

# ENVIRONMENTAL PRODUCT DECLARATION

GENERAL PURPOSE PORTLAND CEMENT  
(ULTRACEM) BULK SUPPLIED AND BAGGED

This Environmental Product Declaration has been prepared in accordance with ISO 14025:2006 and EN15804:2012 +A1 Sustainability of construction works, Environmental product declarations, Core rules for the product category of construction products

**Programme:** EPD Australasia Ltd.

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## INTRODUCTION

This Environmental Product Declaration (EPD) is an independently reviewed document that details the environmental impact of Holcim NZ Ltd.'s "Ultracem" cement, supplied in both bagged and bulk forms.

Geographically, this EPD covers quarrying and manufacturing processes in Japan as well as the transportation of the product to and around New Zealand. Verified primary data from the calendar year 2017 has been collected and analysed to provide a life cycle assessment of the upstream processes A1-A3.

EPDs of construction products may not be comparable if they do not comply with the requirements of comparability set out in EN 15804:2012+A1. EPDs within the same product category but from different programmes may not be comparable.

Holcim NZ Ltd, as the owner of this EPD, has sole ownership, liability and responsibility for this EPD.



## EPD REGISTRATION INFORMATION

**Table 1. EPD Information**

EPD Information:	
EPD registration number:	S-P-00850
Approval date:	19/08/2019
Revision date:	-
Valid until:	19/08/2024
Declared product:	Holcim Ultracem-NZS 3122:2009 General Purpose Portland Cement
UN CPC code:	3740
ANZSIC code:	203100
Declared unit:	1000kg
Reference year for data:	2017
Geographical scope:	New Zealand
Contact Information:	
EPD owner:	Holcim New Zealand Ltd.
Programme operator:	<p>EPD Australasia Ltd. in alignment with the International EPD® System</p> <p><a href="http://www.epd-australasia.com">www.epd-australasia.com</a></p> <p>EPD Australasia Ltd 315a Hardy Street Nelson 7010 New Zealand Email: <a href="mailto:info@epd-australasia.com">info@epd-australasia.com</a></p>
CEN Standard EN 15804 served as the core PCR:	
Product Category Rules (PCR):	Cement and building lime (EN 16908:2017)- 2012:01- SUB-PCR-H, 2018-11-22
PCR review was conducted by:	The Technical Committee of the International EPD® System. Chair: Massimo Marino. Contact via <a href="mailto:info@environdec.com">info@environdec.com</a>
Independent verification of the declaration and data, according to ISO14025:	EPD Verification (External)
Third-party Verifier:	<p>Maurizio Fieschi, as individual verifier, qualified by the Technical Committee of EPD Australasia Ltd.</p> <p>Organisation: Studio Fieschi &amp; soci Srl - <a href="http://www.studiofieschi.it">www.studiofieschi.it</a></p> <p>Email: <a href="mailto:fieschi@studiofieschi.it">fieschi@studiofieschi.it</a></p>
Verifier approved by:	EPD Australasia Ltd.

## HOLCIM NEW ZEALAND LTD.

Holcim (New Zealand) Ltd is a leading supplier of cement and aggregates in New Zealand. Its involvement in the New Zealand building industry dates back to 1888. Holcim New Zealand is part of the regional Holcim Australia/New Zealand business and the global LafargeHolcim Group; the world's leading supplier of cement, aggregates and construction-related services represented in 90 countries on all continents.

Cement is sourced from Mitsubishi Materials Corporation (MMC) in Japan with whom Holcim has a long-term cement supply agreement in place. Around 400,000-500,000T is imported each year into the two 30,000 tonne import terminals in Auckland and Timaru.

The Timaru Cement Terminal supplies cement to the South Island and lower North Island while the Auckland (Waitemata) Cement Terminal supplies cement to the upper North Island with the majority of this cement being used in the Auckland market.

A Holcim domestic ship distributes cement from Timaru to depots around New Zealand in Dunedin, Lyttelton, Nelson, Wellington, New Plymouth and Napier. Road tankers distribute cement to the rest of the depots in Onehunga, Sockburn and Hamilton. About 90% of cement is delivered to customers in bulk and 10% in bags.



## HOLCIM'S ENVIRONMENTAL COMMITMENT

Holcim is committed to taking care of the environment while going about its business. This reflects a modern community's expectations of environmental excellence from its corporate citizens. Ensuring environmental performance is a continual focus at all of Holcim New Zealand's sites and plants and is regarded in the company as everyone's business.

