BORAL™

Boral Cement
Bulk Cement and Cementitious Products EPD

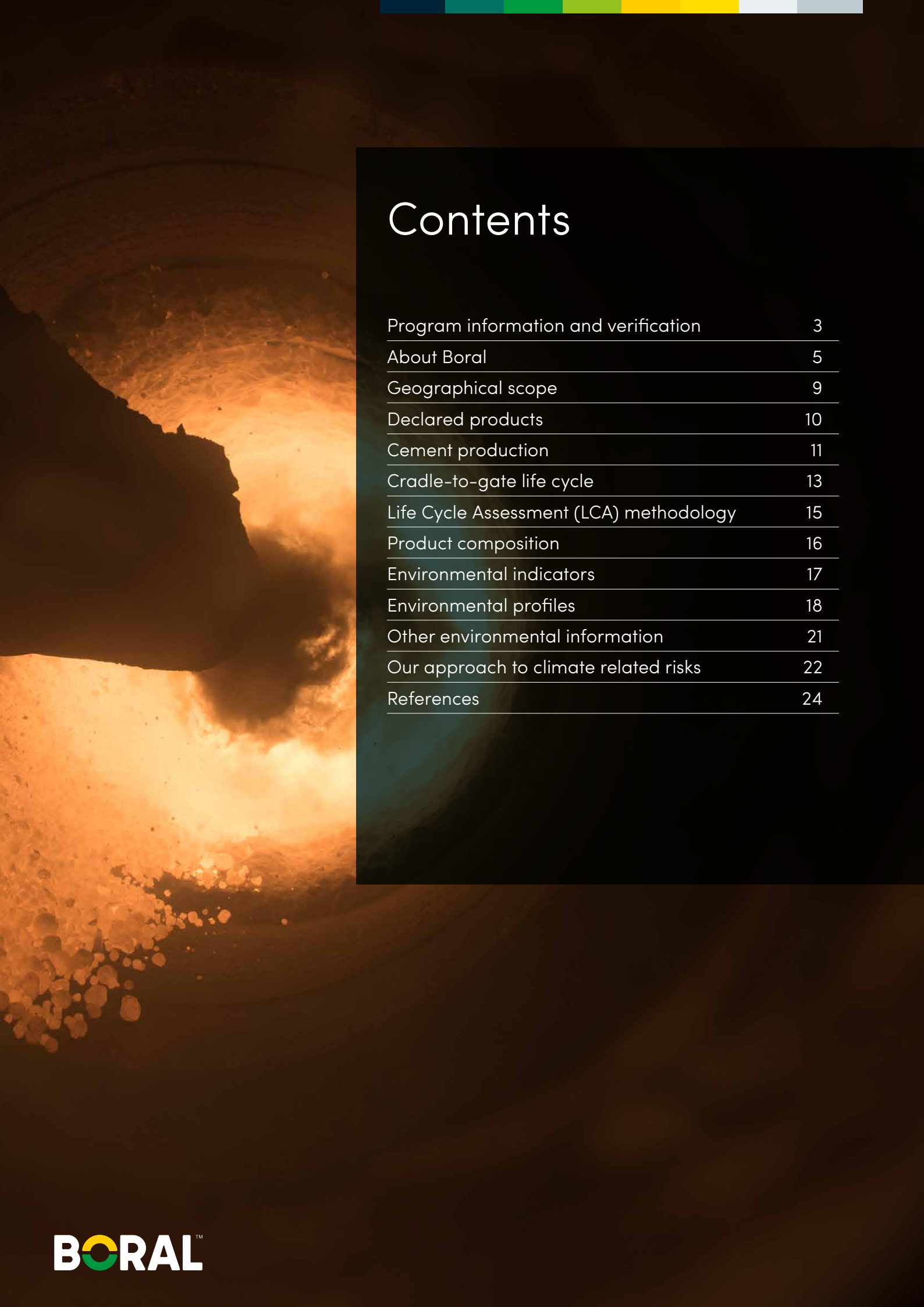
ENVIRONMENTAL PRODUCT DECLARATION

ECO PLATFORM EPD VERIFIED

In accordance with ISO 14025 and EN 15804

EPD Registration Number S-P-02322
Issued 22 February 2022 | Valid until 22 February 2027
Geographical Scope: NSW, Australia

AUSTRALASIA EPD®



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Program information and verification

An Environmental Product Declaration (EPD) is a standardised way of quantifying the potential environmental impacts of a product or system. EPDs are produced according to a consistent set of rules – Product Category Rules (PCR) – that define the requirements within a given product category.

These rules are a key addition to ISO 14025, ISO 14040 and ISO 14044 as they enable transparency and comparability between EPDs. This EPD provides environmental indicators for Boral Cement products manufactured in NSW. This EPD is a "cradle-to-gate" declaration covering production of cementitious products and their supply chain.

This EPD is verified to be compliant with EN 15804. EPD of construction products may not be comparable if they do not comply with EN 15804. EPDs within the same product category but from different programs or utilising different PCRs may not be comparable.

Boral, as the EPD owner, has the sole ownership, liability and responsibility for the EPD.

