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NSW EPA
PO Box A290
Sydney South NSW 1232

Attention: Deanne Pitts

Re: Review – Boral Cement Berrima Works, Use of Solid Waste Derived Fuels in Kiln 6, Human Health Risk Assessment

1.0 Introduction

Environmental Risk Sciences Pty Ltd (enRiskS) has been commissioned by the NSW EPA to review the revised Human Health Risk Assessment (HHRA) for the proposed use of solid waste derived fuels in Kiln 6 at the Boral Cement Works, Berrima. The HHRA was revised by SLR Consulting Australia Pty Ltd in response to previous comments by enRiskS provided in October 2015.

2.0 Comments

The HHRA has been significantly revised in line with the previous comments provided by enRiskS in 2015. The comments provided in this letter relate just to the changes that have been made.

- **Particulate Matter** – the revised report has included an appropriate assessment of the potential effects of PM10 and PM2.5 in line with recent guidance and practice. One error has been made unfortunately. Table 19 lists the result of the more detailed assessment and Appendix A describes the calculations undertaken. Table B-2 in Appendix A lists the baseline incidence rates for the various primary and secondary health end points. The baseline incidence rate for hospitalisations – cardiovascular (short term >65 years) in regard to PM2.5 is reported as 2335.2 per 100000 but should have been 23352 per 100000. If the correct value is used the maximum risk value becomes $2x10^{-4}$ rather than $2x10^{-5}$ which is an unacceptable risk rather than a tolerable risk. There was some discussion in the air quality impact assessment that the maximum values in the air quality modelling for PM10 and PM2.5 resulted mostly from fugitive emissions from the stockpiles of materials at the site rather than the stack emissions. If that is correct then further refinement of the modelling of fugitive emissions or consideration of introducing additional control measures for managing such emissions from the stockpiles into the modelling (which would then need to be implemented on site) may bring the PM risks down sufficiently.

- **Air Toxics** – the determination of the annual average ground level concentration nor the actual value used in assessing the potential risks posed by the VOCs in the emissions is not provided in either the AQIA or the revised HHRA. Consequently, it is not possible to verify the values listed in Table 24. Working backwards from the listed benzene GLC, the annual average for total VOCs would have to be 0.48 $\mu g/m^3$. This seems extraordinarily low. Further advice should be sought from the people reviewing the AQIA.

- **Air Toxics** – the AQIA and the HHRA have taken the total VOCs modelling ground level concentration and broken it down into its component compounds to allow the assessment of risk. This is appropriate. The source of the breakdown into component compounds is the USEPA AP42 emission

factors guidance document and, in particular, the Portland cement manufacturing chapter. Again this is appropriate. Unfortunately, a detailed description of how this was done is not included in either document and there does not appear to be sufficient information provided to check the calculations. The emission factors for each of the individual chemicals in the AP42 guidance document for volatile organics are listed in kg/tonne of clinker produced while the emission factor for total VOCs modelled in the AQIA only appears to be listed as g/s as this is what is required to calculate the ground level concentrations. Also not all the volatile chemicals listed in the AP42 guidance have been listed in the AQIA and HHRA tables. It appears that the emission factors for each of the compounds in the AP42 guidance has been summed and the percentage contribution of each compound has then been determined based on that sum. The problem with that is that it appears the emission factor for benzene used is the one for a stack with an electrostatic precipitator rather than a stack with a bag house. If the other factor is used the proportion of benzene in the VOCs becomes 70%. The plant at Berrima has a bag house but not sure if it also has an ESP. Using this approach the percentage composition becomes very dependent on which chemicals in the table in AP42 are chosen to be included in the summed emission factors – without a detailed explanation of how the calculations were undertaken and which chemicals were included it is difficult to verify that this assessment is correct. The HHRA has used the percentage composition information from the AQIA so it is the AQIA that needed to better explain what was done.

- **Air Toxics** – it is more common to use Australian air quality guidelines where they exist and the USEPA regional screening levels (RSLs) for air in other cases to determine chronic air quality guidelines. Where the USEPA regional screening values do not include a value for a particular contaminant then sources such as the guidelines from the Texas Commission for Environmental Quality or the California EPA are used. The main reason for this is transparency – the methods used to calculate the USEPA RSLs are fully documented in guidance documents and the input values for the calculations (and the sources for these values) are listed in full. While the TCEQ have started publishing full documentation of the development of their guidelines in the last few years, the majority of the guidelines are not fully described and so the basis for them cannot be verified. The California EPA values can be useful where no other options are available for a chemical but their approaches vary quite significantly from the approaches recommended by Australian health authorities. The more commonly used values for the chemicals evaluated in this assessment are as follows:

Table 1 Air toxics screening guidelines from preferred sources – Chronic

Chemical	Chronic Screening Value (µg/m^3)
Acetone	32000[U]
Benzene	1.7[C]
Benzoic acid	No guideline for air exists in the USEPA RSLs as this chemical is not volatile enough – it would be a particulate bound chemical in the emissions not a volatile
Carbon disulfide	730[U]
Chloromethane	94[U]
Formaldehyde	0.22/10[U]
Methylene chloride	100/630[U]
Toluene	5000[C]
Xylenes	870[C]

