

ASSESSMENT REPORT

Section 75W Modification Berrima Cement Works - Use of Waste Derived Fuels (DA 401-11-2002-i MOD 9)

1. INTRODUCTION

This report assesses a modification request by Boral Cement Limited (the Proponent) to allow the use of Solid Waste Derived Fuel (SWDF) as an energy source to fuel Kiln 6 at the Berrima Cement Works. The request has been lodged pursuant to section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

2. BACKGROUND

The Proponent operates a cement works off Taylor Road, New Berrima, in the Wingecarribee Local Government Area (refer **Figure 1**). The cement works was built in 1929 and has operated continuously ever since on the basis of continuing use rights.

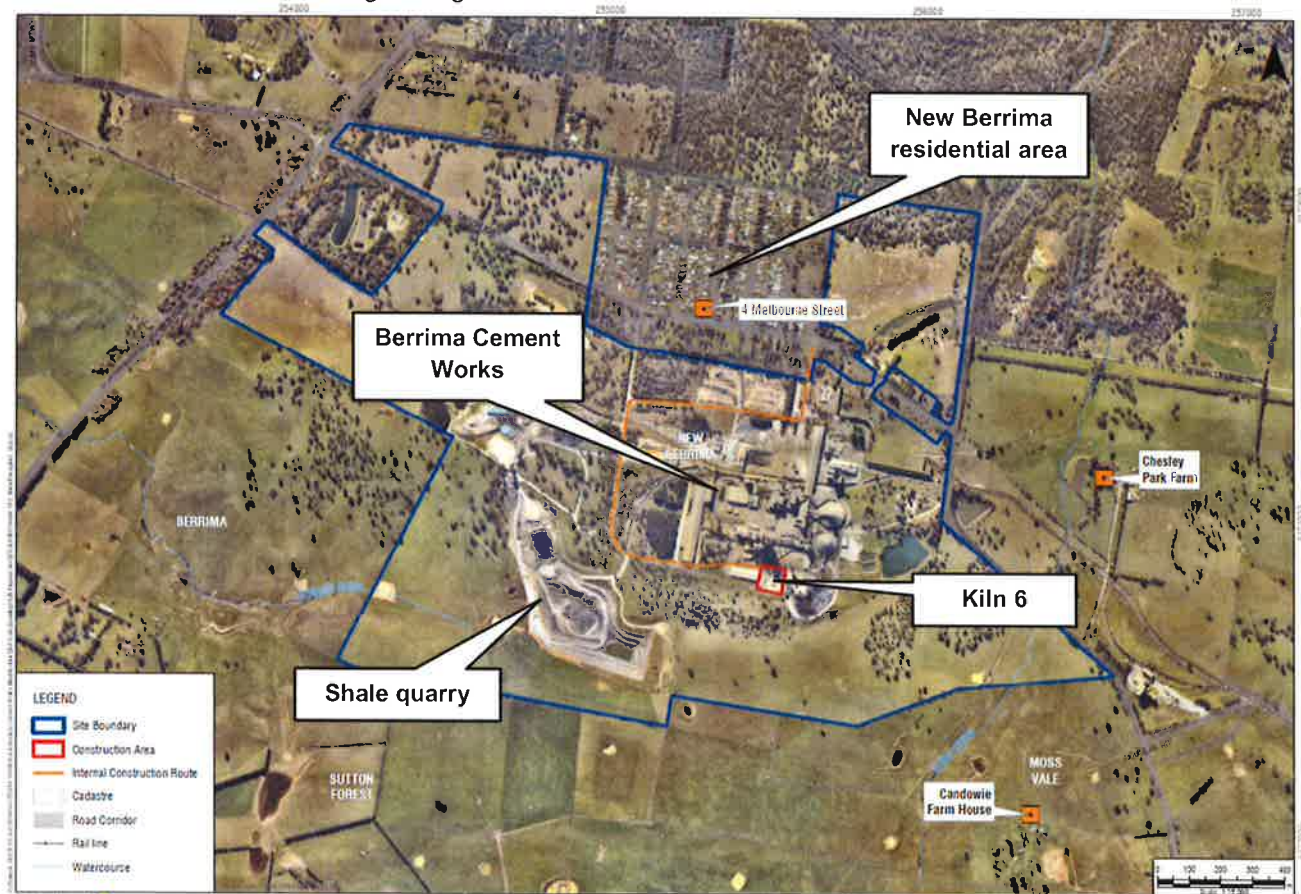


Figure 1: Site location

The facility produces cement products (cement and clinker) for sale in NSW, the ACT and for export. The facility has approval to produce up to 1.56 million tonnes per annum (tpa) of cement products which has historically represented approximately 60% of cement sold for building and construction in NSW. Operational infrastructure includes one kiln (Kiln 6) and two cement mills, including storage and stockpiling facilities.

The main raw material inputs to the production of cement and clinker are limestone, sourced from the Marulan mine (transported via rail), and shale, sourced on site. Cement is made from measured amounts of raw materials, including limestone, various shale rocks, steel slag, iron ore and occasionally sand, which are

blended together, ground into a fine powder and fused at a very high temperature (up to 1500 degrees Celsius ($^{\circ}\text{C}$)) in a rotary kiln. The fused material is called clinker. Clinker is then cooled and ground with a small amount of gypsum to produce the finished cement powder. **Figure 2** illustrates a flow diagram of the current operating process.

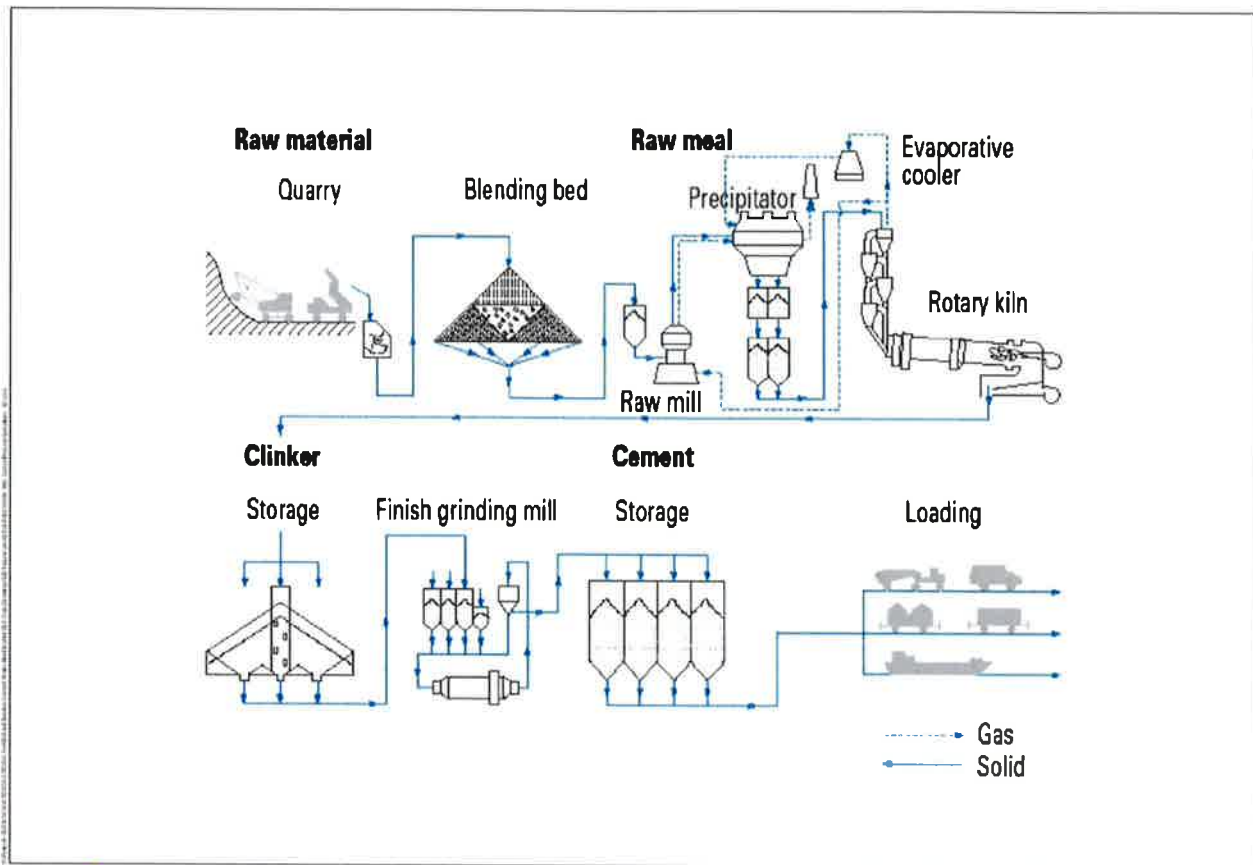


Figure 2: Process diagram

The 149 hectare (ha) site is immediately south of the residential settlement of New Berrima and approximately 2.5 kilometres (km) east of the Hume Highway (refer to **Figure 1**). The cement works is the most physically dominating feature of the New Berrima area, being roughly equivalent in size to the adjacent township, with the tallest structure on the site being the upgraded pre-heater tower, which is approximately 85 metres (m) high. The closest residential dwellings in New Berrima are approximately 650 m north of Kiln 6. Two isolated farms, Chesley Park Farm and Candowie Farm House, are located to the east and south east of the cement works, respectively. The site is zoned IN3 'Heavy Industrial' in the *Wingecarribee Local Environmental Plan 2010*.

3. APPROVAL HISTORY

The facility operates under a combination of continuing use rights and the following two development consents approved by the then Minister for Planning:

- DA 401-11-2002-i – approved in 2003 to upgrade and increase the capacity of Kiln 6 at the existing cement works; and
- DA 85-4-2005-i – approved in 2005 for the establishment and operation of a new cement mill (Cement Mill 7).

The Proponent is seeking to modify the consent for Kiln 6 (DA 401-11-2002-i). The original consent involved an increase in the output of Kiln 6, an upgrade of Kiln 6 infrastructure to allow for the burning of non-standard fuel, upgrade of the coal mill capacity and intermittent use of Kiln 5 during periods of Kiln 6 maintenance, shut-down and high production demands. The facility operates under an Environment Protection Licence (EPL 1968) issued by the Environment Protection Authority (EPA) which has also been subject to numerous variations.

Subsequent modifications approved by delegates of the Minister have allowed the trialling and use of certain non-standard fuels, the use of alternative 'low cost' raw materials in the manufacture of clinker (such as Granulated Blast Furnace Slag), the use of rail for coal deliveries and the stockpiling of coal on the site. **Table 1** outlines the various modifications to the development consent.

