction of two diversion channels within Bowmans Creek will mitigate subsidence impacts on the creek and enable the socio-economic benefits associated with the ACP to be realised.
	I. In summary, I&I NSW MR is supportive of the proposed Bowmans Creek Diversion Project subject to the proponent adequately addressing the before mentioned matters.	I. ACOL appreciates the support of I&I NSW MR and is committed agrees to adequately address and resolve the issues raised by I&I MR.

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	Fisheries	
	J. As such I&I NSW Fisheries consider Bowmans Creek a significant stream in maintaining the integrity and carrying capacity of the fish populations in the Hunter River. Given that the proposed works are almost at the junction with the Hunter River, I&I NSW Fisheries has concerns that any failure in the creek reconstruction may isolate the Bowmans Creek catchment from the Hunter River, reducing the available habitat for the Hunter migratory fish populations.	J. ACOL has designed the diversion in accordance with best practice and relevant industry and government guidelines. In addition ACOL has developed a rehabilitations strategy for the proposal which includes detailed completion criteria and contingencies **(**Appendix 3).
	K. I&I NSW Fisheries maintains its objection to mining under key fish habitat and the proposed channel diversions as both may have a significant impact on Bowmans Creek. The destruction of fish habitat by redirecting the creek is not adequately addressed in the EA as the proposal does not meet the environmental compensation requirements outlined in the "Policy and Guidelines for Aquatic Habitat Management and Fish Conservation (1999)" which states in "General Policies" (s.1.2) that the environmental compensation should require the creation of new habitat (of the type lost) on a 2:1 basis to account for the indirect as well as the direct impacts. Appendix 9 of the EA states that there is a loss of 199m of the existing creek length overall, which is less than 1:1 habitat replacement in its current form.	K. Section 1.2j of the Policy and Guideline for Aquatic Habitat Management and Fish Conservation (the AHMFC Policy) states: *"Environmental compensation needs to be integrated into the planning process. Where, despite mitigation, a significant environmental impact is unavoidable, environmental compensation should be provided. This would normally require the creation of new habitat (of the type lost), and on a 2:1 basis to account for the indirect as well as the direct impacts of development."* Section 6.4.1 the AHMFC Policy states that: *"There are two types of activity which can be used to mitigate damage to fish habitat: Habitat rehabilitation involves repairing damage caused by past activities. Environmental compensation is the creation or enhancement of aquatic habitats or fish resources in order to compensate for anticipated adverse or actual environmental effects of proposed developments."* These statements present the overarching aims of the proposed diversions, being the minimisation of impact plus the inclusion of sufficient mitigation such that "significant environmental impact" is avoided. This has been achieved by design factors incorporated into the design of the diversions to match the significant aquatic ecological attributes of the sections of creek to be lost, while also assessing and incorporating measures to improve the creek as a whole (as outlined in Appendix 9 – the Ecology Report, Section 4.1 pp 37 to 39). A key feature of the proposal is that it seeks to create new high quality habitat in addition to retaining the majority of the existing habitat. The existing habitat in the excised sections will change as flows change, however the new habitat will also become more established during that period. It is concluded that the achievement of these design factors will ensure significant environmental impact is avoided. As additional mitigation, the adopted design has incorporated a number of design features as specifically recommended in the AHMFC Policy being: – Incorporation of riparian buffer zones (with stock exclusions) and enhancement of native riparian and instream vegetation; (as per AHMFC Policy 1.2e, 2.3.3, 2.3.4). (see EA Appendix 9 Section 4.3.1).

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		– Avoidance of "channelization of streams" (as per AHMFC Policy 5.1.3g) by incorporating meanders in both the diversion creek flood plain and in the base flow channel (also thus minimising 'loss' of stream length – see EA Appendix 9 Section 4.3.1). – Re-connection of (currently) off-line oxbow channel sections to provide off-line refuges for fish migrating through the stream plus creating additional connected aquatic habitat (see Appendix 9, Table 4 and Section 4.3.1). – Addition of snags (engineered log jams) to the diversion creek sections (see Appendix 9 Section 4.1 p 37) as per AHMFC Policy Sections 5.7 Snag Management. The EA report and Appendix 9 have addressed the question of environmental compensation for aquatic habitat loss by using the NSW Fisheries' AHMFC Policy as the overall guiding document. The combination of: – Impact minimisation; – Provision of alternate aquatic habitat of similar or better quality; and the – Provision of additional valuable aquatic habitat restoration features as suitable mitigation; ensures that the Bowmans Creek Diversion Project is consistent with the AHMFC Policy and avoids significant environmental impact.
	L. Any modifications to the approved mining plans should include a buffer zone adjacent to the creek that does not allow the lowest subsidence point to go below the lowest point in the creek to ensure there is no connectivity between the creek aquifer and the subsidence trough.	L. ACOL has committed to ensuring the landscape will be free draining consistent with the original development consent.
	M. The proposal to divert flows to the diversions while still maintaining flows in the existing channels requires the availability of reasonably significant flows to be able to service both 'streams'. I&I NSW Fisheries have concerns regarding the ability for this to occur effectively in dry conditions. This could result in only a minimal flow of water being available to assist in the recovery/rehabilitation of the new channels or to maintain the ecology of the existing creek.	M. The proposal is to put low flows down the diversion (ie <6 month flows). This proposal is not "flow dependant"
	N. I&I NSW Fisheries recommend that any approval conditions include a mechanism that would see the proponent having responsibility for the maintenance and management of the realignment channels after mine closure, as the re-engineered channel would have the potential to incur significant long term, ongoing costs beyond the operational life of the mine	N. It is expected that during the period of ongoing underground mining following the construction of the diversion channels (about 14 years), there is likely to be a sufficient number of significant flood events to adequately test the integrity of the channels. The hydrologic analysis includes an assessment of the timing of historic flood events that have exceeded flow corresponding to a 5 year ARI flood (about 150 m3/s peak flow) (see Figure 2.4 in Appendix 7 of the EA). That analysis indicates that in any consecutive 14 year period in the historic record there were a minimum of three flood events that exceeded a peak flow of 150m3/s, and a maximum of six. The peak 5 year ARI flood of 150 m3/s is

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		significant in this instance because: – In floods larger than 150 m3/s the floodwater will overtop the block banks and flow will be split between the excised section of creek and the new (diversion) section. (This behaviour is illustrated for 20 and 100 year ARI floods in Drawing G009 and Drawing G010 in Appendix 6 of the EA.) – The detailed flood modelling (see Appendix 6 of the EA) indicates that under these flow conditions, the flow velocity in the diversion channels in a 5 year ARI flood will be very similar to that in a 100 year ARI flood (see Drawing G007 and Drawing G010 in Appendix 6 of the EA). Accordingly, the diversion channels will be subjected to severe "stress" conditions comparable to a 100 year ARI flood on several occasions during the period following construction, while the mine is operational. This will provide sufficient opportunities to identify and rectify any defects in the design or construction of the diversion channels
	O. These conditions should include: I&I NSW Fisheries is directly involved in the planning and implementation of the creek diversion aspects of the project to ensure that the plan adequately achieves the Department's 2:1 habitat replacement policy either within the project area or elsewhere in the Bowmans Creek catchment. I&I NSW Fisheries will confirm its satisfaction with the planned creek diversion and habitat replacement requirements in writing to the Department of Planning prior to the commencement of construction of any creek diversions or other offsets.	O. See K above.
	P. A monitoring program be developed and implemented, to the satisfaction of I&I NSW Fisheries, to monitor the following; – Condition and stability of the geomorphic structures created in the new channel, – Security of the channel bed to ensure excessive amounts of water are not lost to the aquifers and any subsidence related troughs are identified and managed to avoid impacts on the integrity of the diversion channels and existing creek, – Macroinvertebrate monitoring to ensure that the system is achieving the desired outcomes with no greater than 20% variation from existing in the number of taxa found instream. – Fish monitoring is to be carried out throughout the life of the mine to assess the level of colonisation of the new channels, relict channels and the upstream sections of Bowmans Creek. Success should only be measured against existing population types and numbers.	P. ACOL will consult with I&I NSW fisheries in developing a monitoring program for the modification proposal, should it be approved.

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	Agriculture	
	Q. I&I NSW Agriculture considers that the EA for Bowmans Creek diversion fails to consider the impacts of the proposed changes to mining activities and the diversion of Bowmans Creek on agricultural resource lands and agricultural land use. Key issues for sustainable agricultural land use and future food production arising from the exhibited proposed diversion of Bowmans Creek are the; – Permanent degradation of alluvial lands resulting from subsidence, connective cracking and the predicted substantial dewatering of alluvial soils during and post mining. Permanent loss of highly productive agricultural resource lands due to creek diversions and associated riparian habitat creation. – Soil stock piles on alluvial areas (Fig 2.6 of EA) that will alienate Class 1 and 2 resource lands for an unspecified period Proposed surrender of existing water licences which will restrict irrigated agricultural options.	Q. The impacts of the underground mine on agricultural resources was assessed in the 2001 EIS which has been approved. ACOL has modified its intended post mining land use on land to which the modification applies to include a mix of conservation and agricultural outcomes. As the owner of this land ACOL has a vested interest in ensuring that those parts returned to agricultural productivity are capable of reaching the intended end use.
General Public and Special Interest Group Submissions		
8. DR & MK Bridge.	A. Opposes any project that interferes with any water course.	A. The authors of the submission oppose the interference to any water course. If such a broad scale prohibition was introduced most land use activities (including farming) would not occur nor would our society enjoy the benefits (standards of living) derived from the development of land or resources. The project includes a wide range of measures to mitigate the impacts of the creek diversions, including best practice design. ACOL seeks that the application be treated on its merit.
9. BW & RA Cherry.	A. Opposes the Bowmans Creek Diversion Project.	A. The development of and the operations of a coal mine requires the proponent to apply for and obtain the necessary project approvals in advance of any construction and mining activities associated with a project occurring. This process enables the 'weighing up' of the advantages and disadvantages associated with a project by the relevant approval authority. The project approval authority is the Minister for Planning. Any approvals issued in respect to the project would require ACOL to undertake construction, mining and rehabilitation activities consistent with all relevant approvals, licences and permits.
	B. ACOL wants to change nature for profit.	B. The coal resources are owned by the State of NSW. ACOL is responsible for mining the resource for the broader benefit of the State of NSW. Mining companies (as do most organisations) need to operate profitably otherwise society would not enjoy the benefits derived from the development of land or

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		resources. The safety and health of our employees, contractors, sub-contractors, visitors and the general public, the protection of the environment and interaction with the community are paramount to ACOL. Ongoing success in these areas and compliance with all relevant Acts and Regulations is a fundamental objective of our continued operation and growth as a commercial enterprise. ACOL is committed to: – Establishing, implementing and maintaining documented procedures for hazard identification, assessment and control of our activities, products or services that may have an impact on Safety, Health, Environment and Community (SHEC) relations over which we have control or influence, including those of our suppliers and contractors. – Providing an Incident-free and healthy workplace through the application of a Zero Incident Culture. Personnel at Ashton Coal have a personal responsibility for their own safety and that of their workmates and to prevent environmental impacts. Management objectives and targets for SHEC will be integrated into the overall planning process and deployed to all relevant functions activities and processes, and strive for continual improvement in performance. – In the event that an employee or contractor sustains a work related injury or illness, ACOL will provide an efficient workplace injury management program with the goal of restoring the injured person to pre-injury status. – Complying with the SHEC legislation, regulations, standards and codes of practice relevant to the operation as a minimum requirement. This information will be kept up to date and relevant information communicated to personnel. – A process of consultation and communication with relevant internal and external stakeholders will be established and maintained on SHEC matters that may affect them. There will be regular review of the effectiveness of the communication in collaboration with stakeholders. The effectiveness of this process is reliant upon the development, approval, and maintenance of relevant documents and systems and the willing participation of employees and stakeholders. All appropriate SHEC documents and systems will be available to personnel whose activities are dependent upon them and where appropriate, to other stakeholders. – Regularly reviewing and assessing the need for changes in policy, objectives and targets, and other elements of SHEC in the light of SHEC audit results, changing circumstances and our progression through continual improvement. ACOL seeks that the application be treated on its merit.

