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M024.L1
5 September 2016

NSW EDO
Level 5, 263 Clarence Street
Sydney, NSW 2000

Attention: M Kessler

Dear Madam

RE: WALLARAH 2 – PAC ASSESSMENT AND PROPONENT RESPONSES

1. INTRODUCTION

This letter is in response to a Brief from the EDO of 23 August 2016.

I have prepared this report in accordance with the requirements of Division 2, Part 31 of the uniform Civil Procedure Rules 2005. In respect to this report I am bound by that document.

The Brief requires that my report be:

“...an expert report within your area of expertise on the documents that have been produced since the original EIS was exhibited. Specifically, we seek your opinion on the potential groundwater and surface water impacts of the Project, as amended, and the adequacy of both the Proponent’s response to submissions received on this issue and the PAC’s principal findings and recommendations. We further seek your opinion on the potential subsidence impacts of the Project and the adequacy of both the Proponent’s response to submissions received on this issue and the PAC’s principal findings and recommendations.”

I find that there has been a very large amount of documentation produced since I submitted reports in 2013. In the time available for this report I have not been able to read and assess all the material in the documents germane to groundwater, surface water and subsidence. Therefore I restrict this report to matters of groundwater in the PAC documents and in the 760 page document ‘Response to Submissions’ dated September 2013.

2. OVERALL STATEMENT

According to my reading of the ‘Response to Submissions’ by Wallarah 2 (**the Response**), there is not one submission by any party, in respect to groundwater and surface water impacts, critical of the findings of the original EIS, which is given any credence by the Proponent.

As a matter of logic this is strange, simply because it implies that only the Proponent understands the truth, and that truth is that the proposed mine will have no impact of

any significance on the useful groundwater system, on stream baseflows, and on surface water resources.

In my opinion this adversarial approach makes objective scientific examination and discussion impossible.

3. GROUNDWATER - KEY POINT IN PAC REPORT

A disturbing matter in the PAC report is that it states that:

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

Yet in our report we stated:

In this Section 4 we simply take what is given by calculations presented in the EIS without critical assessment of the validity of the calculations.

We did no independent modelling; we simply expressed the plots presented in the EIS in a readily understood manner and showed that the work done by the Proponent demonstrated far greater impacts on the groundwater systems than were admitted in the words of the EIS.

PAC rather chose to highlight matters where we considered the parameters used by the Proponents modelling were skewed to benefit the Proponent. Those matters were secondary to the key point which is that the proponents own analyses did not support the proponent's claims, and they still do not. There appears to be no rational way forward in this regard – it is true that people choose to believe what they believe, and ignore facts which contradict those beliefs .

Yours sincerely

4. PROPONENTS RESPONSES

4.1 General

The Proponent dismissed matters we raised as summarised in the following subsections.

4.2 Importance of considering drought flow conditions

Our point was that groundwater systems and river flows in extreme dry periods must be addressed, because those are the conditions which matter to the public, and the public water supply. The Proponent's response is:

"The model calibration process is described in Section E6 in Appendix E of the GIA. Subsequent to calibration, a recharge rate of 150 mm/year (0.41 mm/day) was adopted for the assessment of mining related impacts. This rate of recharge is the average calculated rate to the alluvial lands during the relatively dry spell between 2002 and mid 2007 (see Figure E7 in the GIA) and is therefore considered to be conservative."

The Millennium Drought started in 1999 and ended in 2004/5. That drought was about the 5th worst on record and came nowhere near the severe droughts of

Federation and the 2nd World War. It is untrue to say the using the period 2002 to 2007 was conservative – this just trivialises the point.

4.3 Where does the mine inflow come from?

The PAC report correctly states:

“The areas of agreement can be summarised as:

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

The Proponents response also includes a truth, namely:

Ultimately, long term downwards leakage from the alluvial lands will be established.