Our Environmental Policy outlines key focus areas such as implementation of environmental management systems, ensuring efficient resource utilisation and minimising environmental impacts.

Compliance with consents and other environmental regulations is a top priority, and the company strives to outperform compliance limits whenever practicable. Compliance is assured through regular management reviews and external environmental auditing.

All company sites are certified to the internationally recognised ISO14001 standard, which requires the company to continuously improve its environmental performance.

More information about Holcim's environmental commitment can be found at:

<https://www.holcim.co.nz/sustainable-development/environmental-commitment>

## MMC'S ENVIRONMENTAL COMMITMENT

MMC's cement plants make a proactive effort to absorb society's waste. Waste materials including plastics, sewage, fluids, tyres, woodchips, garbage and oils are detoxified at high temperatures of around 1,450°C and their thermal energy utilized as secondary fuel sources. Gypsum, the retarding agent used in cement, is recycled from gypsum board used in building and construction. More information around MMC's environmental commitment is available at:

<http://www.mmc.co.jp/corporate/en/csr/environment/policy.html>

## HEALTH AND SAFETY

### ULTRACEM PRODUCT CONTENT DECLARATION

**Table 2 Ultracem (CAS number 65997-15-1) Product Content Declaration**

Constituents	Portion of cement product by weight (%)	Substances	CAS number
Portland Cement Clinker	92	Calcium Silicates	12168-85-3
		Calcium Aluminates	12042-78-3
		Calcium Aluminoferrite	12068-35-8
Gypsum	2.7	Calcium Sulfate	7778-18-9
Limestone	3.9	Calcium Carbonate	1305-78-8
Silica (quartz)	<0.05	Crystalline Silica	14808-60-7
Other materials	<1		

### HAZARDOUS SUBSTANCES AND NEW ORGANISMS ACT DECLARATION

Classified as hazardous according to criteria in the EPA Hazardous Substances (Minimum Degrees of Hazard) Notice 2017.

Group standard: Construction Products (Corrosive 8.2C) Group Standard 2017

HSNO APPROVAL NUMBER: HSR002542

#### Hazard classification:

6.1D - Substances that are harmful if swallowed / inhaled

6.5A - Substances that are Respiratory sensitisers

6.5B - Substances that are Skin sensitisers

8.2C - Substances that are Corrosive to skin

8.3A - Substances that are Corrosive to eyes



When handling Ultracem, or any cementitious material, the following PPE is recommended:

#### Safety glasses



#### Dust mask



#### Gloves



The complete handling and storage information can be found in the Ultracem Safety Data Sheet: <https://www.holcim.co.nz/safety-data-sheets-sds>

## ULTRACEM TECHNICAL INFORMATION

Ultracem meets the following National and International Cement Standards: New Zealand NZS 3122: 2009 Type GP, Australia AS 3972: 2010 Type GP, UK and Western Europe EN 197-1: 2011 CEM1 - 52.5N.

### APPLICATIONS

Ultracem's binding strength and outstanding consistency make it an ideal choice for a wide range of general-purpose concrete applications, including general and specialist construction, mortars, renders, grouts, precast and manufacture of concrete products. In bagged form, Ultracem also provides consistently good results for projects such as driveways, patios, paths, floors, foundations and footings.



### QUALITY CONTROL

Ultracem is tested throughout production in Japan to ensure it meets MMC's and Holcim's quality requirements. The cement is transported via bulk tanker which undergoes rigorous cleaning and inspection by independent parties prior to loading. During loading, independent surveyor samples are collected and sent to Holcim NZ for testing prior to the ship's arrival into Auckland and Timaru. More samples are taken throughout the unloading process and sent to Holcim's IANZ accredited cement and concrete materials testing laboratory in Auckland. All cement is tested for compliance with NZS3122:2009 specification for Portland and blended cements as well as internal product quality limits. Samples from Timaru and Auckland truck load outs are also tested on a weekly basis to provide results for the weekly certificate. Retention samples are taken from all Holcim regional depots.