Table 1: Description of Consent Modifications

Application	Description	Date Approved
DA 401-11-2002-i	Upgrade of Kiln 6 to allow for burning of non-standard fuels, installation of continuous monitoring equipment, increase in Kiln 6 output, upgrade of coal mill capacity and intermittent use of Kiln 5	12 May 2003
MOD 1 ⁽¹⁾	Use of non-standard fuels, including used tyres (AKF5), liquid oil residues (AKF1) and spent aluminium electrode carbon (HiCal 50)	26 September 2005
MOD 2	Removal of prohibition on the acceptance of materials classified as "hazardous waste" under the DEC's waste guidelines	September 2006
MOD 3 ⁽²⁾	Small scale trial use of tyre chips over a six month period	13 February 2007
MOD 4	Increase in usage of coal fines from 1.5 tonnes per hour (tph) to 10 tph	8 May 2008
MOD 5	Approval to use rail for coal deliveries	31 August 2009
MOD 6	Stockpiling of coal for sale and transport to Port Kembla	20 June 2012
MOD 7	Trial and use of Granulated Blast Furnace Slag as a raw material additive, not exceeding 150,000 tpa	16 April 2012
MOD 8	Administrative changes to align DA and EPL conditions	5 August 2012

Note: (1). MOD 1 approved the use of non-standard fuels subject to further approval and construction of appropriate storage and kiln feeding infrastructure. (2). MOD 3 approved a small scale trial of 205 tonnes of tyre chips without the need for the storage and kiln feeding infrastructure required by MOD 1.

In August 2007, the use of non-standard fuels at the facility (approved under MOD 1) was suspended by the EPA due to inaccuracies in reporting and the use of incorrect methodologies for source emissions monitoring and continuous emission monitoring for Kiln 6. The suspension was lifted in December 2008 when the Proponent demonstrated appropriate Quality Assurance / Quality Control (QA/QC) systems for monitoring were in place and it was demonstrated all air quality limits for non-standard fuels could be reliably achieved during the burning of standard fuels (coal, natural gas, fuel oil, diesel).

4. PROPOSED MODIFICATION

The Proponent lodged a modification request under section 75W of the EP&A Act to modify the development consent for Kiln 6 (DA 401-11-2002-i) to allow the following:

- use of up to 100,000 tpa of SWDF as an energy source;
- an increase to air emission limits specified in the consent and EPL for particulate matter (PM), nitrogen oxides (NO_x) and volatile organic compounds (VOCs) to align with the *NSW Energy from Waste Policy Statement* (EPA, 2015) (the Policy);
- changes to emissions reporting for VOCs and NO_x; and
- construction of a fuel storage and kiln feeding system.

The modification request relies on the EPA's Policy as a framework for the modification request. The modification is described in full in the Environmental Assessment (EA), the Response to Submissions (RTS) (included in **Appendix B**) and is illustrated in **Figure 3** and **Figure 4**.

The Proponent also proposes to delete all of the conditions for the coal stockpiling for sale and transport to Port Kembla as this activity is no longer undertaken. These conditions relate to Modification 6, which was approved on 20 June 2012.

The delivery of SWDF will necessitate a minor increase in truck movements to and from the facility (6.5% and 11.3% increase on weekdays and Saturdays, respectively).

Solid Waste Derived Fuels

The following SWDFs are proposed to be used in Kiln 6 operations:

- wood waste – material left over from industrial processes like milling, furniture making and building and construction; and
- refuse derived fuel (RDF) – combustible materials recovered and processed from waste streams, such as papers, cardboards, packaging, and construction and demolition materials.

These fuels are not listed as 'eligible waste fuels'¹ in the Policy. The Proponent is therefore seeking approval for the use of 'non-eligible' waste by demonstrating the facility meets the criteria for an 'energy recovery facility' (a facility that thermally treats a waste or waste-derived material that does not meet the definition of an 'eligible

¹ Eligible waste fuels are waste or waste-derived fuels considered by the EPA to pose a low risk of harm to the environment and human health due to their origin, low levels of contaminants and consistency over time.

waste fuel'), as provided for in the Policy. The existing (approved) and proposed classes and quantities of standard and non-standard fuels used at the facility are outlined in **Table 2** below. The proposed changes are highlighted in yellow.

Table 2: Proposed Modifications to Approved Fuels for Berrima Cement Works

Fuel	Category	Current	Proposed	
		Tonnes per annum	Tonnes per annum	% of total fuel by mass
Natural gas, fuel oil, diesel	Standard	No limit	No change	No change
Coal	Standard	No limit	No change	No limit
Coke fines	Standard	No limit	No change	No change
Aluminium electrode carbon (Hi Cal 50)	SWDF	10,000	No change	No change
Liquid oil residues (AKF1)	LWDF ⁽¹⁾	20,000	No change	No change
Used tyres (AKF5)	SWDF	30,000	30,000	Maximum combined ≤ 100,000
Wood waste	SWDF	Not currently approved	50,000	
RDF	SWDF		80,000	

Note: (1). Liquid Waste Derived Fuel

Emission Limits

The Proponent is seeking to align the emission limits for the facility with the requirements of the Policy which states that the process and air emissions from the facility must satisfy the Group 6 emission standards in the *Protection of the Environment Operations (Clean Air) Regulation 2010* (POEO (Clean Air) Regulation). It is noted, however, that the Proponent is seeking approval for:

- an alternative emission standard for NO_x and VOCs under Clause 36 of the POEO (Clean Air) Regulation; and
- equivalent emission limits for particulate matter during the burning of standard and/or non-standard fuels.

For clarification, the approved and proposed emission limits for the burning of non-standard fuels at the facility are outlined in **Table 3** below. The proposed changes are highlighted in yellow.

Table 3: Approved versus proposed emission limits

Air Emissions	Limit using standard fuels		Limit using non-standard fuels		Group 6 Emission Standards ⁽¹⁾
	Current	Proposed	Current	Proposed	
Particulate matter (PM)	95 mg/m ³	50 mg/m ³	30 mg/m ³	50 mg/m ³	50 mg/m ³
Nitrogen Oxides (NO _x)	1000 mg/m ³	1000 mg/m ³	800 mg/m ³	1250 mg/m ³ ⁽²⁾	500 mg/m ³
Volatile Organic Compounds (VOCs)	NA	NA	20 ppm	40 ppm ⁽²⁾	40 mg/m ³

Note: (1). Emission limits are taken from Schedule 3 of the POEO (Clean Air) Regulation 2010 for Group 6 activities. (2). Alternative emission standard being sought

Emissions Reporting

The Proponent seeks to change the way that emissions are reported in the Annual Environmental Management Report (AEMR) (required by the consent) and the Annual Return (required by the EPL) for VOCs and NO_x as follows:

- the definition of VOCs to be changed to Non-Methane Volatile Organic Compounds to account for the inherent VOC levels in the blue shale, which is used as a raw material for the production of clinker in Kiln 6; and
- the averaging period for the reporting of NO_x changed from 1-hour to 24-hour averaging to account for the hourly variations in NO_x levels which are not reflective of the environmental impact of the kiln emissions.

Fuel Storage and Kiln Conveyor System

The proposed new fuel storage, handling and feeding system is designed to store and handle all SWDF approved and proposed for use in Kiln 6, including used tyres, wood waste and RDF. The system comprises:

- a receival and storage building approximately 33 m wide by 50 m long and 13 m high;
- an RDF bale feed conveyor to feed bales into the storage building;
- a de-baler / shredder and feed system at the back end of the storage shed;
- an enclosed conveyor from the storage building to the existing preheater tower;
- a screw conveyor and air sealing device around the pre-calciner in the preheater tower; and
- an outdoor storage area for SWDF received in the form of plastic wrapped bales.

Figure 3 and Figure 4 illustrate the location and proposed layout of the new infrastructure.

