BORAL LAND AND PROPERTY GROUP
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Berrima Cement Works

Statement of Environmental Effects
HiCal50 Modification Application
May 2019

Section 4.55(1A) Modification Application

Control Sheet

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Contents

1. Introduction

1.1 Project overview

Boral Cement Limited (formerly known as Blue Circle Southern Cement Ltd, hereafter 'Boral') operates the New Berrima Cement Works (the facility) in the Wingecarribee Shire local government area (LGA). Operating since 1929 the site produces an array of cement products for use in domestic and international construction markets.

The facility operates subject to two development consents issued by the Department of Planning and Environment (DPE), namely; DA 401-11-2002 (Kiln 6, May 2003); and DA 85-4-2005 (Mill 7, Aug 2005). The development consent for DA 401-11-2002 has been modified ten times. The site is also subject to an Environment Protection Licence (EPL 1689) issued by the NSW Environment Protection Authority (EPA).

MOD 10 of DA-401-11-2002, the latest modification, sought approval to modify the development layout of the Solid Waste Derived Fuels (SWDF) storage shed. SWDF material is used as an energy source in the kiln system, as well as non-standard fuels to reduce the kiln's reliance on coal; this was introduced into operations in 2004.

The approval history of the facility is summarised in **Table 1.1** below.

Table 1.1 SWDF storage shed specification

Date	Approval		Particulars
	Mod No.	Reference	
26 September 2005	1	MOD 2-1-2004	Use of non-standard fuels
22 September 2006	2	MOD 109-9-2006	Removal of hazardous waste prohibition
13 February 2007	3	MOD 12-2-2007	Trial use of tyre chips
24 April 2008	4	MOD 4	Varying usage of coke fines
31 August 2009	5	MOD 5	Coal deliveries by rail
20 June 2012	6	MOD 6	Stockpiling of coal for sale and transport
16 April 2012	7	MOD 7	Trial and use of blast furnace slag
5 August 2012	8	MOD 8	Administrative changes to align DA and EPL
5 October 2016	9	MOD 9	Receipt and use of up to 100,000 tpa of SWDFs
11 April 19	10	MOD 10	Modification to SWDF storage shed dimensions

Boral submits this application pursuant to Section 4.55 (1A) of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to modify State significant development (SSD) DA 401-11-2002. The proposed modification seeks to permit:

- use of Hi-Cal 50 at the site during the start-up and shut down processes of the kiln; and
- technical adjustments to the limitations on use of HiCal50.

No other operational changes are proposed as part of the modification. The modification will be achieved through changes to conditions 1.4D, and 3.24 as detailed in the proceeding sections of this report.

1.2 The applicant

The proponent and owner of the Cement Works is Boral Cement Limited, formerly known as Blue Circle Southern Cement Ltd., which is a wholly owned subsidiary of Boral Limited. Boral is an international building and construction materials group, headquartered in North Sydney, Australia. Boral's competitive position is underpinned by being a market leader in cement and construction materials in Australasia, the Boral USG Joint Venture plasterboard business in Australia and Asia, and cladding and roof tiles in the USA.

Boral Australia employs over 5,000 employees in its quarry, concrete, asphalt, concrete placing and cement operations. The business is a major supplier of products to the dwelling, commercial construction, and roads and engineering markets.

In NSW, Boral has over 180 operations which include cement works, quarries, sand pits, recycling facilities, and asphalt and concrete plants. These operations produce a range of products including concrete aggregates, crushed rock, cement, asphalt and sealing aggregates, road base materials, sand and gravels for the Australian construction materials industry.

2. Site location and context

2.1 Site location

The facility is located south of New Berrima in the Southern Highlands of NSW in the Wingecarribee LGA (**Figure 2.1**). Access is via Taylor Avenue, which connects the facility with the Hume Highway, approximately 2.5km to the west.

The facility is located on Boral owned land, which comprises approximately 135 ha. The area to the south east of the Cement Works between New Berrima and Moss Vale is part of the Moss Vale Enterprise Corridor (MVEC) set aside for employment generating development under the *Wingecarribee Local Environmental Plan 2010* (Wingecarribee LEP).

The closest residential zone to the works site is located in New Berrima, approximately 650m north from the No 6 kiln stack at the closest points. Residential zones are also located in New Berrima, approximately 2,150m north of the No. 6 kiln stack. New Berrima residential area is flanked to the south and east by "Private Recreation" areas.

2.2 Land use designation and zoning

The site is situated within the Wingecarribe LGA and is zoned Heavy Industrial (IN3). The land to the immediate east and south is zoned General Industrial (IN1).

Figure 2.1 Regional context

3. Existing operations

Operating since 1929, the Berrima Cement Works produces up to 1.56 million tonnes of cement products per year (cement and clinker) for sale in NSW, the ACT and internationally. This product is transported via road, rail, and sea via Port Kembla.

The facility operates one kiln and two cement mills, along with ancillary storage and stockpile facilities. Cement manufacture is an energy intensive process due to the high temperatures required to produce clinker. To fuel this process, the site uses a range of fuel sources including coal; gas; diesel; and SWDFs.

The current development consent issued for the kiln 6 upgrade (DA-401-11-2002i as modified) and EPL 1698, permits the use of the following non-standard fuels:

- HiCal50 - spent aluminium electrode carbon;
- AKF1 - liquid oily residues comprising recovered oil from the treatment of wash waters, oils, dewatered sludges, and grease trap emulsions;
- AF5 - used and unwanted tyres;
- wood waste - organic fibrous wood residues and natural wood wastes that result from the processing of waste;
- RDF - fuel produced by processing the residues of waste by sorting and shredding (particle size reduction), dehydrating (moisture removal), and removal of recyclable and hazardous materials.

At present, only wood waste and RDF non-standard fuels are in use at the site. Previously both HiCal50 and AKF1 fuels were used with approval from the EPA and the DPE (then Department of Planning), however their use was suspended in approximately 2008.

Discussion on the existing conditions which affect the use of HiCal50 at the site are detailed in the latter sections of this report. The implications of the proposed modification have been considered against the controls imposed by these ongoing conditions.

4. Proposed modification

The proposed modification involves:

- use of Hi-Cal 50 at the site, for the purposes of use during the start-up and shut down processes of the Kiln; and
- technical adjustments to the limitations on use of HiCal50.

A modification of DA-401-11-2002 is being sought to modify existing conditions within the development consent. More specifically the proposal seeks to modify the following conditions.

Table 4.1 Existing and proposed conditions

Existing condition	Proposed condition
Conditions 1.4D - Only Standard Fuels are permitted to be used at the development during start-up and shut-down.	Conditions 1.4D - Only Standard Fuels are permitted to be used at the development during start-up and shut-down; except for HiCal50.
Condition 3.24 - The Applicant shall cease to burn Non-Standard Fuels in Kiln 6 if: a) the temperature is below 850C in the zone where Non-Standard Fuels are fired or in the vicinity of the pre-calciner; or b) the temperature is below 300C at the outlet of the preheater strings.	Condition 3.24 - The Applicant shall cease to burn Non-Standard Fuels in Kiln 6 if: a) the temperature is below 850C in the zone where Non-Standard Fuels are fired or in the vicinity of the pre-calciner; or b) the temperature is below 300C at the outlet of the preheater strings, except for HiCal 50

4.1 HiCal50 use during start up and shut down

The use of solid waste derived fuels to power kilns has been common practice in cement plants in Europe for over 25 years. The benefits of using HiCal50 as fuel in the kiln include diverting waste from landfill and decreasing the reliance on coal as an energy source.

HiCal50 is a high calorific value carbon anode material which has approval for use during the operation of the kiln, apart from during the start-up and shut down periods.

While Boral currently has approval to use HiCal50 as a non-standard fuel during the operation of the kiln, it is currently not permitted to be used during the kiln start up and shut down phases. The Department has confirmed in writing, on 6 December 2018, that the HiCal50 material meets the definition of a Group 1 Non-Standard Fuel for the purposes of the consent.

Currently the consent does not permit the use of non-standard fuels during start up and shut down, and also defines temperatures (>850^{0}C at zone where non-standard fuels are fired and >300^{0}C at the outlet of the pre-heater strings) that must be met before non-standard fuels can be used.

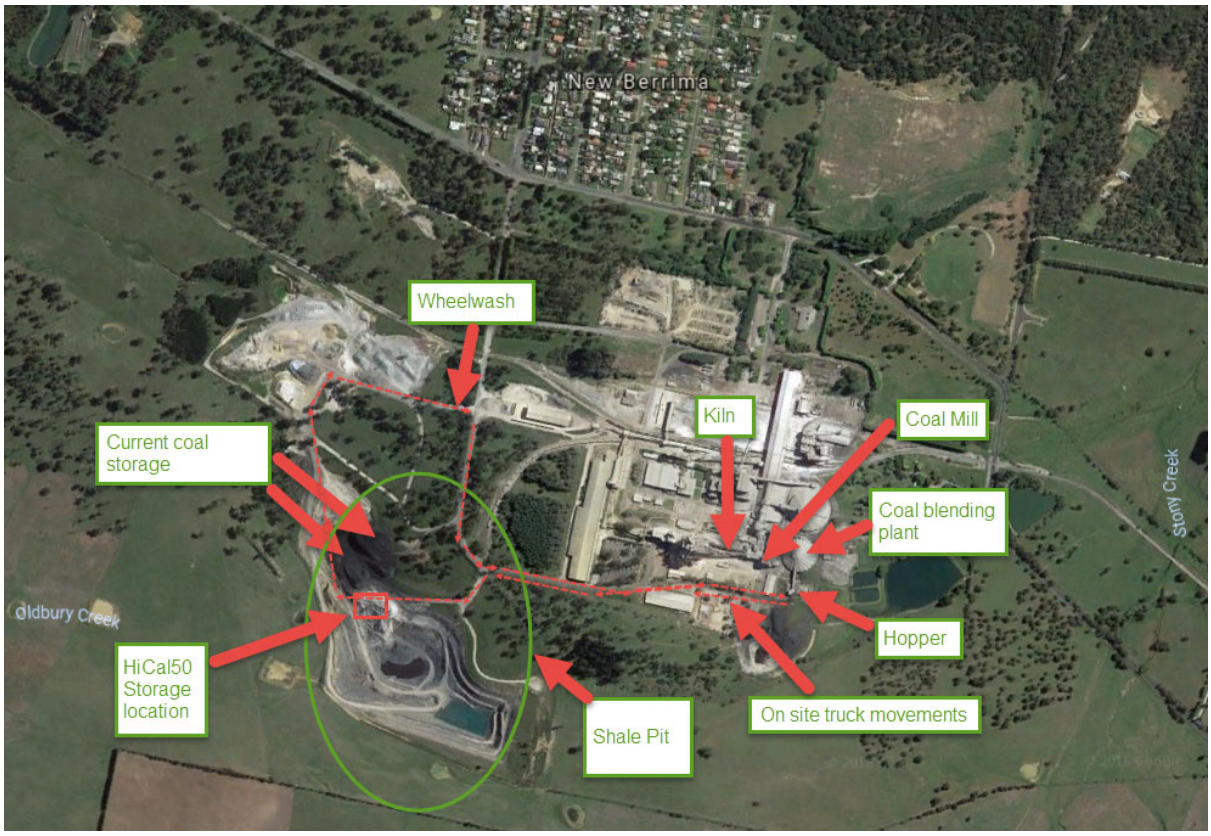
In the case of HiCal50, it can only be currently fed into the kiln via the coal mill, which receives the coal and HiCal50 from the coal blending plant to create a homogenous blend. If there are stoppages and during start-up it is not possible to exclude the HiCal50 that is already blended within the blending plant and avoid the use of HiCal50 during start-up conditions. It is expected that the concentration of HiCal50 in the blend would be 4%.

In order to facilitate the use of HiCal50 during the start-up and shut down phases, Boral has undertaken an air quality assessment which modelled the predicted impacts on the kiln stack emissions and described the current preheater temperatures when coal is added during start-up and shut down.

Boral currently has approval to receive and store up to 17,500t of HiCal50 for up to 36 months sourced from Hydro Kurri Kurri, with consent provided under the provision of existing condition 1.4E. The letter provided by the Department dated 4 April 2019, attached as Appendix C of this report, illustrates this consent.

The material sourced from Hydro Kurri Kurri will be transported via truck to the site. This material will be blended with coal to use as fuel in kiln 6 at Berrima, in line with the consumption limit under EPL 1698 of 10,000 tonnes.

In this instance a specific storage procedure has been prepared to appropriately consider and control the environmental risks of storing the material during this period. The following figure, extracted from Appendix 2 of the procedure, details the storage location and internal vehicle movements for the HiCal50 sourced from Hydro.



The above figure illustrates the preferred location for the storage of the material, being the shale pit located to the south-west of the kiln. It is considered that this location is suitable for storage purposes due to its depression which provides shelter from wind. In addition, the existing structures and systems in place will reduce the likelihood of the HiCal50 causing environmental impacts. These include:

- existing diversion drain around the shale pit to minimise the ingress of clean surface water into the pit; and

- existing earthen berm around the shale pit to provide additional shelter to stockpiles from high winds.