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10. JH & MR Moore.	A. Object to the Bowmans Creek Diversion project. B. Questions the validity of the Department of Planning to approve "environmental vandalism". C. ACOL are profit driven. D. Land owners have no rights.	A. Refer to Submission 8, Response A. B. The development of land for the construction and operation of a coal mine requires the proponent to apply for and obtain planning approvals in advance of construction and mining activities occurring. The "weighing – up" of the advantages and disadvantages of a coal mine project occurs under the provisions of the Environmental Planning and Assessment Act, 1979. The approval authority for the project is the Minister for Planning. C. Refer to Submission 9, Response B. D. ACOL owns the land upon which the diversions will be located. The Environmental Planning and Assessment Act, 1979 does not discriminate between the rights of a land owner or the proponent of a coal mine project. The Environmental Planning and Assessment Act, 1979 enables the assessment of a project to occur with transparency.
11. B Russell.	A. The Bowmans Creek Diversion project has a strong likelihood of interfering with the flow of Bowmans Creek and therefore the Hunter River. The Precautionary Principle must be applied and the application refused.	A. Section 14 of Volume 1 of the EA Report contains an assessment of the Bowmans Creek Diversion Project with regard to its consistency with the objects of the Environmental Planning and Assessment Act, 1979 including an assessment (refer to Section 14.4.5.1 of the EA *Report) of the project with respect to ecological sustainable development and the precautionary principle, see further discussion in* ***Appendix 4.*** *"Application of the precautionary principle to the Bowmans Creek Diversion Project requires that there has been:* *i) Careful evaluation of the proposal to avoid serious or irreversible damage;* *ii) Predictable and transparent decision making for the proposal; and* *iii) An assessment of consequences of various options undertaken.* *A change in the understanding of how the alluvial and groundwater systems function at the Ashton Coal Project (ACP) site since the 2001 Environmental Impact Statement (EIS) has enabled a better understanding and the importance of certain impacts to be better understood and interpreted which, has enabled the proponent to design a more efficient mining operation that protects the more important elements of the environment. While the approved Subsidence Management Plan mine plan for the Pikes Gully seam contains miniwalls and can operate with minimal impacts to Bowmans Creek and the alluvium, there is some scientific uncertainty with regard to the performance of the miniwalls on the lower seams, which limits the economic certainty of the underground if the coal resources cannot be extracted in that area without significant impact. The proposed Bowmans Creek Diversion Project provides for greater certainty of impacts as mining progresses to the lower seams.* *At all stages of project development there has been an open and transparent decision making process. Consultation has occurred with the various*

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		stakeholders and concerns addressed in the design of the diversions, including minimising the loss of base flow from Bowmans Creek by developing a design that includes a geosynthetic clay liner under the diversion channels. Features of the design include: – *Designing each of the channels to be an analogue of the adjoining existing channel in terms of its geomorphic features; meandering alignment, pools of various depths, riffles and cobble bars;* *The habitat and geomorphic characteristics of the diversion channels will be enriched by the inclusion of large woody debris which is largely absent from the existing channel. This will take the form of a number of engineered log jams;* – *Compiling a Rehabilitation Plan that incorporates a significantly enhanced vegetation density and vegetation community richness compared to the existing creek channel."*
	B. Allowing mining to encroach into the connected alluvium and indirectly into the regulated river (Hunter River) is not consistent with the rules of the Hunter Unregulated River and Alluvial Water Sharing Plan. If the Bowmans Creek Diversion Project reduces the base flow of Bowmans Creek ACOL would be in breach of the Hunter Unregulated River and Alluvial Water Sharing Plan prepared under the Water Management Act, 2000. Part 3A of the EP&A Act, 1979 does not take precedent over the Water Management Act, 2000.	B. The 2001 EIS predicted impacts on all water sources in the vicinity of the ACP. The ACP was approved by the Minister for Planning prior to the introduction of the regulated and unregulated river and connected alluvium water sharing plans. The Bowmans Creek Diversion Project is a modification to the existing ACP development consent and the predicted impacts are within the limits assessed and approved within the original consent Refer to Submission 6, Responses A, B and C.
	C. Waters of the Hunter River sustain agriculture, viticulture, electricity generation, town water supply and the equine industry. These industries are worth hundreds of millions of dollars to the state economy. The annual value of these industries may be damaged if a mining operation damages the river system.	C. Specialist impact assessment reports (subsidence, groundwater, flooding and geomorphology, water balance modelling and aquatic ecology assessments) have concluded that the Bowmans Creek Diversion project will have no significant impact on the surface water flows of the Hunter River. The proponent for the project maintains that no adverse impact will be occasioned to downstream industries or water users which rely upon reliable overall water flows associated with the Hunter River. The Proponent seeks that the approval authority consider the application on its merits.
	D. Objects to the offset proposal for the loss of base flows in Bowmans Creek. Under the Water Management Act, 2000 and the Hunter River Water Sharing Plans there is no provision to offset water. Water can be transferred to other licences or bought or sold. Without the offset strategy the project is environmentally unsustainable.	D. Refer to Submission 6,Responses A, B and C..
12. C Russell.	A. Objects to the Bowmans' Creek Diversion project for the purpose of allowing underground mining as the Department of Planning in 2001 refused a similar mining application – those considerations are still relevant today, whilst there is uncertainty about hydraulic connectivity between	A. With the benefit of additional monitoring of groundwater, subsidence and surface waters since the commencement of the ACP, together with specific studies presented in the EA ACOL has significantly improved its understanding of the Bowmans Creek alluvium since the preparation of the original EIS.

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	Bowmans Creek and the underground workings.	In particular, groundwater investigations have improved the understanding of the nature, extent and quality of Bowmans Creek alluvial aquifer and its degree of connection with Bowmans Creek. The proponent now has the benefit of groundwater monitoring results for the first five years of open cut mining and three years of underground mining which has provided a far better understanding of the hydrological regime together with a greater understanding and knowledge in relation to potential impacts of longwall mining. The provisions of the Environmental Planning and Assessment Act, 1979 enables the proponent to make application for a modification of the existing development consent (DA 309 -11 -2001 - 1). The application enables the approval authority to consider the project (as proposed) on its merits.
	B. The integrity of Bowmans Creek must be maintained and objects to any approval of this project prior to completion of a Mine Subsidence Plan.	B. The EA Report demonstrates that the integrity of Bowmans Creek and the Hunter River will be maintained should the project be approved. Prior to longwall mining the proponent will be required to submit and have approved a Subsidence Management Plan. The project includes a wide range of measures to mitigate the impacts of the diversions, including best practice design. Refer to Submission 7, Responses B and C. In addition the proponent has made a commitment to the preparation of a Subsidence Management Plan, refer to the proponents draft Statement of Commitments contained in Section 13.3 of Volume 1 of the EA Report.
	C. The waters of the regulated Hunter River provide reliable flows for access by water users. The Water Sharing Plan provides a high level of protection to water users (agriculture, viticulture, equine and electricity generation) worth hundreds of millions of dollars per annum. The project has the potential to adversely impact downstream water users as water may be "lost" due to longwall mining.	C. Refer to Submission 11, Response C.
	D. There is presently an embargo on ground water extraction within the Water Sharing Plan under the Water Management Act, 2000. The project is contrary to the principles of the Water Sharing Plan and Water Management Act, 2000. Part 3A of the EP & A Act, 1979 does not take precedent over the Water Management Act, 2000.	D. Refer to Submission 6, Responses A, B and C.
	E. Claims that there is no guarantee that by diverting parts of Bowmans Creek around the subsidence affected areay and constructing with "mini-walls" that there will be a reduction of water losses from Bowmans Creek and Hunter River. The project will alter the aquifer system and floodplain regime which will in turn adversely impact Bowmans Creek and the Hunter River. Doubts the validity of hydrology studies associated with this project or original project.	E. The 2001 EIS predicted impacts on all water sources in the vicinity of the ACP. The ACP was approved by the Minister for Planning prior to the introduction of the regulated and unregulated river and connected alluvium water sharing plans. The Bowmans Creek Diversion project is a modification to the existing ACP development consent and the predicted impacts are within the limits assessed and approved within the original consent.

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		The Bowmans Creek Diversion project is reliant upon the hydrological data obtained since the 2001 EIS was prepared. The data has formed the foundation of groundwater impact modelling which has been reported within Volumes 1 (Section 7) and Appendix 5 of Volume 2 of the EA Report. In addition the proponent undertook a flood assessment of the project which has been reported in Volumes 1 (Section 8) and Appendix 6 of Volume 2 of the EA Report. A summary of the groundwater, hydrology and flooding issues associated with the Bowmans Creek Diversion project is shown on pages ix, x and xi of Volume 1 of the EA Report. The groundwater impact assessment contained within the EA Report, identifies that despite the development and operation of the ACP there has been and will continue to be a draw down upon groundwater's by other mining operations, refer to (middle figure) Figure 6.15 contained in Appendix 5 of Volume 2 of the EA Report.
	F. Under the Water Management Act, 2000 and the Hunter Unregulated River Water Sharing Plan there is no provision to "offset water". All mines should comply with the water management legislation. It is not clear how water "offsetting" would work or be legally allowable or whether the mine owners would honour such an offset.	F. Refer Submission 6, Responses A, B and C.
	G. Rejects the benefits of two creek channel diversions as a benefit of the project. The submission claims that if the modification is a "business critical factor" and if something goes wrong ACOL or the mine owners could not afford to remediate or compensate other water users that might be adversely impacted.	G. ACOL has undertaken detailed engineering, environmental and financial risk assessments for the project and is confident the Bowmans Creek Diversion Project can be successfully undertaken. The project includes a wide range of measures to mitigate the impacts of the diversions, including best practice design. Refer to Submission 11 Response C.
	H. The design of the channel diversions has not been tested with respect to the impacts of subsidence. Strong concerns regarding unanticipated surface cracking of Bowmans Creek resulting in the drawdown of shallow groundwater from the alluvium giving rise to water inflow into the underground mine workings. The design of the project that includes subsidence and creek diversion will change the degree of floods and flood patterns.	H. The location of the diversions with respect to the mine plan will ensure that subsidence impacts on the diverted creek sections will be minimal, refer to Figures S.1 and 6.1 of Volume 1 of EA Report. ACOL has committed to reviewing and modify mine plans in response to actual subsidence and geotechnical behaviour associated with mining in the deeper seams based on monitoring experience, expert interpretation and other advice, refer to Section 13.3 of Volume 1 of the EA Report. The design of the creek diversion has been specifically undertaken with regard to longwall mining and the impacts of subsidence. A geosynthetic clay liner (GCL) which is a manufactured hydraulic barrier system comprising a layer of bentonite clay sandwiched between and bonded to, layers of geosynthetic fabric forming an impermeable layer will be placed under the bed of the diverted sections of channel. The current contribution of baseflow from this section of the alluvial aquifer also contributes an estimated 36 tonne/year of salt to Bowmans Creek and the