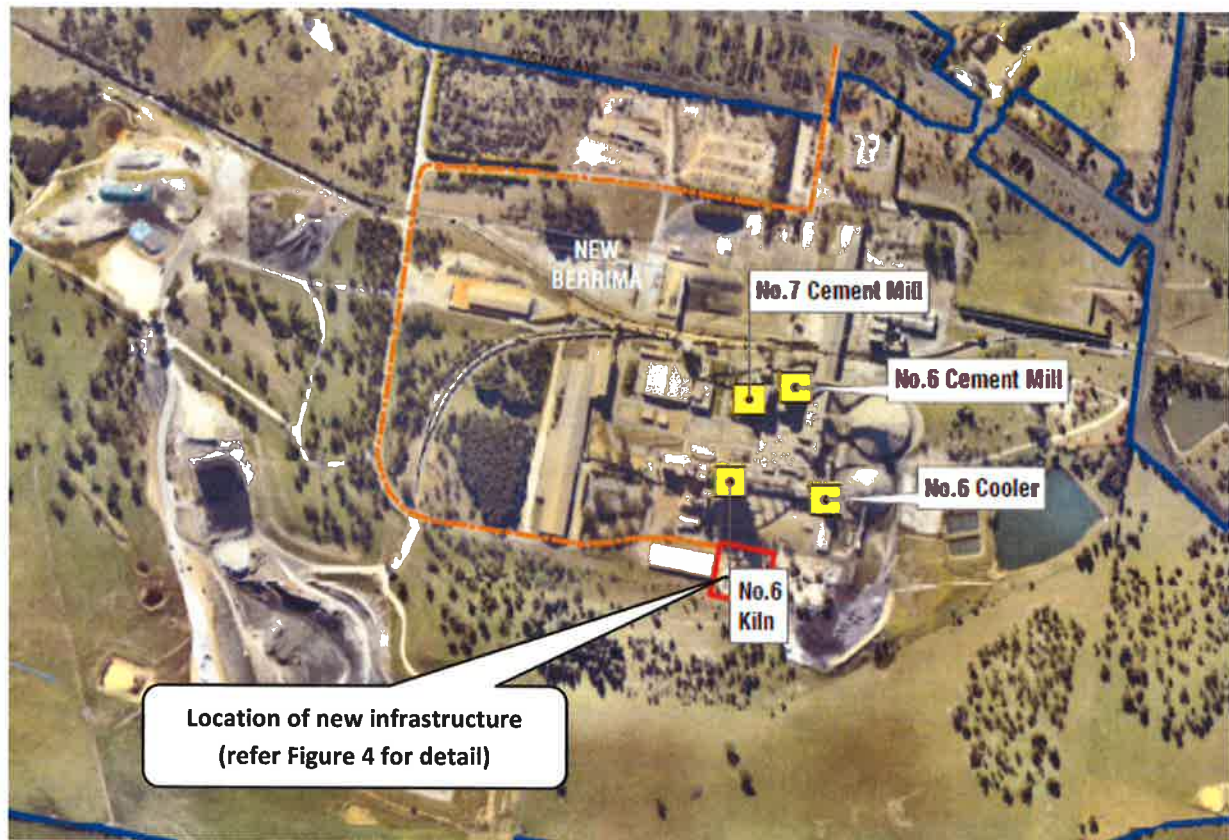


Figure 3: Location of proposed new infrastructure

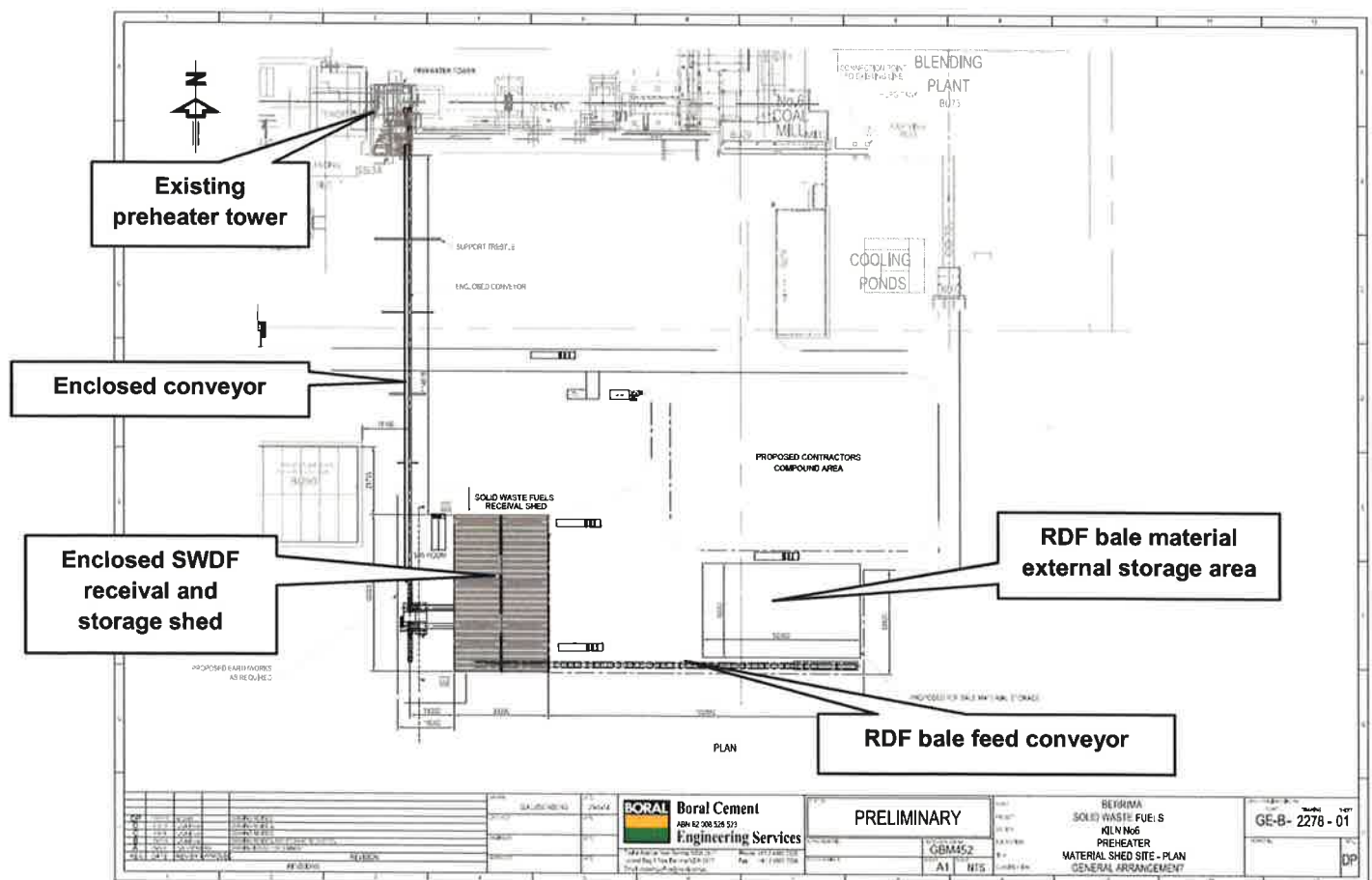


Figure 4: Proposed layout of new kiln feeding infrastructure and storage areas

Proponent's Justification

Cement manufacture is an energy intensive process due to the high temperatures required for the production of clinker. Currently, 220,000 tonnes of coal per year is used to heat the kiln which contributes approximately 40% of the total energy cost of the facility. Due to the recent closure of the Berrima Colliery at Medway, coal is now sourced from the Illawarra area by road. Boral is therefore pursuing the use of alternative fuel sources to reduce operational and transportation energy costs and improve environmental performance. The Proponent considers that the use of SWDF in Kiln 6 is appropriate and seeks approval of the modification request based on the following reasons:

- it is the most economically viable alternative fuel;
- it will reduce greenhouse gas emissions generated by the operation of the facility;
- it is supported by and consistent with the EPA's Policy; and
- the project has State government financial support for its implementation through a grant provided by the EPA's 'Waste Less Recycle More Initiative' grants program.

5. STATUTORY CONTEXT**5.1 Approval Authority**

The Minister for Planning is the approval authority for the modification. Under the Minister's delegation of 16 February 2015, the Director, Industry Assessments may determine the request under delegation as:

- the relevant local council has not made an objection; and
- a political disclosure statement has not been made; and
- there are no public submissions in the nature of objections.

5.2 Section 75W

Under clause 8J(8)(b) of the *Environmental Planning and Assessment Regulation 2000* (the EP&A Regulation), a development consent granted by the Minister for Planning under section 80 of the EP&A Act is to be modified under section 75W of the EP&A Act.

The Department is satisfied the proposed changes are within the scope of section 75W of the EP&A Act and do not constitute a new development application. Accordingly, the Department considers that the modification request can be assessed and determined under section 75W of the EP&A Act rather than requiring a new development application to be lodged.

5.3 Energy from Waste Policy (EPA 2014)

In March 2014, the EPA released the *Energy from Waste Policy* (the Policy) to increase investment in energy from waste infrastructure and deliver regulatory certainty to industry and confidence to the wider community. The Policy sets out a framework for the operation of new purpose-built facilities and other existing facilities proposing to thermally treat waste or waste-derived materials for the recovery of energy. The Policy aims to ensure that all energy from waste facilities:

- have minimal risk of harm to human health and the environment; and
- will not undermine higher order waste management options, such as avoidance, reuse or recycling (i.e. to avoid mass burn disposal outcomes).

To ensure emissions are below levels that may pose a risk of harm to the community, facilities must meet current international best practice techniques in relation to:

- process design and control;
- emissions control equipment design and control; and
- emissions monitoring with real-time feedback to the controls of the process.

The Policy requires facilities proposing to thermally treat any waste or waste-derived materials that are not listed as an 'eligible waste fuel' to meet the requirements of an 'energy recovery facility'. These requirements include a range of technical, thermal efficiency and resource recovery criteria. The Proponent considers it can meet these requirements.

6. CONSULTATION

Under section 75W of the EP&A Act, the Department is not required to formally notify or exhibit the request. However, due to the complex nature of the proposal and the potential for public interest in the proposal, the Department:

- exhibited the request from 7 August 2015 to 7 September 2015:
 - on the Department's website;
 - at the Department's information centre; and
 - at Wingecarribee Shire Council's offices,

- notified adjoining landowners and previous objectors (those that objected to the original development application) of the modification request and invited them to make a submission;
- notified Wingecarribee Shire Council (Council), the Environment Protection Authority (EPA), Roads and Maritime Services (RMS), the Department of Primary Industries (DPI) and the Department of Health (DoH) by letter; and
- advertised the modification in the *Highlands Post* and *Southern Highlands News*.

During the exhibition period, the Department received a total of four submissions from public authorities. **No public submissions** were received. However, one submission from the public was received after the public exhibition period, which raised concern regarding human health impacts.

A summary of the issues raised in submissions is provided below, with a copy of each submission included in **Appendix B**.

Council did not object to the modification but requested the Department consider the following in its assessment of the modification:

- whether changing the reporting of NO_x from 1-hour averaging periods to 24-hour averaging is appropriate;
- the significance of impacts from a potential increase in number and/or scale of guideline level exceedances;
- whether the proposal demonstrated international best practice when the assessment shows that the facility cannot meet the NO_x emission requirements outlined in the Policy;
- the cumulative impact of rail and road transport of fuel to the site;
- a comparison of pre- and post- development traffic volumes and an assessment of the operating conditions at the facility access intersections; and
- minimisation of noise impacts during construction and operation.

The **EPA** did not object to the modification but raised the following concerns:

- insufficient information to demonstrate consistency with the Policy;
- ambiguity and insufficient detail regarding fuel composition and sources;
- insufficient information to demonstrate that Kiln 6 will meet the proposed emissions limits, that VOCs are associated with blue shale raw material and that NO_x emissions have been reduced as far as practicable; and
- insufficient justification for a 24-hour averaging period for NO_x.

The **DPI** did not object to the modification but noted it was unclear if the proposal is likely to intercept groundwater and require dewatering, use surface water or groundwater as a water supply source, or pollute/degrade groundwater and surface water during construction.

The **DoH** did not provide a submission during the public exhibition period. A submission was received on the RTS which supported further monitoring during the trial phase to validate modelling predictions.

The **RMS** raised no objection to the proposed modifications.

The **Department** engaged an independent specialist consultant in alternative energy engineering, ARUP Pty Ltd, to review the EA. Based on ARUP's advice and on the Department's own consideration of the modification request, the Department raised the following concerns:

- insufficient information to demonstrate consistency with the Policy;
- lack of consideration and assessment of human health risks;
- insufficient information regarding impacts to groundwater and surface water; and
- insufficient assessment of noise impacts, particularly under worst case meteorological conditions.

To address the issues raised in all submissions and the independent review, the Proponent was required to prepare a Response to Submissions (RTS) report.

On 27 January 2016, the Proponent submitted a RTS report that included a Human Health Risk Assessment (HHRA), a Surface and Groundwater Assessment, and additional information regarding compliance with the Policy, noise impacts, air quality and emission limits. The RTS was referred to the EPA, DPI, DoH, Council and ARUP for review and final comment.

To review the HHRA submitted with the RTS, the Department and EPA jointly commissioned an independent specialist health risk consultant, Environmental Risk Sciences Pty Ltd (EnRisks). Copies of the independent review reports are included as **Appendix D** to this report.

7. ASSESSMENT

In its assessment of the merits of the proposed modification, the Department considered:

- the EA and RTS for the proposed modification;
- submissions from the public and government agencies;
- the independent review reports;
- relevant EPIs, policies and guidelines;
- relevant provisions of the EP&A Act, including the Objects of the Act; and
- Assessment Reports and conditions of consent (as modified) for the original development application for the facility (DA 401-11-2002-i); and
- other modifications, as necessary.

The Department considers the key issues associated with the proposal to be consistency with the Policy, air quality and human health risks. These issues are considered in detail below. Other issues including traffic, groundwater impacts, noise, hazards and risk, visual impacts, greenhouse gases and community consultation, are discussed in **Table 5** in **Section 7.4**.

7.1 Consistency with the NSW Energy from Waste Policy Statement

The development has the potential to be inconsistent with the requirements of the Policy with respect to meeting the required technical criteria and use of international best practice emissions technology. An inconsistency may result in harmful emissions of air pollutants and may present an increased risk to human health.