It is proposed that a second earthen berm will be constructed around the HiCal50 stockpile to provide additional shelter from wind and rain. The Shale Pit floor of the stockpile area, due to the geology, is largely impermeable and given that the sump is of significant size, and does not free drain in the event of a rain event, makes the pit a desirable storage location. Any Rainwater in the pit/stockpile area drains to the pit sump, where it is pumped for use as process water in the mill and kiln.

Whilst the process have been refined to account for the use of the HiCal50 sourced from Hydro during start-up and shut-down, the processes and control methods introduced to site as a result of this proposal could easily be replicated to facilitate other sources of HiCal50, and thereby allowing start-up or shut down use of HiCal50 to continue in the future; should additional sources become available in the future.

4.2 Construction

No significant construction works are required at the site. It is noted that a second earthern berm is proposed to be constructed around the stockpile, however these works would be short term, and any associated dust impacts associated with the construction would be mitigated through existing dust control measures on site.

4.3 Justification

The proposed redistribution of use of HiCal50 in the kiln burning process is required to more efficiently process the anode material at the site, in light of an opportunity to use waste material, which has no higher order waste use opportunities.

By using the material at the site, the necessity for the resource to be disposed at landfill is reduced. As the material has no higher order waste opportunities, the thermal treatment of this waste provides an opportunity to recover the embodied energy from waste and off-set the use of coal at the kiln.

This spent carbon anode material, which meets the definition of HiCal50, is a high calorific value carbon which could be used as a non-standard fuel at Berrima Cement works. Significant testing on the spent carbon material has been undertaken and indicates that the product meets Boral's specification including concentrations of mercury and cadmium.

Currently the consent does not permit the use of non-standard fuels during start up and shut down, and also defines temperatures (>850^{0}C at zone where non-standard fuels are fired and >300^{0}C at the outlet of the pre-heater strings) that must be met before non-standard fuels can be used.

The HiCal50 material can only be currently fed into the kiln via the coal mill, which receives the coal and HiCal50 from the coal blending plant to create a homogenous blend. If there are stoppages, and during start-up, it is not possible to exclude the HiCal50 that is already blended within the blending plant and avoid the use of HiCal50 during these conditions.

Coal as a standard fuel, is traditionally added when the temperature reaches ignition point i.e 850^{0}C, however, the preheater string temperature can take a number of hours before reaching 300^{0}C. As the HiCal50 can only be added as a blend with coal, the preheater temperature restriction on non-standard fuels limits the ability to consume HiCal50.During the start-up phase, the first stage is the introduction of diesel if the duration of stop is greater than 12 hours. The combustion of diesel will create heat and temperature in the ignition zone of the kiln. When the temperature in the ignition zone is greater than 850^{0}C (temperature required for coal ignition) the second stage is the introduction of coal into the ignition zone of the kiln.

After this second stage, the kiln goes into a further heating period using diesel and coal. In this heat-up period, combustion gases will travel through the kiln (about 85m) and through the preheater for approximately 150m. The hot gas generated in the kiln will heat up the refractory lining within the kiln and preheater. Hence, the hot gas coming out of the preheater is initially below 300^{0}C as the hot gas heats up the refractory.

In the final stage, about one hour prior to starting processing, the preheater refractory will have sufficient retained heat and the hot gas at the preheater exit is >300^{0}C (see Figure 5.2

graphical representation below extracted from the Air Quality review).

As the HiCal50 will only be blended up to 4% of the coal mix, and has substantial similarities in properties to coal, there is negligible change to the emission profile.

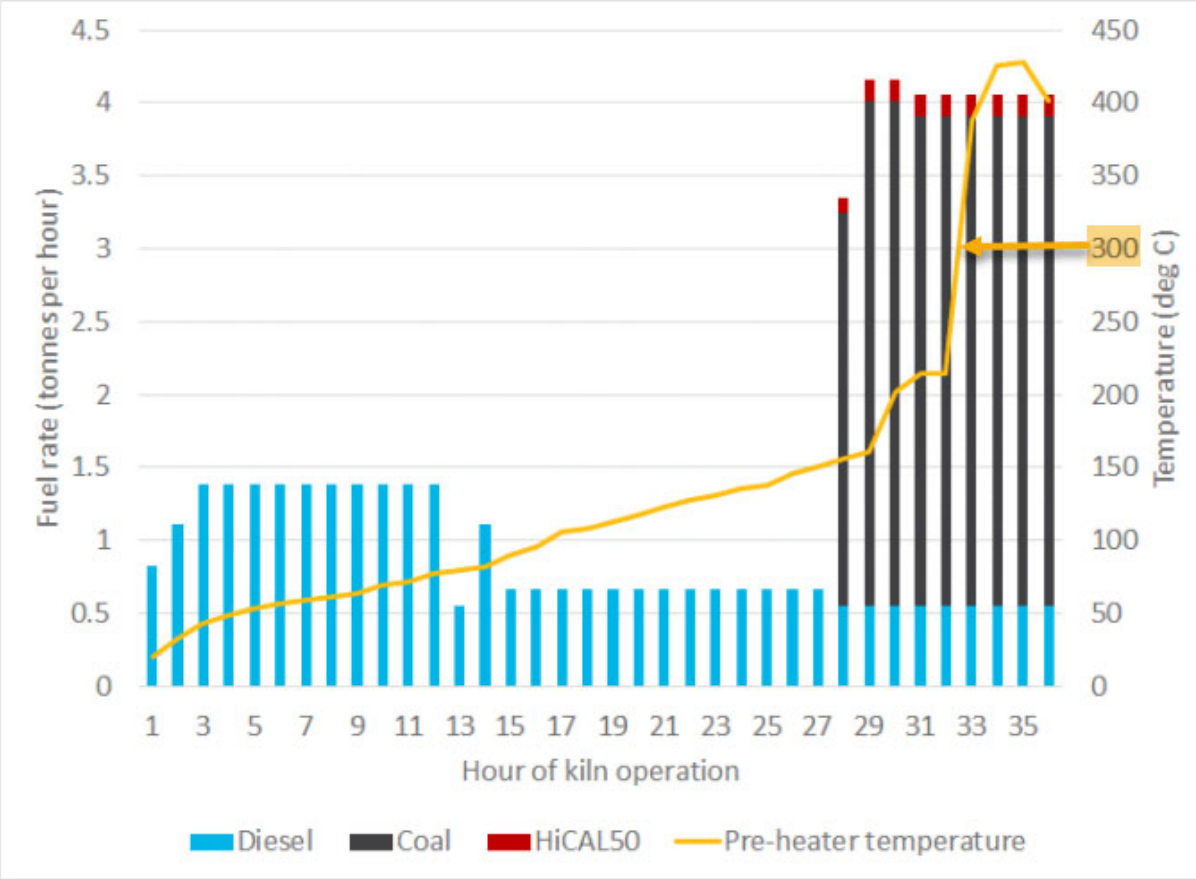


Figure 5.2 **Indicative Kiln 6 start-up fuel load and pre-heater temperature rise – shut-down greater than 36 hours – coal-HiCal50 blend feed**

Note: For comparative purposes , diesel oil was converted from litres to tonnes using a factor of 920 kg/m³ (2016, Department of Industry, Innovation and Science).

In the process of calcination of raw materials within cement kilns, the preheater is the area where limestone is heated up to 900^{0}C and releases CO2 creating an enriched environment of calcium oxide (lime). No other major chemical reactions occur within the preheater. The limit of 300^{0}C along with other temperature limits was imposed as a condition when alternative fuels were first considered as a way of defining stable kiln conditions when raw materials would typically be added to commence processing.

As the HiCal50 will only be blended up to 4% of the coal mix and the similarities in properties to coal, there is negligible change to the emission profile during start and there would be no environmental impacts as compared to just coal during the period required to heat the preheater to 300^{o}C.

Given the above, the utilisation of waste materials such as HiCal50 rather than just coal, allows the site to maintain kiln temperatures and facilitate ongoing operations at the site in a more sustainable and less coal-reliant manner.

5. Legislative context

5.1 Environmental Planning and Assessment Act 1979

The Cement Works was approved under Part 4 of the EP&A Act in May 2003. The current modification is being presented as a 4.55(1A) modification, which is discussed in Section 5.4 of this report.

The proposed modification has been assessed against key aspects of the original application and development consent. As the proposed modification will involve minimal environmental impact, as demonstrated through the EMM air quality assessment attached to this application, the proposal is acceptable as a modification under 4.55(1A).

The changes proposed to the consent through this modification application will not substantially change the operations at the site, nor will it result in a substantial deviation from what was originally approved. The operations at the site will remain substantially the same, notwithstanding the introduction of HiCal50 material during start up and shut down, which is discussed further in section 5.4.2 of this report.

It is noted that the proposed conditions to be altered, as discussed earlier in the report, are not the only conditions which related to the use of HiCal50. Other conditions within the consent, relating to HiCal50 use, will be adhered to, as demonstrated in the following table:

Table 5.1 Existing and proposed conditions

Condition	Wording	Method for Compliance
1.4G	Prior to the receipt of the first batch of a Group 1 Non-Standard Fuel from a particular supplier, the Applicant shall certify in writing to the Secretary that the supplier has implemented appropriate quality control and quality assurance procedures to ensure the Applicant's responsibilities under this consent can be met. At the request of the Secretary, the Applicant shall forward a copy of the supplier's quality control and quality assurance procedures to the Department demonstrating how those procedures cause the Applicant to meet the requirements of this consent.	Quality control measures are to be implemented in line with the Storage and Handling procedure approved by the Department on 4 April 2019. Requests for the provision of documentation to substantiate compliance will be provided in a timely manner.
3.23	The Applicant shall submit a Report that details and assesses the results of the Tracking Program prescribed in condition 3.22 of this consent to the Secretary. The Report shall be submitted to the Secretary: a) every three months in the first year of operation using Non-Standard Fuels under this consent, (to be synchronised with stack monitoring); and b) thereafter every six months, or as otherwise agreed to by the Secretary.	HiCal will be included in the existing tracking program.

6.6	Prior to the use of any Group 1 or Group 2 Non-Standard Fuels under this consent, the Applicant shall update the Operation Environmental Management Plan required under conditions 6.3 and 6.4 of this consent to reflect any modifications required at the development in light of the use of Non-Standard Fuels. Where the Applicant considers that the Operation Environmental Management Plan does not require any amendment then a clear justification of this must be provided. The Applicant shall not receive or use Non-Standard Fuels at the development until the Secretary has approved the amended Operation Environmental Management Plan. Updating of the Plan shall include, but not necessarily be limited to providing additional detailed measures to the Air Quality Management Plan to minimise the emissions of air pollutants (including toxic pollutants and dioxins) to ensure compliance with the EPL.	The existing OEMP currently details all alternative fuel management. The Updated HiCal50 specification and the HiCal50 Storage procedure have been prepared and approved by the Secretary and the EPA. The OEMP will be updated following approval of the proposed Modification.

5.2 Protection of the Environment Operations Act 1997

The Cement Works operates under Environment Protection Licence 1698 issued under the Protection of the Environment Operations Act 1997 (POEO Act) for the Scheduled activities of cement production, extractive activity and recovery of general waste.

The current Environment Protection Licence (EPL) 1698, contains the following conditions specifically relating to the use of HiCal50 product in Kiln 6:

Condition O6.1 – Reinstatement of non-standard fuel use

The licensee must give prior written advice to the EPA on the date of commencement of the use of non-standard Fuels AKF1, AKF5 and Hi Cal 50 in Kiln 6.

Condition O6.3 - Except as permitted by any other condition of this licence, the following fuels only are permitted to be fed to Kiln 6 string at the firing rates or proportions as specified in the table below (Table 2.1).

Fuel type	Category	Tonnes per annum	Tonnes per hour	Percent by total fuel (by mass)
Natural gas, fuel oil, diesel	Standard	-	No limit	-
Coal	Standard	No limit	No limit	equal to or greater than 60
Coke fines	Standard	No limit	Equal to or less than 10	equal to or less than 30
HiCal50	Non-standard	10,000	Equal to or less than 1	equal to or less than 6
AKF1	Non-standard	20,000	Equal to or less than 2.8	equal to or less than 10
AKF5	Non-standard	30,000	Equal to or less than 4.5	equal to or less than 21
Wood waste	Non-standard	50,000	-	equal to or less than 50
RDF	Non-standard	80,000	-	equal to or less than 50

Condition O6.6 - Only standard fuels are permitted to be used in kiln 6 during start-up and shut-down.

Condition O6.7 – PROCESS PARAMETERS

The licensee shall not burn Non-Standard Fuels in Kiln 6 unless:

- the feed rates for Non-Standard Fuels are maintained at a steady controlled rate to provide combustion in a proper and efficient manner; and

- a temperature of above 850°C is maintained in the zone where Non-Standard Fuels are fired at the main-firing end of the kiln; and

- a temperature of above 800°C is maintained in the zone where Non-Standard Fuels are fired at or in the vicinity of the pre-calciner/de-NOx system of the kiln; and

- a temperature of above 300°C is maintained at the outlet of the pre-heater strings of the kiln; and

- a temperature of below 200°C is maintained at the inlet to the electrostatic precipitator and fabric filter of the kiln

The HiCal50 product is proposed to be consumed in Kiln 6 at a rate of 1 tph and less than 10,000t per year, and blended with coal at a ratio of 96% coal and 4% HiCal50. Consequently, the proposed use of the HiCal50 at the site would comply with condition O6.3.