Table 3 provides the typical chemical and physical properties of Ultracem. More information regarding technical performance, including weekly laboratory result certificates, can be found at: <https://www.holcim.co.nz/products-services/our-products/cement>

**Table 3 Typical Chemical and Physical Properties of Ultracem**

Chemical Analysis (%)		Compressive Strength – ISO Mortar	
SiO <sub>2</sub>	20.0	3 Day	35 MPa
Al <sub>2</sub> O <sub>3</sub>	5.8	7 Day (35 MPa Minimum)	49 MPa
Fe <sub>2</sub> O <sub>3</sub>	2.8	28 Day (45 MPa Minimum)	65 MPa
CaO	64.3	Setting Time	
MgO	1.4	Initial Set	120min
SO <sub>3</sub>	2.4	Final Set	3:00hrs
K <sub>2</sub> O	0.42	Le Chatelier	1mm
Na <sub>2</sub> O	0.26	Specific Gravity	3.11
TiO <sub>2</sub>	0.3	Fineness- Specific Surface (m <sup>2</sup> /kg)	330
Mn <sub>2</sub> O <sub>3</sub>	0.1	Normal Consistency (%)	27.9
P <sub>2</sub> O <sub>5</sub>	0.1	Peak Temperature Rise	31.4°C at 15.9hrs
Cl	0.020	Bulk Density	
LOI	2.2	Aerated (kg/m <sup>3</sup> )	1170
NaEq	0.54	Packed (kg/m <sup>3</sup> )	1420

## THE PROCESS

### RAW MATERIALS

The main raw materials used for Ultracem production are calcareous and argillaceous materials; calcium (limestone), silicon (sand, clay and slag), iron (clay) and aluminum (fly ash and clay). During the quarrying process, core samples of the materials are taken and analyzed for their chemical composition. Acceptable materials are extracted, crushed and transported to the MMC plant for processing. Processing involves drying the materials to remove all moisture and finely milling them together in specific proportions. Again, samples are taken, and the chemical composition analyzed to ensure the raw meal meets specific quality criteria.

### CLINKER PRODUCTION

The raw meal is then injected into the upper end of the rotary kilns. The lower end of the kilns is heated using coal as the primary energy source as well as a range of recycled detoxified industrial waste products; including plastics, sewage, fluids, tires, woodchips, garbage and oils. The raw meal travels slowly down the rotating kiln through increasing temperature zones.

**400-600°C:** Clay materials are decomposed into silica and alumina oxides.

**650°C-900°C:** Belite is formed from calcium carbonate and silica dioxide.

**900-1050°C:** The remaining calcium carbonate decomposes to CO<sub>2</sub> and calcium oxide.

**1300-1500°C:** This zone produces the main constituent of Portland cement, alite, from the reaction of belite with calcium oxide.

The result is partially melted round nodules called “clinker”. The clinker is air cooled and the heat is recovered and returned to the kilns to recycle energy. Clinker samples are analyzed for quality control.

### CEMENT PRODUCTION

The clinker is finely ground in vertical or roller mills with small amounts of gypsum (a retarding agent), slag and high-grade limestone filler to produce Ultracem cement. Bulk tanker ships deliver the Ultracem to New Zealand where it is discharged into two Holcim terminals; in Auckland and in Timaru. Ultracem is transported from these terminals to the other Holcim depots around the country by way of road tanker or Holcim’s coastal ship. At some of these depots, Ultracem is bagged into 25kg and 40kg paper bags and 1tonne plastic bags for distribution.