Declaration Owner		
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Program information and verification

EPD Version:	1.0
Reference year for data:	2019-07-01 / 2020-06-30

CEN standard EN 15804 served as the core PCR	
PCR	PCR 2012:01 Construction Products and Construction Services, Version 2.33, 2020-09-18 PCR 2012:01-Sub-PCR-H, Product category rules Cement and Building Lime, version 2.31, 2020-09-18
PCR review was conducted by	The Technical Committee of the International EPD® System. Chair: Massimo Marino. Contact via info@environdec.com
Independent verification of the declaration and data, according to ISO 14025	☐ EPD process certification (Internal) ☒ EPD verification (External)
Procedure for follow-up of data during EPD validity involved third-party verifier	☐ No ☒ Yes

About Boral

Boral is the largest integrated construction materials company in Australia, with a leading position underpinned by strategically located quarry reserves and an extensive network of operating sites.

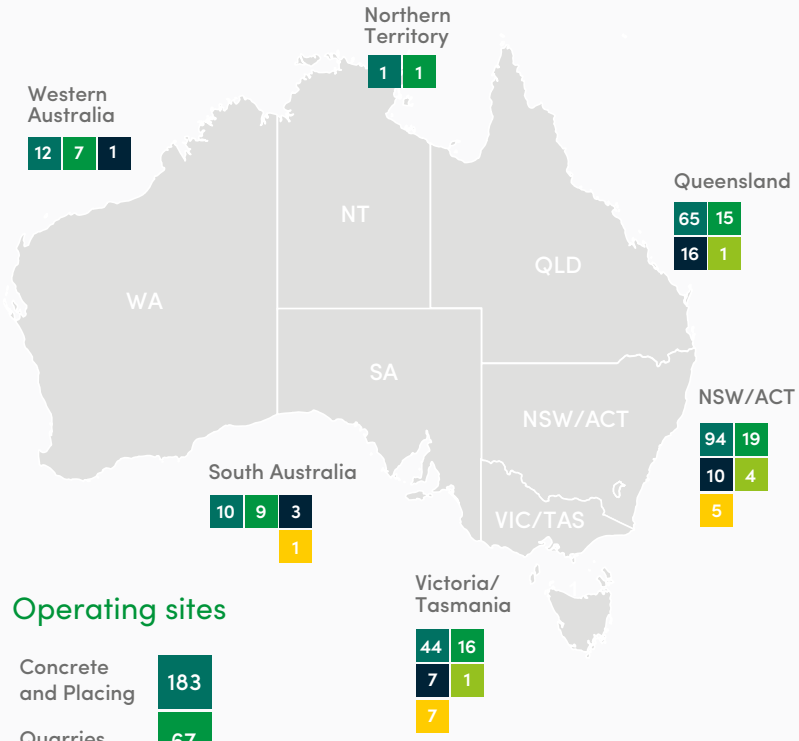
Boral Cement manufactures and supplies a wide range of cementitious products used by the building and construction industries of Australia. These products include both 'bulk' and 'bagged' cements, cement blends, and dry mixes with a variety of applications. They also produce a range of limestone and lime products.

Boral Cement supplies Cementitious and Supplementary Cementitious Materials (ground granulated blast furnace slag (BFS) and fly ash) used by all segments of the construction industry including infrastructure, social, commercial and residential construction. They also ship the intermediate product clinker to customers and within the cement operating sites.

The products are grouped by type of product and will be presented in two EPDs:

1. Bulk cement and cementitious products
2. Lime and Limestone Products

This EPD covers the Bulk cement and cementitious products. For the purpose of this EPD clinker, BFS and fly ash products are not included.



Operating sites

Concrete and Placing	183
Quarries	67
Asphalt	37
Cement	6
Recycling	13

1. At 1 December 2021. Includes transport, fly ash and R&D sites. Concrete and asphalt sites include mobile plants. Excludes mothballed plants, distribution and administration sites.
2. Includes cement manufacturing, grinding, bagging and lime plants in NSW, a clinker plant in Victoria and a clinker grinding Joint Venture in Queensland.

How we work

At Boral, we have a culture of 'working together' with a focus on Zero Harm Today. Our first and foremost priority is the health and safety of our people, and all those whom we interact with through our operations. Our key focus is to strengthen the prevention of serious harm through more standardised and tailored controls that identify and mitigate our critical risks.

Boral has a team of full-time Health, Safety, Environment and Quality specialists who operate across our integrated business, offering a single interface for safety communications and innovation across raw materials, logistics, operations and placement.

Innovation and technical capability

The Innovation Factory is Boral's in-house centre of excellence responsible for developing advanced cement and concrete solutions for our customers. Through consultation with our customers, the Innovation Factory is central to enabling transformation through innovative products at Boral.

Our focus on engagement and action is backed by intensive research and development through our dedicated and talented team who work in collaboration with many sections of the company to create a world of future generations will be proud of.

About Boral

Technical Services

As one of Australia's largest construction materials companies, Boral is committed to excellence, providing customers with quality products and reliable service. Our aim is to provide products backed up by specialised testing as well as extensive quality control testing and technical support.