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		Hunter River. A positive impact of the proposed modification will be the removal of this salt load. The flood modelling undertaken for the project including the construction of the diversion and the subsidence of the landscape will not have a significant impact on flood conditions because of the increased flood storage volume in the subsidised landscape – refer to Section 8.3Volume 1 Appendix 6 of Volume 2 of the EA Report.
	I. Longwall mining is a key threatening process with fracturing or cracking the water chemistry will change leading to a reduction of water quality to other water users and upon aquatic habitat.	I. ACOL and the EA Report study team is aware that alteration of habitat following subsidence due to longwall mining is a key threatening process,which is one of a number of key threatening processes which have been considered in the design of the project. The EA Report within Appendix 5 of Volume 2 and within Section 7.4.5 of Volume 1 has assessed the risks to alluvial aquifers by possible upward migration of saline waters. Section 7.4.5 of Volume 1 of the EA Report is produced below: *"The only potential impact to groundwater quality will come from the risk that changes in the post mining hydrogeological environment could cause saline waters within the mine workings and caved overburden to leak upwards to the Bowmans Creek alluvium through the connective cracking that occurs above the abandoned longwall panels. However, detailed analysis of the post mining recovery modelling shows that the dynamic equilibrium that groundwater heads reach within the mine workings and caved Permian overburden are lower than the water table that establishes within the Bowmans Creek alluvium. There will therefore be no upward movement of water from the mine workings to the alluvium, and hence no risk of saline flow. Indeed, the modelling shows that groundwater heads in the Permian will be slightly lower than in the pre-mining condition, and that upward flow from the Permian to the alluvium will no longer occur. Groundwater quality within the Bowmans Creek alluvium should therefore be better than in the pre-mining condition."*
	J. Rejects the findings of the EA Report hydrogeological study as the monitoring period upon which it is premised is too short a time period for any reliable conclusions to be drawn.	J. ACOL supports the findings of the specialist studies and relies upon the results of monitoring undertaken since the ACP commenced operations.
	K. The geology of the proposed mine and diversion is not fully known. Lack of knowledge creates concern about the reliability of modelling given the uncertainty of faults, jointing in the coal seams or hard rocks. Avoiding significant impacts is the key to ecological sustainable development and fundamental for effective land use planning.	K. The geology of the Camberwell/Ravensworth area is well known and understood by the proponent, mining industry and government agencies. Effective land use planning does not mean avoiding significant impacts associated with a project. If this approach was adopted by land use consent authorities most activities would be prohibited or not occur and society would not enjoy the benefits derived from the development of land or natural resources.

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	L. There needs to be performance testing of the geosynthetic clay liner demonstrated by field and scientific investigations given the geological features of the Ravensworth area.	L. Refer to Submission 7, Response C.
	M. The diversions channels do not mimic the hydraulic and geomorphic characteristics of the existing creek nor do they provide opportunities for enhancement of the riparian and aquatic habitat. The stability of the diversions over a long period of time to cause scouring and incision upstream and downstream needs to be fully investigated.	M. Refer to Submission 7, Response B.
	N. The extent of subsidence is likely to have an adverse effect on flooding behaviours and should have been discussed in relation to the NSW Flood Plain Policy.	N. The channel diversions have been designed to provide equivalent or better ecological conditions than that which prevails along the existing creek. The NSW Flood Prone Land Policy recognises that: i) Flood prone land is a valuable resource that should not be sterilised by unnecessarily precluding its development; and If all statutory applications involving flood prone land are assessed according to rigid and prescriptive criteria, some appropriate proposals may be unreasonably disallowed or restricted, and vice versa. The primary objective of the policy is to reduce the impact of flooding on flood prone property and to reduce both public and private losses resulting from floods utilising ecologically positive methods where possible. The policy requires a merit approach in the assessment of development decisions relating to floodplain lands to take into account, social, economic and ecological factors. i) The Bowmans Creek Diversions has been the subject of a rigorous assessment that has taken into account the social, economic and ecological factors together with flooding considerations associated with the project.
13. W Bowman.	A. The resulting tremors from Top Coal Caving mining technique could cause landslides and possibly block Glennies Creek. If Glennies Creek is blocked all waters from Maison Dieu in Singleton downstream will be without water. This will have a huge economic impact on wineries, other agriculture and tourism.	A. The Bowmans Creek Diversion project does not involve mining by Top Coal Caving methodology. Specialist impact assessment reports (subsidence, groundwater, flooding and geomorphology, water balance modelling and aquatic ecology assessments) have concluded that the Bowmans Creek Diversion Project will have no significant impact on the surface water flows of the Hunter River. The proponent for the project maintains that no adverse impact will be occasioned to downstream industries which rely upon reliable overall water flows associated with the Hunter River.
	B. The Hunter Valley is an earthquake area. There have been numerous quakes in this valley over the centuries. Some of the recent quakes are: 07.09.1981 – 4.2 Richter Scale, 17.06.1983 – 3.5 Richter Scale, 17.07.1991 – 3.2 Richter Scale. The Top Coal Caving mining could exacerbate this	B. All ACOL mining operations are designed by appropriately qualified geotechnical engineers to ensure safe working conditions for employees, contractors and visitors to the operations. The Bowmans Creek Diversion project does not involve mining by Top Coal

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	potential danger.	Caving methodology.
	C. Top Coal Caving mining operation is being used at the Austar Mine near Cessnock. The Austar Top Coal Caving has resulted in tremors that are being picked up by the seismograph in Canberra.	C. The Bowmans Creek Diversion project does not involve mining by Top Coal Caving methodology.
	D. These two mine plans are interrelated and are dangerous to Glennies Creek.	D. The Bowmans Creek Diversion project and the ACOL South East Open Cut project are stand alone mining projects within ACOL's existing mining tenements. The 2001 EIS predicted impacts on all water sources in the vicinity of the ACP. The ACP was approved by the Minister for Planning prior to the introduction of the regulated and unregulated river and connected alluvium water sharing plans. The Bowmans Creek Diversion project is a modification to the existing ACP development consent and the predicted impacts are within the limits assessed and approved within the original consent. The Bowmans Creek Diversion project is not dangerous to Glennies Creek. The South East Open Cut project is subject to a separate application and not "tied" to the Bowmans Creek Diversion project or vice versa.
	E. This proposal should not be allowed to proceed. There are too many uncertainties both ecologically and health wise. The water, the surrounding environment and the residents are far too important.	E. Refer to Submission 11, Response C.
	F. There is no written or verbal agreement to purchase "Rosedale" property.	F. The Bowmans Creek Diversion project does not rely upon nor require the acquisition of the Rosedale property.
14. B Whitten.	A. Objects to the Bowmans Creek Diversion project on the basis that it will have severe adverse effects on water supply and quality on my community and region.	A. Refer to Submission 11, Response C.
	B. The objector is a farmer and user of the regulated Hunter River (water) resource as well as unregulated and ground water resources.	B. The objectors' comments and usage of the various sources of water (regulated Hunter River, unregulated and ground waters) is noted.
	C. Supports in total the submission made by the Hunter Valley Water Users association – of which the objector is a member.	C. Refer to Submission 17, Responses A, B,C,D,E and F.
J Wokes.		The submission is an objection to the South East Open Cut project – but the author has made reference to "Modification 6" and as such the following responses are offered.
	A. The proposed exclusion zone was 1 km in 2005. What has changed since then?	A. The 1km exclusion zone is not premised on scientific fact is not government policy and is contrary to the principle of treating applications on merit.

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	B. No more mines please.	B. The provisions of the Environmental Planning and Assessment Act, 1979 apply in respect to the Bowmans Creek Diversion project. The provisions enable the proponent to make application for a modification and, for that application to be treated on merit. The Minister for Planning (as the approval authority) through the Department of Planning will "weigh – up" the advantages and disadvantages of the project during its assessment of matters relevant to the application.
	C. The project threatens tourism.	C. The ACOL operations as with most other mining ventures act as a significant catalyst for the construction and continued operations of tourist facilities within the economic profile areas of Singleton, Cessnock, Maitland and Muswellbrook. Importantly, the tourism sector within Singleton has expanded in part to satisfy the demand for accommodation and food services associated with visitations to the mines for construction and operations business purposes.
15. Xstrata Coal (David O'Brien).	The thrust of the Xstrata Coal NSW submission is to advise of their coal mine operations and interests which are located in the general vicinity of the Ashton Coal Bowmans Creek Diversion project, and that their primary concerns relate to potential subsidence impacts on their existing and proposed coal mining operations and associated infrastructure, predicted groundwater impacts including potential seepage into the Ravensworth Underground Mine (RUM), road traffic impacts, impact on the water management infrastructure associated with operations and reject emplacement constraints: -	**General Response** The draft Statement of Commitments (refer to Section 13 of Volume 1 of the EA Report) specified that subsidence would continue to be managed and monitored as approved within the Subsidence Management Plan (SMP) process. Therefore consultation will occur with the owner of surface infrastructure on at least a seam by seam basis. ACOL undertook consultation with Ravensworth Underground Mine (RUM) on 13 January 2010 to address the DoP concerns regarding timeframes for consultation. The meeting resolved to: Consult with RUM using the SMP framework and thereafter assessing – Impacts seam by seam. – Use subsidence and groundwater experts to assess the western longwall (i.e. LW/MW9 or LW8) – Provide ACOL access to RUM mine plans for the purposes of undertaking the required assessments. These resolutions will ensure the concurrent operation of the RUM and ACOL underground mines can be undertaken safely and efficiently. ACOL have reviewed draft Statement of Commitments (3.3) and provided a fresh commitment (3.5) with respect to the repair and maintenance of Brunkers Lane. These are reproduced below: – [NEW] ACOL will consult with Ravensworth Underground Mine using. the SMP framework and thereafter assessing impacts seam by seam – [REVISED] ACOL will use subsidence and groundwater experts to assess the western longwall to ensure concurrent operation of the RUM and ACOL underground mines can be undertaken safely.

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		– [NEW] ACOL will take responsibility to maintain existing surface infrastructure in a manner which is safe, serviceable and repairable. As such ACOL will mitigate or remediate damage to existing infrastructure that is not owned by the proponent. – ACOL commit to the maintenance of Brunkers Lane in its current form and status (not a public road) in a manner which is safe, serviceable and repairable.
	A. Further consideration of Ashton's proposed approach to the management of subsidence impacts on Brunkers Lane and the realigned Lemington Road be described so access to each road is not impacted in any way. ACOL has not made a commitment to manage or fund remedial works for subsidence impacts for the proposed realignment of Lemington Road which might be part of Xstrata Coal NSW future mining operations.	A. See General Response above. Lemington Road is a public road which provides public road access between the New England and Golden Highways. Currently, Brunkers Lane is a private access supporting minimal traffic and not a public road. This area will be undermined by ACOL and will be impacted by subsidence. ACOL has approved plans in place to manage the subsidence impact on Brunkers Lane as a private access. These plans were developed in consultation with the affected parties. ACOL has no plans for the management of cumulative subsidence effects on a public road. ACOL does not support the extension of the Ravensworth Operations Project over any part of its existing development consent, mining lease or approved underground mine area. Further, it does not support Xstrata's proposal to realign surface infrastructure, particularly Lemington Road, over an area of approved multi-seam longwall mining. ACOL will not make a commitment to remediate infrastructure proposed by mining operations that have not been approved nor constructed, refer to comments above. Xstrata Coal NSW need to be mindful of ACOL's approved and proposed mining operations by ensuring that the proposed infrastructure is appropriately located.
	B. Xstrata Coal NSW propose to realign a 330kV transmission line and includes the construction of a number of transmission towers within the vicinity of Bowmans Creek and in close proximity to the project.	B. ACOL is aware that Xstrata Coal NSW has recently submitted an EA Report for the Ravensworth Operations Project and that its proposed in part to realign the existing 330 kV transmission line. ACOL does not object to realignment of the existing 330 kV transmission lines on lands controlled by Xstrata that will not be impacted by ACOL mining operations.
	C. ACOL to provide further quantification of potential inflows impacts and appropriate assurance that the barrier will be subject to appropriate design monitoring and response to prevent uncontrolled flow of water from Ashton's operation into RUM workings.	C. See general response above.
	D. Xstrata Coal NSW want a strengthening of Ashton's commitment to ensure RUM operations and the safety of the workforce are not affected by uncontrolled inflows and that sufficient wet weather capacity has been appropriately considered and does not affect barrier design considerations.	D. See general response above.