Further discussion relating to the use of HiCal50 in the kiln during start-up and shut-down phases (Condition O6.6) is provided in the attached EMM report, specifically within Section 5.4.

5.3 NSW Waste Policy and Legislation

The NSW EPA prepared the NSW Energy from Waste Policy Statement (EWPS) in January 2015, which outlines policy framework and technical criteria applicable to facilities proposing to recover energy from waste in NSW.

Within this document, the NSW EPA states that facilities proposing to use an eligible waste fuel must demonstrate compliance with the following criteria:

- Poses minimal risk or harm to human health and the environment
- Does not undermine higher-priority management options, such as avoidance, re-use or recycling
- Facility emissions are below levels that may pose a risk of harm to the community
- Facilities proposing to recover energy from waste meet current international best practice techniques, particularly with respect to process design and control equipment design and control, and emission monitoring with real-time feedback to the controls of the process.

The HiCal50 material is not listed in the EWPS as an eligible fuel for energy recovery. However, the site is approved to accept, store and consume HiCal50 as a non-standard fuel. The existing EPL for the site contains emission limits and real-time monitoring and controls applicable to the use of HiCal50.

The HiCal50 material will be received on site meeting the approved specification and stored on site. Management practices relating to the onsite storage of the HiCal50 material is presented in Section 6 of the EMM report attached. We note that on 4 April 2019, the Director of Industry Assessments at the DPE approved the storage of HiCal50 material at the site, for a period up to 36 months; this letter is attached to the application.

It is considered that the HiCal50 material has no higher order waste opportunities and the thermal treatment of this waste provides an opportunity to recover the embodied energy from waste and off-set the use of coal.

Section 4 of the EWPS states the following:

> *the gas resulting from the process should be raised, after the last injection of combustion air, in a controlled and homogenous fashion and even under the most unfavourable conditions to a minimum temperature of at least 850°C for at least 2 seconds.*

Coal is consumed as a standard fuel and is only added for combustion when it reaches ignition temperature 850°C. The HiCal50 will be blended with coal and added in the same fashion and would therefore meet the requirements of the EWPS.

The EWPS does not stipulate pre-heater temperature limits.

5.4 Modification approval pathway

Given the nature of the proposed modification, it is recommended that this modification be assessed pursuant to section 4.55 (1A) of the EP&A Act. The particulars of the relevant section are reproduced below.

(1A) Modifications involving minimal environmental impact

A consent authority may, on application being made by the applicant or any other person entitled to act on a consent granted by the consent authority and subject to and in accordance with the regulations, modify the consent if:

(a) it is satisfied that the proposed modification is of minimal environmental impact, and
(b) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which the consent was originally granted and before that consent as originally granted was modified (if at all), and
(c) it has notified the application in accordance with:
  (i) the regulations, if the regulations so require, or
  (ii) a development control plan, if the consent authority is a council that has made a development control plan that requires the notification or advertising of applications for modification of a development consent, and
(d) it has considered any submissions made concerning the proposed modification within any period prescribed by the regulations or provided by the development control plan, as the case may be.

Subsections (1), (2) and (5) do not apply to such a modification.

5.4.2 Substantially the same development

In order to draw a conclusion as to whether a proposal is substantially the same development as approved, a proponent must have regard to the following considerations which have been

established through decisions of the NSWLEC:

1. *"Substantially" means "essentially or materially" or "having the same essence".*[1]

The proposed redistribution of use of HiCal50 within the Kiln is in line with current operations, notwithstanding the current limitation on its use for start-up / shut down. This material is not currently utilized during standard operational temperatures within the Kiln.

2. *A development can still be substantially the same even if the development as modified involves land that was not the subject of the original consent (provided that the consent authority is satisfied that the proposal is substantially the same).*[2]
3. *If the development as modified, involves an "additional and distinct land use", it is not substantially the same development.*[3]

The proposal does not involve an additional and distinct land use. The proposed activities would be wholly contained in lot 1 DP 1017008.

4. *Notwithstanding the above, development as modified would not necessarily be substantially the same solely because it was for precisely the same use as that for which consent was originally granted.*
5. *To determine whether something is ''substantially the same'' requires a comparative task between the whole development as originally approved and the development as proposed to be modified. In order for the proposal to be ''substantially the same'', the comparative task must:*
   (i) result in a finding that the modified development is ''essentially or materially'' the same;
   (ii) appreciate the qualitative and quantitative differences in their proper context; and

6. In addition to the physical difference, consider the environmental impacts of proposed Modification Applications to approved developments.[4,5]
7. The results of the comparative task ''does not eclipse or cause to be eclipsed a particular feature of the development, particularly if that feature is found to be important, material or essential."[6]

A comparative task has been undertaken at **Table 5.2**. The proposal is considered to be complimentary to the existing operations on the site, and would allow Boral to distribute cement products on a mass scale through a more efficient means, well within the limitations originally imposed.

The proposal is therefore within the scope of Section 4.55 (1A) as the proposed activities are of minimal environmental impact and are substantially the same development as the development from which consent was originally granted.

Table 5.2 Comparative task

	Approved (MOD 10)	Proposed (MOD 11)
Operations		
Cement production	1.56 million tonnes per annum	No change
Hours of operation	24 hours and day, 7 days a week.	No change
Site personnel	150	No change

[1] Vacik Pty Limited v Penrith City Council (1992) NSWLEC 8
[2] Scrap Realty Pty Limited v Botany Bay City Council [2008] NSWLEC 333
[3] Vacik Pty Limited v Penrith City Council (1992) NSWLEC 8

Total truck movements per day	317	No change (deliver of the material to the site can be accommodated for, within the current maximum limitations relating to truck movements).
Environmental impacts		
Noise	Condition 3.3 requires the operator to design, construct, operate and maintain the facility and to not exceed maximum allowable noise contributions limits prescribed at Table 2.	No change.
Traffic	Up to 317 trucks trips per day during the typical 12-hour working weekday and up to 100 truck trips per day during a typical 6-hour working Saturday.	No change (deliver of the material to the site can be accommodated for, within the current maximum limitations relating to truck movements).
Air quality	Condition 3.7, 3.7A, 3.8, and 3.9 require the operator to maintain air quality mitigation measures and control dust emissions. Dust management is a requirement of EPL 1698. The facility conducts ambient air/dust monitoring	Impacts have been assessed and are discussed in Section 6 of this report.
Greenhouse Gas	No conditions relating to greenhouse gas emissions. The facility undertakes monitory of stack emissions.	No change
Visual Impact	No visual amenity related conditions provided	No change.
Waste	Conditions 3.17, 3.17A, 3.17AB, 3.17AC, 3.17AD, 3.17AE, 3.17B, and 3.17C relate to waste	No change to the amount of waste produced by the site.

6. Environmental assessment

The proposed modification seeks to facilitate the use and handling of HiCal50 material for the purposes of startup and shutdown activities. The process will involve HiCal50 material being fed along with coal, into the coal blending plant hopper, before introducing this blended mixture into the kiln.

Given there are no proposed changes to operational procedures, the only impact that requires assessment is air quality. No new plant or equipment is required for this modification, and operational hours and approved truck routes and volumes remain unchanged.

The existing consent contains conditions relating to the overall management and handling of HiCal50 material at the site, in accordance with approved management procedures. These conditions take into account dust, noise, stockpiles and alike. The conditions have been extracted and have been considered in the following table:

Table 6.1 Compliance Conditions Comment

Condition	Wording	Method for Compliance
1.4C	Hi Cal 50 and AKF1 are approved for use at the development under this consent subject to the detailed design for any necessary storage facilities and kiln feeding infrastructure being approved to the Secretary. In particular, the detailed design shall: a) demonstrate that the storage facilities would be appropriately bunded in accordance with the relevant Australian Standards, especially Australian Standard AS1940-2004 (for AKF1, this would include having a minimum capacity sufficient to accommodate catastrophic failure of the tank and that adequate measures are in place to ensure a catastrophic failure of a tanker during transfer was adequately contained to ensure no off-site discharge; b) b) include appropriate measures to ensure liquids draining from the bund (and other containment areas) are kept separate and adequately treated prior to discharge to the onsite stormwater management system, and demonstrate that these measures were developed in consultation with the Sydney Catchment Authority and Wingecarribee Shire Council; and c) c) include a Fire Safety Study prepared in accordance with the Department's guideline Hazardous Industry Planning Advisory Paper No. 2: Fire Safety Study and in consultation with Fire and Rescue NSW. A construction certificate must not be issued in relation to any necessary storage facilities and kiln feeding infrastructure until the Secretary has approved the detailed design parameters. No Hi Cal 50 or AKF1 is permitted to be received at the site under this consent until any necessary storage facilities and kiln feeding infrastructure have been constructed in accordance with the detailed design parameters approved by the Secretary.	Storage and handling of the HiCal50 material has been approved by the Department on 4 April 2019, subject to the management measures to be implemented as part of the Storage and Handling Procedure submitted to the Department for assessment in March 2019. Both the Approval Letter and Storage and Handling Procedure are attached to this report, in Appendix B and C respectively.
1.4F	No Non-Standard Fuel is permitted to be received at, or used at the development, unless it complies with: a) the handling, transporting, sampling, analysis and quality control requirements of this consent; b) any requirements of a licence issued under the Protection of the Environment Operations Act 1997 for the site; and	Quality control measures are to be implemented in line with the Storage and Handling procedure approved by the Department on 4 April 2019. Requests for the provision of documentation to substantiate compliance will be provided in a timely manner.

	c) the fuel specification for that specific fuel.	
3.7	The Applicant shall design, construct, operate and maintain the cement works upgrade in a manner that minimises dust emissions from the site and complies with the EPL.	This is an ongoing compliance condition which is adhered to through ongoing site audits completed by the operations team.
3.8	The Applicant shall take all practicable measures to ensure that all vehicles entering or leaving the site and carrying a load that may generate dust are covered at all times, except during loading and unloading. Any such vehicles shall be covered or enclosed in a manner that will prevent emissions of dust from the vehicle at all times.	Air quality impact assessments completed to facilitate previous modifications have considered the emissions impacts associated with various activities being completed at the site. Mitigation measures previously imposed on operations will continue to operate.

6.1 Air quality

Potential air quality impacts associated with the use of HiCal50 in the startup and shut down processes have been assessed in accordance with NSW EPA's *"Approved Methods for the Modeling and Assessment of Air Pollutants in NSW (2005)".* The Air Quality Impact Assessment was undertaken by EMM Consulting. This chapter summarises the air quality assessment, which is provided in full in Appendix A.

The air quality assessment notes that emissions from kiln 6 during start-up periods under coal-feed are not recorded as it is not a requirement of the EPL, or a condition of consent to do so. Furthermore it should be noted that emissions cannot be measured accurately during start-up periods due to variability in flow, temperature and pollutant concentrations and are exempt from licensed emission concentrations as per Clause 56 of the Protection of the Environment Operations (Clean Air) Regulation 2010.

Notwithstanding the above, comparison between the elemental composition of the coal-only fuel and coal-HiCal50 blend was completed, and showed only minor differences in emissions, with all concentrations well below applicable limits. The comparisons relied on data derived from AQIA's completed over the years for the site, since 2003.

More specifically, as part of the modification application submitted in 2015, being MOD9, the AQIA presented the 2003 emission testing results, identified that sampling was completed prior to the upgrading of the Kiln 6 preheater capacity and construction of the precalciner. The same report stated that those upgrades increased the ability of the kiln system to reduce formation of dioxins and improve the combustion efficiency, and concluded that these improvements would reduce pollutant emission concentrations if the trials were retested post-2015.

