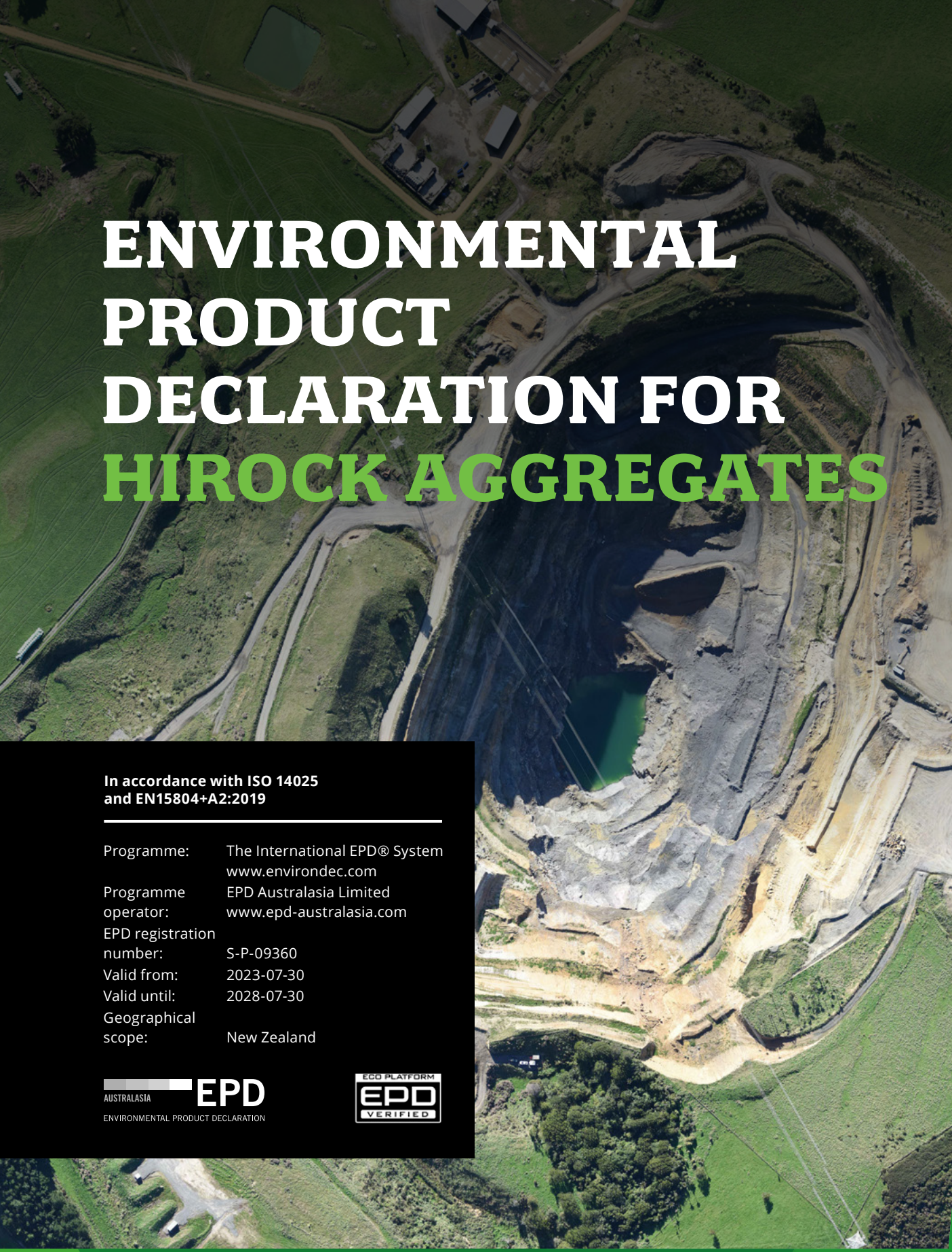


ENVIRONMENTAL PRODUCT DECLARATION FOR HIROCK AGGREGATES

In accordance with ISO 14025 and EN15804+A2:2019

Programme:	The International EPD® System www.environdec.com
Programme operator:	EPD Australasia Limited www.epd-australasia.com
EPD registration number:	S-P-09360
Valid from:	2023-07-30
Valid until:	2028-07-30
Geographical scope:	New Zealand

AUSTRALASIA EPD
ENVIRONMENTAL PRODUCT DECLARATION

ECO PLATFORM EPD VERIFIED

HIROCK

HFH LIMITED

HFH LIMITED

HIROCK

This Environmental Product Declaration (EPD) has been produced in accordance with a consistent set of rules known as product category rules (PCR). EPDs within the same product category from different programmes may not be comparable.

EPDs of construction products may not be comparable if they do not comply with EN15801+A2 or if they are produced using different product category rules.

CONTENT

WHAT IS AN ENVIRONMENTAL PRODUCT DECLARATION?

An Environmental Product Declaration (EPD) tells the environmental story of a product over its life cycle in a format that is clear and transparent.

It is science-based, independently verified and publicly available. EPDs are often compared to the nutrition labels on food products.

EPDs help manufacturers translate complex sustainability information about their products' environmental footprint into simpler information that governments, companies, industry associations and end consumers can trust to make decisions.

An EPD communicates the environmental impacts at different stages in a product's life cycle. This may include the carbon emitted when it's made, and any emissions that pollute the air, land or waterways during its use.

ABOUT
HIROCK LTD

Hirock Ltd was established in August 2020 as part of the Higgins Family Holdings Ltd group of companies. Located in the lower North Island of New Zealand, Hirock is an experienced team of aggregate industry experts. With a focus on continual innovation, our reputation is based on exceptional service and premium aggregate products.

Privately owned by the Higgins Family and operating under the umbrella of parent company Higgins Family Holdings Limited (HFHL), Hirock has six quarries located in the Manawatū, Tararua, and Hawkes Bay regions.

Hirock supplies high quality aggregate to meet the needs of all sectors of the construction market. Linton, as our stand alone hardrock quarry, also produces a specialist range of products used in a wide range of flood protection work. With a range of mobile and fixed plants for crushing, screening, and extraction and our expertise and experience, Hirock is a quarry market leader in the central and lower North Island.

Backed by nearly five decades of industry experience, we have the capacity to supply aggregate projects of all sizes - from residential driveways to nationally significant civil infrastructure projects such as Te Ahu a Turanga (the Manawatū Gorge replacement highway project).

Our valued customers include individuals, Waka Kotahi New Zealand Transport Agency, regional and district councils, energy companies, large commercial site developers, residential builders, roading contractors and KiwiRail to name a few.

HFHL is managed by Bernard Higgins, Shane Higgins, and Grant Higgins, who form the current Board of Directors.

WHAT WE DO

Hirock operates five Alluvial land base quarries and one Hardrock site, across the Lower North Island. Greywacke Aggregate is sourced from all of these sites to produce a wide variety of construction, roading and flood protection products, Hirock also produces rail ballast at Linton and Maraekakaho quarries.

Hirock's focus is on producing high quality aggregates to meet market demand for a wide range of sectors in the construction and roading market.

Concrete Aggregates and Concrete Sand are predominantly produced and distributed to Higgins concrete operations with Hirock's transport fleet of truck and trailer units.

Roading and Sealing Chip products are produced on all our sites with Pahiatua quarry supplying much needed High PSV Sealing Chip into the infrastructure market.

Linton quarry is one of few Armour Rock quarries in the Lower North Island that can supply Flood Protection Rock into Council Climate Resilience contracts. Linton Rock has a proven track record of standing up to increased floods due to its hardness and resistance to weathering.

We continually invest in new resources such as plants, equipment, and safety systems.