This is the key issue we sought to raise in respect to concerns on impacts to creek baseflows and groundwater supplies, namely how long would it take for the certain impacts to occur.

Yet the Proponent retains the argument that almost all the flow into the mine will come from deep down, viz:

The predicted groundwater inflows of up to 2.5 ML/day are sourced almost entirely from porous storage in the deep strata.

And this will not (never) impact on the upper portion of the groundwater system which is critical to stream baseflows, vegetation and groundwater supplies.

In our submission we showed that this is not true, not by any theoretical work we did but by looking carefully at what the proponents own modelling showed.

5. CONNECTIVITY

From our understanding of the physics of groundwater flow Section 3.1.8 of the Response is incorrect, apart from the fact that like the rest of the response material it simply dismisses the concerns raised by others. Connectivity is not a matter of some major defect in the rock allowing inrush of water into an underground mine – it actually has nothing to do with quantity of flow. Connectivity is simply the question of the impact of complete depressurisation of the strata at coal seam level on the groundwater pressure regime near the ground surface. The only way there would not be such connection would be if there were a perfectly impermeable barrier between mine and surface. And such a perfectly impermeable barrier does not exist.

Therefore the question not whether there is connectivity, but rather how long will it take for the impacts to be noted and become significant.

6. GROUNDWATER MODELLING

Change in water movement in the alluvium from the present near-horizontal flow to downward flow will, as a matter of physics cause loss of baseflows and loss of bore supplies, regardless of the magnitude of flow.

However, the magnitude of flow is also important to the overall water balance and in this regard the issue around which debate rages are the permeability values adopted in the theoretical modelling by the Proponent. No regard has been given to the matters raised in our submissions and we retain those views.

In response the Proponent simply restate what was derived from the theoretical model which we consider is based on incorrect permeability data skewed to suit the Proponent (Hansen Bailey, Appendix F – Residual Matters)

Leakage losses from the alluvial lands at the completion of mining have been assessed by groundwater flow modelling. These losses are sustained in time and are predicted to be about 2 millilitres/day per square metre of land surface over subsided panels at the completion of mining. This equates to about 7.3 ML/annum.

The losses are uniformly distributed and are balanced by rainfall recharge across the region. The impact on groundwater storage in the alluvium is negligible since the stored groundwater is estimated to be about 2.4 kL per square metre based on an average 20 m high saturated column and 0.12% drainable porosity. The predicted leakage rate of 2 millilitres/day per square metre of land surface represents 0.000083% of the stored water per square metre. The column of water would deplete at the rate of 0.73 mm/annum without recharge. The predicted leakage rate is based upon conservative groundwater model parameters that include inter alia:

- A matrix conductivity for claystone strata which is based on siltstone conductivities (claystone samples could not be assessed due to failure of the core during sample preparation). Adopting a lower and more representative value for claystone would reduce downwards leakage;
- Variably saturated flow modelling without invoking unsaturated flow which would otherwise reduce the conductivity of unsaturated strata and inhibit downwards leakage; and
- No reduction of insitu vertical conductivity in the constrained zone – a reduction is normally attributed to increased horizontal stresses which tend to reduce the transmission capacities of joints (and inhibit downwards leakage).

A more conservative assessment assumes that the vertical conductivity that governs the rate of leakage is an order of magnitude (10 times) higher than the value adopted in groundwater assessments in MER 2013. While considered to be highly unlikely, an increase of this scale would yield a similar increase in the leakage rate from 2 to 20 millilitres/day per square metre or 73 ML/annum.

In our opinion the way the results are expressed in regard to “drainage of an average 20m high column” is very misleading and represents incorrect understanding of groundwater flow systems.

7. SUBSIDENCE IMPACTS

In our report on the original EIS we expressed concern that the impacts of subsidence on individual homeowners had not been explicitly stated. That situation remains.

Whether the NSW system of compensation for subsidence induced damage is fair and reasonable is not for me to comment on.



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