Data collected in 2016 and 2018 confirmed the conclusion of the 2015 AQIA report, which shows notably lower emissions for all pollutants relative to the 2003 coal baseline concentrations. The changes of recorded pollutants over the years is best represented in the following table, also shown in Table 5.2 of the EMM report attached in Appendix A:

Table 6.1.1 Recorded Pollutant Concentrations by Fuel Type

Elemental component	Recorded pollutant concentration by fuel type				
	Unit	Coal (2003 baseline test)	Coal/HiCal50 (2003 test)	Coal (average of results 2016 to 2018)	EPL limit
Total suspended particulate (TSP)	mg/m^3	39	**40**	18	50
Oxides of nitrogen (NO_x)	mg/m^3	**1,700**	1,200	907	1,250
Sulfur oxides (as H_2SO_4)	mg/m^3	**13**	11	0.7	100
Cl	mg/m^3	<1	<1	0.01	50
Hydrogen chloride (HCl)	mg/m^3	<1	<1	0.72	10
Hydrogen fluoride (HF)	mg/m^3	<1	<1	0.02	1
Hg	mg/m^3	**0.011**	0.0091	0.01	0.05
Cd	mg/m^3	<0.002	**0.015**	0.01	0.05
Type 1 and type 2 substances	mg/m^3	0.2	**0.22**	0.04	0.5
Volatile organic compounds (VOCs)	mg/m^3	32	**51**	1.4	40
Dioxins and furans (as TEQ)	ng/m^3	0.0034	**0.0049**	0.0005	0.1

The results relating to the Coal/HiCal50 blend utilized an expected mix of 96% coal and 4% HiCal50 material. Comparison between element concentrations of Coal only and HiCal50 + Coal blends is shown in the following table, also reflected in Table 5.1 in the EMM Report:

Table 6.1.2 Concentration of Element by Fuel Feed

Elemental component	Concentration of element by fuel feed (mg/kg)		EPL limit (mg/kg)
	Coal	Coal-HiCal50 blend	
Antimony (Sb)	0.2	**0.3**	10
Arsenic (As)	0.5	**0.8**	50
Beryllium (Be)	0.5	0.5	10
Cadmium (Cd)	0.1	0.1	15
Chlorine (Cl)	-	<0.1	0.5
Chromium (Cr)	2.2	**3.0**	250
Cobalt (Co)	0.9	0.9	250
Copper (Cu)	11.1	**11.8**	400
Lead (Pb)	9.7	**9.8**	250
Manganese (Mn)	346.0	332.4	500
Mercury (Hg)	0.1	0.1	10
Nickle (Ni)	0.7	**2.8**	750
Selenium (Se)	1.2	1.2	20
Sulfur (S)	-	0.1	4
Thorium (Th)	0.1	0.1	-
Tin (Sn)	0.3	0.3	30
Vanadium (V)	3.8	**4.5**	400

Based on the emission similarities between coal-only and the coal-HiCal50 blend, the kiln heating and emission concentrations are unlikely to differ significantly for start-up periods using a coal-HiCal50 blend, from currently accepted practices using a coal-only fuel feed.
It should be noted that whilst elemental changes are observed, the changes are minimal when having regard to the EPL limit imposed for each element; and is therefore considered to be negligible.

A review of the preheater temperatures indicates that coal needs to be added once the kiln reaches 850°C to enable the heating of gases, which in turn heat the refractory material in the kiln and preheater. This period can take a few hours where coal is required to be added before the preheater reaches 300°C. See Figure 5.2 as an example where coal typically be added and the percentage of HiCal50 as part of the blend.

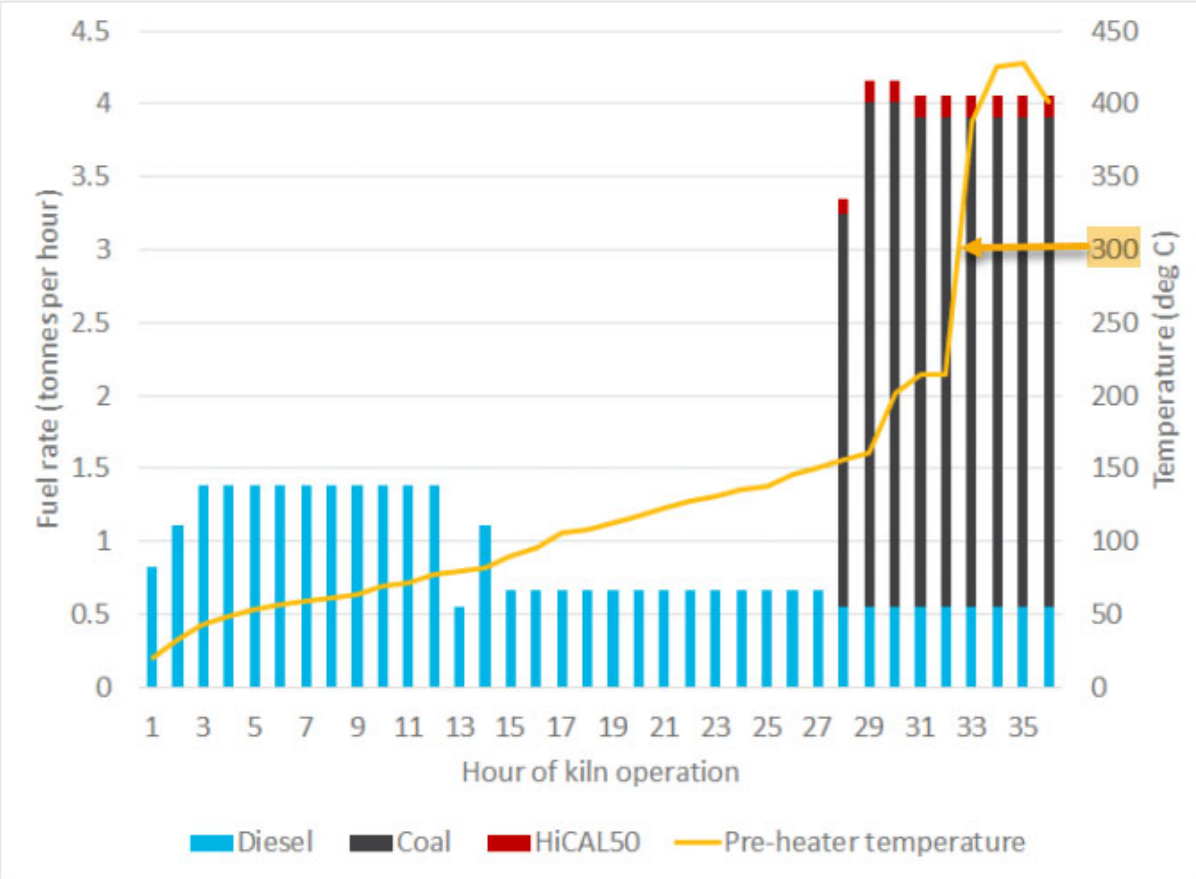


Figure 5.2 **Indicative Kiln 6 start-up fuel load and pre-heater temperature rise – shut-down greater than 36 hours – coal-HiCal50 blend feed**

Note: For comparative purposes , diesel oil was converted from litres to tonnes using a factor of 920 kg/m³ (2016, Department of Industry, Innovation and Science).

As the HiCal50 will only be blended up to 4% of the coal mix and the similarities in properties to coal, there is negligible change to the emission profile during start and there would be no environmental impacts as compared to just coal during the period required to heat the preheater to 300°C.

Based on these findings, the assessments concludes that the proposal will have minimal implications for air quality emissions and associated impacts relative to existing operational emissions using a coal-only blend, which is applicable to both normal and start-up/shut-down kiln 6 operational phases including the use prior to the preheater reaching 300°C.

7. Consultation

The Berrima Cement works holds regular community meetings to discuss the facility in general, provide feedback on environmental monitoring, and discuss any issues with the community. At the most recent community meeting held on 6 December 2018, Boral employees reported to the community the status of ongoing activities at the site, and detailed the commissioning of more intensive HiCal50 utilisation within the kiln processes. The meeting was used to introduce future changes to Boral's operations at the Berrima Cement Works, with the project generally well-received with no issues or concerns raised at the time.

The proposed modification was also discussed with DPE on 18 October 2018 and again via email during February and March 2019. Boral's representatives provided a brief description of the proposed modification and confirmed DPE's requirements for assessment. Engagement with the DPE and EPA has been ongoing since January 2019, with the most recent teleconference held on 3 April 2019, discussing HiCal50 on the site more generally, as well as the upcoming submission of this application.

Given the relatively minor nature of the modification, further consultation was not considered to be necessary.

8. Conclusion

Boral Cement Limited seeks approval to modify the existing development consent for the New Berrima Cement Works which allows:

- the use of Hi-Cal 50 at the site during the start-up and shut down processes of the kiln; and

- technical adjustments to the limitations on use of HiCal50.

This SEE has been prepared in accordance with Part 4 of the EP&A Act. It has described the site, its environs, the proposal, and provides an assessment of the relevant matters of consideration under section 4.55 (1A) of the EP&A Act.

An air quality assessment was undertaken in accordance with the relevant guidelines, and concluded there would be a minimal impact on stack emissions as a result of this modification. No other technical assessments were required due to the minor nature of the proposed changes.

The proposal is considered to be in the public interest as it would allow for the continued effective operation of the Berrima Cement Works, a key industrial facility supporting direct workforce of up to 150 employees, and facilitate the reduction in the reliance on coal as a fuel source within the kiln.

In light of the above, Boral recommends that the modification application be approved.

Appendix A

Berrima Cement HiCal50 Project - Air quality review

EMM – March 2019

Berrima Cement HiCal50 Project

Air quality review

Prepared for Boral Cement
March 2019

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Berrima Cement HiCal50 Project

Air quality review

Report Number

J180568 RP1

Client

Boral Cement

Date

18 March 2019

Version

v1-2 Final

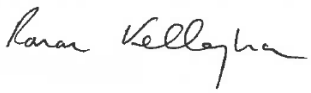
Prepared by	**Approved by**
	
Scott Fishwick Associate - National Technical Leader Air Quality 18 March 2019	**Ronan Kellaghan** Associate - Air Quality 18 March 2019

Table of Contents

Tables

Figures

1 Introduction

1.1 Overview

Boral Cement Ltd (Boral) own and operate the Berrima Cement Plant (the site) at New Berrima, approximately 8km southwest of Bowral in the Southern Highlands of NSW.

The current development consent issued for the Kiln 6 upgrade (DA-401-11-2002i as modified) and Environment Protection Licence (EPL) 1698, permits the use of the following non-standard fuels:

- HiCal50 - spent aluminium electrode carbon;
- AKF1 - liquid oily residues comprising of recovered oil from the treatment of wash waters, oils, dewatered sludges and grease trap emulsions;
- AF5 - used and unwanted tyres;
- Wood waste - organic fibrous wood residues and natural wood wastes that result from the processing of waste;
- RDF - fuel produced by processing the residues of waste by sorting and shredding (particle size reduction), dehydrating (moisture removal), and removal of recyclable and hazardous materials.

At present, only wood waste and RDF non-standard fuels are in use at the site. Previously both HiCal50 and AKF1 fuels were used with approval from both the EPA and the Department of Planning and Environment (then Department of Planning), however their use was suspended in approximately 2008.

Boral has been in discussions with the Hydro Aluminium Kurri Kurri Pty Ltd (Hydro) regarding an opportunity to accept spent carbon anode material from their Hydro Aluminium Remediation Project (EPL 1548) at the former Kurri Kurri aluminium smelter site. This spent carbon anode material, which meets the definition of HiCal50, is a high calorific value carbon which could be used as a non-standard fuel at Berrima Cement works. Hydro has undertaken a significant amount of testing on the spent carbon material which indicates that the product meets Boral's specification including concentrations of mercury and cadmium.

1.2 Project description

The current proposal is for the use of 17,500 tonnes of HiCal50, which will be trucked in from the Hydro Kurri Kurri aluminium smelter crushed to a <50mm consistency. This will be blended with coal to use as fuel in Kiln 6 at Berrima, subject to compliance with specified testing parameters.

The annual consented consumption limit under EPL 1698 of 10,000 tonnes will not be exceeded as the expected kiln consumption rate will be 1 tph and less than 10,000 tonnes per year. The requested storage period of 36 months is required to allow delivery of HiCal50 within one transport campaign, while complying with the existing consumption limit.

The HiCal50 will be delivered to site by truck and stored in the shale pit as per the HiCal50 Storage and Handling Procedure (Boral, 2019).

The HiCal50 stockpile will be covered by a waterproof tarpaulin(s). When required, and when environmental conditions are suitable, the HiCal50 stockpile will be accessed by rolling back the tarpaulin. An excavator or FEL will be used to load the HiCal50 onto the transport truck. Once loaded on the truck, the material will be covered and

driven from the shale pit to the coal blending plant hopper where it will be unloaded and enter the raw coal blending system. Chevron stacking is used in the coal blender to maintain a homogeneous mix of HiCal and coal, which ensures stable kiln operation and consistent product.

Once within the coal blending plant, the blend of HiCal50 and coal will be transferred to the coal mill by an enclosed conveyor, and subsequently used as fuel to heat Kiln No. 6. The HiCal50, fine and coarse coal is blended in two stages, once within the coal blending plant, and a second time during milling in the coal mill.

1.3 EPA Comments

EPL 1698 states in condition O6.1– Reinstatement of non-standard fuel use

> The licensee must give prior written advice to the EPA on the date of commencement of the use of non-standard Fuels AKF1, AKF5 and Hi Cal 50 in Kiln 6.

In compliance with condition O6.1, Boral has briefed both the Department of Planning and Environment (DPE) and NSW Environment Protection Authority (EPA) on the proposed recommencement of HiCal50 as a non-standard fuel for Kiln 6 at the site. An initial meeting was held between Boral, DPE and EPA on 213 October 2018. A follow up briefing letter on the project was sent to DPE and EPA by Boral dated 16 November 2018.