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	E. Xstrata Coal NSW expect that groundwater loss from the alluvial system will be appropriately monitored and accounted for so losses can be clearly tracked and attributed to ACOL.	E. ACOL will undertake groundwater monitoring and reporting consistent with, approvals, permits, licences and commitments.
	F. Xstrata Coal NSW does not support the outcome that if the Bowmans Creek Diversion Project does not proceed that the impacts from other mines would result in a similar impact on Bowmans Creek baseflows.	F. This is a matter for resolution by statutory authorities refer Appendix 5, within Volume 2 of the EA Report.
	G. Xstrata Coal NSW seeks access to the ground water monitoring data in the Bowmans Creek alluvial area to further interrogate and verify their impacts on this alluvial system.	G. ACOL publishes its groundwater monitoring data in its Annual Environmental Management Reports which are publicly available.
	H. The proposed haulage route and site compound are within 20 metres of the Ravensworth Operations Lease and close to the Narama Dam spillway infrastructure and have not been considered.	H. The location of the haulage route and site compound have been considered in relation to the Narama Dam. The proposed haulage route, site compound and construction activities are wholly within ACOL's mine lease and are at least 200 metres distant from the Narama Dam. The Bowmans Creek Diversion project does not impact on the Narama Dam.
	I. The interaction of the proposed ACOL works with Ravensworth's existing approved water management infrastructure have not been identified or addressed, nor have the impacts of diversion channels and altered flows upon the existing Ravensworth Water Management Systems licensed discharge point been considered.	I. The proposed Bowmans Creek Diversion project will not impact upon the Ravensworth water management systems 'licensed discharge point' which is excess of 500 metres downstream of construction works associated with the project.
	J. The diversion may cause an alteration in the physical and chemical parameters of Bowmans Creek, which may impact on the continued approved discharge of water from the Narama Mine 1,000ML dam. The impact of this diversion proposal on the currently approved water management infrastructure and discharge arrangements for Xstrata have not been identified or assessed as part of the EA report. Further assessment in consultation with Xstrata Coal NSW, relevant agencies and the DoP is necessary.	J. The proposed Bowmans Creek Diversion project is wholly within the ACOL mining lease and will not impact upon the Ravensworth Water Management System. The proposed Bowmans Creek Diversion Project has been designed to not impede high flows which are required for the release of saline mine water under the Hunter River Salinity Trading Scheme from the Narama Dam.
	K. Further consideration by ACOL is required for Bowmans Creek EA Report traffic assessment on the likely timing and use of Brunkers Lane as part of the proposal in relation to planned construction activities by Xstrata Coal NSW for their future operations.	K. ACOL will not make a commitment to remediate infrastructure proposed by mining operations that have not been approved nor constructed, refer to response above. Xstrata Coal NSW need to be mindful of ACOL's approved and proposed mining operations by ensuring that the proposed infrastructure is appropriately located. ACOL will comply with the requirements of the NSW Roads and Traffic Authority (RTA).
	L. Seek clarification from ACOL of further details for the long term capacity and management of additional reject and tailing materials in the Ravensworth Voids and assurance that there will be no impacts on current existing and proposed operations within this area.	L. The Bowmans Creek Diversion project does not seek to modify the existing tailing management arrangements.

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16. Hunter Valley Water Users Association (A. Burns).	A. Waters of the Hunter River sustain agriculture, viticulture, electricity generation, town water supply and the equine industry. These industries are worth hundreds of millions of dollars to the state economy. The annual value of these industries may be damaged if a mining operation damages the river system.	A. Refer to Submission 11, Response C.
	B. Concerned at the proximity (of the project) to Bowmans and Glennies Creeks as well as the possible effect on groundwaters in the immediate vicinity. Concerned at the attempt to mine under Bowmans Creek and proposals to realign the creek.	B. The Bowmans Creek Diversion project is located within ACOL's existing mining tenements. The projects location is determined by the presence of the coal formations which happen to be situated between Bowmans Creek Glennies Creek and the Hunter River. The 2001 EIS predicted impacts on all water sources in the vicinity of the ACP The ACP was approved by the Minister for Planning prior to the introduction of the regulated and unregulated river and connected alluvium water sharing plans. The Bowmans Creek Diversion project is a modification to the existing ACP development consent and the predicted impacts are within the limits assessed and approved within the original consent. The Bowmans Creek Diversion project will have no adverse impact upon Glennies Creek. Glennies Creek is downstream of Bowmans Creek. Refer to Submission 6 Responses A, B and C and Submission 12 Response A.
	C. Concerned about longer term diffuse contamination of Bowmans Creek and or the Hunter River remain possibilities if the project proceeds.	C. The additional monitoring since the preparation of the original EIS has led to a number of fundamental changes in the understanding of the hydrogeology of the alluvial aquifer and its interaction with Bowmans Creek. It is now understood that prior to mining the Bowmans Creek alluvial aquifer contributed about 10 ML/year to the reach of Bowmans Creek between the New England Highway bridge and the Hunter River. The current contribution of baseflow from this section of the alluvial aquifer also contributes an estimated 36 tonne/year of salt to Bowmans Creek and the Hunter River. A positive impact of the proposed modification will be the removal of this salt load.
	D. Is the estimated 45ML of ground water losses which are proposed to be offset with existing licence holdings compliant with the Water Sharing Plan?	D. Refer Submission 11, Response B.
	E. The diversion could affect future flood behaviour.	E. The flooding impacts associated with the Bowmans Creek Diversion project have been the subject of a specialist study and are reported with the EA Report. The flood modelling demonstrates that the construction of the Bowmans Creek Diversion project and the subsidence of the landscape will not have a significant impact on flood conditions at the New England Highway bridge and will lead to a reduction in peak flow to the Hunter River because of the

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		increased floodplain storage volume in the subsided landscape.
	F. Needs to be consideration of cumulative effects of this proposal upon the waters of the Hunter Valley.	F. Specialist groundwater and surface water studies have been undertaken for the Bowmans Creek Diversion project and these studies have considered the cumulative effects of the project.
17. Hunter Environment Lobby (Jan Davis).	A. Objects to the Bowmans Creek Diversion project as the project proposal is unsustainable and the environmental impact conclusions are based on poor or incorrect information.	A. ACOL submits that the Bowmans Creek Diversion Project is sustainable and that the EA Report and specialist studies have the benefit of relating to groundwater, subsidence and environmental monitoring results for the first five years of open cut mining and three years of underground mining which has provided ACOL with a strong understanding and knowledge base for underground mining and assessment of potential impacts. The EA Report relies upon data obtained from extensive monitoring and application of best practice modelling and bench marking against industry case studies.
	B. The project will result in the destruction of alluvial aquifers and connectivity between surface and ground water systems whilst the diversion has not been considered in any planning framework.	B. Refer to Submission 12, Response E.
	C. Impact of loss of water on the Hunter River system may have serious implications on the Hunter River Salinity Trading Scheme. If more water is released from the Glennies Creek Dam to mitigate water quality impacts the consequence on water supply to other uses including Singleton's town water supply has not been taken into account.	C. The Bowmans Creek Diversion project will not impact upon the Hunter River Salinity Trading Scheme. This project will remove 36 tonnes/year of salt from entering the Bowmans Creek and Hunter River.
	D. No confidence in Felix Resources to operate in an environmentally responsible manner and manage surface water flows in rainfall events.	D. ACOL will construct and operate the project in accordance with approvals, licences, permits and its Statement of Commitments.
	E. River and creek diversions in the Hunter Valley have a history of environmental problems that are not adequately rehabilitated or restored.	E. ACOL will construct and operate the project in accordance with industry best practices, approvals, licences, permits and its Statement of Commitments.
	F. The Hunter Environment Lobby claims that the proponent is "double dipping" with job figures.	F. The Bowmans Creek Diversion project is "business critical" to ACOL as described in the EA Report. The development of the coal resource provides security for 195 employees and 35 construction employees as reported in the EA Report.
18. Singleton Shire Healthy Environment Group (Dr. J. Drinan).	A. Seeks the deferral of all mining projects (including the Bowmans Creek Diversion project) until the NSW Government conducts an independent Health Study that includes real time monitoring of airborne particulates and pollutants.	A. This is a matter for the NSW Government. The proponent requests that the Bowmans Creek Diversion project be processed and treated on its merit.
19. Rivers SOS (C. Russell).	A. Rivers SOS policy calls on the NSW Government to mandate and apply a 1 kilometre zone around all rivers in the state from mining. Rivers SOS take the view that any impact to a water course or water dependant ecosystem should be avoided.	A. Refer to Submission 15, Response A.
	B. Longwall mining (with associated subsidence) has been identified by the	B. Refer to Submission 12, Response I.

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	NSW Scientific Committee as a key threatening process.	
	C. In 2001 Planning NSW rejected the proposal on environmental grounds – nothing has altered to make that decision less sound.	C. Refer to Submission 12, Response A.
	D. Subsidence impacts associated with the project have not and cannot be adequately predicted and that there is a danger of the creek bed cracking. It is unacceptable that significant alluvial groundwater or surface water will drain as a result of cracking of the underlying Permian rocks. There is an unacceptable level of experimentation in the project. Mining four (4) seams will increase cracking leading to a modification of landform above the longwall panels and will partially drain the alluvium aquifers.	D. The Bowmans Creek Diversion project is an application by ACOL to modify an existing development consent (DA 309-11-2001-i). Conditional consent has been already granted on 11 October 2002 for a descending longwall mining operation targeting four (4) coal seams. The Executive Summary contains on page iii of Volume 1 of the EA Report a succinct summary of the project and is reproduced below: *"Based on the information that was available at the time of the 2002 development consent, it was thought that direct hydraulic connection between the Bowmans Creek alluvium and the underground workings occurring through connective cracking would allow upward migration of saline groundwater following completion of mining and result in an increase in the salinity of the Hunter River. On this basis and other uncertainties Planning NSW approved longwall mining beneath Bowmans Creek and its associated alluvium provided no direct hydraulic connection between the Bowmans Creek alluvium and the underground workings occurred through connective cracking. The original proposal included a 2.4km long diversion of Bowmans Creek, which was removed from the approved project.* *The current mine plan for the upper (Pikes Gully) seam, which has received subsidence management plan (SMP) approval, involves full longwall extraction in areas that lie outside the saturated zone of the Bowmans Creek alluvium and two "miniwalls" that run under the alluvium and sections of the creek. The term "miniwalls" has been adopted to describe narrow longwall blocks designed to minimise subsidence and thereby satisfy the current development consent constraint in relation to direct hydraulic connection between the Bowmans Creek alluvium and the underground workings through connective cracking). Notwithstanding the SMP approval for the use of miniwalls in the Pikes Gully seam, miniwalls have the disadvantage of being inefficient in terms of resource extraction, having questionable economic viability and potential uncertainty in relation to the degree of subsidence that would occur as a result of their use in the lower seams.* *In the light of extensive groundwater monitoring and better understanding of subsidence, ACOL has prepared a revised mine plan for the more efficient extraction of the coal resource in the vicinity of the Bowmans Creek alluvium which addresses the key issues of concern at the time that the original consent was granted. ACOL now considers that options are available that would allow diversion of the creek and the implementation of alternative mining plans which would result in acceptable environmental impacts whilst providing reserve optimisation, business sustainability and employment security.*