In order to demonstrate consistency with the Policy, the Proponent provided an assessment of the proposal against the technical criteria for an 'energy recovery facility' (as specified in the Policy) and undertook a review of its existing emissions technology against the European Commission's *Best Available Techniques (BAT) Reference Document for the Production of Cement, Lime and Magnesium Oxide* (2013) (BREF). To further support the assessment, the Proponent also provided a comparison of the proposed emissions limits with stack emissions testing data from the Adelaide Brighton Cement facility between 2013 and 2016. This is a similar cement works burning similar non-standard fuels operating in Birkenhead, South Australia (referred to in the Policy as a 'reference facility'). The Proponent's assessment concluded the proposal is consistent with the EPA's Policy, will be utilising best practice emissions technology, and will be using technology that is proven, well understood and capable of handling the expected variability and type of waste feedstock.

To assist with the assessment, the Department consulted with the EPA and also engaged (in collaboration with the EPA) an independent international expert in alternative engineering and emissions technology (ARUP) to review the EA and RTS. The Department's independent expert advised the cement facility is currently operating with a range of international best practise techniques with respect to process design and control, emission control equipment and emissions monitoring. ARUP also accepted the Proponent's use of the Adelaide Brighton Cement facility as a suitable 'reference facility'.

ARUP's assessment concluded the existing emission control equipment for controlling NO_x and particulate emissions from the Kiln 6 stack is consistent with the best available technology specified in the BREF document. However, as a contingency for preventing 'contaminated' waste from entering the kiln, ARUP recommended the Proponent be required to:

- prepare a methodology for the pre-qualification of suppliers of SWDF to ensure that contracts for supply of alternative fuels are placed only with suppliers that have the appropriate technical expertise, quality assurance systems, identifiable sources of waste and other criteria as appropriate; and
- prepare and undertake a test program for the use of each SWDF in order to demonstrate the appropriateness of the SWDF and other fuels at different ratios and feed rates until the desired performance is achieved. Full scale operation can then occur.

Having regard to ARUP's advice, the Department and EPA are satisfied the existing emission control equipment being used for controlling emissions at the Berrima facility constitutes best practice and as such, no additional emission control equipment is required as part of this modification. The Department and EPA are satisfied that the Proponent's assessment against the reference facility demonstrates the Berrima facility should be capable of handling the expected variability and proposed type of waste fuel.

The Department and EPA are satisfied the project complies with all of the Policy's technical criteria, with the exception of the temperature and residence time (>1100°C for at least two seconds) for the safe incineration of 'halogenated organic substances' (includes wood waste containing wood preservatives or coating and various types of plastics such as plastic bags, bottles, polyvinyl chloride (PVC), as well as chemical disinfectants, and the like). These substances can cause harmful emissions of dioxins and furans, which can have acute and chronic health impacts (e.g. skin lesions, altered liver function and impairment of the immune

and nervous systems). The Department's assessment of compliance with the Policy having regard for the independent expert advice is provided in **Appendix C**.

The Proponent advised that, while Kiln 6 can reach temperatures of 850°C for at least two seconds (the minimum temperature and residence time for the safe incineration of all other potentially polluting substances), it is unable to achieve temperatures greater than 1100°C in the pre-calciner vessel, which is where the new conveyer system will feed SWDF into the cement works. In any case, the Proponent considers it is unnecessary to meet the temperature and residence requirements for these substances as it does not propose to use SWDF containing more than 1% of halogenated organic substances as the chlorine in these substances affects the quality of the clinker produced in the process.

Following concerns raised by the Department and the EPA regarding the Proponent's inability to meet the temperature and residence time requirements, the Proponent was requested to prepare a comprehensive set of Quality Assurance / Quality Control (QA/QC) operational procedures as a safeguard to ensure waste containing >1% halogenated organic substances does not enter the system. Subsequently, as part of the RTS, the Proponent developed a *Quality Assurance and Control Procedure for Receipt and Use of Solid Waste Derived Fuels* document. This was developed having regard to a draft QA/QC best practice guidance note prepared by the EPA specifically for non-eligible waste used in energy recovery facilities. The Proponent's QA/QC document includes procedures for the tracking, checking, receipt (including visual inspections), storage (including quarantine areas for 'contaminated' waste) and sampling of waste deliveries which will form part of the facility's existing operational QA/QC procedures.

As part of the QA/QC procedure, the Proponent also developed fuel specifications for SWDF which includes a limit on total chlorine of 1% and a specific requirements for testing, sampling and reporting that are consistent with international best practice. Suppliers of SWDF will be contractually required to have in place appropriate and auditable QA/QC procedures to ensure that limits on contaminants stipulated in the SWDF specifications are met. The Proponent's procedures also ensure that the cement works shall only engage with suppliers of SWDF who demonstrate they have the technical expertise, facilities and processes required to meet the requirements of the Policy.

As an additional safeguard and to further reduce the risk of contaminated fuel entering the kiln, the Proponent also proposes to feed SWDF into the process through a system with screw conveyors (a mechanism that uses a rotating helical screw blade) which will be linked with the process control system. This will ensure that the system cannot start feeding SWDF into the pre-calciner if the kiln is in start-up conditions, the temperature in the vicinity of SWDF input has not reached 850°C and continuous emission measurements exceed the emission limits. The Department and the EPA are satisfied with this approach, and have recommended modifying the existing non-standard fuel process parameters in condition 3.24 to reflect these requirements.

The Department and EPA are satisfied the implementation of strict acceptance and quality control testing and the screw conveyor system proposed by the Proponent will ensure the risk of non-compliant or 'contaminated' SWDF making its way into the kiln is low and acceptable. The Department and EPA are satisfied the QA/QC procedures may be accepted in lieu of meeting the temperature and residence time requirements of the Policy and there are appropriate safeguards in place to ensure the facility, at a minimum, will meet the emission standards within the POEO (Clean Air) Regulation.

The adoption and implementation of the approved QA/QC procedures has been recommended as a modified condition of consent. This condition also requires the procedures to be reviewed and updated on an annual basis to reflect the recommendations of an annual non-standard fuels audit. To ensure the pre-qualification requirements for suppliers are being met, the Department has recommended a condition that requires the Proponent to certify in writing to the Secretary that the supplier has met the pre-qualification requirements specified in the approved QA/QC procedures, prior to the receipt of the first batch of any SWDF from a particular supplier. The EPA supports this approach.

As recommended by ARUP, the Department and EPA have also recommended modified conditions of consent that require the Proponent to prepare and undertake Proof of Performance (PoP) trials for each SWDF over a period of eight months, prior to the ongoing use of these fuels in Kiln 6. Minor monthly reports are required during the trial, with a major report submitted to the Secretary for approval after six months. Use of SWDF is not permitted outside of the approved PoP trials until such time as the Secretary has indicated in writing that it is satisfied with the results of the six month PoP trial report for an individual SWDF.

The Department's assessment concludes the implementation of the Proponent's QA/QC operational procedures, the screw conveyor system, the ongoing non-standard fuel audits and the PoP trials, will ensure the proposal is consistent with the technical requirements of the Policy. The risk of consequent impacts on air quality and human health risks is low and acceptable. The proposed development is consistent with the EPA's

Policy and the cement facility is operating with international best practice technology.

7.2 Air Quality and Emission Limits

The construction and operation of the development has the potential to generate harmful and nuisance air pollution and odour emissions in the vicinity of the site. To determine the impacts of the proposal, in particular, the proposed increase in emission limits, the Proponent carried out an Air Quality Impact Assessment (AQIA), prepared in accordance with the EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* ('Approved Methods'). A total of 87 sensitive receivers were identified within approximately 4 km of the site, including both residential and non-residential developments. The locations of all sensitive receivers are illustrated in **Figure 5**.

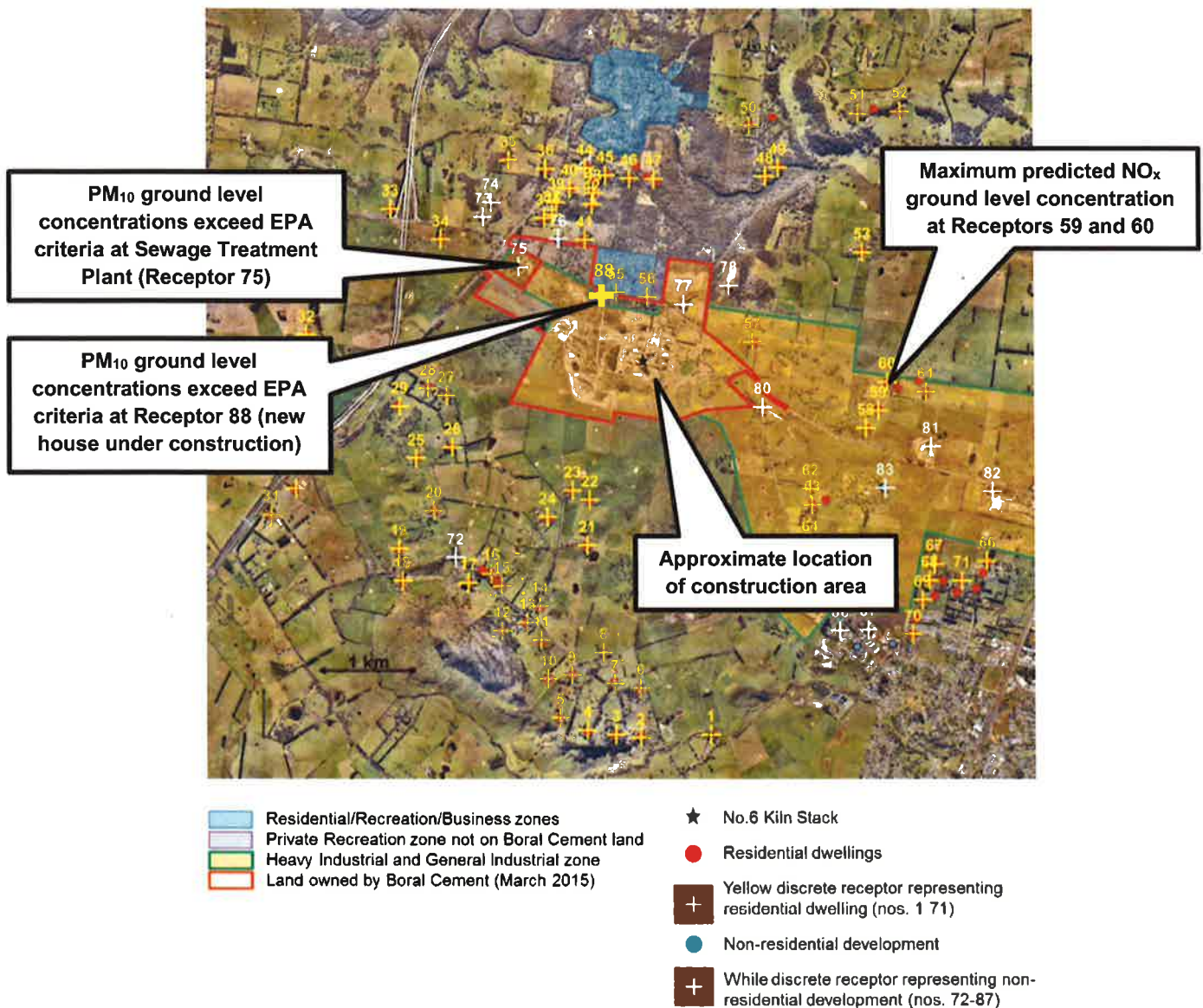


Figure 5: Location of sensitive receivers

Construction

Potential impacts of air emissions during the construction phase were assessed qualitatively in the AQIA. Key air quality impacts associated with construction works include nuisance dust and particulate matter during earthworks.