To ensure we remain at the forefront, we constantly improve, develop and refine our products to maintain the high standards customers have come to expect.

Our production, technical and quality managers are committed to quality excellence in our manufacturing process. We have committed additional resources to research and we strive to develop whole-of-life solutions that offer a sustainable future. Our innovative products are designed in collaboration with our clients.

Not only are we the only Australian construction materials company to maintain a full-service construction materials laboratory in Australia, **Boral Materials Technical Services is also the largest facility of its kind in the country**, providing special and standard testing and product development services to Boral and our customers.

Boral maintains an ISO 9001-certified Quality System to ensure we conduct a regular regime of physical properties testing on all materials to certify they:

- Meet Australian Standards in the civil and structural construction industry;
- Comply with applicable legislation, regulations and industry standards;
- Meet project specifications; and
- Allow for continuous improvement.

Boral laboratory facilities have a quality management system that meets international standards and they are NATA-accredited for construction materials testing and chemical testing. These customer-focused services have earned Boral the reputation of a market leader in its approach.

About Boral

Sustainability at Boral

At Boral, we recognise that as a leading Australian construction materials company, we have a unique opportunity and responsibility to do things right.

We are committed to leading the way in sustainability and creating a world that future generations will be proud of.

Our Sustainability Framework sets out our commitments to achieving this across four focus areas: Our People, Our Operations, Our Products and Our Performance.

About Boral

Our commitment

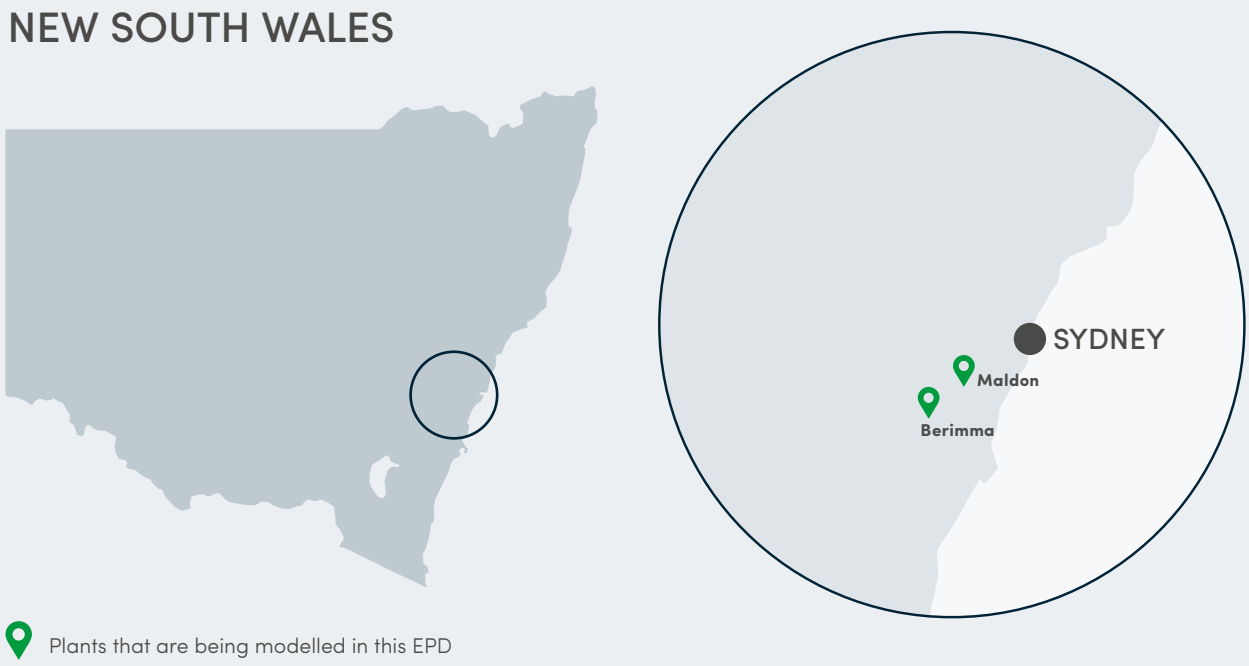
Our overarching goal is to deliver Zero Harm Today. This means we target zero injuries to our people and seek to eliminate adverse environmental impacts. Where elimination is not possible, we seek to minimise any harmful effects from our operations. At an absolute minimum, this means complying with environmental legislation, regulations, standards and codes of practice.

- Reducing greenhouse gas emissions from our processes, operations and facilities.
- Reducing waste in all forms including through the efficient use of energy, conservation of water, minimising and recycling waste materials and energy, prevention of pollution, and effective use of virgin and recovered resources and supplemental materials.
- Protecting biodiversity values at and around our facilities.
- Openly and constructively engaging with communities surrounding our operations.

Geographical scope

The Cement manufacturing sites considered for this Environmental Product Declaration comprise those operated by Boral in NSW, namely:

- Boral Cement – Berrima
- Boral Cement – Maldon



Case study: Berrima lower carbon alternative fuels program

The transition from the use of coal towards a greater use of lower carbon alternative fuels in our Cement business is a core part of our energy decarbonisation lever.