## THE SYSTEM BOUNDARY (MODULES A1-A3)

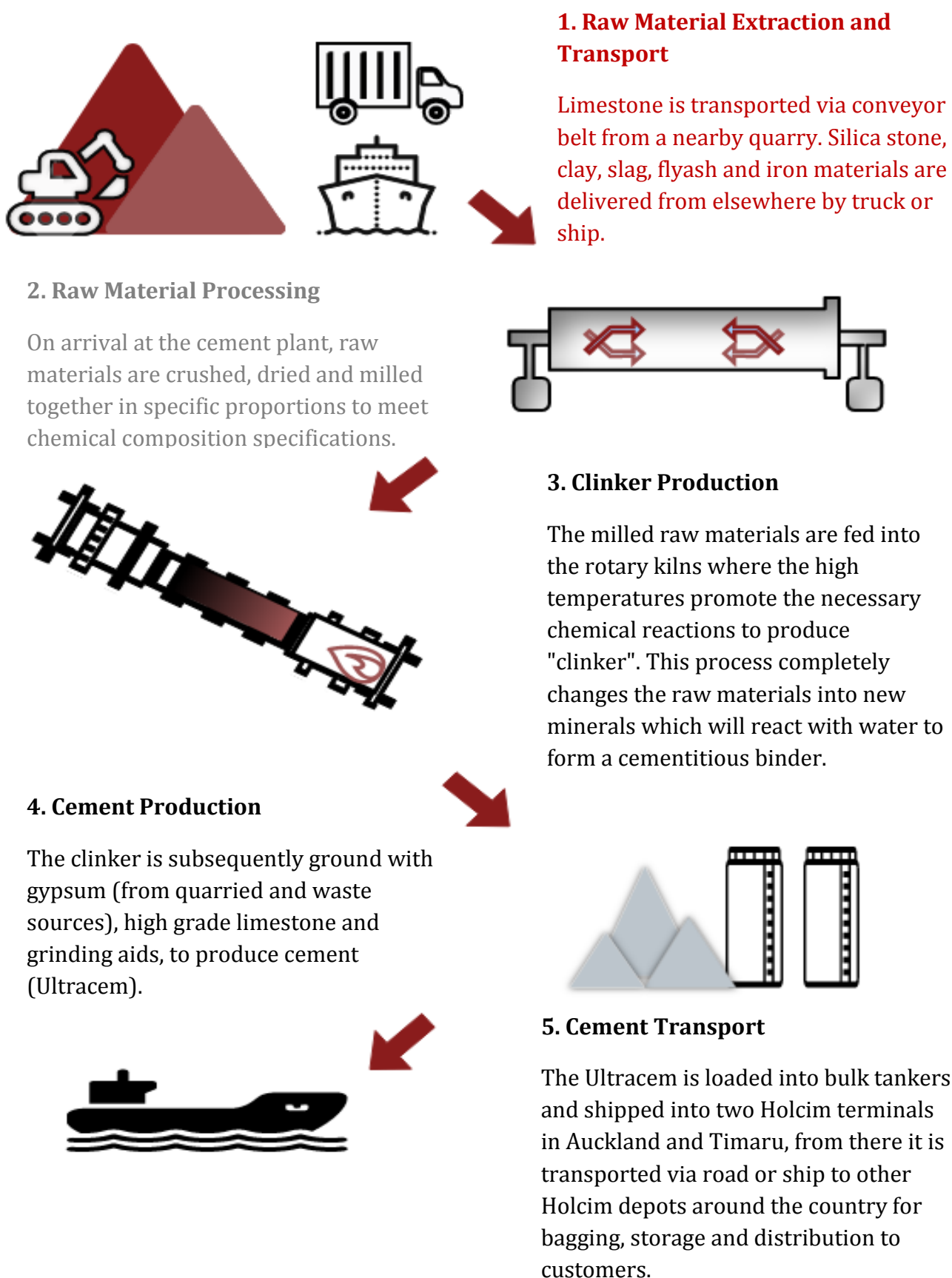


Figure 1 Ultracem Manufacturing Process

## LCA CALCULATION RULES

### SYSTEM BOUNDARY

The life cycle assessment presented in this EPD is cradle to gate because other stages are very dependent on particular scenarios and are better developed for specific building or construction works. It covers from raw material extraction in Japan right the way through cement production, transportation to the storage depots in New Zealand and ends with regional depot operations including bagging of cement where this occurs. It does not include onward transport to customer sites and usage of the cement. Therefore, the Reference Service Life is not specified in this EPD. It also does not cover other downstream processes such as recycling and recovery phases.

**Table 4 The System Boundary**

<b>PRODUCT STAGE</b>	Raw Material Supply	A1	✓
	Transport	A2	✓
	Manufacturing	A3	✓
<b>CONSTRUCTION STAGE</b>	Transport to Site	A4	MND
	Onsite Processes	A5	MND
<b>USE STAGE</b>	Use	B1	MND
	Maintenance	B2	MND
	Repair	B3	MND
	Replacement	B4	MND
	Refurbishment	B5	MND
	Operational Energy Use	B6	MND
	Operational Water Use	B7	MND
<b>END OF LIFE STAGE</b>	Deconstruction/ Demolition	C1	MND
	Transport	C2	MND
	Waste Processing	C3	MND
	Disposal	C4	MND
<b>BENEFITS BEYOND SYSTEM BOUNDARY</b>	Reuse/Recovery/Recycling Potential	D	MND

MND= Module Not Declared (such a declaration shall not be regarded as an indicator of a zero result)

## DECLARED UNIT

The declared unit is 1000kg of Holcim Ultracem cement, provided in bagged and bulk forms.

## CUT OFF CRITERIA

Inputs and outputs to processes for which MMC and Holcim NZ have control have been included in the calculations that underpin this study. No specific cut off criteria have been set for the collection of these data.

For clinker and cement production, for example, this includes input materials and fuels (including mode and distance for delivery), use and supply of grid electricity (in Japan), carbonation and fuel combustion emissions, other process emissions, water usage and generation of waste.