In response to the correspondence from Boral dated 16 November 2018, the NSW EPA issued a letter outlining the following comments relating to the proposed use of HiCal50 material at Kiln 6:

- Based on chemical characterisation results of the HiCal50 anode material from the decommissioned Kurri Kurri smelter provided by Boral, the material meets the chemical limits outlined in the previously approved specification for HiCal50 (dated August 2006);
- Boral have described their ability to comply with Consent and EPL conditions if they are to use HiCal50, in particular, EPL Conditions O6.6 and O6.7 as “partial”. EPL Condition O6.6 relates to Consent Condition 1.4D, while O6.7 relates to consent condition 3.24. These conditions state that non-standard fuels are not permitted to be used in Kiln 6 during start up and shut-down and during particular operational situations. Boral propose to add HiCal50 to the existing coal feed system, which means that the HiCal will be present in the coal mix during start-up and shutdown.
- Boral state they would propose to submit a consent modification to permit the use of HiCal50 blended with coal during start-up and shut down. If Boral were to proceed with an application to modify their consent, and subsequently modify their EPL conditions, it would need to contain a description and assessment of the potential air quality impacts of using HiCal50 during unscheduled kiln shut-downs, and when the kiln operating requirements of 06.7 were not being met.
- Boral must ensure they have adequate QA/QC procedures in place to ensure the HiCal50 meets the required chemical standards in the Blue Circle Southern Cement Recovered Resource Specification HiCal50 (dated August 2006); and
- Boral proposed to store HiCal50 on site for up to 36 months. Boral must describe how this material will be sorted/handled/processed on site, and how any environmental risks will be assessed and managed.

1.4 Scope of study

The primary purpose of this report is to provide a response to the third point of EPA letter as presented above, specifically:

a description and assessment of the potential air quality impacts of using HiCal50 during unscheduled kiln shut-downs, and when the kiln operating requirements of 06.7 were not being met.

A general overview of the condition is as follows:

- provide an analysis of relevant emissions data representative of Kiln 6 operating under standard coal fuel feed and the proposed HiCal50 blend;
- provide a description of the kiln operating process and how this may change during the use of the HiCal50 blend; and
- prepare an analysis of the potential implications for air quality emissions and air quality impacts as a result of the HiCal50 use.

Discussion is also provided relating to the management of environmental risks associated with the storage and processing of HiCal50 material on site.

2 EPL conditions

The site operates under Environment Protection Licence (EPL) 1698. The following conditions relate specifically to the use of HiCal50 product in Kiln 6:

Condition O6.1 – Reinstatement of non-standard fuel use

The licensee must give prior written advice to the EPA on the date of commencement of the use of non-standard Fuels AKF1, AKF5 and Hi Cal 50 in Kiln 6.

Condition O6.3 - Except as permitted by any other condition of this licence, the following fuels only are permitted to be fed to Kiln 6 string at the firing rates or proportions as specified in the table below (Table 2.1).

Table 2.1 Approved fuels and consumption rates – Kiln 6 – Condition O6.3 EPL 1698

Fuel type	Category	Tonnes per annum	Tonnes per hour	Percent by total fuel (by mass)
Natural gas, fuel oil, diesel	Standard	-	No limit	-
Coal	Standard	No limit	No limit	equal to or greater than 60
Coke fines	Standard	No limit	Equal to or less than 10	equal to or less than 30
HiCal50	Non-standard	10,000	Equal to or less than 1	equal to or less than 6
AKF1	Non-standard	20,000	Equal to or less than 2.8	equal to or less than 10
AKF5	Non-standard	30,000	Equal to or less than 4.5	equal to or less than 21
Wood waste	Non-standard	50,000	-	equal to or less than 50
RDF	Non-standard	80,000	-	equal to or less than 50

Condition O6.6 - Only standard fuels are permitted to be used in kiln 6 during start-up and shut-down.

Condition O6.7 – PROCESS PARAMETERS

The licensee shall not burn Non-Standard Fuels in Kiln 6 unless:

- the feed rates for Non-Standard Fuels are maintained at a steady controlled rate to provide combustion in a proper and efficient manner; and

- a temperature of above 850°C is maintained in the zone where Non-Standard Fuels are fired at the main-firing end of the kiln; and

- a temperature of above 800°C is maintained in the zone where Non-Standard Fuels are fired at or in the vicinity of the pre-calciner/de-NO_x system of the kiln; and

- a temperature of above 300°C is maintained at the outlet of the pre-heater strings of the kiln; and

- a temperature of below 200°C is maintained at the inlet to the electrostatic precipitator and fabric filter of the kiln

The HiCal50 product is proposed to be consumed in Kiln 6 at a rate of 1 tph and less than 10,000 t per year and blended with coal at a ratio of 96% coal and 4% HiCal50. Consequently, the proposed use of the HiCal50 at the site would comply with condition O6.3.

Discussion relating to the use of HiCal50 in the kiln during start-up and shut-down phases (Condition O6.6) is provided in Section 5.4.

3 DA conditions

Under DA 401-11-2002-i (as modified), the site is approved to accept, store and consume HiCal50, a non-standard fuel, being spent aluminium carbon that is approved for use as a non-standard fuel by the EPA. The following conditions outline when non-standard fuels, including HiCal50, may be consumed.

> Condition 1.4A Table 1 – Permitted Fuels for use in upgraded Kiln 6 (same as EPL 1698 Table 2.1 shown above)
>
> Condition 1.4D Only standard fuels are permitted to be used at the development during start-up and shut-down.
>
> Condition 3.21 Based on the Non-Standard Fuel specification in condition 3.20 the following Non-Standard Fuel specification criteria are required to be met:
>
> > b) for Hi Cal 50 a mercury specification no greater than 1 mg/kg and a cadmium specification no greater than 10 mg/kg.
>
> Condition 3.24 The applicant shall cease to burn Non-Standard fuels in Kiln 6 if:
>
> The temperature is below 850°C in the zone where Non-Standard fuels are fired or in the vicinity of the pre-calciner; or
>
> The temperature is below 300°C at the outlet of the preheater strings.

The following definitions from the DA are also applicable to this review:

> Kiln Start-up – a start-up period – that is, while the kiln is being brought up to normal operation following a period of inactivity
>
> Kiln Shut-down – a shutdown period – that is, while the kiln is being taken out of service from normal operation to inactivity.

4 NSW Energy from Waste Policy

The NSW EPA prepared the NSW Energy from Waste Policy Statement (EWPS) in January 2015, which outlines policy framework and technical criteria applicable to facilities proposing to recover energy from waste in NSW. Within this document, the NSW EPA states that facilities proposing to use an eligible waste fuel must demonstrate compliance with the following criteria:

- Poses minimal risk or harm to human health and the environment
- Does not undermine higher-priority management options, such as avoidance, re-use or recycling
- Facility emissions are below levels that may pose a risk of harm to the community
- Facilities proposing to recover energy from waste meet current international best practice techniques, particularly with respect to process design and control equipment design and control, and emission monitoring with real-time feedback to the controls of the process.

The HiCal50 material is not listed in the EWPS as an eligible fuel for energy recovery. However, as stated in Section 3, the site is approved to accept, store and consume HiCal50 as a non-standard fuel. The existing EPL for the site contains emission limits and real-time monitoring and controls applicable to the use of HiCal50.

The carbon anode material will be received as waste from the Hydro site in Kurri Kurri and stored on site. Management practices relating to the onsite storage of the HiCal50 material is presented in Section 6.

It is considered that the HiCal50 material has no higher order waste opportunities and the thermal treatment of this waste provides an opportunity to recover the embodied energy from waste and off-set the use of coal.

Section 4 of the EWPS states the following:

> the gas resulting from the process should be raised, after the last injection of combustion air, in a controlled and homogenous fashion and even under the most unfavourable conditions to a minimum temperature of at least 850°C for at least 2 seconds.

Coal is consumed as a standard fuel and is only added for combustion when it reaches ignition temperature 850°C. The HiCal50 will be blended with coal and added in the same fashion and would therefore meet the requirements of the EWPS.

5 Air emissions

5.1 Fuel composition

The elemental composition of the standard coal feed and the coal-HiCal50 blend for Kiln 6 are presented in Table 5.1. Results for the coal-HiCal50 blend are presented on an expected mix of 96% coal, 4% HiCal50. Where the element concentration increases for the coal-HiCal50 blend, the results are marked in bold.

Table 5.1 Elemental composition comparison for standard coal feed and coal-HiCal50 blend feed – Kiln 6

Elemental component	Concentration of element by fuel feed (mg/kg)		EPL limit (mg/kg)
	Coal	Coal-HiCal50 blend	
Antimony (Sb)	0.2	**0.3**	10
Arsenic (As)	0.5	**0.8**	50
Beryllium (Be)	0.5	0.5	10
Cadmium (Cd)	0.1	0.1	15
Chlorine (Cl)	-	<0.1	0.5
Chromium (Cr)	2.2	**3.0**	250
Cobalt (Co)	0.9	0.9	250
Copper (Cu)	11.1	**11.8**	400
Lead (Pb)	9.7	**9.8**	250
Manganese (Mn)	346.0	332.4	500
Mercury (Hg)	0.1	0.1	10
Nickle (Ni)	0.7	**2.8**	750
Selenium (Se)	1.2	1.2	20
Sulfur (S)	-	0.1	4
Thorium (Th)	0.1	0.1	-
Tin (Sn)	0.3	0.3	30
Vanadium (V)	3.8	**4.5**	400

From the values presented in Table 5.1, the proposed coal-HiCal50 blend represents an increase in elemental concentration for Sb, As, Cr, Cu, Pb, Ni and V relative to the standard coal feed. It is noted, however, for each of these elements, the change from coal only fuel is minor relative to the applicable EPL limit and the increase in the concentration is therefore considered negligible. Concentrations of Cl and S are not present in the coal feed and are therefore higher for the coal-HiCal50 blend.

5.2 Monitoring results

Boral (then Blue Circle Southern Cement Ltd) undertook investigation studies relating to the use of alternative fuels in Kiln 6 in 2003. The 2003 investigation recorded in stack concentrations for Kiln 6 using coal-only to establish a

comparison baseline, HiCal50 + coal, HiCal50 + AKF1 + coal and HiCal50 + AKF1+ AKF5 + coal. The results of the coal-only baseline and HiCal50 only trial runs are presented in Table 5.2.

For further comparison to current Kiln 6 operations, stack test results collated from 2016 through to 2018 for coal only are also presented in Table 5.2.

Table 5.2 Kiln 6 emission concentration monitoring results – 2003 alternative fuel trials and post-Kiln 6 monitoring results

Elemental component	Recorded pollutant concentration by fuel type				
	Unit	Coal (2003 baseline test)	Coal/HiCal50 (2003 test)	Coal (average of results 2016 to 2018)	EPL limit
Total suspended particulate (TSP)	mg/m³	39	**40**	18	50
Oxides of nitrogen (NO_x)	mg/m³	**1,700**	1,200	907	1,250
Sulfur oxides (as H_2SO_4)	mg/m³	**13**	11	0.7	100
Cl	mg/m³	<1	<1	0.01	50
Hydrogen chloride (HCl)	mg/m³	<1	<1	0.72	10
Hydrogen fluoride (HF)	mg/m³	<1	<1	0.02	1
Hg	mg/m³	**0.011**	0.0091	0.01	0.05
Cd	mg/m³	<0.002	**0.015**	0.01	0.05
Type 1 and type 2 substances	mg/m³	0.2	**0.22**	0.04	0.5
Volatile organic compounds (VOCs)	mg/m³	32	**51**	1.4	40
Dioxins and furans (as TEQ)	ng/m³	0.0034	**0.0049**	0.0005	0.1

In support of the development application for MOD9, an air quality impact assessment (AQIA) completed by Air Quality Professionals in 2015. The 2015 AQIA presented the 2003 emission testing results and identified that sampling was carried out prior to the upgrading of the Kiln 6 preheater capacity and the construction of the precalciner. Further, the 2015 AQIA states that those upgrades increase the ability of the kiln system to reduce formation of dioxins and improve the combustion efficiency and concludes that these improvements would reduce pollutant emission concentrations if the trials were retested post-2015.

This conclusion from the 2015 AQIA is supported by the results presented in Table 5.2 for the coal-only results from 2016 to 2018, which show notably lower emissions for all pollutants relative to the 2003 coal baseline concentrations.

From the results presented in Table 5.2 and in the absence of post-Kiln 6 upgrade HiCal50 trial results, the following points are made:

- with the exception of the 2003 coal only sampling results for NO_x and 2003 coal-HiCal50 sampling results for VOCs, all recorded concentrations are below the current EPL limits. It is noted that the 2016 to 2018 coal only results for NO_x, which were recorded post-Kiln 6 upgrades, are below the current EPL limits;

- the results for coal-HiCal50 from 2003 are higher than the coal-only baseline for Cd, VOCs and dioxin and furans. With the exception of VOCs, recorded concentrations for both fuel types are well below applicable EPL emission limits. Concentrations are lower for all other recorded pollutants;

- Boral notes that in 2003, the raw materials used in the kiln, specifically blue shale, routinely produced elevated levels of VOCs in sampling for all fuel types. This issue was highlighted during discussions with EPA/DoP in 2015, after which the emission limit for VOC was raised for Kiln 6, for both the use of standard and non-standard fuel.;

- the Kiln 6 upgrades have improved the emissions performance of Kiln 6 demonstrated by the 2016 to 2018 sampling results presented for all pollutants. It is considered that the relationship between 2003 coal only and 2003 coal-HiCal50 sampling results, which are similar, would be reflected in a comparison between current coal only test results (presented in Table 5.2) and expected coal-HiCal50 blend emissions (not recently tested). In other words, Kiln 6 upgrades are expected to improve the emission performance of the coal-HiCal50 blend, relative to the 2003 test, at a scale similar to the improvements in coal-only emissions.