At the Berrima Cement plant, our lower carbon solid waste-derived fuels (SWDFs) facility reduced our coal-related carbon emissions by 50,000 tonnes CO^2 in FY2021, up from 36,500 tonnes in the prior year.

In FY2022, we expect to further reduce coal-related emissions at Berrima as a result of increased supply of SWDFs. SWDFs include wood waste, which is organic fibrous residues and natural wood wastes that results from processing waste – and refuse-derived fuel, produced by processing the residues of solid waste and removing recyclable and hazardous materials.

Following development approval during the year, detail design work is underway to enable procurement and construction of a chloride bypass at the facility. The bypass will enable an increase in the capacity to consume SWDFs to 100,000 tonnes per annum – equivalent to about 30% alternative fuel use.

Investment in the chloride bypass will benefit from a $4.6 million grant from the NSW Government.

Declared products

Products covered by this environmental product declaration

The products included in this EPD are:

Berrima Cement Works – Bulk Products

Shrinkage Limited (SL) Cement:

Shrinkage Limited Cement is a special purpose cement complying with AS 3972, type SL. It is manufactured from specially prepared Portland Cement clinker and gypsum.

Shrinkage Limited Cement may contain up to 7.5 per cent of AS 3972 approved additions.

High Early Strength (HES) Cement:

High Early Strength Cement is a special purpose cement complying with AS 3972, type HE. It is manufactured from specially prepared Portland cement clinker and gypsum. High Early Strength Cement is more finely ground than Shrinkage Limited Cement, but is chemically similar.

Maldon – Bulk products

Shrinkage Limited (SL) Cement:

Shrinkage Limited Cement is a special purpose cement complying with AS 3972, type SL. It is manufactured from specially prepared Portland Cement clinker and gypsum.

Shrinkage Limited Cement may contain up to 7.5 per cent of AS 3972 approved additions.

Off-White (OW) Cement:

Off White Cement is a general purpose cement complying with AS 3972, type GP. Off White Cement is produced from a specially manufactured light coloured Portland cement clinker which provides the unique colour of this cement.

Enviroment Slag Cement:

Enviroment® is a Ground Granulated Blast Furnace Slag which complies with AS3582.2 as supplementary cementitious material. It can be used as a partial Portland cement replacement to enhance the durability characteristics of concrete.

Marine/Low Heat/SSC40 cement:

Marine Cement complies with AS3972, special purpose cement, type LH/SR. It is manufactured from the ingredients of specially selected cement clinker, gypsum and ground granulated blast furnace slag, combining the benefits of significantly lower heat evolution and greater sulphate, chloride and salt water resistance.

70-30 Binder (70% Enviroment : 30% Hydrated lime):

Is a specialised binder produced for stabilisation applications. It is manufactured from selected ground granulated blast furnace slag and hydrated lime, as a nominal blend of 70:30.

Stabilment Binder (85% Enviroment : 15% Hydrated lime):

Stabilment is a specialised binder produced for stabilisation applications. It is manufactured from selected ground granulated blast furnace slag and hydrated lime, as a nominal blend of 85:15.

Cement production

Clinker and cement production

The Berrima Cement Works' primary function is to produce clinker, the precursor to cement. Berrima's operational infrastructure includes one kiln (Kiln 6) and two cement mills (Mills 6 and 7), and storage and stockpiling facilities.

The main raw material inputs to the production of cement and clinker are limestone, sourced from Boral Cement's Marulan South Limestone Mine (transported via rail), and shale, sourced both on site at a shale quarry or off-site. Steel slag and granulated blast furnace slag are both sourced from Port Kembla. The limestone, shale and slag are blended together, ground into a fine powder (also known as raw meal) and fused at very high temperatures (up to 1,500 ˚C) in the kiln. The fused material is called clinker.

Clinker is either stored ready for reclamation or distribution to customers by road and rail transport, or is mixed with gypsum into one of two cement mills, where it is crushed to produce cement. It is then fed into cement silos from where it is dispatched by either road tanker or rail tanker/wagon for delivery to Boral Cement's customers (internal Boral customers or external).

Boral's operations at Maldon, located outside Picton (NSW), form a strategic hub for the supply of crucial building and construction materials into the greater Sydney metropolitan area.

The operations began with the opening of the Cement Works in 1951. With direct road (Hume Highway) and rail (Main Southern Railway) access into Sydney, the site has continuously supplied bulk and bagged cement since that time. Since the decommissioning of the last operating cement kiln at the end of 2014, the Cement Works has reverted to grinding clinker from the Boral Berrima Cement Works as well as imported material in its mill. Over its life, the site has produced and ground 'grey', 'white' and 'off white' variants of clinker. Grey clinker is now the predominant form used at Maldon.

The Cement Works hosts a modern bagging facility to support dispatch of bagged cement products around the state. The facility incorporates advanced technology and robotics to assist with the speed and efficiency of supply.

Bulk cement is dispatched by trains and road tankers, both familiar sights around Maldon.

Cement production

Technical and functional characteristics

The Shrinkage Limited, High Early Strength, Off White & Marine/Low Heat/SSC40 cements comply to AS 3972 – 2010 General Purpose and Blended Cements.