Notes:

[C] CRC CARE Health Screening Levels Technical Guidance Document (CRC CARE 2011) – Australian guidance that has been reviewed by Australian health authorities

[U] USEPA Regional Screening Levels (Residential Air) (USEPA 2015)

Table 2 Air toxics screening guidelines from preferred sources – Acute

Chemical	Acute Screening Value (µg/m^3)
Acetone	60000[A]
Benzene	29-170[C]
Benzoic acid	No guideline for air exists in the USEPA RSLs as this chemical is not volatile enough – it would be a particulate bound chemical in the emissions not a volatile
Carbon disulfide	730[U#]
Chloromethane	1000[A]
Formaldehyde	50[A]
Methylene chloride	2000[A]
Toluene	7600[A]
Xylenes	8800[C]

Notes:

[C] CRC CARE Petroleum Vapour Intrusion Guidance TR No. 23 (CRC CARE 2013)

[A] ATSDR Acute Minimum Risk Levels as reported in Toxicological Profiles for each chemical available at http://www.atsdr.cdc.gov/toxprofiles/index.asp#L

[U] USEPA Regional Screening Levels (Residential Air) (USEPA 2015)

[#] ATSDR lists an acute guideline value for oral intake only; when this is converted (using standard assumptions) to a concentration in air it is lower (more stringent) than this value from the USEPA RSLs for chronic exposures. The chronic value has been left in this list.

- **Air Toxics** – The HHRA list low molecular weight PAHs like naphthalene and phenanthrene in Table 22 but then flags that they are covered in the PAHs assessment based on BaP TEQs so are assessed no further as part of the total VOCs. The BaP TEQs do not include the low molecular weight PAHs normally. These TEQs are based on the high molecular weight PAHs only. It is not clear from a quick review of the AQIA whether the way BaP TEQs have been used in that report includes these low molecular weight compounds or not. If it doesn't then the contribution these chemicals may have to the risk has not been assessed.

- **BaP TEQs** – It would be useful to do the actual risk calculations in Section 2.1.13 to bring it into line with other similar HHRAs. The WHO unit risk for BaP TEQs is 0.087 risk per 1 µg/m^3(WHO 2000). This means a GLC of 0.000017 µg/m^3 poses a risk of 1.5x10^{-6} which is within acceptable levels. Again this appears to be a low estimate for the GLC for PAHs from a combustion process and comment should be sought from the people commenting on the AQIA.

- **Dioxins** – the estimated ground level concentrations from this combustion process seem extraordinarily low. The value used in the HHRA is the value listed in the AQIA. Further advice should be sought from those reviewing the AQIA to check that the modelled GLC has been assigned the correct units as this is a common issue in modelling dioxins emissions/GLCs.

3.0 Conclusion

The revised HHRA has included additional material in line with the comments made previously. A number of matters in this revised HHRA remain less than transparent or not in line with standard practice. In particular, further consideration of the modelling of PM2.5 emissions from the site is needed. Also comments on the whether the estimated ground level concentrations for total VOCs (annual average), BaP TEQs and dioxins are realistic given the combustion sources at the site should be sought from those commenting on the AQIA.

4.0 References

CRC CARE 2011, *Health screening levels for petroleum hydrocarbons in soil and groundwater. Part 1: Technical development document*, CRC for Contamination Assessment and Remediation of the Environment, CRC CARE Technical Report no. 10, Adelaide. <http://www.crccare.com/products-and-services/health-screening-levels>.

CRC CARE 2013, *Petroleum hydrocarbon vapour intrusion: Australian Guidance*, CRC CARE Technical Report no. 23, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia. <http://www.crccare.com/publications/technical-reports>.
USEPA 2015, *Regional Screening Levels for Chemical Contaminants at Superfund Sites*, US Environmental Protection Agency. <http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm >.
WHO 2000, *Air Quality Guidelines for Europe, Second Edition*, Copenhagen. <http://www.euro.who.int/en/publications/abstracts/air-quality-guidelines-for-europe>.

5.0 Limitations

Environmental Risk Sciences has prepared this report for the use of NSW EPA in accordance with the usual care and thoroughness of the consulting profession. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report.

The methodology adopted and sources of information used are outlined in this letter report. Environmental Risk Sciences has made no independent verification of this information beyond the agreed scope of works and assumes no responsibility for any inaccuracies or omissions.

This report was prepared in February 2016 and is based on the information provided and reviewed at that time. Environmental Risk Sciences disclaims responsibility for any changes that may have occurred after this time.

This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

If you require any additional information or if you wish to discuss any aspect of this letter please do not hesitate to contact Therese on (02) 9614 0297 or 0487 622 551.

Yours sincerely,

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