Supported by proven management capability, we're able to maintain a sustainable supply chain and meet the market demand of our local communities.

SUSTAINABILITY COMMITMENT

Hirock recognises that taking a sustainable approach to managing resources is key to running an efficient business. Our sustainability framework encompasses three pillars:

carbon reduction

We're committed to reducing the cradle-to-gate carbon emissions of our business operations and products and supporting New Zealand to meet its obligations under the Paris Agreement.

This EDP will provide a baseline from which to measure our progress, enabling us to put more sustainable products out into the construction market.

How we are reducing our carbon footprint:

Recycling - Hirock recycles concrete and glass with their state-of-the-art mobile crushing fleet and these recycled products are blended back into roading aggregates to reduce waste to cleanfill and tips.

Concrete waste - All sites have solutions available for the recycling and reuse of concrete waste material.

Vehicles - We're working on maximising performance while reducing emissions across our fleet. This includes opting for electric and hybrid vehicles where appropriate.

social sustainability

The Higgins family has been part of the Manawatū community for over 60 years.

HFHL is deeply embedded in the communities we operate in, particularly our founding region of the Manawatū. We believe it's important to give back, and we're proud to have supported many worthy services, sports clubs and facilities over the years. These include Arohanui Hospice, Manawatū Turbos Foundation, Central Energy Trust Arena, Manawatu Jets, Marist Sports Clubs, Child Cancer Foundation, Coachhouse Museum and many community and school fundraisers.

Looking after the wellbeing of our employees is a top priority so our employees and their families have free access to Groov – a programme that supports mental wellbeing.

Through our partnership with local iwi, we're able to provide Māori youth with work experience and a pathway into the industry.

water conservation

Hirock operates erosion and sediment control ponds on all their sites that allow for the treatment and reuse of surface water as well as discharge water from plant and manufacturing processes.

All water types (including captured rainwater) are recycled back into concrete production and washing processes at each site.

RECYCLING AND CARBON REDUCING OPTIONS

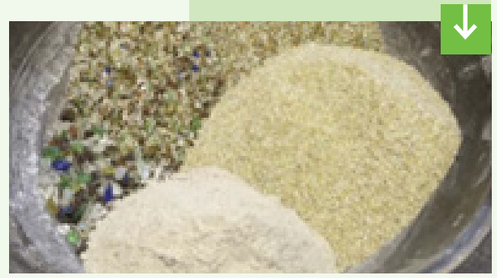
Glass/Cullet in Concrete

Cullet can replace part or all the sand and gravel in concrete, for effects that range from multicolour mosaics to granite or marble-like finishes.

Process: At Hirock we collect, sort and crush glass that would have ended up in landfill, we use our state of the art Mobile Crushing fleet to achieve the best results, crushing, washing and screening the glass into useable aggregate and sand.

Grading glass aggregate for concrete

Glass aggregate is typically graded by colour and size. Sizes can range from 19mm rocks to gravel-sized pieces to a fine talc-like powder. Polishing, grinding, or other exposed aggregate techniques are employed to reveal the glass. Or glass can be seeded on the surface and then exposed.



Waste glass comes in a variety of sizes, from a fine powder and sand grain pieces to small and larger aggregates.

Recycled Concrete for use in Non-Structural Concrete and Roading

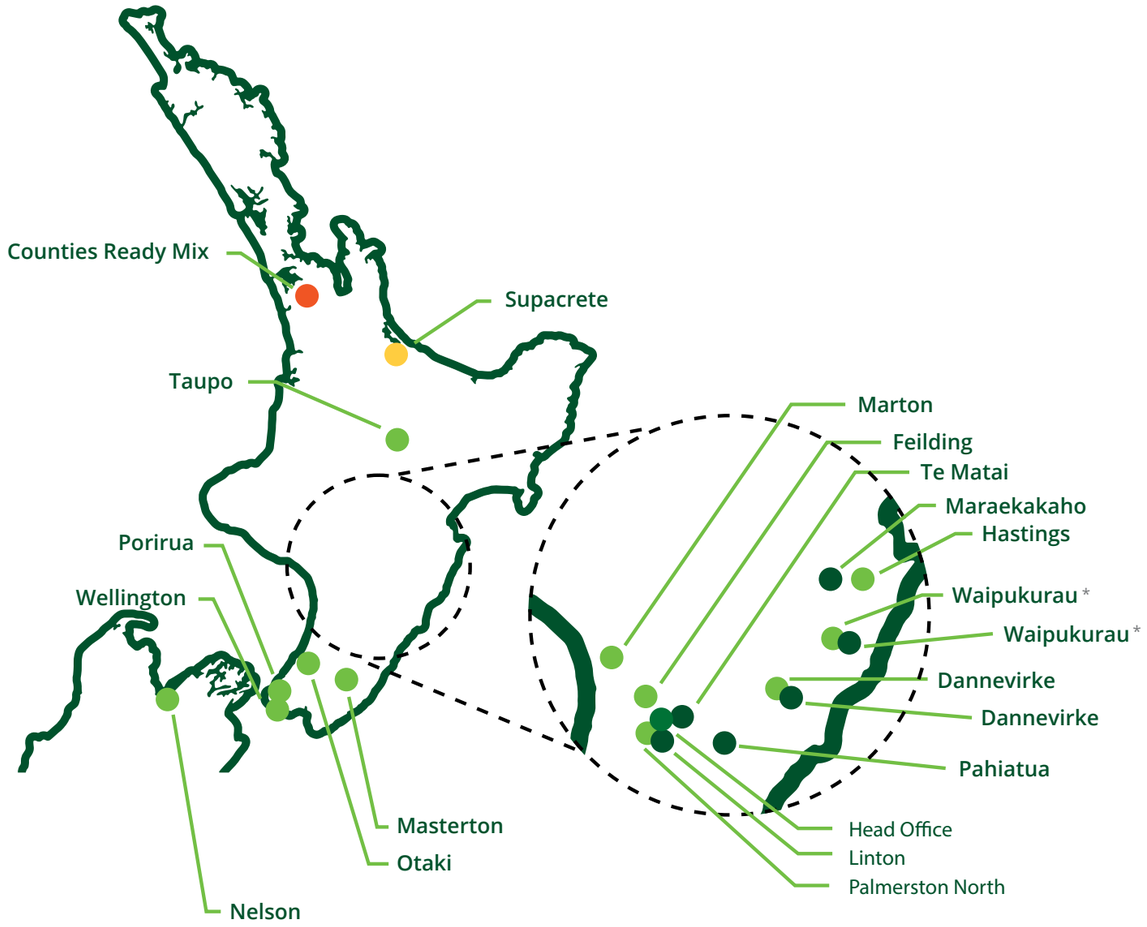
The environmental and economic impact of carting and dumping waste concrete into landfill is detrimental to any business and will lead to long term impact on future generations. The use of Recycled Concrete in non-structural Concrete reduces the pressures on landfill and cleanfill operations and has a positive environmental effect.

Process: At Hirock we collect, sort and crush concrete that would have ended up in landfill, we use our state of the art Mobile Crushing fleet to achieve the best results, crushing and screening the concrete into useable aggregate and sand. The Crushed Concrete is then used in low MPa mixes such as footpaths and driveways.