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		ACOL seeks to modify the 2002 development consent to provide for: *1. Underground mining operations which may result in a direct hydraulic connection between the Bowmans Creek alluvium and the underground workings occurring due to subsidence cracking;* *2. The relocation of sections of Bowmans Creek to mitigate subsidence* *3. Impacts resulting from 1. above; and* *Extraction of coal from the Upper Liddell seam, Upper Lower Liddell seam and the Lower Barrett seam in the western most area of the approved underground".* In addition the proposed development consent modification of DA 309-11-2001 (MOD 4) to authorise the development and mining of an additional longwall panel in the Pikes Gully seam was approved on 26 March, 2010 The project is a business critical project to ACOL that will ensure the job security of 195 personnel and the long-term sustainability of the mine and therefore its contribution to the local, state and federal economies. The diversion project seeks to ensure that the integrity of the BowmansCreek as modified is maintained whilst clearly stating that there may be a direct hydraulic connection between the alluvium and underground workings. As consequence of the 2002 development consent being granted it was accepted that the landform above the coal resources which was to be mined would be modified.
	E. The geology of the proposed mine and diversion area is not fully known.	E. The geology of the Camberwell/Ravensworth area is well known and understood by the proponent, mining industry and government agencies.
	F. By the end of mining 39ML of water per year will be lost from the base flows of Bowmans Creek taking 60 to 100 years to recharge – this is contrary to the principles of Ecologically Sustainable Development – Intergenerational Equity Rivers SOS reject the "new understand" and argue that the period of monitoring is too short to allow for any reliable conclusion upon which to base the project.	F. Refer to Submission 11, Response A, and to Section 14.4.5 of Volume 1 of the EA Report.
	G. The clay liner proposed beneath the two creek diversions needs to be "performance tested".	G. Refer to Submission 7, Responses B & C.
	H. The diversion shortens the stream length with a consequent loss of natural pools. The offsets on creek flow rates and ecosystems health is unknown.	H. The stream length will be reduced by 198 metres in length or 3.2% between the existing creek and proposed channel diversion. Bowmans Creek will be impacted by a baseflow reduction which progressively increases to a total of 37.5ML/year by the end of mining and about 20ML/year after 100 year recovery. Aquatic mitigation and offsets proposed are: – Increase width of diversions, such that there is an increase in pool area. – Incorporation of additional aquatic habitat (large woody debris) in the

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		diversions. – Incorporation of fish friendly riffle and rock bar structures. – Provision of backwater resting pools to assist fish migration. Fauna mitigation and offsets proposed are: – Provision of replacement hollows or nesting boxes at a ratio of 3:1 within the riparian corridor. Flora mitigation and offsets proposed are: – The diversions will be planted with 7.3ha of terrestrial riparian woodland of similar or better composition. Agricultural mitigation and offsets proposed are: – In the case while the fenced riparian corridor will naturally revegetate and be of the diversions these areas will be replanted with woodland managed for weed and erosion control measures. Surface Water flow mitigation and offsets proposed are: – Impermeable barrier under the diverted sections to minimize loss. Residual loss will be off set against existing licences. Surface Water Quality mitigation and offsets proposed are: – Salt load to the Hunter reduced by 36t/year. – Exclusion of stock from riparian zone will reduce sediment load resulting from stock trampling. Diversion channels will be provided with erosion protection matting and dense planting in zone immediately adjacent to the channel below the 1 year flood level – Temporary low block banks (overtopped in 6 month flow) to reduce the risk of flood damage in early stages of rehabilitation in diversion channels. Subsidence mitigation and offsets proposed are: – Construction of diversion channels to minimise impacts to the creek. – Partial extraction under the functional sections of creek – Create free draining landscape by construction of drainage or filling of subsidence troughs. – The mitigation and offset measures proposed should ensure ecosystem health of lower reaches of Bowmans Creek is maintained and enhanced
	I. Re-entry of the diversions channels into Bowmans Creek will lead to stream degradation because of increased stream energy levels and doubts the design can accommodate extreme floods such as that which occurred in 2007.	I. Refer to Submission 7, Response B for general response The analysis of flow conditions for a range of floods that includes floods larger than the 2007 flood is presented in Appendix 6. The analysis considers the hydraulic conditions along the full length of Bowmans Creek

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		from upstream of the Highway to the Hunter River, including the locations at which the diversion channels join the existing creek. The subsequent assessment of bed and bank stability (see Appendix 7) was based on the hydraulic data from the flood analysis and, as noted in Section 9.4.1, included a short section of existing channel upstream and downstream of the diversion channels (ie the points at which the diversion channels re-enter the existing creek). The analysis shows that there is no significant increase in stream energy levels or stability of the bed or banks at the points where the diversion channels re-enter the existing channel. This is to be expected because the design of the diversion channels mimics the existing channel.
	J. The NSW DoP must follow the provisions of the Water Management Act, 2000 and Water Sharing Plans – The project is contrary to the above legislation. Rivers SoS rejects the use of offset strategies for losses of water from the creek and groundwater systems. There are no provisions in the Water Management Act, 2000 to offset water only to trade or transfer entitlements.	J. Refer Submission 11, Response B.

3 STATEMENT OF COMMITMENTS

This document has provided ACOL's response to submissions as requested by the Department of Planning. As a consequence of reviewing the submissions ACOL has revised its commitments for the project as shown within **Table 3** below.

Table 3: Statement of Commitments

Item	Description
1.	**Mining**
1.1	All mining will be undertaken within the approved mining lease.
1.2	The final extraction design of each subsequent seam below the Pikes Gully seam, including whether longwall panels are stacked or offset, will be subject to the results of impact monitoring and subsidence from the preceding seam and would be detailed in an SMP consistent with the current SMP approval process.
2.	**General**
2.1	Subsidence troughs will be reshaped and fill will be used where practicable to create a free-draining landform. This approach is expected to reduce the potential for surface pooling and inflow into the mine.
2.2	The diversion channels will be constructed in accordance with the civil and landscape designs (**Plan Sets 2 and 3**) including the placement of an impermeable geosynthetic clay liner under the bed to eliminate baseflow losses from the constructed channels.
2.3	A geosynthetic clay liner will be placed under the low flow section of the diversion channels to minimise loss of base flow from the diversion sections of the creek.
2.4	All workers involved in the construction of the diversion channels and block banks will receive site specific induction that includes requirements for good environmental management including minimisation of noise and dust, erosion and sediment control, Aboriginal heritage, avoidance of fuel spills and waste management requirements.
3.	**Subsidence Monitoring and Mitigation**
3.1	ACOL will review and modify mine plans in response to actual subsidence and geotechnical behaviour associated with mining in the deeper seams based on monitoring experience, expert interpretation, and other advice.
3.2	The Southern limits of LW5, LW6 and LW7 will be offset at least 200m from the Hunter River alluvium.
3.3	ACOL will continue to monitor and manage subsidence as approved within the SMP process. Particular actions that will be included in the SMP process are:- • A continued strategy of monitoring of subsidence over Longwalls 1 to 4 in the lower seams as each seam is mined will allow more accurate predictions of subsidence parameters above Longwalls 5 to 8. (Per Condition 3.27 of the Development Consent). • Complete End of Panel Reports with particular reference to subsidence. • ACOL will refine the multi-seam panel geometry below Bowmans Creek to ensure long term overburden bridging below the creek if ongoing monitoring and numerical modelling of multi-seam operations indicates that this is necessary. • ACOL will consult with Ravensworth Underground Mine using the SMP framework and thereafter assessing impacts seam by seam.

Item	Description
	• ACOL will use subsidence and groundwater experts to assess the western longwall to ensure concurrent operation of the RUM and ACOL underground mines can be undertaken safely. • ACOL will take responsibility to maintain existing surface infrastructure in a manner which is safe, serviceable and repairable. As such ACOL will mitigate or remediate damage, from the effects of ACOL induced subsidence, to existing infrastructure that is not owned by the proponent
3.4	ACOL commits to complying with existing development consent conditions such as:- • Condition 3.16:- No tunnelling or mining shall occur directly underneath the piers or abutments of Bowmans Creek Bridge. The RTA must approve access tunnel layouts in the vicinity of the Bridge. • Condition 3.17:- The angle of draw for the mine subsidence after removal of the coal is to be kept outside of the New England Highway Road Reserve.
3.5	ACOL commit to the maintenance of Brunkers Lane, from the effects of ACOL induced subsidence, in its current form and status (not a public road) in a manner which is safe, serviceable and repairable.
4.	**Groundwater**
4.1	The current groundwater monitoring network will be maintained and expanded to monitoring of water extracted from the mine workings as the lower seams are mined.
4.2	Three additional nested groundwater monitoring points will be installed in the alluvium and Pikes Gully overburden at the following locations: • Southwest of LW6A; • On the eastern side of LW6B near the downstream end of the Eastern Diversion; and • On the eastern side of LW6B near the upstream end of the Eastern Diversion. These monitoring points will be monitored monthly as part of the routine monitoring and weekly at the time that mining occurs in the Pikes Gully seam immediately below in order to detect any drainage of the alluvium.
4.3	An additional monitoring bore will be installed to the south of LW2 to provide monitoring down to the Lower Barrett seam.
4.4	Monitoring of the volume of water extracted from the mine workings will be undertaken for the life of mine.
4.5	Volumes and qualities of individual sources of groundwater inflows will be undertaken where separation of sources is possible.
4.6	Operational monitoring and response plans will be implemented in relation to the Bowmans Creek floodplain around Longwalls 6A and 6B, in order to assess and mitigate the operational risk posed by potential connective cracking between the underground mine and the surface water environment above the floodplain alluvium.
4.7	The ACOL Groundwater Trigger Action Response Plan will be reviewed and extended to include monitoring of the lower seam inflows as they are mined.
5.	**Water Licensing**
5.1	ACOL will offset, under existing Water Access Licences, 47.5 ML per annum to the Minister administering the Water Management Act 2000 for the loss of base flows in Bowmans Creek for the duration of underground mining.
5.2	At the conclusion of mining in the ACP underground operations, ACOL will permanently surrender existing Water Access Licences with a share component of 20 ML per annum to the Minister administering the Water Management Act 2000 for the loss of base flows in Bowmans Creek.
5.3	ACOL will account for water extracted from the underground workings under bore licences issued or required in accordance with the 2002 development consent and the Water Act 1912

Item	Description
6.	**Water**
6.1	Water level monitoring will be undertaken in two pools immediately above LW6B as part of the routine monthly monitoring program. While mining is occurring in LW6B, water levels will be monitored weekly.
6.2	ACOL will continue the existing surface water quality monitoring program.
7.	**Geomorphology**
7.1	Cross section survey will be undertaken every five years or immediately after a flood that has a peak flow greater than 150 m^3/s (about 5 years ARI) at all existing cross sections in the existing creek. For purposes of this commitment, flow will be determined from the Office of Water gauging station.
7.1a	Cross section survey will initially be undertaken after 6 months, one year and two years from completion of construction of the diversion channels.
7.2	Cross section survey will be undertaken every five years or immediately after a flood event that has a peak flow greater than 150 m^3/s (about 5 years ARI) at 10 new cross sections and along the thalweg of each diversion channel. The cross sections will be established to be representative of the various geomorphic forms within the channels.
7.3	At the same time as the surveys, bed samples will be collected from four locations in each diversion channel (two pools and two riffles). Samples will also be collected from eight comparable representative sites in the remaining functional sections of the creek for statistical comparison.
7.4	If there is a variation of more than 20% in the statistics of the data from the diversions compared to the existing channel, ACOL will commission an appropriately qualified geomorphologist to investigate the causes and recommend any remedial actions.
8.	**Construction of Diversion Channels**
8.1	Erosion and sediment control for the construction works will be undertaken in accordance the relevant aspects of the ACP *Erosion and Sediment Control Management Plan* and *Soil Stripping Management Plan*, and the specific site details shown on the relevant civil engineering design drawings (C045 – C047).
8.2	Topsoil will be separately stockpiled within the designated stockpile areas in accordance with the existing ACP *Soil Stripping Management Plan* to provide a resource for subsequent placement of topsoil onto excavated batters and soil stockpiles.
8.3	During and immediately after mining of the Pikes Gully seam groundwater monitoring together with visual monitoring of stream flows and pools within Bowmans Creek will be undertaken. If there is any indication that significant drainage of the alluvium is occurring, or there is loss of stream flow, due to cracking the full height block banks will be constructed immediately.
8.4	Noise nuisance will be minimised by limiting the use of heavy machinery for construction of the channels to daylight hours (7am-6pm) seven days per week.
8.5	Dust generation on the Project Area will be minimised by implementation of the following: • Disturbed areas will be minimised; • Dust suppression water spraying (water trucks) will be used on all active haul roads and stockpile areas where required. • Prompt revegetation following completion of earthworks.
8.6	Existing ACP monitoring for dust and noise will continue throughout the construction program.
8.7	Advance warning signage will be installed on the New England Highway for the duration of the creek diversion works.