The Applicant has committed to manage and mitigate any potential impacts from dust during construction into a Construction Environmental Management Plan (CEMP). The Department and EPA are satisfied the impacts from construction will be limited to the generation of dust and particulate matter, which can be appropriately managed by the Applicant's CEMP. The Department has recommended a condition of consent that requires the Applicant to prepare an updated CEMP which outlines all environmental management practices and procedures to be followed during construction works to manage construction impacts, including dust. An existing condition also requires the Applicant to implement all reasonable and feasible measures to minimise dust generated by the development.

The Department's assessment concludes that air emissions during construction can be adequately managed and are unlikely to cause unacceptable impacts at any nearby sensitive receptors.

Operation

Key air impurities discharged to the air from the Kiln 6 stack when burning standard or non-standard fuel include fine particulates (dust, total suspended particles, PM₁₀ and PM_{2.5}), sulfur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO) and volatile organic compounds (VOCs). Trace pollutants include heavy metals, polycyclic aromatic hydrocarbons (PAHs), hydrogen halides, chlorine and sulfuric acid mist/sulfur trioxide and dioxins. The proposed development will also introduce a potential new source of fugitive emissions, in the form of dust and odour, through the SWDF fuel storage, handling and feeding system.

The main potential sources of particulate emissions associated with operations at the cement works arise from both point and fugitive sources on the site. Point sources include the No.6 and No.7 Cement Mill Stacks, Kiln 6 and the Kiln 6 Cooler. Fugitive sources of dust, particulates and odour include stockpiles of dry raw materials, vehicle movements on internal roads, activities in the shale quarry area, the crushing and mixing of materials prior to kiln processing and the SWDF storage building.

The Proponent carried out dispersion modelling of all air impurities assuming the proposed emission limits, as outlined in **Table 3** (refer Section 4 above) for the burning of non-standard fuels. This included modelling of the predicted odour emissions from the proposed new storage building for SWDF. The predicted concentrations at each receptor location were combined with background data and compared to EPA assessment criteria, as defined in the EPA's 'Approved Methods' guidelines. The results for key air impurities associated with the operation of Kiln 6 burning non-standard fuels are outlined in **Table 4** below.

Table 4: Results of Air Quality Modelling at Boral Berrima Cement Works Using Proposed Emission Limits

Pollutant	Averaging Period	EPA Assessment Criteria (at Sensitive Receiver) ⁽¹⁾	Maximum Predicted Ground Level Concentration	Sensitive receiver where maximum concentration occurs	Complies (Y/N)
PM ₁₀ ⁽²⁾	24 hour	50 µg/m ³	64.6 µg/m ³	75 ⁽⁴⁾	N
			52.5 µg/m ³	88	N
	Annual	30 µg/m ³	5.25 µg/m ³	75 ⁽⁴⁾	Y
			4.27 µg/m ³	88	Y
PM _{2.5} ⁽²⁾	24 hour	25 µg/m ³	9.0 µg/m ³	75	Y
			7.6 µg/m ³	88	Y
	Annual	8 µg/m ³	1.01 µg/m ³	57	Y
TSP ⁽²⁾	Annual	90 µg/m ³	15.2 µg/m ³	75 ⁽⁴⁾	Y
			12.7 µg/m ³	88	Y
NO ₂ ⁽³⁾	1 hour	246 µg/m ³	210 µg/m ³	59, 60	Y
	Annual	62 µg/m ³	13.1 µg/m ³	60	Y
SO ₂	1 hour	570 µg/m ³	34.7 µg/m ³	59	Y
	24 hour	228 µg/m ³	10.6 µg/m ³	18	Y
	Annual	60 µg/m ³	0.84 µg/m ³	60	Y
Total VOCs	24 hour	Various	21 µg/m ³ (total VOCs)	Site boundary	Y
Odour	1 hour	1.3 Odour Units (OU) (New Berrima & Berrima residential)	0.143 OU	22	Y
		2.6 OU (other areas)	0.147 OU	77	Y
Sulfuric acid mist	1 hour	18 µg/m ³	24.2 µg/m ³	Site boundary	N
Chlorine	1 hour	50 µg/m ³	48.4	Site boundary	Y

Note: (1) Criteria taken from the EPA's 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW'. (2) Includes fugitive and point source emissions; (3) Kiln 6 is the only significant source of NO₂ and SO₂ at the site. (4) Sensitive receiver no.75 is the New Berrima Sewage Treatment Plant. The maximum concentration at the nearest residential development (no.88) has also been reported.

With the exception of the 24-hour average PM₁₀ and sulfuric acid mist ground level concentrations, the AQIA demonstrated that compliance with EPA assessment criteria can be demonstrated for all air impurities when

point source emissions and fugitive source emissions are combined and added to the background data. The assessment considered the incremental impact caused by the proposed development as well as the cumulative impact. The Department and EPA are satisfied the analysis provides a reasonable estimation of the expected air pollutant emissions from the development.

With respect to the predicted sulfuric acid mist emissions the ground level concentration used in the modelling was derived from an assumed discharge at the emission concentration limit specified in the EPL (100 mg/Nm³), which means the modelling was highly conservative. While in reality, emissions of sulfuric acid mist are much lower than this, in the order of 1.5 mg/Nm³, as demonstrated by the results of four years of annual reporting provided in the EA. As such, the Department and EPA are satisfied that sulfuric acid mist is unlikely to exceed ground level criteria as a result of the modification.

Particulates

As shown in Table 6, the predicted 24-hour PM₁₀ ground level concentrations exceed the EPA's ground level criteria at sensitive receivers 75 (the Berrima Sewage Treatment Plant) and 88 (a residential dwelling). However, the Proponent's dispersion modelling demonstrated the ground level concentration at these receptors is highly dependent on fugitive dust emissions from existing on-site activities and not on the PM₁₀ stack emissions generated by this modification. This was demonstrated by the Proponent using two methods in the AQIA.

Firstly, by modelling the Kiln 6 stack emissions alone, the resultant maximum off-site incremental 24-hour PM₁₀ concentration beyond the site boundary at any off-site sensitive receptor is very low, at only 3.7 µg/m³ at receptor 12, located to the south of the facility. This maximum predicted PM₁₀ concentration is only 7.5% of the NSW EPA ground level assessment criteria of 50 µg/m³. Secondly, the insensitivity to Kiln 6 stack PM₁₀ emissions was demonstrated by increasing the modelled emission rate from Kiln 6 by 50%, with no resultant impact on the maximum PM₁₀ impacts beyond the site boundary.

The Proponent's assessment concluded there would be no effective change to off-site local air quality impacts of PM₁₀ due to the modification as the model results are insensitive to Kiln 6 stack PM₁₀ emission rates at the emission concentrations proposed during the burning of SWDF. Furthermore, the Proponent advised the modelling of fugitive emissions was highly conservative because the modelled representative year had higher wind speeds compared to the average and the PM₁₀ from open sources (e.g. open ground and stockpiles) was estimated using emission factors from the National Pollutant Inventory (2012), not actual measurements. As such the predicted fugitive dust concentrations were over-estimates of the actual maximum ground level concentrations.

The Department and EPA are satisfied the Proponent's conclusions are supported by the long-term PM₁₀ data recorded at the local ambient air quality monitoring station provided in the EA. This indicates that PM₁₀ levels at that location stay consistently below the EPA's 24-hour and annual ground level assessment criteria.

The Department and EPA accept the 24-hour average PM₁₀ ground level concentrations are unlikely to be caused by the proposed burning of SWDF, the subject of this modification. However, as the cumulative assessment has predicted the 24-hour PM₁₀ ground level concentration will exceed the EPA's assessment criteria when the background data is combined with fugitive and point source emissions from the facility, the EPA recommended the modelling be revised to more accurately predict fugitive dust emissions.

In lieu of undertaking further refinement of the air quality model, the Proponent proposes to validate the current modelling by undertaking additional PM₁₀ monitoring between the existing raw material stockpiles and New Berrima village, at a location to be agreed with the EPA. This general location is also where the air quality modelling indicated the worst case PM₁₀ emissions would be under adverse weather.

The Department and EPA are satisfied that the Proponent's dispersion modelling has demonstrated that the proposed burning of SWDF will not generate a significant increase in PM₁₀ ground level concentrations off-site. While the modelling of fugitive dust emissions indicates existing ground level concentrations of PM₁₀ exceed the EPA ground level criteria, the Department and EPA acknowledge the dispersion modelling is inherently conservative. The Department and EPA agree with the Proponent's approach to validate the modelling by collecting real-time data. The Department has therefore recommended the existing air quality monitoring program be modified to include an additional PM₁₀ monitor for fugitive dust emissions. It should also be noted that the existing condition 4.2 on the consent (as modified) provides the Department and EPA with a mechanism for the Proponent to provide remedial actions and a timetable for implementation in the event that PM₁₀ emissions exceed the limits in the consent.

The Department's assessment concludes the Proponent has demonstrated a particulates emission limit of 50µg/m³ for the Kiln 6 stack is unlikely to result in off-site ground level concentrations of PM₁₀ exceeding the

EPA assessment criteria at any sensitive receiver. The proposed emission limit is consistent with the Group 6 emission standard in the POEO (Clean Air) Regulation. The Proponent's commitment to undertake additional monitoring to validate fugitive dust emissions is a suitable means of obtaining a realistic set of contemporary data for PM₁₀ emissions.

NO_x

The Proponent proposes to increase the limit for NO_x emissions for the burning of non-standard fuels from 800 mg/m³ to 1,250 mg/m³ over a 1-hour averaging period or to 1,000 mg/m³ over a 24-hour averaging period for the burning of non-standard fuels. The Proponent considers this provides a practical approach to limiting peak hourly NO_x emission levels as required by the EPA while also taking into account international best practice in relation to the application of a 24-hour averaging period.

The Group 6 emission standard in the POEO (Clean Air) Regulation is 500 mg/m³ measured over a 1-hour averaging period. However, Clause 36 of the Regulation allows a Proponent to seek an alternative emission standard for NO_x provided it is supported by appropriate air dispersion modelling in accordance with the EPA's 'Approved Methods' guideline.