Unprocessed Concrete Stockpile

Processed Concrete Stockpile (Builders mix)

OUR MANUFACTURING LOCATIONS



HIGGINS CONCRETE
HIROCK
SUPACRETE CONCRETE LTD
COUNTIES READYMIX
HFH LIMITED

*not in operation currently

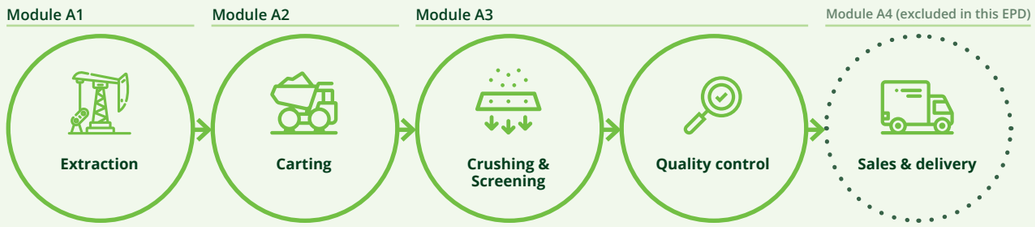
HIROCK MANUFACTURING PROCESS

HARD ROCK

The hard rock quarrying process consists of:

ALLUVIAL

Alluvial Processing does not require any drilling or blasting as the alluvial deposits are excavated by front end loader or excavator. The rest of the process stays the same.



Included in this EPD
Not included in this EPD

WHAT IS AN EPD

An Environmental Product Declaration (EPD) is an independently verified and transparent declaration of the environmental impact of the life cycle of our products.

Hirock has developed this product specific EPD to help to showcase the environmental credentials of their aggregate products. The EPD also provides life cycle data for calculating the impacts of aggregate products. These data sets may be used by specifiers and developers to calculate and present the environmental impacts of particular construction projects.

COVERED IN THIS EPD

AGGREGATES

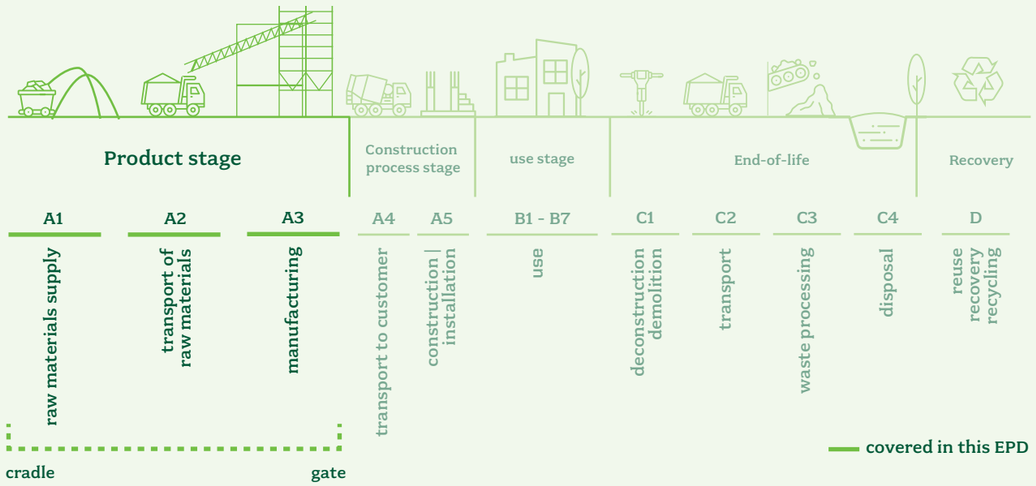
Aggregates are coarse-to-medium-grained particulate materials mined from the earth used in construction, such as sand, gravel, or crushed stone. They are a component of composite materials such as concrete and asphalt that provide strength to the overall composite material.

Aggregates are used for a wide range of applications.

PRODUCT LIFE CYCLE

This is a 'cradle-to-gate' type EPD. This means that only the production (modules A1-A3) are modelled in this EPD. The transport and construction process (modules A4-A5), use stages (B1-B7), end-of-life (C1-C4) and recovery (D) stages are dependent on particular scenarios and best modelled at the building/ infrastructure level.

The product stage involves the extraction (cradle) of all raw materials, mainly rock and sand from quarry pits (using excavators and explosives), transport, and processing using a series of screeners and crushers to produce aggregate and sand products. These products are then used for various building and infrastructure applications.



AGGREGATE TYPES

Product	code
Concrete Sand	SANDC
Pebbles 13mm	PEB13
Pebbles 20mm	PEB20
Concrete Aggregates 14 - 5mm	CA145
Concrete Aggregate 20mm	CA20

Product	code
PAP Washed	ASPPAP5W
Bedding Material	BED
Filter Material F2, F6	FILTER F2-F6
Peametal	PM
Thermal Sand	SANDT

Product	code
General All Passing 20mm	GAP20
General All Passing 40mm	GAP40
General All Passing 65mm	GAP65
General All Passing 100mm	GAP100
TNZ40	TNZ40

Product	code
10-8 Chip	ASPC 10-8
15-10 Chip	ASPC 15-10
20-15 Chip	ASPC 20-15
6-4 Chip	ASPC 6-4
8-6 Chip	ASPC 8-6
Grade 2 Sealing Chip	SC2
Grade 3 Sealing Chip	SC3
Grade 4 Sealing Chip	SC4
Grade 5 Sealing Chip	SC5
Grade 6 Sealing Chip	SC6
Crusher Dust	CRDUST
Crusher Dust Washed	CRDUSTW

Product	code
Ballast	Ball
Feature Rock Large	FEATRL
Gabion Stone	GABION
Rock 100-150TG	R100-150TG
Rock 100 Horizons	RO100H
Rock 200 Horizons	RO200H
Rock 200-500	200-500RO
Rock 300 Horizons	WRO300H
(A Grade)Rock 300-600	300-600RO
Rock 400-800	400-800RO
Rock 50-150 Fletcher	RO50-150F
Rock 750 Horizons	RO750H
Rock 800-1300	800-1300RO
Rock B Grade WRC	ROBGRADEW
Rock C Grade WRC	ROCGRADEW
Face Metal	FACE
Filling	FILL

PRODUCT INFORMATION

This EPD covers 72 aggregate and sand products produced by Hirock at 4 different quarries in New Zealand.

INDUSTRY CLASSIFICATION

Table 1 shows the relevant standard and application for aggregate and sand products.

Table 1. Industry Classification

Product	Classification	Code	Category
Aggregate and sand products	UN CPC Ver.2.1	15310 15320	Natural sands Pebbles, gravel, broken, or crushed stone,macadam, granules, chippings, and powder of stone

QUARRY TYPE SUMMARY

Two types of quarries are operated by Hirock and are included in this LCA study: hard rock, and alluvial quarries. Table 2 presents a short description of each type of quarry and indicates which quarry locations are relevant to a given type.

Table 2. Quarry type summary

Quarry type	Hirock quarry locations	Quarry description
Hard rock	Linton	Mining of consolidated hard rock, which requires explosives
Alluvial	Te Matai, Dannevirke and Pahiatua	Mining of stream bed deposits

TECHNICAL SPECIFICATIONS

Table 3. Technical specifications

Product group	Relevant Standards
Aggregate and sand products	ANZSIC 2006: 0911 Gravel and Sand Quarrying

PRODUCT GROUPING

The differences between quarry sites are notable due to the age of the plant and processing technologies. Hence, the products are grouped at site level and results are presented per site. Quarries and their region of operation are presented in Table 5.