Item	Description
8.8	The detailed construction works to be undertaken in the base of the channel excavation in order to create the geomorphic and habitat features (pools, riffles and cobble beaches in the low active floodplain, rock bars and a rock ramp; engineered log jams) will be undertaken under close supervision of an experienced fluvial geomorphologist. .
9.	**Rehabilitation and Land Management**
9.1	All areas in which filling of subsidence troughs occur will be topsoiled and revegetated in a manner that is consistent with the final land use.
9.2	Landscape restoration will be undertaken in accordance with the *Landscape Restoration Report,* the *Landscape Design Drawings* and the existing ACP *Landscape and Revegetation Management Plan* and *Weed Management Plan.*
9.3	A staged program of vegetation establishment will be undertaken in accordance with the staging set out in the *Landscape Restoration Report.*
9.4	Weed control will be regularly undertaken within the rehabilitation areas in accordance with ACOL's *Weed Management Plan* with particular attention during the first 12 to 18 months after initial vegetation establishment, so as to facilitate the colonising of the great majority of available niches by native species.
9.5	In the event of significant flood damage to the channels, ACOL commits to prompt full restoration works in accordance with the *Landscape Restoration Report* and the *Landscape Design Drawings.*
9.6	Stock proof fencing will be installed and maintained along the boundaries of the rehabilitation works on the diversion channels. Stock proof fencing will also be installed along both banks of the existing creek (at least 5 m from the alignment of any riparian trees) for the full length of the existing creek between the New England Highway and the Hunter River.
9.7	Where required, stock watering troughs will be installed at strategic locations on pasture areas adjacent to the creek.
10.	**Riparian and Aquatic Habitat**
10.1	ACOL's existing Flora and Fauna Management Plan will be updated where necessary to ensure the management of riparian vegetation, threatened species and habitat creation reflect the specific features of this project.
10.2	Any isolated trees that have been identified as providing hollows, and which are located close to the construction and stockpile areas, will be protected with orange barrier netting during construction.
10.3	Fish passage will be maintained in the diverted creek sections under at least moderate flow conditions.
10.4	Resting pools will be included within the diverted creek sections.
10.5	Large woody debris will be used to restore aquatic habitat.
10.6	The collection of any seed from local plants of River Red Gum will be conducted under the appropriate licence or certificate under the Threatened Species Conservation Act 1995.
11.	**Aboriginal Heritage**
11.1	All workers involved in construction will be given a site induction that includes awareness of the location of aboriginal heritage sites in the area, prohibition on entering identified sites and procedures to be followed in the event of any Aboriginal artefacts be detected during construction work.
11.2	Should any Aboriginal artefacts be detected during the Project, work in that location will cease immediately and the finds will be reported to the ACOL Environmental Manager. At which time the Management strategy as defined in the ACOL *Archaeology and Cultural Heritage Management Plan* will be implemented in accordance protocols with agreed with the Aboriginal community. Work will not recommence in the area until instructed to do so by the ACOL Environmental Manager.

Item	Description
11.3	Methodologies that will be employed to ensure that no inadvertent impacts occur at the Waterhole Site where earthworks will be in close proximity: Clear fencing of the site to form a boundary between contractors and the outer perimeter of the site. Inclusion of a work method statement (WMS) that outlines the responsibilities of contractors in order to ensure that the site is not impacted and which outlines the repercussions of not adhering to the WMS (ie. Fines etc. administered by DECCW). Inclusion of a cultural awareness component in the general induction of contractors working on the project.
11.4	The management for sites and areas of potential Aboriginal heritage impacted by the proposed diversions will be developed in consultation with the registered Aboriginal Stakeholders, and approved through the SMP approval process.
11.5	The oral history of the area will be recorded through consultation with relevant Aboriginal stakeholders, local landowners and other sources as appropriate to inform mitigation measures during construction.
12.	**Environmental Management Systems and Plans**
12.1	Environmental management of this project will be undertaken using existing *Environmental Management Strategy: Phase 2 Underground Mining Operations* to manage, mitigate, or monitor impacts associated with this Project.
13.	**Environmental Monitoring and Reporting**
13.1	ACOL will undertake ongoing environmental monitoring as detailed in this EA.
13.2	An Annual Environmental Management Report (AEMR) will be prepared and forwarded to relevant government departments, including DoP. The AEMR will include a summary of all monitoring undertaken during the year, including a discussion of any exceedances and responses taken to ameliorate these exceedances.
13.3	The proposed completion criteria, the associated monitoring regime and selection of reference sites will be formalised in a Rehabilitation Management Plan to be prepared in consultation with relevant Agencies.

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Appendix 1: Morwell River Presentation

AUSTRALIAN CONSTRUCTION ACHIEVEMENT AWARD .06

Morwell River Diversion
ROCHE THIESS LINFOX (RTL)

Howard Spark & Laurice Temple

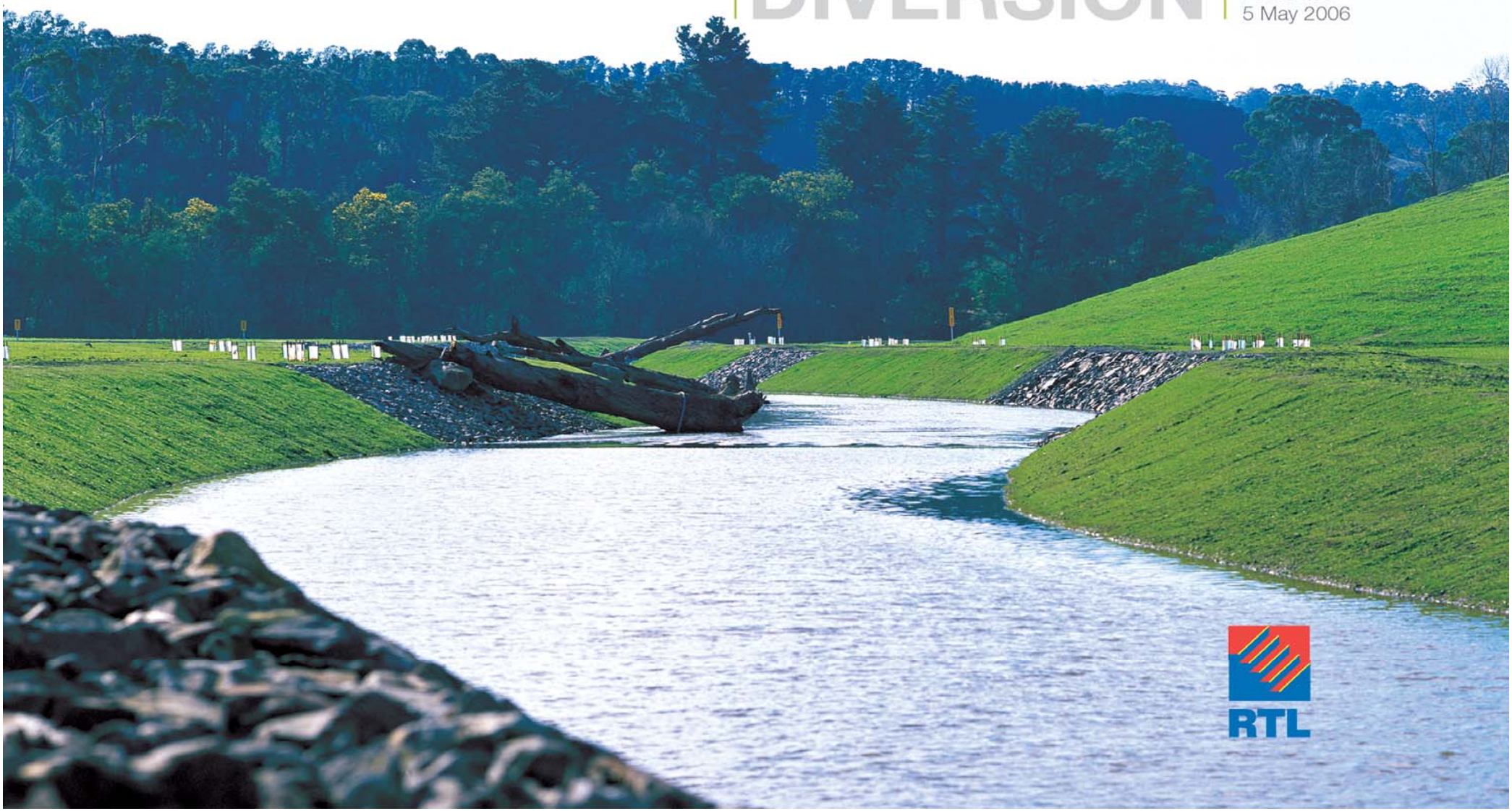
Winner

Victorian ENGINEERING EXCELLENCE Awards 2005

MORWELL RIVER DIVERSION

Australian Construction Achievement Award 2006

Presented 5 May 2006



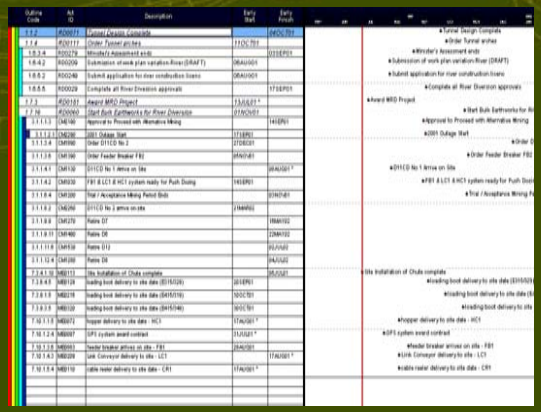
RTL

The Challenge in 2000

- Yallourn Energy (now TRUenergy) called tenders for a new river diversion with novated design
- Invited alternative submissions which had lower cost
- RTL proposed alternative route on an embankment through workings
- Benefits to Yallourn substantial
  - ✓ Much lower cost (~$40m less)
  - ✓ Increase in coal reserves
  - ✓ Would not have to divert again
  - ✓ Built from O/B (mining cost less)
  - ✓ Less disturbance to natural river