The Proponent seeks the alternative emissions limit on the basis that interactions between fuel combustion and chemical processes during the clinker manufacturing process in the cement kiln can result in significant hourly variations in NO_x which are not reflective of the environmental impact of the kiln emissions. The Proponent's dispersion modelling was therefore based on a worst case scenario using an emission concentration of 1,200 mg/m³ over a 1-hour averaging period and were assumed to apply continuously, i.e. 365 days per year, 24 hours per day. As outlined in **Table 4** above, this demonstrated an increase is unlikely to exceed the EPA's 1-hour and annual average ground level assessment criteria for NO_x at the nearest sensitive receiver.

The Department and the EPA acknowledge the Proponent's dispersion modelling was highly conservative, and there is a need to make some allowance for the short-term variability of NO_x emissions from the cement kiln during the burning of non-standard fuels. Therefore, the Department and EPA consider an increase in the emission limit for the burning of non-standard fuels to 1,250 mg/m³ over a 1-hour averaging period is reasonable and justified. Similar to the approach taken with the particulates emission limit, the EPA have recommended the cement facility has a single set of emission limits for NO_x which would apply during the burning of any fuel, which would be applied to the EPL, rather than adopting separate limits for the burning of standard or non-standard fuels. The EPA therefore recommends retaining a limit of 1,000 mg/m³ over a 24-hour averaging period which is currently the emission limit for standard fuels. A 24-hour averaging limit for NO_x is standard practice in Europe across all cement kilns.

The Department agrees with this approach as it provides for simplicity in reporting and monitoring against the EPL requirements. In addition, retaining a 'blanket' of 1,000 mg/m³ over a 24-hour averaging period ensures transparency in the process, as this is the existing limit to which the public have become accustomed to controlling NO_x emissions from the facility.

VOCs

The Proponent proposes to increase the limit for VOC emissions from 20 ppm to 40 ppm (equivalent to approximately 59 mg/m³) over a 1-hour averaging period. The Group 6 emission standard in the POEO (Clean Air) Regulation is 40 mg/m³. To support this request, the Proponent provided information to demonstrate that VOC emissions at the facility are derived from the use of blue shale (one of the raw materials required for manufacturing grey clinker) and are therefore not related to combustion. Further evidence showed that VOC emissions vary over time due to the natural variation of blue shale within the on-site shale pit resource. At times, a 20 ppm VOC limit will therefore currently be exceeded even when not using alternative SWDF.

In view of the above, the Proponent is proposing to set a VOC emission limit of 40 ppm, on a 24-hour basis, expressed as Propane (a non-methane hydrocarbon), which eliminates the VOCs generated by the shale. This is supported by the Proponent's AQIA which demonstrates the relevant EPA ground level assessment criteria will not be exceeded at any sensitive receiver.

The Department and EPA are satisfied that the Proponent has provided sufficient evidence to demonstrate the increase in the VOC emission limit to 40 ppm will not result in any exceedance of the relevant EPA ground level criteria and will not generate any off-site harmful emissions.

Conclusion

Overall, the Department is satisfied the Applicant has provided a reasonable and conservative estimate of the predicted air emissions from the proposed modification and has justified the reasons for an increase in emission limits. The Department and EPA are satisfied the Proponent has demonstrated the proposed air

quality emission limits for particulates, NO_x and VOCs are unlikely to cause the relevant EPA ground level assessment criteria to be exceeded at any sensitive receiver during the burning of non-standard fuels. With appropriate mitigation measures in place, there is not expected to be any nuisance air emissions generated during construction or operation of the development. It is acknowledged that ground level concentrations of particulates (PM₁₀) are highly dependent on fugitive dust emissions and not on the PM₁₀ emission rate from Kiln 6 emissions rates proposed by this modification.

In order to demonstrate the appropriateness of the SWDF at different ratios and feed rates, the Department and EPA have agreed to a set of conditions that require the Proponent to undertake POP trials until the desired performance is achieved (as previously discussed in Section 7.1 of this report). This is standard practice in Australia and Europe. This includes preparation of a trial plan for each SWDF, minor monthly reports and a major report at six months during the trial period, to the satisfaction of the Secretary.

The Department and EPA have also agreed there should be a single set of emission limits that apply during the burning of either standard or non-standard fuels which should be applied to the EPL, rather than the consent. This reduces duplication between the EPL and the consent, should any limits need to be varied following the POP trials. The Department has therefore recommended the consent be modified accordingly. The Proponent agrees with this approach.

The Proponent has committed to undertaking a number of management and mitigation measures to ensure emissions do not exceed the emission limits applied to the EPL. These include continuous measurement in the Kiln 6 stack of particulates, NO_x and VOCs to monitor emissions from the burning of SWDF, continuous monitoring of operational parameters such as temperature, oxygen concentration and water content, and the operation of an ambient monitoring station beyond the site boundary to continuously record meteorological data and TSP, PM₁₀ and other compounds.

The Department's assessment concludes the proposed emission limits are acceptable and are unlikely to result in unacceptable air quality impacts. The PoP trials required by the modified conditions of consent would test all major process components, including air pollution control equipment and implementation of the QA/QC procedures (including adherence to the fuel specifications), and confirm the technology can meet relevant criteria and EPL requirements. The trials will also ensure appropriate analysis of continuous monitoring stack emissions data prior to allowing full scale operation and use of SWDF at the facility. Ongoing auditing of the use of non-standard fuels is also required under existing condition 4.6 of the consent. The Department and EPA consider the risk of unacceptable air quality impacts is very low.

7.3 Human Health Risk

Emissions from the burning of SWDF at the Berrima cement facility have the potential to have adverse health impacts via both direct and indirect exposure pathways if not appropriately managed and controlled.

The Proponent prepared a Human Health Risk Assessment (HHRA) in accordance with the *Environmental Health Risk Assessment: Guidelines for Assessing Human Health Risks from Environmental Hazards* (enHealth, 2012) (the enHealth Guidelines). The report provides a quantitative assessment of the risk to human health associated with the use of SWDF in Kiln 6. To assist with the assessment of health risk issues, the Department consulted with the DoH and the EPA and also engaged an independent health risk specialist (EnRisks) to review the HHRA (in collaboration with the EPA).

Initial reviews of the HHRA by EnRisks and the EPA identified some fundamental issues with the assessment methodology. The Proponent subsequently submitted a revised HHRA supported by supplementary air quality information to address the outstanding concerns. Following a number of discussions with the Proponent, EnRisks and the EPA advised the Proponent had satisfactorily addressed their concerns. The Department, EPA, EnRisks and DoH are satisfied the HHRA now provides a robust assessment of potential health risk issues associated with the modification.

The local communities potentially impacted include the townships of New Berrima, Berrima, Moss Vale and Burradoo. The contaminants of potential concern (COPC) include fine particulates (PM₁₀ and PM_{2.5}), sulfur dioxide, nitrogen oxides, carbon monoxide, VOCs, polycyclic aromatic hydrocarbons (PAHs), heavy metals, hydrogen halides, sulfuric acid mist / sulfur trioxide and dioxins. Sources include combustion processes, dry goods handling and milling processes. The primary exposure routes were determined to be via the airborne pathway and inhalation and ingestion of the COPC. The secondary exposure pathway was determined to be via soils and subsequent exposure through inhalation, ingestion or dermal absorption.

HHRA typically use a combination of Australian and international health based criteria to assess acute and chronic health impacts. The HHRA compared predicted COPC concentrations at or near receptor sites with acute and chronic health based criteria and the EPA impact assessment criteria in the 'Approved Methods'

guideline. With the exception of chlorine and sulfuric acid mist / sulfur trioxide, all COPCs were assessed as unlikely to be present at concentrations likely to impact on the health risks to sensitive receptors in the surrounding communities.

The predicted peak ground level concentration of chlorine at the nearest sensitive receiver is $48.4\mu\text{g}/\text{m}^3$, which exceeds the acute health based criteria² of $15\mu\text{g}/\text{m}^3$ and the chronic health based criteria³ of $0.15\mu\text{g}/\text{m}^3$. Predicted peak ground level concentrations of sulphuric acid mist / sulphur trioxide at the site boundary is predicted to be $24.2\mu\text{g}/\text{m}^3$, which exceeds the EPA impact assessment criteria in the 'Approved Methods' guideline of $18\mu\text{g}/\text{m}^3$. Therefore the potential for health risks to local communities was assessed further by the Proponent.

The HHRA identified the lowest concentration of airborne chlorine and sulfuric acid to cause a physiological response in the most sensitive population groups. For chlorine and sulfuric acid mist/sulfur trioxide, this is a concentration of $761.5\mu\text{g}/\text{m}^3$ and $70\mu\text{g}/\text{m}^3$, respectively⁴. As the maximum exposure concentration for chlorine and sulfuric acid at the nearest sensitive receptor was predicted to be $48.4\mu\text{g}/\text{m}^3$ and $24.2\mu\text{g}/\text{m}^3$, respectively, the HHRA concluded that the predicted COPC emissions during the operation of Kiln 6 when burning non-standard fuels are not expected to lead to an increase health risk to the surrounding communities.

Based on the advice of the EPA, DoH and EnRisks, the Department agrees with the conclusions of the revised HHRA and concludes that the proposed modification is unlikely to result in increased health risks to local communities. The Department is satisfied the HHRA was generally conducted in accordance with the requirements outlined in the enHealth Guidelines and the other relevant and appropriate guidance documents referred to in the HHRA. The HHRA adequately demonstrates that the risk to human health as a result of emissions from the Kiln 6 stack is low and acceptable.

The EPA recommended conditions of consent to require a program of ambient monitoring of TSP, $\text{PM}_{2.5}$, PM_{10} and other relevant pollutants and an updated air quality management plan (AQMP) to validate that the performance of the modification reflects the assumptions, estimates and conclusions made in the HHRA and AQIA. The Department has included these in the recommended modified conditions of consent.

The Department's recommended modified conditions of consent also require the Applicant to carry out PoP trials to demonstrate compliance with the relevant requirements of the EPL, development consent and relevant environmental and safety criteria. The Department is satisfied this will demonstrate and verify the Proponent's assessment of air emissions is representative and conservative. As the burning of any SWDF in Kiln 6 is not permitted outside of the POP trials until the Secretary is satisfied with the results of the PoP trial report for each SWDF, the Department is satisfied the risk of harmful emissions is low and acceptable.

The Department's assessment concludes the HHRA is robust and is based on appropriate methodology and assumptions. The HHRA adequately demonstrates there is unlikely to be any potential health impacts as a result of the modification and the burning of non-standard fuels in Kiln 6 presents an acceptable health risk. Validation of the assumptions, estimate and conclusions of the HHRA and AQIA will be provided through the requirement for an updated AQMP and the PoP trial reports, which must be approved by the Secretary.

7.4 Other Issues

The Department's consideration of other issues is provided in **Table 5**.