Table 4. Product groups information

Product group	Acronym	Approx. no. of passes	Description
Aggregates - No Processing	ANP	0	Aggregate that isn't processed past the extraction phase, with no washing process
Aggregates - Primary Processed	APP	1	Aggregate that is screened and crushed once, with no washing process
Aggregates - Primary Processed, Washed	APPW	1	Aggregate that is screened and crushed once, with washing process
Aggregates - Secondary Processed	ASP	2	Aggregate that requires 2 passes of screening and crushing, with no washing process
Aggregates - Secondary Processed, Washed	ASPW	2	Aggregate that requires 2 passes of screening and crushing, with washing process
Aggregates - Tertiary Processed	ATP	3	Aggregate that requires 3 passes of screening and crushing, with no washing process
Aggregates - Tertiary Processed, Washed	ATPW	3	Aggregate that requires 3 passes of screening and crushing, with washing process
Aggregates - Quaternary Processed	AQP	4	Aggregate that requires 4 passes of screening and crushing, with no washing process
Aggregates - Quaternary Processed, Washed	AQPW	4	Aggregate that requires 4 passes of screening and crushing, with washing process

Table 5. Quarry characterisation by region

Region	Hirock quarry locations
Manawatu	Linton Te Matai Dannevirke
Tararua	Pahiatua

PRODUCTS COVERED IN THIS EPD

Table 6. Product groups information

Product name	Product acronym	Quarry site	Grouping
Filling	Fill	Linton	Aggregates - No Processing
General All Passing 30mm	GAP30	Linton	Aggregates - Secondary Processed
General All Passing 65mm	GAP 65	Linton	Aggregates - Secondary Processed
General All Passing 40mm	GAP 40	Linton	Aggregates - Secondary Processed
ROCK LINTON	ROCK LINTON	Linton	Aggregates - No Processing
Ballast	Ballast	Linton	Aggregates - Tertiary Processed, Washed
Gabion Stone	GABION	Linton	Aggregates - No Processing
General All Passing 100mm	GAP 100	Linton	Aggregates - Secondary Processed
General All Passing 20mm	GAP 20	Linton	Aggregates - Secondary Processed
ROCK 50-150 FLETCHER	50-150	Linton	Aggregates - Secondary Processed
Race Rock	Race Metal	Linton	Aggregates - No Processing
Peametal	P-Metal	Te Matai	Aggregates - Secondary Processed, Washed
Pebbles 13mm	Peb 13	Te Matai	Aggregates - Secondary Processed, Washed
Crusher Dust Washed	Washed Crusher Dust	Te Matai	Aggregates - Quaternary Processed, Washed
Grade 6 Sealing Chip	Grade 6	Te Matai	Aggregates - Quaternary Processed, Washed
Pebbles 20mm	Peb 20	Te Matai	Aggregates - Secondary Processed, Washed
TNZ All Passing 40mm M/4	M4	Te Matai	Aggregates - Tertiary Processed
Crusher Dust 5	Crusher Dust 5	Te Matai	Aggregates - Quaternary Processed
Grade 4 Sealing Chip	Grade 4	Te Matai	Aggregates - Quaternary Processed, Washed
Concrete Sand	Concrete Sand	Te Matai	Aggregates - Secondary Processed, Washed
General All Passing 40mm	GAP 40	Te Matai	Aggregates - Tertiary Processed
Grade 3 Sealing Chip	Grade 3	Te Matai	Aggregates - Quaternary Processed, Washed
15-10 Chip (Asphalt Plant)	15-10	Te Matai	Aggregates - Quaternary Processed, Washed
General All Passing 65mm	GAP 65	Te Matai	Aggregates - Tertiary Processed
Concrete Aggregates 14-5mm	CA 14-5	Te Matai	Aggregates - Secondary Processed, Washed
10-8 CHIP (Asphalt Plant)	10-8	Te Matai	Aggregates - Quaternary Processed, Washed
General All Passing 20mm	GAP 20	Te Matai	Aggregates - Tertiary Processed
Thermal Sand	Thermal Sand	Te Matai	Aggregates - Quaternary Processed, Washed
Concrete Aggregates 20-10mm	Conagg 20	Te Matai	Aggregates - Secondary Processed, Washed
6-4 Chip (Asphalt Plant)	6-4 Chip	Te Matai	Aggregates - Quaternary Processed, Washed
8-6 Chip (Asphalt Plant)	8-6 Chip	Te Matai	Aggregates - Quaternary Processed, Washed
Grade 5 Sealing Chip	Grade 5	Te Matai	Aggregates - Quaternary Processed, Washed
Grade 2 Sealing Chip	Grade 2	Te Matai	Aggregates - Quaternary Processed, Washed
Builders Mix	Builders Mix	Te Matai	Aggregates - Secondary Processed
20-15 Chip (Asphalt Plant)	20-15 Chip	Te Matai	Aggregates - Quaternary Processed, Washed
Arena Mix Crusher Dust/Sand Blend	Arena Mix Crusher	Te Matai	Aggregates - Quaternary Processed

Table 6. contd. Product groups information

PAP5 Washed (Asphalt Plant)	PAP5 Washed	Te Matai	Aggregates - Quaternary Processed, Washed
PAP 7	PAP 7	Te Matai	Aggregates - Quaternary Processed
Builders Mix	Builders Mix	Dannevirke	Aggregates - Secondary Processed
Pebbles 13mm	Peb 13	Dannevirke	Aggregates - Secondary Processed, Washed
Pebbles 20mm	Peb 20	Dannevirke	Aggregates - Secondary Processed, Washed
Concrete Sand	Concrete Sand	Dannevirke	Aggregates - Secondary Processed, Washed
Oversize Round Stone 20-150mm	Oversize Rounds	Dannevirke	Aggregates - Secondary Processed, Washed
Oversize Round Stone 20-40mm (drain pebble)	Oversize Rounds 20-40m	Dannevirke	Aggregates - Secondary Processed, Washed
Oversize Round Stone 40-150mm (Soak Pit)	Oversize Rounds 40-150m	Dannevirke	Aggregates - Secondary Processed, Washed
General All Passing 20mm	GAP 20	Dannevirke	Aggregates - Secondary Processed
General All Passing 40mm	GAP 40	Dannevirke	Aggregates - Secondary Processed
General All Passing 65mm	GAP 65	Dannevirke	Aggregates - Secondary Processed
TNZ All Passing 40mm M/4	M4	Dannevirke	Aggregates - Secondary Processed
Grade 2 Sealing Chip	Grade 2	Dannevirke	Aggregates - Tertiary Processed, Washed
Grade 3 Sealing Chip	Grade 3	Dannevirke	Aggregates - Tertiary Processed, Washed
Grade 4 Sealing Chip	Grade 4	Dannevirke	Aggregates - Tertiary Processed, Washed
Grade 5 Sealing Chip	Grade 5	Dannevirke	Aggregates - Tertiary Processed, Washed
Grade 6 Sealing Chip	Grade 6	Dannevirke	Aggregates - Tertiary Processed, Washed
Crusher Dust	Crusher Dust	Dannevirke	Aggregates - Tertiary Processed
Peametal	Peametal	Dannevirke	Aggregates - Secondary Processed, Washed
Builders Mix	Builders Mix	Pahiatua	Aggregates - Primary Processed
Pebbles 13mm	Peb 13	Pahiatua	Aggregates - Primary Processed, Washed
Pebbles 20mm	Peb 20	Pahiatua	Aggregates - Primary Processed, Washed
Concrete Sand	Concrete Sand	Pahiatua	Aggregates - Primary Processed, Washed
Oversize Round Stone 20-40mm (drain pebble)	Oversize Rounds	Pahiatua	Aggregates - Primary Processed, Washed
Oversize Round Stone 40-150mm (Soak Pit)	Oversize Rounds 20-40m	Pahiatua	Aggregates - Primary Processed, Washed
General All Passing 20mm	GAP 20	Pahiatua	Aggregates - Secondary Processed
General All Passing 40mm	GAP 40	Pahiatua	Aggregates - Secondary Processed
General All Passing 65mm	General	Pahiatua	Aggregates - Secondary Processed
Grade 2 HPSV Sealing Chip	Grade 2 HPSV	Pahiatua	Aggregates - Tertiary Processed, Washed
Grade 3 HPSV Sealing Chip	Grade 3 HPSV	Pahiatua	Aggregates - Tertiary Processed, Washed
Grade 4 HPSV Sealing Chip	Grade 4 HPSV	Pahiatua	Aggregates - Tertiary Processed, Washed
Grade 5 HPSV Sealing Chip	Grade 5 HPSV	Pahiatua	Aggregates - Tertiary Processed, Washed
Grade 6 HPSV Sealing Chip	Grade 6 HPSV	Pahiatua	Aggregates - Tertiary Processed, Washed
Crusher Dust	Crusher Dust	Pahiatua	Aggregates - Tertiary Processed
Boulders	Boulders	Pahiatua	Aggregates - Primary Processed, Washed