The Enviroment cement complies with AS 3582.2:2016 Supplementary cementitious materials Part 2: Slag – Ground granulated blast furnace standard.

The products intended use are in a wide range of building and construction applications. Further details on product use and design for different applications can be found on Boral's website, see **www.boral.com.au/products/cement-and-lime**

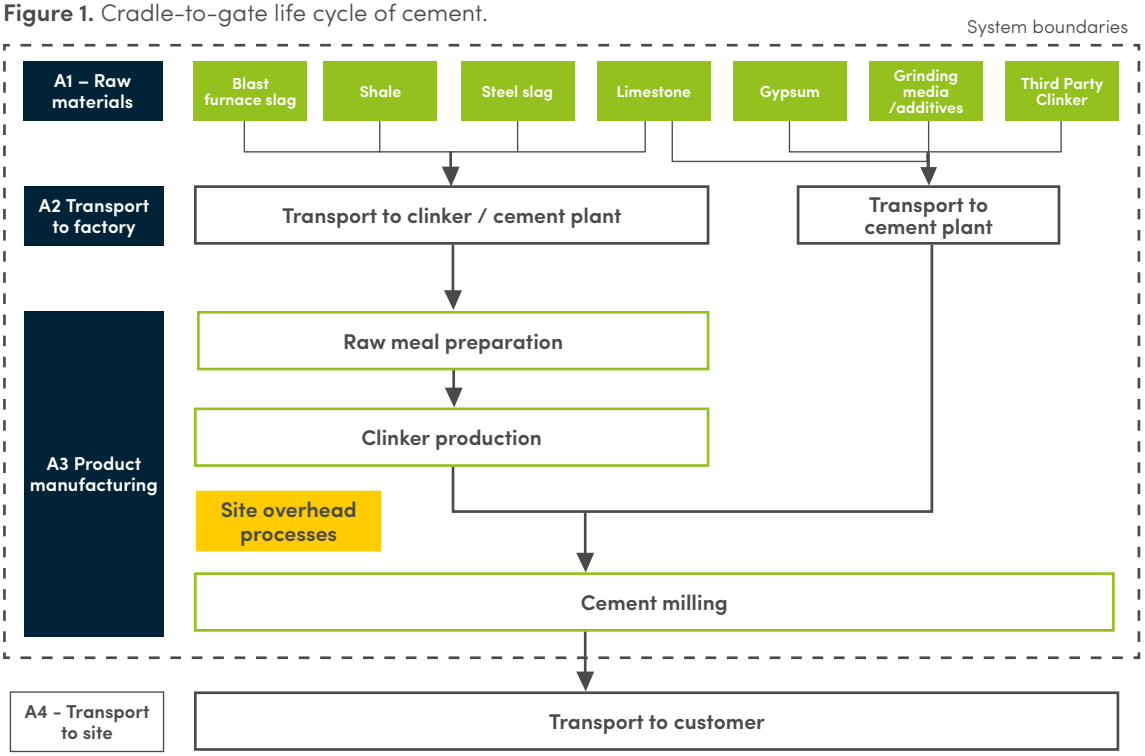
The product codes for cement and building lime products are UN CPC 374 (Plaster, lime and cement) and ANZSIC 20310 (Cement manufacturing).

Boral Cement operates a Quality Management System certificated to ISO 9001:2015 for its operations.

Cradle-to-gate life cycle

This EPD covers the cradle-to-gate life cycle stages (A1-A3), as per diagram below. Downstream stages have not been included.

Figure 1. Cradle-to-gate life cycle of cement.



Raw Material Stage A1

The main raw material inputs for the production of our cementitious materials are clinker, gypsum, mineral addition (limestone) and slag.

The vast majority of clinker used in our products is produced in Berrima from limestone, shale/clay, steel slag and gypsum.

Limestone is sourced from Boral Cement's Marulan South Limestone Mine; shale is extracted at Boral's Berrima shale quarry; clay comes from off-site suppliers; slag is supplied from local and overseas suppliers; and natural gypsum is mined in South Australia.

The cement milling process also uses grinding media (steel balls) and grinding aids (organic compounds) in small quantities.

Cradle-to-gate life cycle

Transportation Stage A2

Raw materials are transported to our sites via articulated trucks or by train.

Limestone is supplied to Berrima and Maldon by rail from our Marulan South operations. Gypsum and imported materials travel part of their journey on ships. Steel slag and granulated blast furnace slag are sourced from Port Kembla, NSW. The grinding aids come from overseas suppliers.

Manufacturing Stage A3

Boral produces cement at Berrima and Maldon. Berrima is an integrated cement works, which means we also operate a clinker kiln on this site. Maldon is a cement milling & blending facility only. Clinker used in Maldon is produced in Berrima or occasionally sourced from third parties.

In Berrima, the limestone, shale/clay, slag and gypsum are blended, ground into a fine powder (known as raw meal) and fused together at a very high temperatures (up to 1,500 ˚C) in the kiln. The fused material is called clinker.