Table 5: Assessment of Other Issues

Consideration	Recommendation
Traffic and Transport	
<ul style="list-style-type: none"> The modification will result in an increase in traffic movements and has the potential to have an impact on the surrounding local road network. The Proponent undertook a Traffic Impact Assessment to quantify the traffic impacts and determine whether any upgrades to intersections are required. Traffic from the cement works currently travels on Taylor Road (local road), Berrima Road (RMS Main Road) and the Hume Highway (national highway). 	<p>Require the Proponent to:</p> <ul style="list-style-type: none"> prepare a traffic management plan as part of an updated Construction Environmental Management Plan (CEMP) for the modification works; pay a road maintenance levy to Council; and

² Acute health based criteria based on Texas Commission on Environmental Quality Effects Screening Levels (2015)

³ Chronic health based criteria based on USEPA Regional Screening Levels (2015)

⁴ Toxicology criteria based on Agency for Toxic Substances and Disease Registry United States Department of Health and Human Services

Consideration	Recommendation
<ul style="list-style-type: none"> Construction would generate limited additional light and heavy vehicle movements and would be managed in accordance with a Traffic Control Plan required as a recommended condition of consent. Operational traffic would increase as a result of the modification. On a weekday, there is predicted to be 20 additional trips (297 increasing to 317 trips) on an average 12 hour working weekday, equivalent to 1.6 additional trucks per hour. On a Saturday, there is predicted to be 10 additional trips (90 increasing to 100 trips) on an average 6 hour working Saturday, equivalent to 1.7 additional trucks per hour. Council has confirmed that the existing traffic data is acceptable and no road or intersection upgrades would be required. RMS noted that the predicted traffic increase was minor and is unlikely to warrant any upgrades to the intersection of Berrima Road and the site access. RMS did not object to the modification. The Proponent has committed to paying a road maintenance levy to Council of 4 cents/tonne/km for the transport of SWDF. This has been accepted by Council and has been required as a condition of consent. Existing conditions of consent require the Proponent to prepare and implement a Traffic Code of Conduct. It is recommended that this condition is retained and an additional condition requiring the preparation of Traffic Management Plan for construction is included in the modified consent. The Department's assessment concludes that the predicted increase in traffic movements is minor and as such there will be a relatively minor impact on the surrounding road network and negligible impacts from a cumulative perspective. No road or intersection upgrades are required. 	<ul style="list-style-type: none"> retain existing conditions relating to traffic and transport.

Hazard and Risk

<ul style="list-style-type: none"> The Proponent proposes to store 7 tonnes of liquefied petroleum gas (LPG) and 365,000 litres of diesel on the site. LPG and diesel are classed as Dangerous Goods in accordance with the <i>Australian Code for the Transport of Dangerous Goods by Road and Rail</i> (Dangerous Goods Code). The volumes of LPG and diesel to be stored on site are below the screening thresholds specified in the <i>Hazardous and Offensive Development Guidelines – Applying SEPP 33</i> (Department of Planning, January 2011). Dangerous goods vehicle movements are below SEPP 33 thresholds with respect to both load quantity and weekly movement thresholds (1 movement predicted versus a threshold of >30 movements). The Proponent's assessment concludes the proposed modification is not "potentially hazardous" in accordance with SEPP 33 and therefore a Preliminary Hazard Analysis is not required. The Department's assessment concludes that no additional site specific environmental management measures are required outside of the existing requirements for a Fire Safety Study, Hazard and Operability Study, Emergency Management Plan and Safety Management System. The Department recommends the Proponent be required to prepare a Construction Environmental Management Plan (CEMP) for the modification works, which includes an update to the Fire Safety Study and Hazard Operability Study and an updated OEMP (which includes an Emergency Management Plan and Safety Management System) prior to the use of SWDF. 	<p>Require the Proponent to:</p> <ul style="list-style-type: none"> retain existing conditions regarding a Fire Safety Study; retain existing conditions that require a Fire Safety Study and Hazard and Operability Study; retain condition 6.6 which requires an update to the existing OEMP prior to the use of non-standard fuels; and prepare an updated CEMP for the works associated with the modification and to update all associated management plans required under condition 6.2 prior to commencement of construction of the kiln feeding and SWDF storage infrastructure.
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Stormwater and Groundwater Impacts

<ul style="list-style-type: none"> Construction of the kiln feeding system and storage building has the potential to intercept groundwater and require dewatering. Ground disturbance activities will be to a maximum depth of 7 m. Groundwater depths range from 3.6 m to 45 m in the vicinity of the site. Geotechnical investigations drilled to a depth of 9 m within the site footprint but did not intercept groundwater and the nearby shale pit has not intercepted groundwater to a depth of 40 m during its operations. It is therefore unlikely that construction will impact on or contaminate local groundwater. 	<p>Require the Proponent to:</p> <ul style="list-style-type: none"> retain existing conditions regarding stormwater and groundwater management; and prepare an updated CEMP for the works associated with the modification.
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Consideration	Recommendation
<ul style="list-style-type: none"> Construction activities have the potential to generate erosion and sedimentation and pollute local waterways. There are no notable surface water bodies or tributaries on the site and the site is not prone to flooding. Given the small (0.6 ha) area of disturbance, the existing site surface water management system has the capacity to manage any additional runoff. The Proponent proposes to prepare a CEMP prior to the commencement of construction to address construction related environmental impacts, including dust management and sediment and erosion control measures. The EPA and Council did not raise any concerns regarding potential stormwater or groundwater impacts. The Department is satisfied that the management of stormwater impacts as a result of construction may be suitably managed through the proposed CEMP. A recommended condition of consent requires an updated CEMP for the works associated with the modification. The Department's assessment concludes that the proposed modification works are unlikely to intercept the groundwater table and impacts to surface water can be adequately managed via a CEMP during construction and the existing stormwater management system during operation. 	

Noise

<ul style="list-style-type: none"> Noise and vibration impacts may occur as a result of construction, increased traffic and operations as a result of the modification. The Proponent undertook a Noise and Vibration Assessment (NVA) to quantify the predicted impacts from the proposed modification. Three sensitive receivers (identified as R1, R2 and R3, respectively) were identified within the vicinity of the site to the north (4 Melbourne Street), east (Chesley Park Farm) and south east (Candowie Farm House). Construction related noise was assessed in accordance with the <i>Interim Construction Noise Guideline</i> (ICNG) (DECC, 2009). The predicted construction noise levels are not expected to exceed the daytime (standard construction hours) $LA_{eq(15\text{minute})}$ noise management level of 40 dB(A) at any sensitive receiver. Operational noise modelling under calm conditions indicates that the predicted noise levels at the surrounding receiver locations are expected to achieve the noise targets established. Operational modelling under adverse conditions showed compliance with noise targets at R1 and R3 and a 3 dB exceedance at R2. R2 has recently been acquired by Austral Bricks and is no longer occupied, and has therefore been excluded as a sensitive receiver for the purposes of the modification. No noise mitigation is therefore required. Based on a 9% increase in daytime operational traffic the overall traffic noise level is expected to increase by less than 2 dB and therefore operational traffic related noise is considered negligible. The EPA did not raise any concerns regarding noise impacts of the modification. A recommended condition of consent requires a new CEMP for the works associated with the modification and an updated operational management plan to reflect the changes as a result of the modification, which include management of noise impacts. An updated condition is recommended that limits hours of construction. The Department's assessment concludes that the modification is unlikely to result in noise impacts to the surrounding sensitive receivers and no mitigation measures are required other than best practice measures. 	
	<p>Require the Proponent to:</p> <ul style="list-style-type: none"> retain existing conditions of approval regarding noise limits; adhere to a new condition regarding hours of construction; and prepare an updated CEMP for works associated with the modification that includes a construction noise management plan, and implementation of all construction noise mitigation measures identified in the <i>Interim Construction Noise Guideline</i> (DECC, 2009).

Landscape & Visual Impacts

<ul style="list-style-type: none"> The proposed kiln feeding infrastructure and external stockpiling of RDF have the potential to have a visual impact in the surrounding area. The Proponent therefore undertook a Landscape and Visual Assessment. The new enclosed conveyor will extend north for around 110 m from the proposed SWDF reception shed to a maximum of 65 m above ground level 	
	<p>Require the Proponent to:</p> <ul style="list-style-type: none"> retain existing conditions regarding controls on external lighting associated

Consideration	Recommendation
<p>at the point it meets the preheater tower (which stands 85 m high). The conveyor would be most visible from Berrima Road.</p> <ul style="list-style-type: none"> ▪ The Proponent's assessment concluded that the new infrastructure would have a negligible to low visual significance due to screening provided by existing on-site infrastructure; gently undulating and ridgeline landforms; and moderate to dense tree cover within and surrounding the cement works and residential dwellings. ▪ The Proponent has proposed that, where possible, the colour and texture of any new structures will be dark in tone and non-reflective materials used to minimise visual impacts. Existing conditions of consent control external lighting associated with the cement works. ▪ The Proponent confirmed that the stockpiling of RDF would only be required during kiln downtime for maintenance and repair. The maximum height of any stockpile would be no greater than five metres and would not be visible at any sensitive receiver. ▪ The Department's assessment concludes that the proposed new kiln feeding infrastructure and storage shed will have a minor visual impact on surrounding areas. The proposed new structures will be lower than existing structures on the site, have a small footprint within a large site and will be finished in appropriate colours and materials consistent with the existing infrastructure. ▪ Recommended conditions of consent limit RDF stockpiling in the external storage area to times of kiln maintenance or repair and a maximum height of five metres to minimise the visual impacts. 	<ul style="list-style-type: none"> ▪ with the operation of the cement works; and ▪ limit operational stockpiling of RDF in the external storage area to periods of extended kiln downtime for maintenance or repair and stockpiles with a maximum height of five metres.

Greenhouse Gas

- The proposed modification has the potential to generate greenhouse gas emissions, therefore, the Proponent undertook a Greenhouse Gas Assessment to quantify the impacts.
- An assessment of Scope 1 (point source emission factors), Scope 2 (indirect emission factors) and Scope 3 (transport of goods) emissions was undertaken.
- The total (Scope 1, 2 and 3) estimated annual operational GHG emissions for the existing operations are 1,435 kilotonnes of carbon dioxide equivalent (ktCO₂-e) per year. This compares with estimated annual operational GHG emissions for the proposed operations of 1,316 ktCO₂-e per year.
- The results of the greenhouse gas assessment indicate a potential reduction in overall GHG emissions of approximately 119 ktCO₂-e per year.
- In the NSW state context, the proposed operations represent approximately 0.84% of the total annual state emissions.
- The Department's assessment concludes the proposed modification is unlikely to increase greenhouse gas emissions. No additional conditions are required to address greenhouse gas emissions.
- No additional conditions required.