DECLARED UNIT

One tonne of aggregates

ISO 14040 defines functional unit as “quantified performance of a product system for use as a reference unit”. EPDs that do not cover the full product life cycle from raw material extraction through to end-of-life use the term “declared unit” instead. The declared unit for each of the product categories is one tonne of aggregate.

CONTENT DECLARATION

According to the General Programme Instructions, the EPD shall include a content declaration with a list of materials and chemical substances including information on their hazardous properties. The product composition is given in table 7.

- Aggregates and sand products are delivered in bulk, therefore do not require any packaging.
- No pre-consumer or post-consumer recycled materials are currently used in the declared products.
- Aggregates do not contain any biogenic carbon.

Table 7. Product composition (per 1000 kg or 1 Tonne)

Product components	Weight, kg	Post-consumer recycled material, weight-%	Biogenic material, weight-% and kg C/kg
Aggregate	1000	0%	0% and 0
Total	1000	0%	0% and 0

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).

SYSTEM BOUNDARIES

This is a ‘cradle-to-gate’ type EPD. This means that only the production (modules A1-A3) are modelled in this EPD. The production stage (Modules A1-A3) includes all aspects of aggregate or sand production from cradle to gate, utilising elementary and product flows. Downstream stages have not been included in this EPD.

Raw material supply (A1)
- Extraction of rock and sand from quarry pit. For hard rock quarries, explosives are used to break rock away from the pit walls.
- Generation of electricity and heat from primary energy resources such as natural gas, also including their extraction, refining and transport. This also includes energy needed for raw material supply and energy for manufacturing in core process.

Internal transportation (A2)
- Moving of blasted or extracted rock from the quarry pit to the processing areas.

Manufacturing (A3)
- Screening of rock and sand to filter material by grade.
- Crushing of rock to refine into smaller grain sizes.
- Washing of aggregate and sand to remove clay that is bound to the aggregate, if required for the product’s application.
- Conveyor movement of material between processing steps.

The modules declared, geographical scope, share of specific data and data variation are shown in Table 8.

Table 8. Modules included in the scope of the EPD

	Product stage			Construction process stage		Use stage							End-of-life				Recovery
	Raw material supply	Transport	Manufacturing	Transport	Construction Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal	Future reuse, recycling or energy recovery potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Geography	GLO	NZ	NZ	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Specific data	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - sites	NA			-	-	-	-	-	-	-	-	-	-	-	-	-	-

X = included in the EPD; ND = Module not declared
NA = Not Applicable

LIFE CYCLE INVENTORY (LCI) AND ASSUMPTIONS

PROCESSING

Product groups are characterised by the number of passes made through screens and crushers. One 'pass' occurs when a product is filtered through a screen and is refined in a crusher. The number of passes that a typical product goes through during processing is the fundamental characteristic that is used to categorise all aggregate and sand products included in the scope of this study.

The key assumptions related to this allocation method are:

i) The energy used per unit mass of all assets of the same product type is the same.

ii) Each pass uses the same amount of resources (diesel and electricity).

Note: that this method of allocation was used because no primary data was available to adequately define how much of the diesel and electricity was used for each product or product group.

ELECTRICITY

Electricity is used for screening and crushing (processing) aggregates and pumping of water. Hirock were provided this split for one site, based on which washing electricity was calculated per tonnage for the other sites. Electricity for screening and crushing was allocated based on the number of passes (product groups).

DIESEL

Diesel is used for the extraction of raw materials and processing of aggregates. This split was provided for most sites. For sites where this detailed split was not provided, it was split pro rata to the tonnage produced on site as per the product group.

WATER

Water is used for dust suppression and washing aggregates. Water was allocated as per the general quarry water control volume system. All parameters such as rainfall, rainwater runoff, evaporation, seepage and other losses were estimated specific to the site.

PRIMARY DATA

All primary data were collected for the calendar year 2021 (January 1st to December 31st). All data were from Hirock's internal reporting system – which is the financial system fed by and supplemented with production information and internal reporting models.

REPRESENTATIVENESS

Geographical: All primary and secondary data were collected specific to the sites under study. Where specific data was unavailable, proxy data were used. Geographical representativeness is considered to be good.

Temporal: All primary data were collected for the calendar year 2021. All secondary data come from the Sphera 2022 databases and are representative of the years 2018-2021. Temporal representativeness is considered to be very good.

Technological: All primary and secondary data were modelled to be specific to the technologies or technology mixes under study. Where technology-specific data were unavailable, proxy data were used. Technological representativeness is considered to be good.

ENVIRONMENTAL IMPACT INDICATORS

An introduction to the core environmental impact indicators is provided below. The best-known effect of each indicator is listed in the descriptions and the abbreviations, in brackets, correspond to the labels in the following results tables.

Table 9. Environmental impact indicators described

Climate Change (Global Warming Potential)

(GWP-total, GWP-fossil, GWP-biogenic, GWP-luluc)
A measure of greenhouse gas emissions, such as CO_2 and methane. These emissions are causing an increase in the absorption of radiation emitted by the earth, increasing the natural greenhouse effect. This may in turn have adverse impacts on ecosystem health, human health and material welfare. The Global Warming Potential (GWP) includes four sub indicators: GWP-total, GWP-fossil, GWP-biogenic and land-use change GWP-luluc.

Ozone Depletion Potential (ODP)

Depletion of the ozone leads to higher levels of UVB ultraviolet rays reaching the earth's surface with detrimental effects on humans and plants. The Ozone Depletion Potential is a measure of air emissions that contribute to the depletion of the stratospheric ozone layer.

Acidification Potential (AP)

Acidification Potential is a measure of emissions that cause acidifying effects on the environment. A molecule's acidification potential indicates its capacity to increase the hydrogen ion (H+) concentration in the presence of water, thus decreasing the pH value. Potential effects include fish mortality, forest decline, and the deterioration of building materials.

Eutrophication Potential (EP-fw, EP-fm, EP-tr)

Eutrophication covers all potential impacts of excessively high levels of macronutrients, the most important of which are nitrogen (N)and phosphorus (P). In aquatic ecosystems where this term is mostly applied, this typically describes a degradation in water quality. Eutrophication can result in an undesirable change in the type of species that flourish and an increase in the production of biomass. As the decomposition of biomass consumes oxygen, eutrophication may decrease the available oxygen level in the water column and threaten fish in their ability to respire.

Photochemical Ozone Formation Potential (POCP)

Photochemical Ozone Formation Potential gives an indication of the emissions from precursors that contribute to ground level smog formation, mainly ozone (O_3). Ground level ozone may be harmful to human health and ecosystems and may also damage crops. These emissions are produced by the reaction of volatile organic compounds (VOCs) and carbon monoxide in the presence of nitrogen oxides and UV light.