Clinker is either stored, ready for reclamation or distribution to customers by road and rail transport, or is mixed with gypsum into one of two cement mills, where it is crushed to produce cement. Some cements also add limestone at the milling stage as a mineral addition. It is then fed into cement silos from where it is dispatched by either road tanker or rail tanker/ wagon for delivery to Boral Cement's customers (internal Boral customers or external).

Table 1: Scope of EPD

Product Stage			Construction Stage		Use Stage							End-of-life Stage				Benefits beyond system boundary
RAW MATERIAL SUPPLY	TRANSPORT	MANUFACTURING	TRANSPORT	CONSTRUCTION-INSTALLATION PROCESS	USE	MAINTENANCE	REPAIR	REPLACEMENT	REFURBISHMENT	OPERATIONAL ENERGY USE	OPERATIONAL WATER USE	DECONSTRUCTION DEMOLITION	TRANSPORT	WASTE PROCESSING	DISPOSAL	REUSE, RECOVERY, RECYCLING POTENTIAL
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
			Scenario		Scenario							Scenario				
✔	✔	✔	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

✔ = module is included in this study MND = module is not declared*

* When a module is not accounted for, the stage is marked with "MND" (Module Not Declared). MND is used when we cannot define a typical scenario.

Life Cycle Assessment (LCA) methodology

Background data

Boral has supplied primary data from our raw material and cement production facilities. Two cement production sites (Berrima and Maldon) provided primary data, as well as our limestone quarry in Marulan South and shale quarry in Berrima.

Background data for other raw materials (blast furnace slag, steel slag, grinding media and grinding aids), as well as energy and transport processes, have predominantly been sourced from AusLCI and the AusLCI shadow database (AusLCI 2021).

The cement production, limestone quarry and shale quarry data have been collected for financial year 2020 (1 July 2019 - 30 June 2020). The vast majority of the environmental profiles of our products are based on life cycle data that are less than five years old. Background data used is less than 10 years old.

Methodological choices have been applied in line with EN 15804 (CEN 2013); deviations have been recorded.

Allocation

The key production processes that require allocation are:

- **Cementitious binders:** Boral produces clinker in Berrima and various types of cementitious products in Berrima and Maldon. Raw materials have been modelled based on product compositions. Energy use and process emissions for clinker production have been attributed to grey clinker and off-white clinker based on their mass. Grinding energy (electricity) use has been provided for each product type based on production data. Other (overhead) energy use for cementitious material production has been attributed to all co-products based on their mass.
- **Limestone:** Limestone products are produced through quarrying and crushing of limestone rock, which is graded in different sizes. The energy required for the crushing and screening does not differentiate between products. Therefore, limestone production (including manufactured limestone sand) has been allocated based on the mass of product.
- **BFS:** blast furnace slag (BFS) is a by-product from steelmaking. We have used the AusLCI data for BFS ("blast furnace slag allocation, at steel plant/AU U"), which contain impacts from pig iron production allocated to blast furnace slag. As drying and grinding of BFS occurs at our Maldon site, we have used energy data for these processes, rather than the default AusLCI data.

Cut-off criteria

- The contribution of capital goods (production equipment and infrastructure) and personnel is outside the scope of the LCA, in line with the PCR (Environdec 2020a).
- The packaging used for grinding media and grinding aids is well below the materiality cut-off and these materials have been excluded.

Key assumptions

- Clinker sourced from third parties is based on AusLCI data for Australian clinker production and AusLCI data for imported clinker, assuming 50% Chinese and 50% Japanese clinker, for clinker sourced from within Australia and imported clinker respectively.
- Blast furnace slag receives some environmental impacts from pig iron production. This allocation decision has an effect on the environmental profile of products that use slag (e.g. Enviroment® cement).

Product composition

The nominal product composition of the cement products included in this EPD is presented in the following table.

Table 2. Cement product compositions

Constituent (% by weight)	Clinker	Gypsum	Mineral addition	Slag	Hydrated Lime
Shrinkage Limited (SL cement)	87-88	5-6	7		
High Early Strength (HES cement)	94-95	5-6			
Off White (OW cement)	88	5	4-6	0-3	
Enviroment (Slag cement)		2-5		95-98	
Marine/Low Heat/ SSC40 cement	35-39	2-4	0-3	57-60	
70-30 Binder (70% Enviroment : 30% Hydrated Lime)		2-3		67-68	30
Stabilment Binder (85% Enviroment : 15% Hydrated lime)		1-4		81-84	15

The products as supplied are non-hazardous. The products included in this EPD do not contain any substances of very high concern as defined by European REACH regulation in concentrations > 0.1% (m/m).

Hexavalent Chromium Cr (VI) (CAS 1333-82-0) can be present as a trace element in cement (<20ppm).

