BYLONG COAL PROJECT – SURFACE WATER ISSUES

A. Personal Details

Name: Andrew James MARR
Address: [redacted]
Stratford Qld 4870

B. Qualifications

B Sc (Pure Mathematics and Computer Science), University of Sydney
B Eng (Civil), University of Sydney
M Eng Sc (Water), University of NSW
Grad Dip Natural Resources, University of New England

I have over 40 years of experience in surface water hydrology and water resources management studies for government, semi-government and consulting organisations, in over 13 countries. Relevant experience includes modelling of coal mining and power station water balances and flooding in the Hunter and Coxs River Basins, and for urban water supply for Sydney in the Hawkesbury-Nepean Basin. I have also been involved in water management studies including water availability modelling and flood modelling in major rivers basins of the world including Mekong, Blue and White Nile, Zambezi, Ganges and Murray-Darling. Many of these projects were for government agencies, with funding from major international financial institutions such as World Bank, Asian Development Bank or African Development Bank.

C. Documents Reviewed

PAC Review
 Bylong Final Assessment Report (Executive summary, pp 2-4; Water resources pp 10-15 of 53)

KEPCO Response to PAC Review
 Main Report (Executive summary pp i-iv, Water resources pp 21-36 of 106)
 Appendix F - Bylong Water Management Plan-part A
 Appendix F - Bylong Water Management Plan-Part B
 Appendix K - Groundwater Response to Planning Assessment Commission
 Appendix L - Letter to DPI-Water
 Appendix M - Surface Water Response
 Appendix N - Water Balance Peer Review

DPE Recommendation to IPC
 Bylong Final Assessment Report (Executive summary pp 3-16, Water resources pp 37-51of 122)
 Supplementary Information Main Report (Groundwater pp 34-38; Surface Water pp 38-40; Response to DoI pp 61-63 of 85)
 Supplementary Information Appendix H Updated Surface Water and Flooding Impact Assessment
 Additional Advice: Advice from AGE_ Drawdown due to mining only

 Recommended Conditions to IPC

D. Declaration

I have prepared this expert report in response to a request from EDO NSW, on behalf of the Bylong Valley Protection Alliance in relation to the Bylong Coal Project.

I acknowledge I have read Division 2 of Part 31 of the *Uniform Civil Procedure Rules 2005* (UCPR) and the Expert Witness Code of Conduct in Schedule 7 of the UCPR and I agree to be bound by it. I wish to reiterate that I do not act as an advocate for either party and that any opinion expressed is based on my professional training, knowledge and experience..

I declare that I have made all the inquiries which I believe are desirable and appropriate (save for any matters identified explicitly in the report), and that no matters of significance which I regard as relevant have, to my knowledge, been withheld.

E. Summary

My opinion is that results of the additional studies as presented in the Documents Reviewed above have not changed my previous conclusions (contained in my Original Report contained at **Annexure A** below) in relation to the surface water hydrology impacts of the proposed Bylong Coal Project.

F. Conclusion

The documents relating to the project describe the detailed modelling and reviews that have been performed, but have failed to demonstrate that the Water Access Licences held by KEPCO will provide adequate water from the borefields to meet the water requirements of the mine when any occurrences of dry periods are very likely to result in the reduction of water allocations in the Bylong River well below 100%, possibly down to 0%. This will have the greatest impact during the early open cut mining phase. There is no discussion in the documents of the likely frequency or magnitude of possible reductions below 100% in the annual water allocation from the Bylong Water resource as a result of natural climate variations or of possible climate change.

Annexure A

BYLONG COAL PROJECT – SURFACE WATER ISSUES

Personal Details:

Name: Andrew James MARR
Address: PO Box 194
Stratford Qld 4870

Qualifications:

B Sc (Pure Mathematics and Computer Science), University of Sydney
B Eng (Civil), University of Sydney
M Eng Sc (Water), University of NSW
Grad Dip Natural Resources, University of New England

Over 40 years of experience in surface water hydrology and water resources management studies for government, semi-government and consulting organisations, in over 13 countries. Relevant experience includes modelling of coal mining and power station water balances and flooding in the Hunter and Coxs River Basins, and for urban water supply for Sydney in the Hawkesbury-Nepean Basin. I have also been involved in water management studies including water availability modelling and flood modelling in major rivers basins of the world including Mekong, Blue and White Nile, Zambezi, Ganges and Murray-Darling. Many of these projects were for government agencies, with funding from major international financial institutions such as World Bank, Asian Development Bank or African Development Bank.

Documents Reviewed:

- Bylong Coal Project Environmental Impact Statement (EIS) – particularly Appendix L Surface Water
- Bylong Coal Project Response to Submissions
- Bylong Coal Project Preliminary Assessment Report
- Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009 - Current version for 6 January 2017 to date (accessed 12 May 2017 at 10:04)

Declaration:

I have prepared this expert report in response to a request from EDO NSW, on behalf of the Bylong Valley Protection Alliance.

I acknowledge I have read the Expert Witness Code of Conduct in the Uniform Civil Procedure Rules 2005 and I agree to be bound by it.

Comments:

I have restricted my comments to the adequacy of the proposed water supply provisions to meet the predicted water requirements of the project.