On the basis of the above discussion, it is therefore expected that the use of the proposed coal-HiCal50 blend during normal Kiln 6 operations would have a similar emissions profile to coal only fuel feed.

5.3 Kiln shut-down/start-up periods

In order to understand the frequency of shut-down periods associated with Kiln 6 operations, Boral provided records of the number and duration of kiln shut-downs between 2015 and 2018. These records are summarised in Table 5.3.

Table 5.3 Annual records of Kiln 6 stops – duration and frequency – 2015 to 2018

Year	Total number of stops	Number of stops greater than 24 hours	Number of stops greater than 12 hours and less than 24 hours
2015	70	8	6
2016	63	11	6
2017	76	6	6
2018	60	7	6

The following operational notes are relevant to current Kiln 6 operations and shut-down periods:

- Kiln 6 is shut-down once a year for a planned major maintenance works;

- Over the past four years, the majority of Kiln 6 shut-downs (between 73% and 84%) were less than 12 hours in duration;

- During all Kiln 6 stops less than 12 hours in duration, the coal feed to the kiln is maintained a rate of approximately 2-3 tonnes per hour. This fuel feed rate maintains kiln temperatures greater than 850°C in the area of combustion;

- Standard coal feed will be stopped if the duration of a Kiln 6 shut-down is known to be longer than 12 hours. For Kiln 6 restart from a shut-down of greater than 12 hours, Boral will use diesel oil to increase the temperature within the kiln to achieve ignition temperature (850°C) for the coal feed when it is reintroduced. Because the kiln maintains high temperatures in the refractories and kiln material, the amount of diesel required will vary relative to the duration of kiln stoppage. It is noted that diesel is an approved fuel type for Kiln 6;

- complete cool down of Kiln 6 can occur when a stoppage exceeds 36 hours. At the restart after a long stop, diesel fuel is used for a period of approximately 14 to 18 hours to achieve coal ignition temperatures in the kiln 850°C. When temperatures are reached, the coal feed is reintroduced at a rate of two tonnes per hour and progressively increased over time until normal conditions are reached.

The indicative rate of change for temperature following a greater than 36 hour kiln shut-down relative to fuel (diesel and coal) feed rate is illustrated in Figure 5.1. The temperature profile presented in Figure 5.1 was recorded in the pre-heater area of Kiln 6, approximately 100 m after the kiln coal injection point. While not continually recorded directly, Boral state that the corresponding temperatures within the kiln where coal is introduced and fired would be well above 850°C. Measurements are conducted through an infrared camera measuring temperatures in the area where coal is injected in the kiln.

A key point illustrated in Figure 5.1 is that when coal is introduced within Kiln 6 (i.e. 850°C within kiln), the pre-heater temperature has not yet reached 300°C.

5.4 Emissions from Kiln 6 start-up periods – coal feed and coal-HiCal50 blend feed

Emissions from Kiln 6 start-up periods under coal-feed are not recorded by Boral and it is not a requirement of the EPL or conditions of consent to do so. Emissions cannot be measured accurately during start-up periods due to variability in flow, temperature and pollutant concentrations and are exempt from licenced emission concentrations as per Section 56 of the NSW Government *Protection of the Environment Operations (Clean Air) Regulation 2010*.

Similarly, no emissions monitoring data are available for Kiln 6 start-up periods using a coal-HiCal50 blend. It is acknowledged that Condition O6.6 of EPL 1698 does not allow for the use of alternative fuels, including HiCal50, during start-up and shut-down.

For the proposed coal-HiCal50 blend, the HiCal50 will represent approximately 4% of the total mix. Boral note the following with regards to the proposed coal-HiCal50 mix for Kiln 6:

- The HiCal50 product is added to the coal feed in the coal blender prior to addition to Kiln 6. In order to purge the coal blender of all HiCal50 product, a period of at least 10 days is required;

- The only scheduled Kiln 6 shut-down that is known for more than 10 days in advance is the once a year, major maintenance shut-down;

- All other scheduled Kiln 6 shut-downs do not have a sufficient period of time available in advance to purge the coal blender of HiCal50 product from the blend. For similar reasons, it is also not possible to remove the HiCal50 product from any unscheduled Kiln 6 shut-downs.

Consequently, with the exception of planned major Kiln 6 shut-downs, it is not possible for Kiln 6 operations to avoid the use of coal-HiCal50 blend during start-up operations for Kiln 6.

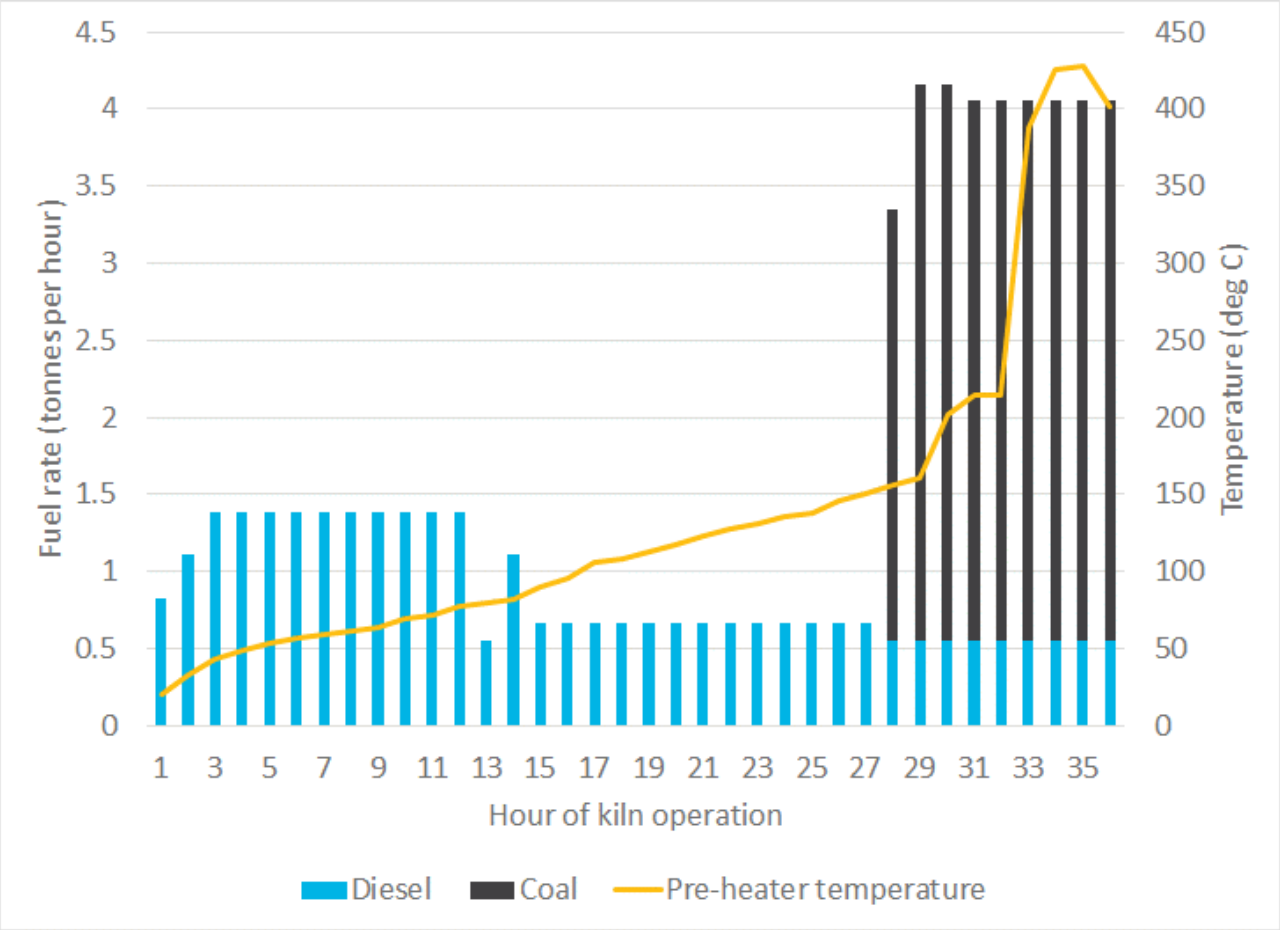


Figure 5.1 **Indicative Kiln 6 start-up fuel load and pre-heater temperature rise – shut-down greater than 36 hours – diesel + coal-only feed**

Note: For comparative purposes, diesel oil was converted from litres to tonnes using a factor of 920 kg/m^3 (2016, Department of Industry, Innovation and Science).

Taking the previous sections of the report into consideration, the following points are made in relation to Kiln 6 emissions during the start-up phase from a period of kiln shut-down using the proposed coal-HiCal50 blend:

- as discussed in Section 5.2, the emission concentration results of the 2003 alternative fuel trial indicated that there was unlikely to be a notable difference in emissions between the coal only fuel feed and a coal-HiCal50 blend fuel feed. Emissions from the coal-only feed for post-Kiln 6 upgrades in 2016 were improved relative to the 2003 monitoring study;
- on this basis, the start-up phase emissions associated with the use of a coal-HiCal50 would be very similar to start-up emissions from the coal-only feed; and
- as stated in Section 5.4, the coal feed is only reintroduced when the coal ignition temperature is reached following a period of diesel fuel combustion. This would also be the case for the coal-HiCal50 blend.

Figure 5.2 illustrates the indicative rate of change for temperature following a greater than 36 hour kiln shut-down relative to fuel (diesel and coal-HiCal50 blend) feed rate. It can be seen that once the coal-HiCal50 blend is

introduced, the HiCal50 product represents approximately 3% of the total hourly fuel load. The presence of the HiCal50 product in the fuel feed for this scenario is unlikely to alter associated emissions from start-up using a coal-only feed.

Similar to the coal-only feed profile presented in Figure 5.1, Figure 5.2 shows that the coal-HiCal50 is introduced when temperatures at the pre-heater outlet are less than the 300°C required under EPL Condition O6.7. It is reiterated that coal (or coal-HiCal50 blend) is only introduced within Kiln 6 when the internal temperature at the coal injection point is above 850°C. Consequently, the use of coal-HiCal50 blend during start-up periods would only occur when temperatures within Kiln 6 are at or above 850°C, satisfying EPL Condition O6.7.

From these points, it is considered that if a coal-HiCal50 blend was used during the start-up phase, Kiln 6 emissions or process temperatures are unlikely to differ from those associated with the same start-up phase using a coal-only feed.

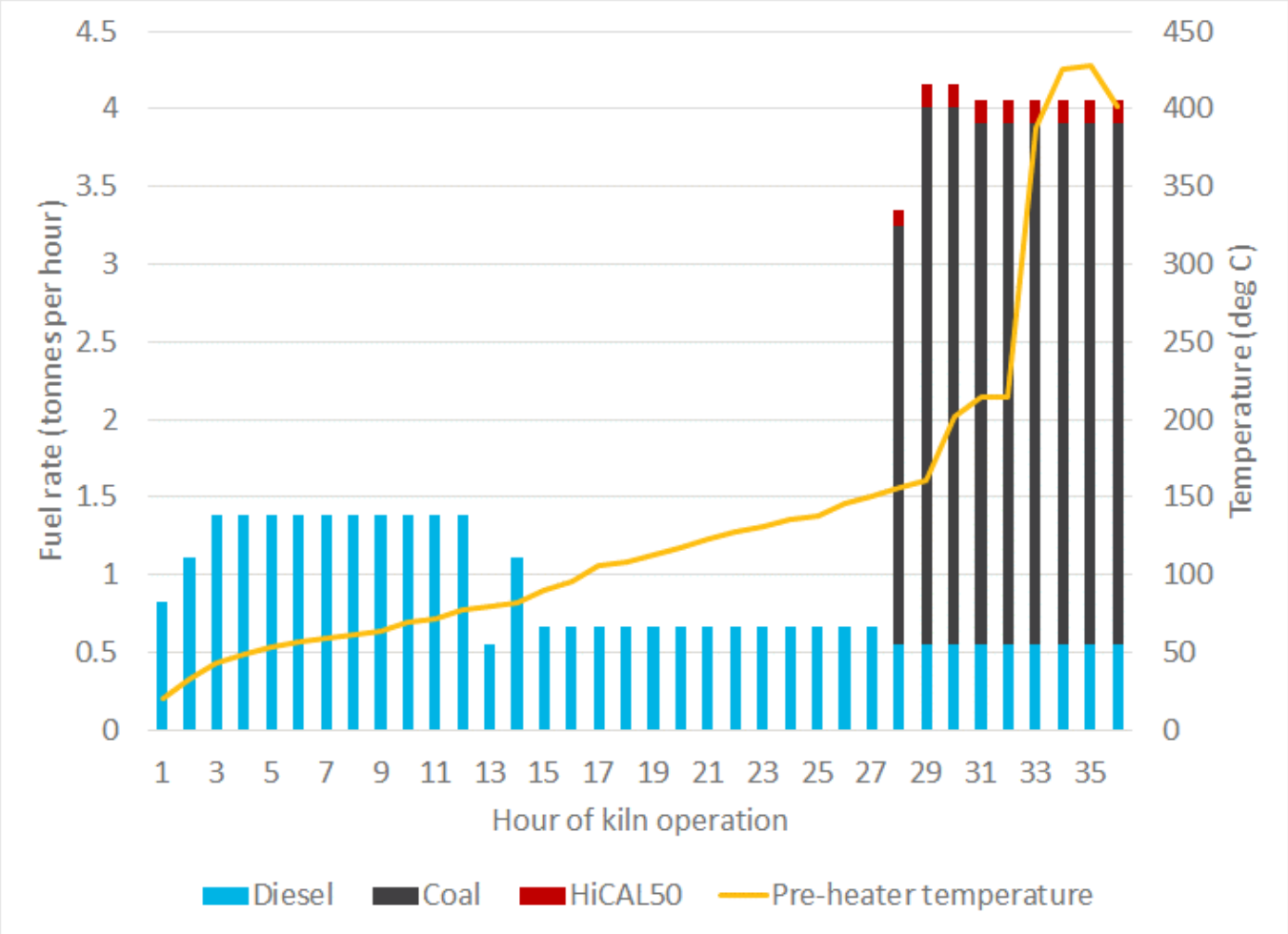


Figure 5.2 **Indicative Kiln 6 start-up fuel load and pre-heater temperature rise – shut-down greater than 36 hours – coal-HiCal50 blend feed**

Note: For comparative purposes , diesel oil was converted from litres to tonnes using a factor of 920 kg/m^3 (2016, Department of Industry, Innovation and Science).