Community Consultation

- The Proponent advised that consultation has occurred with a number of stakeholder groups regarding the proposal prior to and during the preparation of the EA, including the EPA, RMS, Council and the Berrima Cement Works Community Liaison Group (CLG).
- Council and the EPA requested additional requirements be imposed to require ongoing community consultation and engagement in line with the Policy. This was required to demonstrate an ongoing commitment to transparent community engagement during the initial stages of project construction and operation.
- Under the requirements of Modification 1 to the consent (approved in 2005), the Proponent has an established Community Liaison Group (CLG) that meets approximately three to four times each year. The CLG has been operating since 2006 and includes representatives of Boral Cement, the local community and council. All local residents are also invited to the meetings.
- Require the Proponent to:
 - prepare a community consultation and engagement plan to be approved as part of the updated CEMP prior to the commencement of construction; and
 - an updated community consultation plan to be approved as part of the updated OEMP prior to the receipt of any non-standard fuels.

Consideration	Recommendation
<ul style="list-style-type: none"> ▪ The CLG provides advice on the environmental performance of the development. ▪ A recommended condition of consent requires the preparation of a community consultation and engagement plan, including details of how the community will be kept informed regarding the timing of construction and the PoP trials, and must also address complaints management. The plan has been required as part of the updated CEMP. The CEMP must be approved by the Secretary. ▪ A recommended condition of consent also requires an update of the community consultation and engagement plan to be included in the updated OEMP. The condition requires the Proponent to address how the community will be kept informed about the results of the PoP trials and the ongoing use of SWDF. ▪ The Department's assessment concludes appropriate consultation with the community will continue during construction and operation of the modified facility. 	

8. CONCLUSION

The Department has assessed the modification request in accordance with the relevant requirements of the EP&A Act. The Department has worked closely with the EPA to ensure that the burning of SWDF is managed appropriately through conditions on the modified consent and the existing EPL to minimise and manage any residual risks to the environment or human health. The Department's assessment is based on the advice of two independent experts in the fields of human health risk and alternative energy engineering and the Department's recommendations are consistent with their advice.

The Department's assessment concludes that the proposed modification is appropriate on the basis that the proposed amendments will not change the use or operation of the facility and will improve its functionality and efficiency with minimal environmental impacts. The Department also concludes the potential environmental impacts can be appropriately managed through existing and modified conditions of approval. Overall, the key environmental impacts relating to consistency with the *NSW Energy from Waste Policy*, air quality, human health risk and reporting and other minor issues associated with the modification are considered acceptable.


Consequently, it is recommended the modification be approved subject to the recommended conditions.

9. RECOMMENDATION

It is **RECOMMENDED** that the Director, Industry Assessments as delegate of the Minister for Planning:

- **approves** the request under section 75W of the EP&A Act, subject to conditions; and
- **signs** the Instrument of Modification (**Appendix A**).

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4/10/16


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5/10/16

APPENDIX A: NOTICE OF MODIFICATION

APPENDIX B: SUPPORTING INFORMATION

The following supporting documents and supporting information to this assessment report can be found on the Department of Planning and Environment's website as follows:

1. Modification Application

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=7158

2. Submissions

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APPENDIX C: ENERGY FROM WASTE POLICY TECHNICAL CRITERIA

The following provides a summary of the project's compliance with the *Energy from Waste Policy Statement*.

Technical Criteria	Complies (Y/N)	Comment
Gas resulting from process should be raised to 850°C for at least 2 seconds	Yes	A large volume pre-calciner combustion vessel will be used, which gives fuels >6 seconds to burn out at temperatures >800°C
If a waste contains >1% of halogenated organic substances, expressed as chlorine, the temperature should be raised to 1100°C for at least 2 seconds	No	<p>Fuel specifications would limit the chlorine content of SWDF to <1%. Higher chlorine content affects quality of cement/clinker produced.</p> <p>Boral does not consider it necessary to achieve a temperature of 1100°C for >2 seconds</p> <p>In lieu of meeting the temperature and residence time requirements, the Department and EPA have accepted a comprehensive QA/QC document from the Proponent that sets out the pre-qualification requirements for SWDF suppliers, detailed fuel specifications, and the requirements for the checking and sampling of SWDF.</p>
Process and air emissions should satisfy at a minimum the Group 6 emissions standards in the POEO (Clean Air) Regulation	Yes	<p>Seeking to align emission limits for particulates with Group 6 emission standards.</p> <p>Seeking alternative emission limits for NO_x and VOCs under Clause 36 of the POEO (Clean Air) Regulation</p>
Continuous measurement of NO _x , CO, particles (total), total organic compounds, HCl, HF and SO ₂	Yes	In 2004, Boral upgraded Kiln 6 and installed continuous monitoring equipment for key gaseous pollutants, except HF as the cement kiln process is very effective at scrubbing HF, therefore demonstrating compliance with HCl emissions is sufficient to demonstrate compliance with HF limits
Continuous measurements of specific operational parameters	Yes	Continuous monitoring would be undertaken of specified operational parameters, including temperature in the combustion chamber and stack, oxygen concentration and water content
Data made available to EPA in real time	Yes	Data to be made available to EPA
The total organic carbon (TOC) or loss on ignition (LOI) content of the slag and bottom ashes must not be greater than 3% or 5%, respectively, of the dry weight of the material	Yes	There will be no slag or bottom ash produced from the process
Proof of performance (POP) trials to demonstrate compliance with emission standards	Yes	The Proponent notes this requirements and a recommended condition of consent requires these tests to be undertaken
Waste feed interlocks to prevent waste from being fed before the required temperature has been reached	Yes	Interlocks linked to the plant control system will ensure SWDF is only fed when kiln temperatures are appropriate.
Complete an air quality impact assessment in accordance with EPA guidelines	Yes	An AQIA has been undertaken in accordance with relevant guidelines

International Best Practice Emission Controls	Complies (Y/N)	Comment
The BAT Reference Document for the Production of Cement, Lime and Magnesium Oxide (2013) the most effective best practice abatement control measures for the control of NO _x emissions from a rotary cement kiln such as Kiln 6 include selective non-catalytic reduction (SNCR) and selective catalytic reduction (SCR). These processes involve the application of a reagent (either ammonia or urea) to exhaust gases to reduce NO _x emissions.	Yes	<p>The Proponent has employed a number of other best practice techniques identified in the BREF, including a modern low NO_x kiln burner, high level process control to maximise optimal combustion conditions and the staged combustion of fuel in the pre-calciner vessel. The adoption of these techniques has resulted in the maximum predicted 1-hour ground level concentration of NO_x at 210µg/m³ and the maximum predicted annual concentration of NO_x at 13.1µg/m³ at the nearest residential sensitive receivers, remaining well below the relevant health limits, being 246µg/m³ (the acute health based guideline level) and 62µg/m³ (the chronic health based guideline level), respectively.</p> <p>The use of SNCR would require a high level of capital investment (~ \$1.4 million) for storage, pumping and control systems. The ongoing cost of ammonia reagent and additional power consumption for operation of the system is also very high (\$4 million to \$5 million per year).</p> <p>The Department is satisfied the use of SNCR or SCR are not viable options for the Berrima facility and the existing NO_x reducing technology represents international best practice and has the ability to adequately control NO_x emissions from the facility. In addition, the Proponent's dispersion modelling has adequately demonstrated that the required health limits of NO_x can be achieved without the need for further reductions in emissions.</p>
The BAT Reference Document for the Production of Cement, Lime and Magnesium Oxide (2013) notes both electrostatic precipitators and fabric filters are international best practice for the control of particulate emissions from cement kilns	Yes	<p>Kiln 6 already uses both techniques to control dust emissions from the stack.</p> <p>To ensure that the performance of the existing equipment is optimised, it is critical the equipment is adequately maintained. An existing condition of approval (Condition 3.10) requires the Proponent to operate and maintain the facility to ensure discharge limits are not exceeded. A similar requirement exists on the current EPL.</p>
Reference Facility	Complies (Y/N)	Comment
The Policy requires that energy recovery facilities use technologies that are proven, well understood and capable of handling the expected variability and type of waste feedstock. This must be demonstrated through reference to fully operational plants using the same technologies and treating like waste streams in other similar jurisdictions.	Yes	As part of the EA, the Proponent provided supplier specifications and typical analysis of waste derived fuel for the Adelaide Brighton Limited's facility in Birkenhead, South Australia, which is a facility treating similar waste streams with similar technology as used in Kiln 6 at Berrima. A comparison of the two facilities is provided in Table 1 below.

Table 1: Comparison between Boral Berrima and Adelaide Brighton Limited Cement Works

Parameter	Adelaide Brighton Limited, Birkenhead	Boral, Berrima
Cement output	1.3 million tpa	1.56 million tpa

Parameter	Adelaide Brighton Limited, Birkenhead	Boral, Berrima
Standard base fuel	Natural Gas	Coal
Waste derived fuel volume	90,000 tpa	100,000 tpa
Waste derived fuel type	Processed Engineered Fuel (PEF) (derived from commercial / industrial and construction / demolition waste sources)	Wood waste and Refuse Derived Fuel (derived from commercial / industrial and demolition waste sources)
Process technology	Pre-calciner combustion vessel and pre-heater tower	Pre-calciner combustion vessel and pre-heater tower Modern low NO _x burner, staged combustion
Gas filtration ⁽¹⁾	2 electrostatic precipitators	1 electrostatic precipitator 1 bag filter
Particulates limit for burning of standard fuels	250 mg/m ³ (to be reduced to 100 mg/m ³ with no allowance for exceedance in 2016)	95 mg/m ³
Particulates limit for burning of non-standard fuel	250 mg/m ³ (to be reduced to 100 mg/m ³ with no allowance for exceedance in 2016)	30 mg/m ³ (existing) 50 mg/m ³ (proposed)
Annual NO _x ground level concentration ⁽²⁾	2.3 kg/t of clinker	1.55 kg/t of clinker
VOC limit	None	20 ppm (existing) 40 ppm (proposed)

Note: (1). The gas filtration technology at the Berrima facility is more modern / superior to that at Adelaide Brighton. (2). As reported for the 2013 to 2014 period as part of National Pollution Inventory reporting

APPENDIX D: INDEPENDENT TECHNICAL REVIEWS

The following independent technical review reports are attached in support of this assessment report.

1. *Modification to Berrima Cement Works – Use of Waste Derived Fuels – Review of Environmental Assessment (DA 401-11-2002 MOD 9) - Final*, dated 9 October 2015, prepared by ARUP Pty Ltd
2. *Berrima Cement Works Alternative Fuels Submission Review, Issue 2*, dated 26 February 2016, prepared by ARUP Pty Ltd
3. *Review – Boral Cement Berrima Works, Use of Solid Waste Derived Fuels in Kiln 6, Human Health Risk Assessment*, Letter report dated 19 October 2015, prepared by Environmental Risk Sciences Pty Ltd (EnRisks)
4. *Review – Boral Cement Berrima Works, Use of Solid Waste Derived Fuels in Kiln 6, Human Health Risk Assessment*, Letter report dated 11 February 2016, prepared by Environmental Risk Sciences Pty Ltd (EnRisks)