Supporting activities that bring inputs to, and carry away outputs from, processes included in the system boundaries, are based on data embedded in an EPD Tool (see the LCA Model section).

## THE LCA MODEL

An EPD Tool has been developed for the World Business Council for Sustainable Development Cement Sustainability Initiative (WBSCD CSI) to comply with requirements set out in EN15804 (CEN, 2012) and EN16908 (CEN, 2017). The EPD Tool has been independently reviewed against these standards by an International EPD® System and EPD Australasia Limited verifier and has been found to be compliant. In 2019, the responsibility for the EPD Tool has shifted from the WBSCD CSI to the Global Cement and Concrete Association (GCCA).

The results in this EPD were calculated using the EPD Tool which uses supporting data, based on EcoInvent version 3.3, covering:

- Extraction activities (raw materials and fuels)
- Pre-combustion and combustion of fuel for transport by truck and ship.
- Production and distribution of electricity. Data for the Japanese national grid is based on International Energy Agency (IEA) data for 2016 (International Energy Agency, 2016) and the New Zealand national grid data comes from MBIE energy statistics (Ministry of Business Innovation and Employment NZ, 2018).
- Landfill processes

Data for electricity usage at Holcim NZ depots, transport quantities, bagging production and packaging materials comes from Holcim NZ's internal SAP database. All MMC production data (raw material quantities, production quantities, electricity usage etc) comes from MMC's internal database and is independently verified by a third-party reviewer.

## LCA RESULTS

**Table 5 Parameters Describing Environmental Impacts (A1-A3 Inclusive)**

Parameter	Unit	Per 1000kg Ultracem (Bulk)	Per 1000kg Ultracem (Bagged)
Global warming potential	kg CO <sub>2</sub> -eq.	897	904
Ozone depletion potential	kg CFC11 -eq.	0.0000176	0.0000181
Acidification potential for soil and water	kg SO <sub>2</sub> -eq.	2.69	2.74
Eutrophication potential	kg PO <sub>4</sub> <sup>3-</sup> -eq.	1.11	1.14
Formation potential of tropospheric ozone	kg C <sub>2</sub> H <sub>4</sub> -eq.	0.140	0.143
Abiotic depletion potential for non-fossil resources	kg Sb -eq.	0.000423	0.000530
Abiotic depletion potential for fossil resources	MJ NCV	2580	2690

NCV= Net Calorific Value

**Table 6 Parameters Describing Resource Use (A1-A3 Inclusive)**

Parameter	Unit	Per 1000kg Ultracem (Bulk)	Per 1000kg Ultracem (Bagged)
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, NCV	128	263
Use of renewable primary energy resources used as raw materials	MJ, NCV	0	0
Total use of renewable primary energy resources	MJ, NCV	128	263
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, NCV	2640	2760
Use of non-renewable primary energy resources used as raw materials	MJ, NCV	0	0
Total use of non-renewable primary energy resources	MJ, NCV	2640	2760
Use of secondary material	kg	307	307
Use of renewable secondary fuels	MJ, NCV	40.1	40.1
Use of non-renewable secondary fuels	MJ, NCV	344	344
Use of net fresh water	m <sup>3</sup>	3.01	3.75

NCV= Net Calorific Value

**Table 7 Other Environmental Information Describing Different Waste Categories and Output Flows (A1-A3 Inclusive)**

Parameter	Unit	Per 1000kg Ultracem (Bulk)	Per 1000kg Ultracem (Bagged)
Hazardous waste disposed	kg	0	0
Non-hazardous waste disposed	kg	0.0577	0.0577
Radioactive waste disposed	kg	0	0
Components for reuse	kg	0	0
Materials for recycling	kg	0	0
Materials for energy recovery	kg	0	0
Exported energy	MJ	301	301

## REFERENCES

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## ORGANISATIONS

### Project Manager and LCA/EPD Model



#### Company

Holcim

#### Address

23 Plumer Street

Auckland

New Zealand

#### Contact

Dana Leishman

Laboratory Technician

#### Telephone

+64 27 705 5834

#### Email

[dana.leishman@lafargeholcim.com](mailto:dana.leishman@lafargeholcim.com)

#### Website

[www.holcim.com/nz](http://www.holcim.com/nz)

### Technical Lead and Support



BRANZ

1222 Moonshine Rd

RD1, Porirua 5381

New Zealand

Dr Dave Dowdell

Principal Scientist- Sustainability

+64 4 237 1174

[david.dowdell@branz.co.nz](mailto:david.dowdell@branz.co.nz)

[www.branz.co.nz](http://www.branz.co.nz)