Environmental indicators

Table 3. Impact categories included in this assessment

Impact category	Acronym	Unit
Global Warming Potential	GWP	kg CO_2 equivalents
Ozone Depletion Potential	ODP	kg CFC-11 equivalents
Acidification Potential of soil and water	AP	kg SO_2 equivalents
Eutrophication Potential	EP	kg PO_4^{3-} equivalents
Photochemical Ozone Creation Potential	POCP	kg C_2H_4 equivalents
Abiotic Depletion Potential for Mineral Elements	ADPE	kg Sb equivalents
Abiotic Depletion Potential for Fossil Fuels	ADPF	MJ

Table 4: Parameters describing resource use, waste and output flows

Resource use	Acronym	Unit
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ_{NCV}
Use of renewable primary energy resources used as raw materials	PERM	MJ_{NCV}
Total use of renewable primary energy resources	PERT	MJ_{NCV}
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ_{NCV}
Use of non-renewable primary energy resources used as raw materials	PENRM	MJ_{NCV}
Total use of non-renewable primary energy resources	PENRT	MJ_{NCV}
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ_{NCV}
Use of non-renewable secondary fuels	NRSF	MJ_{NCV}
Use of net fresh water	FW	m^3
Waste categories		
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed	NHWD	kg
Radioactive waste disposed	RWD	kg
Output flows		
Components for re-use	CRU	kg
Materials for recycling	MFR	kg
Materials for energy recovery	MER	kg
Exported energy	EE	MJ

Environmental profiles

The cradle-to-gate (module A1-A3) environmental profiles and environmental parameters of each product are expressed per declared unit (1000 kg (1 tonne) of cement).

The environmental parameters are based on the life cycle inventory. There can be some ambiguity around their presentation, and this should be considered when comparing EPDs.

Limitations

This study presents a 'cradle-to-gate' life cycle assessment of cement products produced by Boral in NSW. The results use characterisation methods and models as specified in EN15804:2012+A1:2013 and may not be comparable to EPDs following different standards (including EN15804:2012+A2:2019), characterisation methods or models.

The main limitations of the LCA results are found in the parameter results, which are highly dependent on background data.

The results of this study and the EPD are valid for Boral products only. Products from other manufacturers will likely have different impacts due to differences in product compositions, supply chains and manufacturing processes.

Environmental profiles

Table 5. Environmental profiles, stages A1-A3, per tonne

Indicator	Unit	Shrinkage Limited (SL) Cement (BERRIMA)	High Early Strength (HES) Cement	Off-White Cement	Shrinkage Limited (SL) Cement (MALDON)
GWP	**kg CO_2 eq**	**809**	**893**	**837**	**825**
ODP	kg CFC11 eq	2.66E-06	2.92E-06	3.45E-06	3.39E-06
AP	kg SO_2 eq	1.28	1.40	1.35	1.32
EP	kg PO_4^{3-} eq	0.313	0.345	0.327	0.322
POCP	kg C_2H_4 eq	0.0395	0.0432	0.0441	0.0429
ADPE	kg Sb eq	3.01E-06	3.52E-06	3.07E-06	3.13E-06
ADPF	MJ_{NCV}	4190	4730	4390	4330

Table 6. Environmental parameters, stages A1-A3, per tonne

Parameter	Unit	Shrinkage Limited (SL) Cement (BERRIMA)	High Early Strength (HES) Cement	Off-White Cement	Shrinkage Limited (SL) Cement (MALDON)
PERE	MJ_{NCV}	3.23E+02	3.60E+02	3.32E+02	3.29E+02
PERM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ_{NCV}	3.23E+02	3.60E+02	3.32E+02	3.29E+02
PENRE	MJ_{NCV}	4.22E+03	4.76E+03	4.42E+03	4.37E+03
PENRM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ_{NCV}	4.22E+03	4.76E+03	4.42E+03	4.37E+03
SM	kg	4.59E+01	4.97E+01	4.77E+01	4.63E+01
RSF	MJ_{NCV}	2.70E+02	2.92E+02	2.76E+02	2.73E+02
NRSF	MJ_{NCV}	7.66E+00	8.29E+00	7.83E+00	7.74E+00
FW	m^3	4.20E-01	5.26E-01	4.64E-01	4.65E-01
HWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	9.01E-01	1.13E+00	9.48E-01	9.40E-01
RWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Environmental profiles

Table 7. Environmental profiles, stages A1-A3, per tonne

Indicator	Unit	Enviroment Slag Cement	Marine/Low Heat/ SSC40 Cement	70:30 Binder (Enviroment: Hydrated Lime)	Stabilment Binder (85% Enviroment : 15% Hydrated lime)
GWP	**kg CO_2 eq**	**147**	**441**	**441**	**293**
ODP	kg CFC11 eq	1.89E-06	2.32E-06	1.70E-06	1.79E-06
AP	kg SO_2 eq	0.265	0.730	0.420	0.342
EP	kg PO_4^{3-} eq	0.0576	0.170	0.101	0.0792
POCP	kg C_2H_4 eq	0.0228	0.0326	0.0287	0.0257
ADPE	kg Sb eq	4.81E-06	2.70E-06	3.77E-06	4.29E-06
ADPF	MJ_{NCV}	1680	2810	3790	2730