6 Mitigation measures

The management of air quality emissions associated with the delivery, storage, handling and use of the HiCal50 product at the site is comprehensively detailed in the HiCal50 Storage and Handling Procedure (the procedure), dated 14 February 2019.

A summary of air quality related mitigation measures, as documented in the procedure, are listed below:

- The incoming HiCal50 product will be tested to meet agreed specifications off-site when crushed at the Hydro Aluminium Kurri Kurri aluminium smelter, and on-site when received at the site by Boral;
- pre-crushed HiCal50 product will be delivered to site via truck, directly transported to and unloaded within the shale pit and stored in a tarpaulin-covered stockpile. Both the storage within the existing pit and tarpaulin covers will provide wind breaks reducing the potential for wind-blown dust emissions;
- during periods of high winds or heavy rains, the HiCal50 stockpile will not be accessed, and remain covered to control dust generation and erosion;
- trucks carrying HiCal50 will be covered at all times, except during loading and unloading;
- emissions from the movement of trucks along haul roads will be managed through the use of water sprays;
- a truck speed restriction to 20 km/hour is implemented in stockpile areas;
- stockpile loading and extraction activities are modified or ceased during adverse weather conditions for dust, in particular high winds from the south during dry periods.

7 Conclusions

EMM was engaged by Boral to review the potential implications for site air quality emissions associated with the use of a coal-HiCal50 blend as fuel for Kiln 6, in particular during kiln operational phases outside of normal operating conditions (eg unscheduled kiln shut-downs, reduced kiln temperatures).

The following points are made from the analysis conducted:

- a comparison between the elemental composition of the coal-only fuel and coal-HiCal50 blend showed only minor differences, with all concentrations well below applicable limits;
- emission testing results from a 2003 monitoring trial for alternative fuels indicated that the difference in emission concentrations between coal only and coal-HiCal50 blend for a range of pollutants was negligible;
- Kiln 6 monitoring data highlighted that recent kiln process upgrades have improved the emissions performance of the kiln using coal-only feed relative to the 2003 trial analysis results. Although not tested, similar emissions improvements would be expected for use of the coal-HiCal50 blend;
- for current Kiln 6 operations, the coal feed is only re-introduced to the process when internal temperatures are sufficient for coal ignition of 850°C;
- at the point of coal introduction, the corresponding pre-heater outlet temperature is less than the EPL Condition O6.7 requirement of 300°C;
- for kiln shut-downs less than 12 hours, the coal feed continues as normal, maintaining temperatures at 850°C;
- for all other kiln shut-down periods, the internal temperature is increased to coal ignition temperature by diesel fuel (a standard fuel in EPL 1698) prior to the re-introduction of the coal feed;
- aside from a major planned kiln shut-down that occurs once a year, no Kiln 6 shut-downs are planned more than 10 days in advance, which is the period required to purge HiCal50 product from the coal feed. Consequently, if HiCal50 product was to be used at Kiln 6 within the coal blend, it would not be possible to avoid the use of HiCal50 during start-up and shut-down periods;
- for start-up periods, coal-HiCal50 blend would only be introduced when temperatures at the coal injection point are greater than of 850°C, meeting the requirements of EPL Condition O6.7 and the criteria of the EWPS. As is the case for coal-only, the corresponding pre-heater outlet temperature would not meet the requirement of 300°C;
- taking the discussed emission similarities between coal-only and coal-HiCal50 blend, the kiln heating and emission concentrations are unlikely to differ significantly for start-up periods using a coal-HiCal50 blend from currently accepted practices using a coal-only fuel feed.

It is considered that the monitoring results and process information presented in this report indicate that the use of a coal-HiCal50 blend at Kiln 6 will have minor implications for air quality emissions and associated impacts relative to existing operational emissions using a coal-only blend. This conclusion is applicable to both normal and start-up/shut-down Kiln 6 operational phases.

Separate to emissions from Kiln 6, Boral will implement a range of mitigation measure to control potential air quality emission associated with the delivery, storage and handling of HiCal50 product to site. These measures are formalised in a broader environmental management procedure for site.

References

Air Quality Professionals 2015, *Boral Cement Berrima Works Use of Solid Waste Derived Fuels in Kiln 6 Air Quality Impact Assessment*

Department of Industry, Innovation and Science 2016, *Australian Petroleum Statistics, Office of the Chief Economist*, Canberra, 13/04/2016

NSW EPA 2015, *NSW Energy from Waste Policy Statement*. January 2015

Abbreviations

Sb	Antimony
As	Arsenic
Be	Beryllium
Boral	Boral Cement Ltd
Cd	Cadmium
Cl	Chlorine
Cr	Chromium
Co	Cobalt
Cu	Copper
DPE	Department of Planning and Environment
EPA	Environment Protection Authority
EPL	Environment protection licence
HiCal50	Spent aluminium electrode carbon
Hydro	Hydro Aluminium Kurri Kurri Pty Ltd
Pb	Lead
Mn	Manganese
Hg	Mercury
Ni	Nickle
NO_x	Oxides of nitrogen
Se	Selenium
S	Sulfur
Th	Thorium
The site	Berrima Cement Plant
Sn	Tin
V	Vanadium
VOCs	Volatile organic compounds

Appendix B

DPE HiCal50 Storage Request Approval Letter – 4 April 2019

NSW GOVERNMENT | Planning & Environment

Contact Name: Sally Munk
Number: 02 9274 6431
Email: sally.munk@planning.nsw.gov.au

Mr Greg Johnson
Environmental Sustainability Manager
Boral Cement
Level 3, 40 Mount Street
NORTH SYDNEY NSW 2060

Dear Mr Johnson

Boral Cement, Berrima – Hi Cal 50 Storage Request (DA 401-11-2002-i)

I refer to your letter dated 16 November 2018 seeking approval to store up to 17,500 tonnes of carbon anode material (Hi Cal 50), sourced from the former Hydro Aluminium Kurri Kurri smelter, at the Boral Cement site at Berrima for a period of up to 36 months.

The Department has reviewed your request and the additional information provided on 22 February 2019 and 27 March 2019 in consultation with the Environment Protection Authority (EPA) and confirms the following documentation is approved:

- the 'Hi Cal 50 Storage and Handling Procedure', Version 3, prepared by Boral Cement dated 27 March 2019
- the 'Hi Cal 50 (Carbon anode ex-Hydro Kurri Kurri) Recovered Resource Specification', Version 3, prepared by Boral Cement dated 27 March 2019.

In accordance with Condition 1.4E of the development consent ((DA 401-11-2002-i (as modified)), the Department is satisfied that up to 17,500 tonnes of Hi Cal 50 may be stored at the Boral Cement site in Berrima for a period of up to 36 months to facilitate movement of the material from the Kurri Kurri site in one campaign. Storage and handling of the material must be undertaken in accordance with the approved 'Hi Cal 50 Storage and Handling Procedure' and the 'Hi Cal 50 (Carbon anode ex-Hydro Kurri Kurri) Recovered Resource Specification'.

It is understood that Boral is currently preparing a modification application to permit the use of Hi Cal 50 in the cement kiln as a non-standard fuel. Hi Cal 50 must not be used within the cement kiln as a non-standard fuel or an anode-coal blend until the modification application to assess the environmental impacts of the use of the material has been determined.

I wish to emphasise the importance of effective and genuine community consultation and the need for Boral to proactively respond to any concerns raised by the community. Boral must ensure the community is kept up to date on activities at the Berrima Cement site, in particular, the storage of Hi Cal 50 at the site and the intention to resume the use of Hi Cal 50 in the cement kiln as a non-standard fuel. Sufficient information must be provided to the community to enable a good understanding of the proposal and any potential impacts.

Should you have any queries in relation to this matter, please contact Sally Munk, Principal Planning Officer, on the above contact details.

Yours sincerely

C. Ritchie 4/4/19

Chris Ritchie
Director
Industry Assessments
as delegate of the Planning Secretary

cc. William Dove, Environment Protection Authority

Appendix C

Boral Cement Limited - Berrima Works HiCal50 Storage and Handling Procedure – March 2019

Boral Cement Limited

Berrima Works

HiCal50 Storage and Handling Procedure

Document Filename:	HiCal50 Storage and Handling Procedure
Document Owner:	Environmental Sustainability Manager – Boral Cement
Approved By:	Operations Manager, Berrima Works

Version History:

Version	Change Date	Summary of Change	Signed By
1	22 February 2019	New document	Greg Johnson
2	13 March 2019	Amended to include heavy vehicle movement details	Greg Johnson
3	27 March 2019	Updated to include disposal options for HiCal 50	Greg Johnson

TABLE OF CONTENTS

1. PURPOSE

This HiCal50 Storage and Handling Procedure (the or this Procedure) applies to the Boral Berrima Cement Works (the Works) located at New Berrima, NSW.

This Procedure has been prepared to meet the requirements of the Works' Development consent DA 401-11-2002i (as modified MOD-2-1-2004-i) and to assist in managing risks identified in the extended storage of the non-standard fuel, HiCal50 an aluminium carbon anode recovered waste material, to the satisfaction of the EPA.

The aim of this Procedure is to reduce the potential of impacts to the environment as a result of storing, handling and processing HiCal50 to be blended with coal as fuel in Kiln No.6 at the Works.

This Procedure applies to all aspects of the Works where HiCal50 is stored, handled or processed, and forms part of the Works' Operational Environmental Management Plan (OEMP). This procedure does not substitute the HiCal50 Recovered Resource Specification requirement for the use within Kiln 6 as a non-standard fuel.

2. SCOPE

This Procedure addresses:

- descriptions of where and how HiCal50 will be delivered to the Works;
- responsibilities for storage and handling of HiCal50;
- descriptions of where and how HiCal50 will be stored;
- descriptions of where and how HiCal50 will be transported within the Works; and
- provision of measures to reduce the potential of environmental impacts of HiCal50 at the Works.

3. DEFINITIONS

Table 1 Definitions

Term	Definition
EMS	Environmental management system. A collection of formally approved documents that define Boral's management practices aimed at protection of environment and minimisation of any adverse impacts on land, air, water and the community.
HiCal50	A Non-Standard Fuel, being spent aluminium electrode carbon, that is approved for use as a Non-Standard Fuel by the EPA and in accordance with the requirements of development consent MOD-2-1-2004-i.
SOP	Standard operating procedure. A formal procedure for undertaking complex and recurring tasks where neither physical nor environmental layout will change.
SWMS	Safe work method statement.
OEMP	Operational environment management plan.
EPL	Environment protection licence (issued under the provisions of the NSW *Protection of the Environment Operations Act 1997*).
EPA	Environment Protection Authority

4. RESPONSIBILITIES

The HiCal50 storage and handling responsibilities of personnel are summarised Table 2.