A significant proportion of the water required by the project will be sourced from within the project site. This supply has been modelled and assessed in considerable detail through the groundwater modelling (that also addressed surface water-groundwater interactions) and the water balance modelling. The water balance modelling showed that there was a requirement

for additional water supply in the early years during the open cut operations. It is proposed to supply that water from two sources as summarised in Table 13 of the Department's Preliminary Assessment Report (Assessment Report, p71) which is reproduced below:

Table 13: Predicted Water Take

Water	Water Sharing Plan (WSP)	Predicted Peak Annual Water Take		Water Access Licenses held by KEPCO (units)*	Total Water Entitlements in Water Source (units)
		ML	Year		
Alluvial groundwater and surface water	Hunter Unregulated WSP (Bylong Water Source)	1,835	6	2,644	5,908
Permian hard rock aquifer groundwater	North Coast WSP	4,099	23	411 + current application for 2,093 (total 2,504)	90,000

* 1 unit equates to 1 ML in a 100% allocation year

The table notes that the Water Access Licences held by KEPCO are expressed in "units" under the Water Sharing Plan (WSP), and that 1 unit is equivalent to 1 ML in a "100% allocation year". There is no discussion within the documents of the likelihood of the reduction in the ML/year value of each unit during periods of low flow or of extended drought, when allocation is likely to be reduced well below 100%.

The Water Sharing Plan has not been developed to the same level for the Bylong River water source as it has for more highly developed river basins within the Hunter Basin. This affects the use of the Water Access Licences to determine the quantity of water available and permitted to be taken on a daily basis.

Under the Hunter Unregulated WSP Part 10 – Division 1 – Clause 47 (Current version for 6 January 2017 to date (accessed 12 May 2017 at 10:04)), it is noted that *"Compliance with the long-term average annual extraction limit is managed through the making of available water determinations, under section 59 of the Act, for access licences in these water sources".* Part 11 Division 3 Clause 59 addresses *"Establishment and assignment of total daily extraction limits".* This clause notes that Total Daily Extraction Limits have not been established or assigned for various water sources, including the Bylong River. Therefore, there appears to be no basis under the current WSP for translating the Water Access Licences held by KEPCO expressed in "units" into permissible water take from the Bylong River Water Source on a daily basis. There is no certainty, therefore, that the quantity of water required in any period of time (whether that be a day, a month or a year) will be permitted to be taken under the Water Access Licences, even if the water is actually physically available.

This uncertainty is not specifically addressed in the Assessment Report. However, there are indications in various parts of the report that there is some uncertainty about the provision of water from the Water Access Licences.

On page 5 of the Assessment Report there is the following statement that implies that there are uncertainties in the reliability of water supply to the mine:

KEPCO currently holds sufficient water licences to account for all the water required for the operation of the mine from the productive alluvial aquifers, but may require additional licences associated with the interactions of the mine with the deeper and poorer quality hard rock aquifers at some stage during the project. Both the Department and DPI-Water consider

there is sufficient depth in the market to accommodate the water take from the project. However, the Department has recommended that KEPCO be required to demonstrate it has adequate water supply prior to commencing both the open cut and underground operations.

There are related statements in other parts of the Assessment Report. The report notes that quite detailed groundwater and water balance modelling was conducted by various specialists, and that these models were assessed by other specialists. On page 57 of the Assessment Report it states that *"Water resources impacts of the project has involved reviews by some of the State's most respected water specialists. Based on these assessments the DPI-Water and Dr Kalf are satisfied that an acceptable prediction of the project's potential water resources impacts has now been undertaken, and that the assessments include sensitivity analysis to account for the range of potential water resource impacts."* In spite of this conclusion, it is stated in the following paragraph that DPI-Water *"considers that some uncertainty in groundwater predictions persists, and has recommended measures to address this during mining operations*".

Statements in the Bylong Coal Project EIS that could be interpreted as confirming the availability of water under the Water Access Licences may be misleading. For example, in Paragraph 9.2.5 Mine Site Water Requirements, the following statement appears:

The results of the water balance modelling (see Section 6) show that the existing water licence allocation from the bores of 2,535 units (currently equivalent to 2,535 ML/year) significantly exceeds the requirement for external water supply to satisfy all site demands for all years of operation, even in the driest climatic sequence experienced over the past 125 years.

The water balance modelling computed the maximum annual requirement for external water supply for various climatic sequences based on 125 years of rainfall data, and showed that this was less than 2,535 ML. The report notes that 2,535 units are currently equivalent to 2,535 ML/year. The modelling did not consider how the 2,535 units available under the Water Access Licence might translate on a year-to-year basis into ML/year permissible water take over various climatic sequences. It is possible that in very dry periods, when the water requirement of the mine is greatest, there may be very little water physically available in the borefields, and that the water allocation may be reduced well below 100%, possibly down to 0%, so that the permissible water take is much less than the physical water available.

The Assessment Report addresses risks associated with the uncertainty in water supply as stated below (page 72 of Assessment Report):

The Department accepts that the water take from each of the water sources is within the annual extraction limits and issued shares in each water source, and that there is sufficient depth in the market for each water source to accommodate the water take associated with the project.

The Department notes that, like any other significant water user in the State, access to adequate water supplies is a commercial risk for KEPCO. And like any other significant water user, if KEPCO is not able to secure enough water to meet its demands (e.g. if existing allocations are reduced due to drought), its operations may need to be curtailed, or it may need to investigate additional water efficiency measures. This is consistent with the water sharing and water efficiency principles established under the Water Management Act.

That said, the Department believes that KEPCO should be required to demonstrate that it has secured adequate water supplies to account for the maximum predicted water demand for mining operations in both the open cut and underground phases, prior to commencing mining operations in each phase.

In conclusion, the documents relating to the project describe the detailed modelling and reviews that have been performed, but have failed to demonstrate that the Water Access Licences held by KEPCO will provide adequate water from the borefields to meet the water requirements of the mine, particularly during the open cut stage, during dry periods when water allocations in the Bylong River are likely to be reduced well below 100%.