Table 8. Environmental parameters, stages A1-A3, per tonne

Parameter	Unit	Enviroment Slag Cement	Marine/Low Heat/ SSC40 Cement	70:30 Binder (Enviroment: Hydrated Lime)	Stabilment Binder (85% Enviroment : 15% Hydrated lime)
PERE	MJ_{NCV}	5.00E+01	1.66E+02	5.26E+01	5.17E+01
PERM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ_{NCV}	5.00E+01	1.66E+02	5.26E+01	5.17E+01
PENRE	MJ_{NCV}	1.69E+03	2.84E+03	3.81E+03	2.74E+03
PENRM	MJ_{NCV}	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ_{NCV}	1.69E+03	2.84E+03	3.81E+03	2.74E+03
SM	kg	9.03E+02	6.44E+02	6.32E+02	7.67E+02
RSF	MJ_{NCV}	0.00E+00	1.17E+02	0.00E+00	0.00E+00
NRSF	MJ_{NCV}	0.00E+00	3.32E+00	0.00E+00	0.00E+00
FW	m^3	4.14E-01	4.02E-01	4.20E-01	4.18E-01
HWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	1.14E+00	1.04E+00	1.28E+00	1.21E+00
RWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Other environmental information

Water management

Water is a valuable resource and essential to our manufacturing operations for dust suppression, cooling, cleaning and sanitation. All of our operations have the ability to capture rainfall run-off for reuse via specially designed detention basins, dams or extraction voids. While captured and onsite recycled water is used in the first instance, we also rely on licenced surface water and groundwater sources to meet our needs.

During drought conditions onsite water availability can be limited. We are actively looking at improving our water supplies at our operations including:

- Piping groundwater from the former Berrima Colliery workings to the Berrima Cement Works.
- Using tertiary treated effluent at our Marulan South operations.

Waste and recycling

At Berrima, to reduce our reliance on coal, we have approval to use non-standard fuels with defined fuel specifications, including Solid Waste Derived Fuels such as wood waste and refuse derived fuels, carbon anodes from the aluminium industry and used shredded/chipped tyres. These fuels are derived from waste that normally would end up in landfill.

At Berrima we use steel slag and granulated blast furnace slag as a raw feed in our clinker production to reduce the use of virgin limestone and reduce calcination emissions. We also use granulated blast furnace slag in some of our cement and stabilisation binder products at Maldon.

Biodiversity management

Protecting the diversity of plant and animal species at and around our operational sites is a core component of our land management efforts. Some examples from within the Cement operations include:

- Establishing a biodiversity stewardship site at Coolumburra, NSW, to offset vegetation clearing at our Marulan South operations.
- Working with local experienced wildlife handlers and carers to relocate fauna that could be displaced because of vegetation removal activities.

Through our community partnership with Conservation Volunteers Australia, we support conservation and education initiatives in our local communities, including vegetation initiative in local reserves and schools.

Our approach to climate related risks

Our approach

Boral recognises that climate related physical risks and a global transition to a low-carbon future are expected to impact our operations, customers and suppliers.

We support the Paris Agreement and mechanisms to achieve its objective of limiting future average global temperature rises to well below 2°C, as well as Australia's 2030 target of a 26–28% reduction in carbon emissions below 2005 levels.

Looking at how Boral's carbon emissions are tracking relative to 2005 levels, in Australia we have reduced emissions by around 40% since FY2005. We achieved about half of this decrease largely by realigning our portfolio away from emissions-intensive businesses. The remainder of the decrease is due to reducing clinker manufacturing in Australia in favour of importing it from more efficient and larger scale operations in Asia. Including Boral North America, our Scope 1 and 2 emissions decreased by 43% since FY2005.

We continue to progressively adopt the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD). In FY2019, we enhanced our climate-related governance and risk management, completed scenario analysis of Boral Cement's business and continued to strengthen our resilience to a 2°C scenario. We also broadened our reporting of physical climate-related risks and Scope 3 emissions.

We completed a Group-wide review of our climate-related risks and opportunities using the TCFD framework. This review informed a two-year roadmap to undertake further scenario analysis of key climate related business risks. We transparently and constructively engaged with Climate Action 100+ investor representatives and other stakeholders during the year, sharing our progress in aligning our efforts with the TCFD recommendations and building greater resilience to climate-related impacts.

Our approach to climate related risks

Energy and climate policy

Boral has not identified any major positions on energy and climate policy held by our industry associations that are materially inconsistent with Boral's position.

We support:

- A national approach to climate and energy policy to ensure that least-cost carbon emissions abatement is targeted while ensuring reliable and competitive energy can be delivered.
- Climate and energy policies that do not unduly erode the competitiveness of domestic-based businesses.

Through our community partnership with Conservation Volunteers Australia, we support conservation and education initiatives in our local communities, including native vegetation initiatives in local reserves and schools.

In Australia, we are a member of the Cement Industry Federation (CIF). The CIF policy is to support the Federal Government's national target to reduce emissions by 26–28 per cent by 2030, and the CIF has been working with the World Business Council for Sustainable Development and its current roadmap to reduce emissions.

Boral acknowledges the Paris Agreement and supports mechanisms to achieve its objectives, including a national approach to climate and energy policy. Boral's major industry associations are:

- Cement Industry Federation (CIF)
- Cement, Concrete & Aggregates Australia (CCAA)
- Australian Flexible Pavement Association (AfPA)
- American Coal Ash Association (ACAA)

For more information visit Boral's website.

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