Table 2 Responsibilities

Role	Responsibility
Relevant Employees	Responsible for ensuring that their actions relating to the transport, storage and handling of HiCal50 follow the details set out in this Procedure. This includes: ➢ following the relevant steps in this Procedure; and ➢ identifying and reporting non-compliance with this Procedure.
Team Leaders / Front Line Supervisors	Responsible for prevention of environmental impacts arising from the transportation, storage and handling of HiCal50. This includes: ➢ ensuring that relevant employees are aware of this Procedure, and their responsibilities within it; ➢ monitoring storage and handling activities to ensure that this Procedure is adhered to; ➢ initiating action to prevent non-compliance with this Procedure; and ➢ initiating corrective actions to ensure compliance with this Procedure.
Production Manager, Technical Manager and Maintenance Manager	Responsibility and authority to ensure that the site environmental objectives are achieved. This includes: ➢ ensuring relevant employees are trained with respect to HiCal50 responsibilities, instructions and procedures; ➢ ensuring non-compliance incidents are investigated and corrective and preventative action taken; and ➢ ensuring operations comply with the conditions of development consents, EPL and relevant legislation.
Site Operations Manager	Responsible for: ➢ approving any communications to external parties on HiCal50 transportation, storage and handling activities before their release; ➢ implementing Boral's environmental policy at the Works; ➢ ensuring site environment performance objectives and

	targets are established, monitored and achieved; ➢ defining responsibilities for the OEMP; ➢ ensuring the availability of resources; ➢ communicating the importance of the OEMP and meeting the statutory and regulatory requirements; ➢ Conducting management reviews of the OEMP; ➢ verifying the implementation of corrective and preventive actions; and ➢ recognising and responding to community concerns.

5. REGULATORY REQUIREMENTS

The use and storage of HiCal50 at the Works is permitted under EPL No. 1698. Condition 1.4E of the development consent DA 401-11-2002-I (as modified), currently restricts the storage of alternative fuels (including HiCal50) for up to three months of alternative fuels (including HiCal50), however this can be extended subject to the approval from the Secretary of the NSW Department of Planning and Environment. This Procedure has been prepared to assist the Secretary and give the EPA confidence to grant approval to store, up to 17,500 t of HiCal50 for a period of 36 months.

The delivery, storage and handling of HiCal50 will be carried out in accordance with the conditions of the existing development approval, the EPL No. 1698 and any other regulatory requirements for the Works.

6. HICAL50 DELIVERY PROCEDURE

An assessment of environmental risks was undertaken (See Appendix 1) to aid in the development of the procedure.

6.1 Delivery of HiCal50 to the Works

HiCal50 will be delivered to the Works by truck from the former Hydro Aluminium's Kurri Kurri aluminium smelter. The HiCal50 will be crushed a <50mm consistency and tested to specified compliance parameters of the most recent Boral Cement HiCal50 Recovered Resource Specification before leaving the Hydro site.

Up to 17 500t of Hi Cal 50 (Carbon anode ex-Hydro Kurri Kurri) will be delivered to the Berrima Works by road transport between the hours of 06:00 – 18:00 Monday to Friday and 07:00 – 13:00 Saturday with a maximum of 45 deliveries per day (1200t/day).

The aim will be to commence transportation in early May 2019 and complete by the 30 June 2019, however as there could be delays in receipt of test results/batch certification, weather impacts and truck availability this could continue until the end of August 2019.

Access to the site will be via existing approved transport routes for raw material deliveries. As the bulk of the material will be handled as a campaign, deliveries will be managed to ensure truck movement numbers do not exceed approved raw material delivery approvals.

On arrival at the Works, the trucks will proceed directly to the shale pit, where the HiCal50 will be unloaded and placed in distinct stockpiles up to 1500t within an earthern bunded area.

The individual stockpiles will be sign posted and quarantined until results of post-delivery composite samples have been verified against the HiCal 50 specification.

Once the 1500t batch is verified, the batch will be released and pushed up into the final stockpile. If the batch is rejected, it will be returned to the Hydro Kurri Kurri for placement in their special purpose cell..

All stockpiles will be covered by tarpaulins which will be rolled back to allow delivery and securely replaced afterwards.

7. HICAL50 STORAGE PROCEDURE

7.1 Storage procedure for HiCal50 at the Works

HiCal50 will be stored within the shale pit at the Works, adjacent to existing stockpiles of fine and coarse thermal coal (see Appendix 2 – HiCal50 Stockpile location aerial). The stockpile will be surrounded by an earthen bund.

The HiCal50 stockpile will be covered with a tarpaulin at all times, except for when access to the stockpile is required for the unloading or loading of HiCal50.

During periods of high winds or heavy rains, the HiCal50 stockpile will not be accessed, and remain covered to control dust generation and erosion.

The tarping of HiCal50 at the Works will be undertaken in accordance with the following SWMS:

- Tarping Clinker Piles (SWMS)

7.2 Suitability of storage location

The shale pit is a suitable location for the storage of HiCal50 due to its depression which provides shelter from wind. In addition, there are existing structures and systems which reduce the likelihood of the HiCal50 causing environmental impacts. These include:

- existing diversion drain around the shale pit to minimise the ingress of clean surface water into the pit; and
- existing earthen berm around the shale pit to provide additional shelter to stockpiles from high winds.

In addition, a second earthen berm will be constructed around the HiCal50 stockpile to provide additional shelter from wind and rain.

The Shale Pit floor of the stockpile site, due to the geology is largely impermeable.

The current Shale Pit sump is of significant size and does not free drain in the event of a rain event.

Rainwater in the pit/stockpile area drains to the pit sump where it is pumped for use as process water in the mill and kiln.

7.3 HiCal 50 Off-site Removal

It is proposed to use the HiCal 50 blended via the coal blending plant. Use via this method is currently limited during start up and shut down conditions. A consent modification is currently pending on use in start up and shut down. Should this modification not be approved, Boral will commenced consuming the HiCal 50 via the SWDF feed into the Calciner within 18 months as equipment will require modification.

In the unlikely event that the verified HiCal 50 that has been stored at Berrima will not be consumed either via coal blending or alternatively via the SWDF feed into the Calciner within 18 months of the modification not being approved, Boral will remove the HiCal 50 off site by

returning to the Hydro Kurri Kurri onsite special purpose cell. Should the Hydro Kurri Kurri cell be unavailable the material will undergo appropriate waste classification, with a 'worse case' scenario requiring the material will requiring Special Immobilization Approval prior to landfilling similar to other naturally immobilized coal contaminated materials.

8. HICAL50 HANDLING AND PROCESSING PROCEDURE

8.1 Movement of HiCal50 at the Works

When required, and when environmental conditions are suitable, the HiCal50 stockpile will be accessed by rolling back the tarpaulin. An excavator or FEL will be used to load the HiCal50 onto the transport truck. Once loaded on the truck, the material will be covered and driven from the shale pit to the coal blending plant hopper where it will be unloaded and enter the raw coal blending system. Chevron stacking is used in the col blender to maintain a homogeneous mix of HiCal and coal, which ensures stable kiln operation and consistent product.

Once within the coal blending plant, the blend of HiCal50 and coal will be transferred to the coal mill by an enclosed conveyor, and subsequently used as fuel to heat Kiln No. 6.

The HiCal50, fine and coarse coal is blended in two stages, once within the coal blending plant, and a second time during milling in the coal mill.

Berrima will consume no greater than 10,000 tpa of HiCal50 which is equivalent of about 4% in the coal blend.

Two trucks with HiCal50 will deliver to the blender from the stockpile spread out over an 8 hour window (e.g no two consecutive trucks) with the other coal deliveries to make up the coal requirement.

9. MANAGEMENT MEASURES

Management measures to reduce the likelihood of adverse environmental impacts are detailed below.

9.1 Passive or infrastructure mitigation measures

- Existing earthen berm around the shale pit to shelter stockpiles from high winds, and to reduce noise detected at sensitive receptors;
- Earthen bund around the HiCal50 stockpile
- Tarpaulins to cover HiCal50 stockpiles and prevent exposure to wind and rain;
- Existing diversion drain around the shale pit to prevent ingress of clean surface water into the pit;
- Rainwater in pit/stockpile area drains to the pit sump, where it is pumped to process water (closed system, ie no discharge), and/or re-used at the Works for dust suppression, ; and
- Existing erosion and sediment controls installed and maintained will minimise soil erosion and the discharge of sediment and other pollutants to land and/or waters.

- Use of existing sealed haul roads and cattle grids/baths
- Use of existing enclosed coal blending infrastructure

9.2 Active or procedural mitigation measures

- Delivery of HiCal50 to be undertaken as per the existing traffic management plan. Internal movement will be one-way with vehicles exiting the stockpile area using the designated wheel wash.
- HiCal50 will be tested to meet agreed specifications off-site when crushed at the Hydro Aluminium Kurri Kurri aluminium smelter, and on-site when received at the Works as per the Resource Recovery Specification before use;
- HiCal50 stockpiles won't be used during periods of high winds or heavy rains to prevent exposure to wind and rain;
- Use of water carts or cannons within stockpile area during unloading during dry weather.
- Trucks carrying HiCal50 or coal will be covered at all times, except during loading and unloading.
- When loading of HiCal50 or coal onto trucks, emissions of dust will be minimised by limiting the dropping from height

9.3 Other relevant mitigation measures

Other relevant mitigation measures that will reduce the likelihood of adverse environmental impacts are already in place to reduce dust emissions. These relate to:

- management of haul roads including the use of water carts/cannons, sprays, dust suppression agents, minimising dust track out to sealed roads etc;
- minimising dust from haul truck loads (such as covers, load wetting, etc);
- truck speed restriction to 10 km/hour in stockpile areas;
- weather conditions, especially the strength and direction of wind, must be considered where any works are occurring on stockpiles. Adverse weather, in particular strong southerlies in drought conditions, can potentially cause significant impacts in the neighbouring residential area to the north of the Works. When such conditions are experienced or predicted, stockpile creation and extraction activities should be stopped until the weather changes;
- stockpile operations, due to being especially weather-sensitive, should be managed by the Production Services and Logistics in cooperation with Shift Supervisors. Work schedule should be reorganised in adverse weather to minimise stockpile disturbance; and
- maintain earthen bund and vegetation of earth bund walls around dust-prone areas.

Appendix 1 – HiCal50 Assessment of Environmental Risk (Aspect and Impact Register)

ASPECT IDENTIFICATION				ASSESSMENT OF RISK						
				Inherent Risk				Residual Risk		
Activity	**Aspect**	**Impact**	**Environmental Management Element**	**Consequence**	**Probability**	**Risk Rating**	**Comments and Control (Engineering/Behavioural/Procedural)**	**Consequence**	**Probability**	**Risk Rating**
Delivery of HiCal50 to site	Generation of noise from reversing alarms	Discomfort or inconvenience to local residents	Noise	1	3	**L**	Delivery vehicles to follow existing internal traffic management plan which limits reversing, where reasonably practical, except when tipping.	1	1	**L**
Delivery of HiCal50 to site	Generation of noise in local community from truck entering and leaving site	Discomfort or inconvenience to local residents	Noise	2	3	**M**	Delivery drivers to be informed of the sites traffic management plan and approved delivery routes and the importance of not to use engine brakes within New Berrima.	2	1	**L**
Delivery of HiCal50 to site	Emission of dust when unloading onto stockpile	Pollution of air (particulates)	Air	2	4	**M**	Unloading only permitted in Shale Pit within the HiCal50 storage pad. Use of water cart if roads within stockpile area dry and water cannon with material dry and winds present.	2	2	**M**
Storage of HiCal50	Discharge of sediments into waterways and detention basin	Pollution of waterways (sedimentation) and detention basins	Water	3	3	**H**	Store only in Shale Pit as all run-off contained within pit with nil chance of off-site discharge. Tarp stockpile when not in use. Place earthen bund around HiCal50 stockpile.	3	1	**L**
Storage of HiCal50	Emission of dust from stockpiles and yard area	Pollution of air (particulates)	Air	2	4	**M**	Store only in Shale Pit as natural depression minimised wind and fugitive emissions. Tarp stockpile when not in use. Place earthen bund around HiCal50 stockpile.	2	1	**L**
Storage of HiCal50	Leachate from HiCal50 entering groundwater	Contamination of groundwater	Groundwater	2	2	**M**	Carbon anode material has minimal leachate risks as compared to cathode material, however store only in Shale pit as the floor is relatively impermeable, tarp stockpile when not in use and place earthern bund around stockpile.	2	1	**L**
Handling and Blending of HiCal50	Emission of dust when loading of trucks from stockpile	Pollution of air (particulates)	Air	2	3	**M**	All loading undertaken in Shale pit. Activity to be avoided when windy. Avoid rushing or dropping from height. Use water cart in FEL and vehicle traffic areas.	2	1	**L**

Handling and Blending of HiCal50	Emission of dust from unsealed roads	Pollution of air (particulates)	Air	2	4	**M**	Reduce vehicle speed as sign posted or as per traffic management plans. Minimise use of unsealed roads, use installed cattlegrid/water bath prior to entry to sealed road.	2	2	**M**
Handling and Blending of HiCal50	Generation of noise from onsite vehicle movements	Discomfort or inconvenience to local residents	Noise	2	3	**M**	Avoid reversing. One way movement of vehicles as per traffic management plan. Shale pit is located in furthest storage area from sensitive receptors.	2	1	**L**
Handling and Blending of HiCal50	Emission of dust from blending/processing	Pollution of air (particulates)	Air	3	1	**L**	Blending and grinding of the coal/HiCal blend will be undertaken within the existing enclosed blending and enclosed mill. No further controls required.	3	1	**L**

Appendix 2 – HiCal50 Storage location and onsite transfer