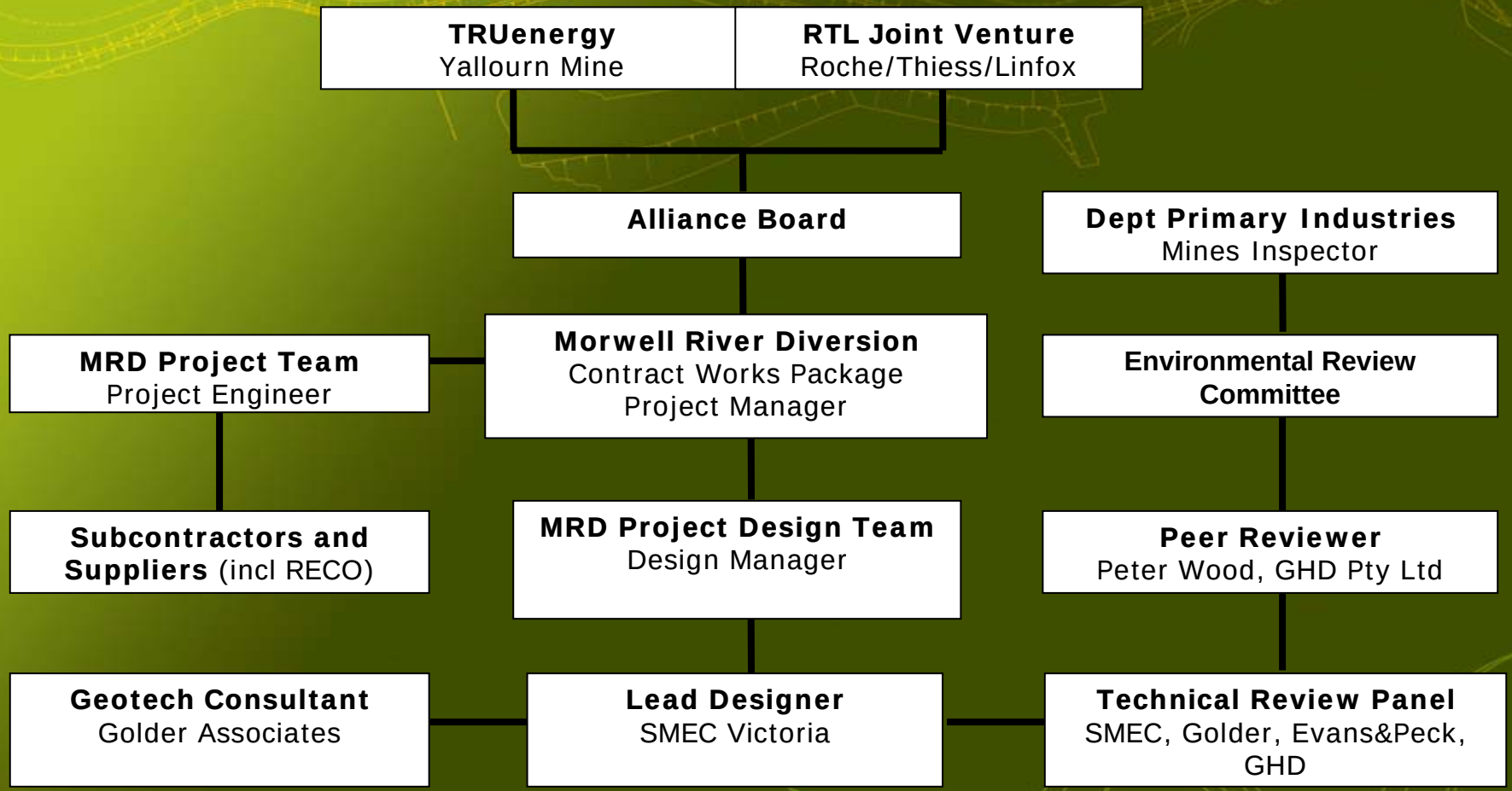
Good idea, but…

- The alternative scheme had no planning approval or detailed design
- A team was put together to:
  - Redraft and resubmit the EES
  - Liaise with EPA, WGCMA, LVCC & others
  - Facilitate public comment
  - Prepare a new work plan for the DPI
  - Confirm scheme feasibility & design details
- Original completion date of May 2005 still had to be achieved, ie no extension of time for the alternative scheme
- An alliancing arrangement had to be put in place between YE and RTL



MORWELL RIVER DIVERSION
Australian Construction Achievement Award 2006
First Submission 3 March 2006

Project Organisation



Diversion scheme

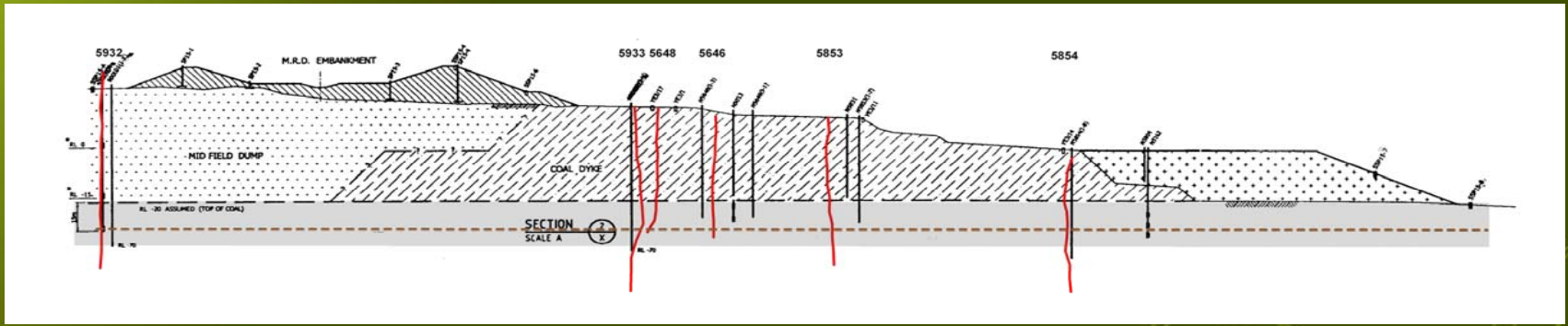
- Involved the Morwell River and the Morwell West Drain
- River diverted across the old mine workings
- Temporary drain diversion
- Overburden stripped from East Field Extension
- Permanent berm drain constructed around EFE
- Temporary diversion closed
- Mining proceeds into Maryvale

Scope of work

- Construct embankment with some 13 million m^3 of fill
- 3.5km of low flow channel, floodplain and revegetation
- 4 conveyor tunnels under the embankment
- 4 major services crossings: LY water main, ash, fire water, sewer
- Heavy vehicle access & mine access crossings
- Morwell West Drain temporary and permanent diversion

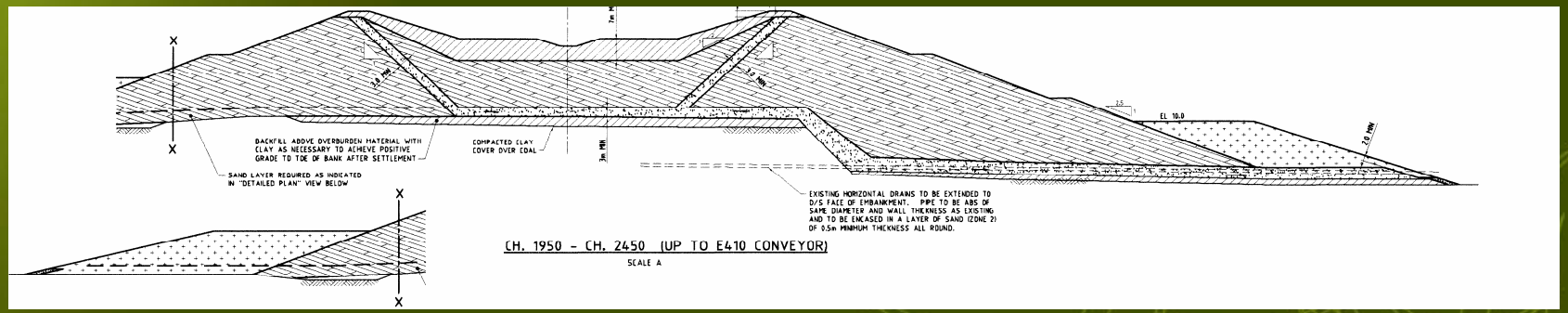
Design considerations

- Along the channel alignment, ground conditions comprise
  - Dumped overburden materials – unconsolidated randomly placed fill
  - Brown coal seams including high plasticity interseam clay bands
  - Some natural soils in cut sections at each end of the channel
- Predicted settlements up to 2 m – major consideration in design of embankment, tunnels and pipe crossings
- Stability issues caused by coal block sliding on clay bands



Embankment features

- constructed using overburden materials (clays & sands)
- clay liner on internal surfaces of channel
- sand/gravel zone to act as both filter and drain, to control seepage
- elsewhere, general fill to contain the clay and sand/gravel zones, and to suit stability requirements
- clay layer on horizontal coal surfaces to limit infiltration into coal



Embankment features

- Batter slopes 3H:1V internally 2.5H:1V externally
- Channel designed for 1:10,000 annual exceedance probability flood
- 70 m wide trapezoidal channel, 10 m deep
- 7 m wide berms at 15 m vertically on outside of embankment
- Instrumentation to monitor piezometric pressures and movements

Natural river channel features

- Low flow channel sized to contain 1 in 2 AEP flood
- lined with ND clay
- Channel grassed for erosion control
- Vegetation planted along stream banks
- Woody debris for fish habitat
- Rock riffles and bank protection in low flow channel

Stability Issues

- Lateral movement of coal dyke detected due to embankment loading during construction
- Movement taking place on clay seams below mine floor level
- Stability enhanced by
  - Limiting the rate of placement of embankment fill
  - Placement of toe weight on eastern and western sides
  - Installation of additional horizontal drains to reduce level of water table in coal dyke

Peer review outcomes

- The peer review process provided an independent review of the all aspects to the MRD design and construction
- The review was undertaken by an independent engineer (GHD) with geotechnical expertise in the Latrobe Valley.
- Peer reviews were undertaken at the end of each season and prior to diversion of the river
- Results to be reported to the DPI and the Environmental Review Committee
- All issues raised were closed out prior to diversion on 27 May 2005

Project Outcomes

- Health and Safety
  - 710,000 hours worked
  - LTI frequency rate 2.8
- Environmental
  - No significant disturbance to local communities
  - Preserved Strezelecki gums
  - Enhanced river environment
  - Established 40,000 plants
- Industrial Relations
  - No lost time to disputes

Project Completion

- Project completed on time and under budget
- Alliance, community, industrial, engineering and risk issues all managed successfully
- Savings initially envisaged for the Yallourn mining operations were realised
- River successfully diverted on 27 May 2005 to the satisfaction of all of the stakeholders

Thank You For Your Attention

Morwell River Diversion

AUSTRALIAN CONSTRUCTION ACHIEVEMENT AWARD .06

ACAA.06 Technical Conference

5th May 2006

Appendix 2: Morwell River Paper

MORWELL RIVER DIVERSION PROJECT

Howard Spark[1]

Laurice Temple[2]

ABSTRACT

TRUenergy (Yallourn) owns and operates an open cut coal mine and power station at Yallourn in the Latrobe Valley, Victoria which supplies about 20 per cent of Victorian's electricity requirements. Further development of the mine meant that the Morwell River had to be diverted to allow access to further coal reserves. The reserves in the existing pit will be exhausted in 2007.

In 1999, tenders were called for the diversion of the river. The Environmental Effects Statement (EES) and engineering design had been completed and it was proposed to novate that design to the successful tenderer. At the same time, Yallourn encouraged tenderers to submit alternative proposals which would be more cost effective.

The Roche Thiess Linfox Joint Venture (RTL) submitted an alternative involving the rerouting of the river back through the old workings on an embankment. The alternative design involved the placing of 13 million m^3 of mine overburden fill over a diversion length of some 3.5 km and the construction of 1.3 km of tunnel structure. RTL entered into an alliance agreement with the owner, resubmitted the EES, obtained revised planning approval, overcame technical difficulties associated with the foundation materials, negotiated a new site agreement and undertook construction of the works for completion within the original time frame and at a saving of some $80m to the client.

KEY WORDS

Morwell River, river diversion, earthworks, construction, coal mine.

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2 Former Project Manager, Morwell River Diversion Project, Roche Thiess Linfox Joint Venture, 68 Ricketts Road, Mount Waverley, VIC 3149.

INTRODUCTION

Yallourn has been operating as a power generator since 1921. The power station currently obtains its coal feed from the East Field open cut pit located to the east of the power station. This pit commenced operation about 15 years ago and will be exhausted in 2007. Additional coal reserves are situated further to the east and to the south of East Field but the Morwell River flows in a former river diversion between the existing mine and the new coal reserves in the Maryvale Field. The former diversion accommodated the low flow of the river in a buried 3m diameter concrete pipe which, while providing a sound engineering solution, did not provide a natural river environment.