Abiotic Resource Depletion (ADP-mm and ADP-fossil)

The consumption of non-renewable resources decreases the availability of these resources and their associated functions in the future. Depletion of mineral resources and non-renewable energy resources are reported separately. Depletion of mineral resources is assessed based on total reserves.

Water Depletion Potential (WDP)

Water scarcity is a measure of the stress on a region due to water consumption

THE RESULTS

The following tables show the results grouped into few categories, each looking at different types of indicators. The headings below and overleaf provide descriptions for each of these categories.

Table 10. Indicators for life cycle impact assessment

Impact category	Abbreviation
Climate change – total	GWP-total
Climate change – fossil	GWP-fossil
Climate change – biogenic	GWP-biogenic
Climate change – land use and land use change	GWP-luluc
Ozone depletion	ODP
Acidification	AP
Eutrophication aquatic freshwater	EP-fw
Eutrophication aquatic marine	EP-m
Eutrophication terrestrial	EP-tr
Photochemical ozone formation	POCP
Depletion of abiotic resources – minerals and metals*	ADP-mm
Depletion of abiotic resources – fossil fuels*	ADP-fossil
Water Depletion Potential*	WDP

ENVIRONMENTAL IMPACTS

The reported impact categories represent impact potentials, i.e., they are approximations of environmental impacts that could occur if the emissions would (a) follow the underlying impact pathway and (b) meet certain conditions in the receiving environment while doing so. The environmental impact results are therefore relative expressions only and do not predict actual impacts, the exceeding of thresholds, safety margins, or risks.

Long-term emissions (>100 years) are not taken into consideration in the impact estimate.

*The results of this environmental impact indicator should be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

Table 11. Additional Environmental Impact Indicators

Impact category	Abbreviation
Climate Change**	GWP-GHG
Particulate Matter emissions	PM
Ionising Radiation – human health***	IRP
Eco-toxicity (freshwater)*	ETP-fw
Human Toxicity, cancer*	HTP-c
Human Toxicity, non-cancer*	HTP-nc
Land use related impacts / soil quality*	SQP

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

Optional environmental impact categories provide further information on environmental impacts.

*The results of this environmental impact indicator should be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

**This indicator is calculated using the characterisation factors from the IPCC AR5 report (IPCC 2013) and has been included in the EPD following the PCR.

***This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and some construction materials, is not measured by this indicator.

Table 12. Life cycle inventory indicators on use of resources

Indicator	Abbreviation
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE
Use of renewable primary energy resources used as raw materials	PERM
Total use of renewable primary energy resources	PERT
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE
Use of non-renewable primary energy resources used as raw materials	PENRM
Total use of non-renewable primary energy resources	PENRT
Use of secondary material	SM
Use of renewable secondary fuels	RSF
Use of non-renewable secondary fuels	NRSF
Total use of net fresh water	FW

RESOURCE USE INDICATORS

The resource use indicators describe the use of renewable and non-renewable material resources, renewable and non-renewable primary energy and water.

Note: Water consumption: The FW indicator in the EPD results tables reports consumption (i.e. net use) of 'blue water' (which includes river water, lake water and ground water). This indicator deliberately excludes consumption of 'green water' (rain water), as net loss should be interpreted as any additional water loss beyond what would occur in the original, natural system.

Table 13. Life cycle inventory indicators on waste categories and output flows

Indicator	Abbreviation
Hazardous waste disposed	HWD
Non-hazardous waste disposed	NHWD
Radioactive waste disposed	RWD
Components for reuse	CRU
Materials for energy recovery	MER
Materials for recycling	MFR
Exported electrical energy	EEE
Exported thermal energy	EET

WASTE AND OUTPUT FLOWS

Waste indicators describe waste generated within the life cycle of the product. Waste is categorised by hazard class, End-of-Life fate and exported energy content.

Table 14. Environmental Impact Indicators in accordance with EN15804+A1

Indicator	Abbreviation
Global warming potential	GWP
Ozone depletion potential	ODP
Acidification potential	AP
Eutrophication potential	EP
Photochemical ozone creation potential	POCP
Abiotic depletion potential for non-fossil resources	ADPE
Abiotic depletion potential for fossil resources	ADPF

ENVIRONMENTAL IMPACT INDICATORS EN15804+A1

EN 15804+A1 Core environmental impact categories aid comparison and backwards compatibility with rating tools.

ENVIRONMENTAL PERFORMANCE

FOR ONE TONNE OF AGGREGATE - MODULE A1-A3 | LINTON /MANAWATU REGION

Indicator	Unit	ANP	ASP	ATPW
Environmental impact indicators - EN15804+A2				
GWP-total	kg CO_2-eq.	4.09	7.05	8.65
GWP-fossil	kg CO_2-eq.	3.91	6.75	8.29
GWP-biogenic	kg CO_2-eq.	0.172	0.297	0.360
GWP-luluc	kg CO_2-eq.	4.12E-05	7.30E-05	1.19E-04
ODP	kg CFC11-eq.	3.94E-13	6.91E-13	1.04E-12
AP	Mole of H+ eq.	0.0221	0.0257	0.0280
EP-fw	kg P eq.	8.28E-07	1.31E-06	2.00E-06
EP-m	kg N eq.	0.0111	0.0124	0.0132
EP-tr	Mole of N eq.	0.121	0.136	0.145
POCP	kg NMVOC eq.	0.0294	0.0331	0.0352
ADP-mm*	kg Sb-eq.	5.62E-08	1.10E-07	1.59E-07
ADP-fossil*	MJ	54.5	93.7	114
WDP*	m^3 world equiv.	8.46	8.48	1,240
Additional environmental impact indicators				
GWP-GHG**	kg CO_2-eq.	3.90	6.73	8.27
PM	Disease incidence	4.47E-07	4.76E-07	4.93E-07
IRP***	kBq U235 eq.	4.11E-04	0.00141	0.00197
ETP-fw*	CTUe	16.9	32.6	54.7
HTc*	CTUh	8.53E-10	1.12E-09	1.32E-09
HTnc*	CTUh	8.98E-08	9.85E-08	1.03E-07
SQP*	Pt	9.43E+05	9.43E+05	9.43E+05
Waste material and output flow indicators				
HWD	kg	9.50E-11	1.59E-10	2.72E-10
NHWD	kg	0.00591	0.00686	0.00828
RWD	kg	2.95E-06	1.06E-05	1.50E-05
CRU	kg	0	0	0
MFR	kg	0	0	0
MER	kg	0	0	0
EEE	MJ	0	0	0
EET	MJ	0	0	0

ENVIRONMENTAL PERFORMANCE CONTD.

FOR ONE TONNE OF AGGREGATE - MODULE A1-A3 | LINTON / MANAWATU REGION

Indicator	Unit	ANP	ASP	ATPW
Resource use indicators				
PERE	MJ	1.62	1.81	7.76
PERM	MJ	0	0	0
PERT	MJ	1.62	1.81	7.76
PENRE	MJ	54.5	93.7	114
PENRM	MJ	0	0	0
PENRT	MJ	54.5	93.7	114
SM	kg	0	0	0
RSF	MJ	0	0	0
NRSF	MJ	0	0	0
FW	m^3	0.0121	0.0125	1.23
Biogenic carbon content				
BCC-prod	kg	0	0	0
BCC-pack	kg	0	0	0
Environmental impact indicators - EN15804+A1				
GWP	kg CO_2-eq.	4.02	6.95	8.52
ODP	kg CFC-11 eq.	4.64E-13	8.14E-13	1.23E-12
AP	kg SO_2 eq.	0.0152	0.0179	0.0195
EP	kg PO_4^{3-}-eq.	0.00371	0.00417	0.00446
POCP	kg Ethene eq.	0.00162	0.00158	0.00158
ADPE	kg Sb eq.	5.63E-08	1.10E-07	1.59E-07
ADPF	MJ	54.4	93.6	114

*The results of this environmental impact indicator should be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

**This indicator is calculated using the characterisation factors from the IPCC AR5 report (IPCC 2013) and has been included in the EPD following the PCR.

***This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and some construction materials, is not measured by this indicator.

ENVIRONMENTAL PERFORMANCE

FOR ONE TONNE OF AGGREGATE - MODULE A1-A3 | TE MATAI / MANAWATU REGION

Indicator	Unit	ASP	ASPW	ATP	AQP	AQPW
Environmental impact indicators - EN15804+A2						
GWP-total	kg CO_2-eq.	2.39	2.45	3.10	3.77	3.82
GWP-fossil	kg CO_2-eq.	2.30	2.35	2.98	3.62	3.68
GWP-biogenic	kg CO_2-eq.	0.0945	0.0951	0.122	0.148	0.148
GWP-luluc	kg CO_2-eq.	5.76E-05	7.24E-05	8.24E-05	1.07E-04	1.22E-04
ODP	kg CFC11-eq.	4.75E-13	5.78E-13	6.64E-13	8.47E-13	9.49E-13
AP	Mole of H+ eq.	0.00716	0.00738	0.00820	0.00899	0.00921
EP-fw	kg P eq.	9.13E-07	1.13E-06	1.28E-06	1.65E-06	1.87E-06
EP-m	kg N eq.	0.00327	0.00333	0.00364	0.00387	0.00394
EP-tr	Mole of N eq.	0.0363	0.0372	0.0406	0.0434	0.0443
POCP	kg NMVOC eq.	0.00871	0.00887	0.00969	0.0103	0.0105
ADP-mm*	kg Sb-eq.	6.25E-08	7.38E-08	8.77E-08	1.12E-07	1.24E-07
ADP-fossil*	MJ	30.8	31.4	40.0	48.6	49.1
WDP*	m^3 world equiv.	74.3	1,520	74.4	74.5	1,520
Additional environmental impact indicators						
GWP-GHG**	kg CO_2-eq.	2.29	2.35	2.97	3.61	3.67
PM	Disease incidence	1.18E-07	1.20E-07	1.26E-07	1.29E-07	1.30E-07
IRP***	kBq U235 eq.	6.66E-04	7.00E-04	9.22E-04	0.00117	0.00120
ETP-fw*	CTUe	27.1	34.2	39.1	50.9	58.0
HTc*	CTUh	1.21E-09	1.24E-09	1.31E-09	1.36E-09	1.39E-09
HTnc*	CTUh	1.22E-07	1.22E-07	1.24E-07	1.20E-07	1.20E-07
SQP*	Pt	5.69E+05	5.69E+05	5.69E+05	5.69E+05	5.69E+05
Waste material and output flow indicators						
HWD	kg	1.55E-10	1.96E-10	2.18E-10	2.80E-10	3.21E-10
NHWD	kg	0.00944	0.00991	0.0102	0.0106	0.0111
RWD	kg	5.50E-06	5.79E-06	7.51E-06	9.45E-06	9.75E-06
CRU	kg	0	0	0	0	0
MFR	kg	0	0	0	0	0
MER	kg	0	0	0	0	0
EEE	MJ	0	0	0	0	0
EET	MJ	0	0	0	0	0

ENVIRONMENTAL PERFORMANCE CONTD.

FOR ONE TONNE OF AGGREGATE - MODULE A1-A3 | TE MATAI / MANAWATU REGION

Indicator	Unit	ASP	ASPW	ATP	AQP	AQPW
Resource use indicators						
PERE	MJ	7.23	10.2	10.8	14.4	17.3
PERM	MJ	0	0	0	0	0
PERT	MJ	7.23	10.2	10.8	14.4	17.3
PENRE	MJ	30.8	31.4	40.0	48.6	49.1
PENRM	MJ	0	0	0	0	0
PENRT	MJ	30.8	31.4	40.0	48.6	49.1
SM	kg	0	0	0	0	0
RSF	MJ	0	0	0	0	0
NRSF	MJ	0	0	0	0	0
FW	m^3	0.0907	1.51	0.0999	0.109	1.53

Indicator	Unit	ANP	ASP	ATPW
Biogenic carbon content				
BCC-prod	kg	0	0	0
BCC-pack	kg	0	0	0

Environmental impact indicators - EN15804+A1						
GWP	kg CO_2-eq.	2.36	2.41	3.06	3.71	3.77
ODP	kg CFC-11 eq.	5.60E-13	6.80E-13	7.81E-13	9.97E-13	1.12E-12
AP	kg SO_2 eq.	0.00501	0.00516	0.00578	0.00637	0.00652
EP	kg PO_4^{3-}-eq.	0.00112	0.00115	0.00125	0.00135	0.00138
POCP	kg Ethene eq.	3.76E-04	3.85E-04	3.78E-04	3.63E-04	3.72E-04
ADPE	kg Sb eq.	6.26E-08	7.38E-08	8.78E-08	1.12E-07	1.24E-07
ADPF	MJ	30.8	31.3	39.9	48.4	49.0

*The results of this environmental impact indicator should be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

**This indicator is calculated using the characterisation factors from the IPCC AR5 report (IPCC 2013) and has been included in the EPD following the PCR.

***This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and some construction materials, is not measured by this indicator.

ENVIRONMENTAL PERFORMANCE

FOR ONE TONNE OF AGGREGATE - MODULE A1-A3 | DANNEVIRKE / MANAWATU REGION

Indicator	Unit	ASP	ASPW	ATP	ATPW
Environmental impact indicators - EN15804+A2					
GWP-total	kg CO_2-eq.	9.21	9.27	11.6	11.7
GWP-fossil	kg CO_2-eq.	8.83	8.88	11.1	11.2
GWP-biogenic	kg CO_2-eq.	0.388	0.389	0.489	0.490
GWP-luluc	kg CO_2-eq.	9.56E-05	1.10E-04	1.27E-04	1.42E-04
ODP	kg CFC11-eq.	9.21E-13	1.02E-12	1.20E-12	1.30E-12
AP	Mole of H+ eq.	0.0320	0.0322	0.0361	0.0363
EP-fw	kg P eq.	1.77E-06	1.99E-06	2.27E-06	2.49E-06
EP-m	kg N eq.	0.0153	0.0154	0.0170	0.0171
EP-tr	Mole of N eq.	0.168	0.169	0.187	0.188
POCP	kg NMVOC eq.	0.0409	0.0411	0.0455	0.0456
ADP-mm*	kg Sb-eq.	1.48E-07	1.59E-07	1.94E-07	2.06E-07
ADP-fossil*	MJ	123	123	155	155
WDP*	m^3 world equiv.	444	4,870	444	4,870
Additional environmental impact indicators					
GWP-GHG**	kg CO_2-eq.	8.80	8.86	11.1	11.2
PM	Disease incidence	5.84E-07	5.86E-07	6.34E-07	6.36E-07
IRP***	kBq U235 eq.	0.00162	0.00166	0.00236	0.00240
ETP-fw*	CTUe	45.6	52.7	61.1	68.2
HTc*	CTUh	9.69E-10	1.00E-09	1.20E-09	1.24E-09
HTnc*	CTUh	6.71E-08	6.72E-08	7.63E-08	7.64E-08
SQP*	Pt	6.39E+05	6.39E+05	6.39E+05	6.39E+05
Waste material and output flow indicators					
HWD	kg	2.05E-10	2.45E-10	2.73E-10	3.14E-10
NHWD	kg	0.00499	0.00546	0.00605	0.00652
RWD	kg	1.26E-05	1.29E-05	1.83E-05	1.86E-05
CRU	kg	0	0	0	0
MFR	kg	0	0	0	0
MER	kg	0	0	0	0
EEE	MJ	0	0	0	0
EET	MJ	0	0	0	0

ENVIRONMENTAL PERFORMANCE CONTD.