The concept for the development of the Maryvale Coalfield envisaged the diversion of the Morwell River around to the eastern side of Maryvale in a revegetated open channel which mimicked the natural sections of the river. To support this concept, a detailed design and EES were completed and the diversion put out to tender in 2000. An innovative and highly cost-effective alternative tender was received from the Roche Thiess Linfox Joint Venture which proposed a different route for the diversion. This novel solution involved the placement of the river on an embankment constructed through the old mine workings. The alternative proposal had a number of advantages including shorter distance, utilisation of waste mine overburden, provision of access to additional coal reserves, significantly less environmental impact and reduced cost of some $80 million under the conforming tender solution. This saving was particularly attractive to the power station owner since after privatisation of the industry, they were operating in a highly competitive electricity market.

While the alternative offered considerable cost savings over the conforming tender design, it did present considerable problems with regard to project approvals and timing. The alternative design was a significant departure from the original concept which meant that a supplementary environmental impact statement had to be prepared and new Ministerial planning approval sought. The task of obtaining the necessary approvals was extremely complex and involved liaison with numerous government departments and other interested community groups. The time required to obtain these approvals meant that construction had to be compressed in order to still comply with the requirement to access new coal areas by 2006. Failure to provide the access to the coal would have resulted in the closure of the power station which currently supplies about 20 per cent of Victoria's electricity. The consequences of the project failing to deliver were enormous.

Aside from the planning issues, there were also a number of key technical issues unresolved at the time of the submission of the alternative proposal and some scepticism as to the technical feasibility due to the high risks associated with these issues. The main items that needed to be addressed before a final decision to proceed could be made were:

- the hydraulics of the diversion system, in particular flood levels upstream of the diversion and the possibility of flooding adjacent mines and key infrastructure such as the Princes Highway; and
- the stability of the river embankment as it was going to be built on top of several different types of existing foundations. A portion was to be partly founded on previously dumped unconsolidated overburden materials which had dubious strength parameters, as well as a coal dyke between Midfield and Eastfield

These issues were addressed in 2000/2001 through extensive FLAC modelling and the construction of a trial embankment. This work confirmed that a viable arrangement could be developed and a concept design for the alternative diversion was prepared in 2001, following which the detailed design of the works was undertaken.

A Supplementary Report was subsequently prepared to the original EES to enable the relevant authorities and members of the public to review the environmental effects of the alternative proposal. The Supplementary Report and submissions from interested parties were considered by the relevant government Ministers and a Work Plan variation under the Mineral Resources Development Act (1990) were formally approved for the alternative proposal in January 2002.

In March 2001, Yallourn Energy and RTL agreed to enter into an alliance agreement for various works at Yallourn including the design and construction of the alternative Morwell River Diversion (MRD). To enable the project to stay on target, the initial Works started without the Alliance Agreement fully established and signed off. Whilst it was identified as a risk, the Alliance team members worked closely to keep the common goal in mind while commencing the Works as well as setting up the Alliance parameters and associated Agreement. This bold move proved to be a positive one that clearly created a strong Alliance bond at the beginning, and was only further strengthened from there on.

In June 2001, SMEC Victoria Pty Ltd was engaged as the lead designer for the project with Golder Associates Pty Ltd as the geotechnical engineer and GHD Pty Ltd as the peer reviewer. The Reinforced Earth Company was engaged to design the tunnel structure and to supply the precast concrete tunnel units.

PROJECT SCOPE

The principal components of the alternative design for the diversion comprised:

Diversion Embankment

The river diversion comprises a low-flow channel located in a 70m wide flood plain. Along most its length, the channel has been formed by construction of an embankment. Some excavation was required at each end of the channel where the existing ground is locally high relative to the channel invert and crest levels.

Services Relocation

Construction of the diversion channel required relocation of a number of major services associated with the existing mine, including;

- southern and northern fire service mains,
- Loy Yang Low Quality (LYLQ) water main,
- ash pipelines, and
- Gippsland Water sewer main.

All the services were realigned to pass under the diversion channel. During their relocation, none could be taken out of service for more than a few days, since they all formed critical functions for the power generation. Failure to satisfactorily relocate the Loy Yang Low Quality water main, for example, could have seen the shut down of the Loy Yang power stations, the largest suppliers of electricity to Victoria. All the relocations were treated as individual projects in themselves due to the associated high risks if Works were not completed within the time constraints of the two Power Stations (Yallourn and Loy Yang) and Yallourn Mine.

Conveyor Tunnels

The MRD embankment crosses four existing coal and overburden conveyors. The coal conveyors provide the transport system for the power station feed. All conveyors were required to remain in operation during and after construction of the MRD. The conveyors were realigned and precast concrete tunnel arch units placed over them. These were subsequently covered by the diversion embankment fill. The depth of fill meant that the tunnel structures had to accommodate

settlement of up to 1.5m. The design of the tunnels incorporated segmental sections which were designed to accommodate the very large settlements predicted by the FLAC modelling.

Vehicle Crossings

Two heavy vehicle crossings (capable of supporting a D10 dozer and the stacker) were provided across the river channel, one near each end of the diversion channel. Both crossings incorporated a series of box culverts across the low-flow channel, with access roads extending up the banks of the flood plain on each side of the river. The final design changed dramatically from the initial design, which was only picked up and communicated as a potential issue by the Construction Team as a part of the ongoing Alliance partnering atmosphere. The movement of the stacker had not even been fully contemplated by the Mine, as it wasn't going to be moved for some 5-10 years, until raised by the Construction team to the Mine staff. Subsequently the Mine staff reprioritised their resources to support the MRD design and construction schedule.

Levees

The Yallourn Mine incorporates a series of levees adjacent to the Morwell and Latrobe Rivers to provide protection against flooding. The hydraulic modelling undertaken indicated that these were necessary to protect critical Latrobe Valley infrastructure and to maintain a 1 in 10,000 year flood protection to the mine. The Yallourn Mine Levee, which protects the southern side of the mine, upstream of the MRD, had to be raised. The Latrobe River Levee is located along the northern side of the mine adjacent to the Latrobe River. With the extensions to the development of East Field, a new section of levee needed to be constructed in the vicinity of the downstream end of the current Morwell River.

Morwell West Drain

The Morwell West Drain is located to the south of the Yallourn Mine, adjacent to the proposed Maryvale pit. The drain currently discharges into the existing Morwell River approximately 2km from its downstream end. As this section of the Morwell River will be excavated as part of the further development of the Yallourn coal field, it was necessary to divert the drain around the extended mine. The design of this part of the project proved to be particularly challenging since there was a stand of nationally significant Strzeleckii Eucalypt Gums along the watercourse which needed to be protected and the topography did not suggest and obvious diversion path. The ultimate design involved a lined watercourse constructed in the batters of the mine.

PROJECT CONSTRAINTS

Logistical problems

The river diversion had to be undertaken within an operating coal mine without disruption of the coal mining operations. A maximum of 12 hours supply of power station feed coal can be stockpiled in the raw coal bunker at the power station. Scheduling of the construction of the conveyor tunnels and liaison with mine and power station operators was a critical activity during the construction of this section of the works.

Other logistical problems were caused by the size of the project. The diversion itself is 3.5 km long and the borrow pits were up to 4 km from the diversion embankment. To minimize travelling time, a site office and compound was established remote from the power station near the principal borrow area.

The works were conducted within a coal mine and hence were subject to the requirements of the Mineral Resources Development Act 1990 which is administered by Inspectors from the Minerals and Petroleum Regulation Branch of the Department of Primary Industry. Normal construction work practices had to be modified to address particular hazards associated with the coal mine environment.

Weather conditions

Earthworks in the Latrobe Valley are severely limited by the wet weather experienced during the winter and spring. The effective season for earthworks extends from December to May, a period of about six months. Traditionally, bulk earthmoving machinery is stood down during wet period, along with the majority of the workforce. This proved to be a challenge, particularly with a workforce who was partly drawn from redundant employees from the Yallourn Mine and who were not accustomed to stand-downs. Earthworks were programmed to commence in November 2001, however, extended rains during the winter season meant that significant earthworks could not commence until January 2002, which put further pressure on the project team to achieve the completion date.

Workforce factors

Even with the challenge of working with the Workforce to continually address the their concerns due to highly differing conditions from what they were used to working in, along with a traditionally highly unionised atmosphere, over 710,000 man-hours were expended over the life of the contract with no Industrial Relations lost days and a Lost Time Injury Frequency Rate of 2.8. This close partnership between Management and the Workforce contributed to the success of the on-time completion of the project.

Community concerns

The proposed development lay between the communities of Yallourn North and Morwell. The potential impact on these communities was recognised, particularly with regard to the generation of noise and dust from the construction works. The construction activities had to be restricted during severe weather conditions conducive to generating noise and dust problems.

Environmental issues

Flora and fauna assessments were undertaken for the original environmental effects statement. The recorded flora included one plant species of national significance (Strzeleckii Gum), one plant species of State significance (Green Scentbark) and 22 plant species of regional significance.

The recorded fauna included one species of State significance (Great Egret) and three species of regional significance; the Wedge-tailed Eagle, the Australian Hobby and the Blue-winged Parrot.

The alternative river diversion proposal was to have significantly less impact on the flora and fauna of the area and this was viewed positively by the planning authorities during their assessment process.

Another positive involved the enhancement of an existing weir with a purpose-built fish ladder so native fish could traverse the river upstream of the embankment for the first time in approximately 30 years.

Additionally, in the final season, there was considerable work around archaeological sites, waterways, and endangered fauna. When working around these identified environmentally sensitive areas the workforce was educated through various management methods to help gain “ownership” of the works and highlight the potential impacts.

Heritage Issues

The flood plains along the Morwell and Latrobe Rivers were recognised as areas of significance for aboriginal and early European heritage. The works would impact some of these areas and appropriate mitigation measures had to be included in the planning and construction process.

Stability Issues

Two critical geotechnical issues and potential high risk areas associated with the project related to the foundation conditions for the diversion channel. These were:

- the dumped overburden material, which comprise up to 60m depth of unconsolidated sand, silt, and clay, which are highly compressible and of low strength; and
- the coal dyke, which is located on so called interseam material which includes clayey material which has undergone significant movement and reduction in strength, associated with development of the adjacent coal mine.

Due to the technical uncertainty associated with the performance of the dumped overburden and coal dyke foundations, they were both subject to extensive investigations, including instrumentation, and detailed modelling and analysis, to assess their likely behaviour during and after construction of the works.

The embankment was constructed using the overburden materials that had to be stripped from above the coal required for future power station feed. The embankment was zoned to suit the technical requirements of the structure, including permeability, drainage and stability, and the mining sequence of Yallourn Energy. The structure was designed to standards appropriate for a major piece of civil infrastructure, namely large dams.

To ensure the integrity of the river and to prevent possible failure of the embankment through leakage from the river, a non-dispersive clay liner material had to be sourced. The locally available clays are generally highly dispersive in nature and this aspect of the project presented a great challenge to the project team. An extensive program of investigations and testing, including treatment, was undertaken to identify an appropriate source of liner material.

The source ultimately adopted was the Recent alluvial clay deposits associated with the former lower reaches of the Morwell River. These soils were found to be the most stable in the area, and had been subject to a similar regime as will occur in the diversion channel.

CONCLUSION

The completed project includes 13 million cubic metres^3 of engineered fill, 3.5 km of river channel, 1.3 km of conveyor tunnel and associated services and revegetation with 40,000 plants at a total cost of some $120m.

The project was completed on time and under budget with no lost time due to industrial issues and with a low lost time injury frequency rate for over 710,000 man-hours worked. The industrial record achieved is particularly significant given the challenging industrial environment of the Latrobe Valley.

The Alliance team, through innovation and commitment, achieved diversion of the river on 27 May 2005.

The successful completion of the diversion project realised substantial savings for TRUenergy

and has made a significant contribution to them being able to continue to access coal for the power station feed at competitive rates until at least 2032.