FOR ONE TONNE OF AGGREGATE - MODULE A1-A3 | DANNEVIRKE / MANAWATU REGION

Indicator	Unit	ASP	ASPW	ATP	ATPW
Resource use indicators					
PERE	MJ	3.28	6.20	4.77	7.70
PERM	MJ	0	0	0	0
PERT	MJ	3.28	6.20	4.77	7.70
PENRE	MJ	123	123	155	155
PENRM	MJ	0	0	0	0
PENRT	MJ	123	123	155	155
SM	kg	0	0	0	0
RSF	MJ	0	0	0	0
NRSF	MJ	0	0	0	0
FW	m^3	0.441	4.77	0.444	4.78
Biogenic carbon content					
BCC-prod	kg	0	0	0	0
BCC-pack	kg	0	0	0	0
Environmental impact indicators - EN15804+A1					
GWP	kg CO_2-eq.	9.08	9.14	11.5	11.5
ODP	kg CFC-11 eq.	1.08E-12	1.21E-12	1.42E-12	1.54E-12
AP	kg SO_2 eq.	0.0223	0.0224	0.0252	0.0254
EP	kg PO_4^{3-}-eq.	0.00516	0.00519	0.00574	0.00577
POCP	kg Ethene eq.	0.00191	0.00192	0.00199	0.00199
ADPE	kg Sb eq.	1.48E-07	1.59E-07	1.94E-07	2.06E-07
ADPF	MJ	122	123	154	155

*The results of this environmental impact indicator should be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

**This indicator is calculated using the characterisation factors from the IPCC AR5 report (IPCC 2013) and has been included in the EPD following the PCR.

***This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and some construction materials, is not measured by this indicator.

ENVIRONMENTAL PERFORMANCE

FOR ONE TONNE OF AGGREGATE - MODULE A1-A3 | PAHIATUA / TARARUA REGION

Indicator	Unit	APP	APPW	ASP	ATP	ATPW
Environmental impact indicators - EN15804+A2						
GWP-total	kg CO_2-eq.	4.25	4.31	5.07	5.73	5.78
GWP-fossil	kg CO_2-eq.	4.07	4.13	4.87	5.49	5.55
GWP-biogenic	kg CO_2-eq.	0.177	0.178	0.209	0.233	0.233
GWP-luluc	kg CO_2-eq.	5.76E-05	7.24E-05	8.97E-05	1.20E-04	1.35E-04
ODP	kg CFC11-eq.	5.25E-13	6.28E-13	7.66E-13	9.93E-13	1.09E-12
AP	Mole of H+ eq.	0.0198	0.0200	0.0211	0.0214	0.0216
EP-fw	kg P eq.	1.09E-06	1.31E-06	1.57E-06	2.02E-06	2.24E-06
EP-m	kg N eq.	0.00975	0.00982	0.0102	0.0101	0.0102
EP-tr	Mole of N eq.	0.107	0.108	0.112	0.112	0.113
POCP	kg NMVOC eq.	0.0260	0.0261	0.0271	0.0270	0.0272
ADP-mm*	kg Sb-eq.	7.40E-08	8.53E-08	1.06E-07	1.35E-07	1.46E-07
ADP-fossil*	MJ	56.4	57.0	67.0	75.2	75.8
WDP*	m^3 world equiv.	375	2,450	375	375	2,450
Additional environmental impact indicators						
GWP-GHG**	kg CO_2-eq.	4.06	4.12	4.85	5.48	5.54
PM	Disease incidence	3.87E-07	3.89E-07	3.97E-07	3.87E-07	3.89E-07
IRP***	kBq U235 eq.	4.40E-04	4.74E-04	7.40E-04	0.00103	0.00107
ETP-fw*	CTUe	27.0	34.1	42.5	57.4	64.5
HTc*	CTUh	7.08E-10	7.42E-10	8.29E-10	9.21E-10	9.55E-10
HTnc*	CTUh	6.39E-08	6.40E-08	6.63E-08	6.56E-08	6.57E-08
SQP*	Pt	5.08E+05	5.08E+05	5.08E+05	5.08E+05	5.08E+05
Waste material and output flow indicators						
HWD	kg	1.38E-10	1.79E-10	2.21E-10	3.01E-10	3.41E-10
NHWD	kg	0.00482	0.00529	0.00583	0.00664	0.00711
RWD	kg	3.56E-06	3.86E-06	5.92E-06	8.23E-06	8.52E-06
CRU	kg	0	0	0	0	0
MFR	kg	0	0	0	0	0
MER	kg	0	0	0	0	0
EEE	MJ	0	0	0	0	0
EET	MJ	0	0	0	0	0

ENVIRONMENTAL PERFORMANCE CONTD.

FOR ONE TONNE OF AGGREGATE - MODULE A1-A3 | PAHIATUA / TARARUA REGION

Indicator	Unit	APP	APPW	ASP	ATP	ATPW
Resource use indicators						
PERE	MJ	5.06	7.98	9.90	14.7	17.7
PERM	MJ	0	0	0	0	0
PERT	MJ	5.06	7.98	9.90	14.7	17.7
PENRE	MJ	56.4	57.0	67.0	75.3	75.8
PENRM	MJ	0	0	0	0	0
PENRT	MJ	56.4	57.0	67.0	75.3	75.8
SM	kg	0	0	0	0	0
RSF	MJ	0	0	0	0	0
NRSF	MJ	0	0	0	0	0
FW	m^3	0.379	2.42	0.391	0.404	2.44
Biogenic carbon content						
BCC-prod	kg	0	0	0	0	0
BCC-pack	kg	0	0	0	0	0
Environmental impact indicators - EN15804+A1						
GWP	kg CO_2-eq.	4.19	4.24	5.00	5.64	5.70
ODP	kg CFC-11 eq.	6.18E-13	7.39E-13	9.02E-13	1.17E-12	1.29E-12
AP	kg SO_2 eq.	0.0137	0.0138	0.0146	0.0149	0.0150
EP	kg PO_4^{3-}-eq.	0.00328	0.00331	0.00344	0.00345	0.00348
POCP	kg Ethene eq.	0.00137	0.00138	0.00137	0.00131	0.00132
ADPE	kg Sb eq.	7.41E-08	8.54E-08	1.06E-07	1.35E-07	1.46E-07
ADPF	MJ	56.4	56.9	66.9	75.1	75.7

*The results of this environmental impact indicator should be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

**This indicator is calculated using the characterisation factors from the IPCC AR5 report (IPCC 2013) and has been included in the EPD following the PCR.

***This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and some construction materials, is not measured by this indicator.

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PROGRAMME-RELATED INFORMATION AND VERIFICATION

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Independent verification of the declaration and data, according to ISO 14025:	☐	EPD process certification (Internal)
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An Environmental Product Declaration, or EPD, is a standardised and verified way of quantifying the environmental impacts of a product based on a consistent set of rules known as a PCR (Product Category Rules).

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The results for EN15804+A1 compliant EPDs are not comparable with EN15804+A2 compliant studies as the methodologies are different. Results that are A1 compliant are given in the report to this document to assist comparability across EPDs.

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