+ Environmental Product Declaration

READY-MIX CONCRETE

Project: TGH Warehouse, Te Rapa
Plant: Te Rapa Certified
Mix Code: VP3519STL

Programme: The International EPD System | www.environdec.com
Programme operator: EPD International AB
Licensee: EPD Australasia | www.epd-australasia.com
Type of EPD: Product specific EPD from a single manufacturer site.
EPD Owner: Firth Industries Ltd
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Information about EPD Owner

Firth Industries is New Zealand's largest and only national manufacturer offering a comprehensive range of concrete products, systems, and solutions. With a legacy of innovation and quality since 1938, Firth produces ready-mix concrete by combining cement, aggregates, water, and admixtures in precise proportions to meet specific performance requirements. Firth's ready-mix concrete is manufactured to comply with New Zealand Standard NZS 3104, and the quality is independently audited by the Concrete NZ Plant Audit Scheme. Additionally, Firth operates under an ISO 9001 certified quality management system, ensuring consistent product quality and adherence to industry standards.

Ready-Mix Concrete

Normal and Special concrete is defined and made in accordance with NZS 3104:2021, to ensure that nominal strengths are achieved. NZS 3104:2021 covers the requirements for material manufacture, testing and control of fresh concrete, ensuring that the concrete produced is of a certain standard, and complies with any other related standards. Standards are interconnected to ensure maintenance of integrity and safety within New Zealand’s construction industry.

Declaration Owner	**Firth Industries Limited** 810 Great South Rd, Penrose, Auckland 1741, New Zealand info@firth.co.nz	www.firth.co.nz
LCA accountability	**Firth Industries Limited** 810 Great South Rd, Penrose, Auckland 1741, New Zealand LCA background report created by **Thinkstep Ltd** on behalf of Firth Industries Limited	www.firth.co.nz

Product Information

Product(s) covered by EPD

The ready-mix concrete covered by this EPD is manufactured with a combination of cement, coarse and fine aggregate, supplementary cementitious materials, recycled or fresh water and admixtures that are primarily sourced locally.

Firth ready-mix concrete can be used in a variety of structures and building elements that comprise the built environment, from residential and light commercial applications to commercial high rise and infrastructural uses, including landscaping applications. Table 3 presents the details of the product covered by this EPD.

The product code for pre-mix concrete is UN CPC 375 (Articles of concrete, cement and plaster) and ANZSIC 20330 (Articles of concrete, cement).

Table 1: Ready-Mix Concretes covered by this EPD.

Plant Name	Plant #	Grade	Mix Code	
Te Rapa Certified	30	35 MPa	VP3519STL	
Customer	**Project**		**Date**	**LCA Version**
Calder Stewart Limited	TGH Warehouse, Te Rapa		21/09/2026	2026.1.1

Content Declaration

The content declaration of the ready-mix concrete and the mass conversion factor are presented in Table 2 and Table 3, respectively.

Table 2: Composition of product (per 1 m^3 of product)

Product components	**Mass, kg**	**Post-consumer recycled material, mass-% of product**	**Biogenic material, mass-% of product**	**Biogenic material, kg C/ declared unit**
Aggregate	0-1,300	0	0	0
Sand	300-1,500	0	0	0
Binder	200-650	0	0	0
Water	100-250	0	0	0
Admixture	0-12	0	0	0
Total	**2,100 – 2,500**	**0**	**0**	**0**

Table 3: Unit Weight by mass (kg/m³)

Unit Weight (kg/m³)	2,345.7

Hazardous Content

The product:

- Does not release dangerous substances to soil and water.
- Does not contain hazardous substances requiring labelling.
- Does not contain materials identified in the European Chemicals Agency's Candidate List of Substances of Very High Concern in the products at a concentration greater than 0.1% (European Union, 2024).

Packaging

Firth Industries ready-mix concrete is delivered in bulk without packaging. Packaging does not apply for ready-mix concrete products.

Recycled Materials

There are no recycled materials used in producing the product.

LCA Information

Declared Unit	1 m³ of ready-mix concrete
Scope	Cradle-to-gate (A1-A3) with modules C1-C4 and module D.
Manufacturing Location	Te Rapa Certified
Time Representativeness	The plant data for the LCA is based on FY24 production data (2023-07-01 to 2024-06-30). The concrete mix data for the LCA is based on current production data.
Databases and Software Used	The LCA was conducted in Microsoft Excel tool The inventory data for the processes are entered in the LCA software and linked to the pre-existing back- ground data for upstream feedstocks and services. Background inventory data was selected per the standards, in the following order of preference: -Product specific EPDs for cement, aggregates, and admixtures - ecoinvent, Allocation, cut-off, EN15804, ecoinvent database version 3.11
Allocation	Allocation was carried out based on physical relationships for production of concrete mixes – all shared processes are attributed to concrete products based on their volume. One exception is the fuel consumption for mixing in manufacturing plants. Firth Industries performed calculations on a typical mixing truck. The fuel consumption for mixing and loading or loading only (for some plants) for 1 m^3 product was diagnosed, calculated, and directly used without any allocation since it's measured per declared unit covered in this EPD. Fly ash is supplied by Holcim (Holcim, 2025b) and Golden Bay. While Golden Bay doesn't have an EPD for their fly ash yet, both suppliers receive fly ash from coal fired electricity generation plant, with no further processing required. Given its relatively low market value compared to the primary energy product, all environmental impacts of the electricity generation plant have been allocated to the main product - electricity. Only transport to concrete batching plants has been accounted for, as modelled in (Holcim, 2025b). This allocation approach is in line with the technical guidance published by EPD Australasia (2025). Ground granulated blast furnace slag (GGBFS) is supplied by

	Holcim (Holcim, 2025c) and New Zealand Independent Cement (NZIC). NZIC doesn't have an EPD. Holcim has treated granulated blast furnace slag as a by-product of steel production and allocated zero environmental impacts (Holcim, 2025c). This is however not aligned with the allocation approach recommended in the technical guidance published by EPD Australasia (2025), which suggests allocating 1.3% of steel production's impacts using economic allocation. Silica fume: Published EPD for Chinese silica fume is used (Quanzhou Winitoor Import and Export CO., LTD, 2024). According to the EPD, silica fume is a by-product of silicon metal/alloys production and economic allocation has been applied considering the economic value of these products.
Cut-off Criteria	As required by the PCR (EPD International, 2025b), LCI data include a minimum of 99% of total inflows (mass and energy) per unit process and 95% of total inflows (mass and energy) per life-cycle stages A1-A3, C1-C4, and D. At least 95% of the environmental impact per such aggregated module is included in LCI data
Modelling of infrastructure/capital goods	In this study capital goods and infrastructure have been included in the background datasets as provided by Ecoinvent (Wernet, 2016). It is not possible, within reasonable effort, to subtract the data on infrastructure/capital goods from these datasets. Note that, while one of the cement EPDs (Holcim, 2025a) has been modelled using Ecoinvent database v3.11 (Wernet, 2016), the other cement (Golden Bay, 2024) has been modelled using the Life Cycle for Experts (LCA FE, v10.7.1.28) Software for life cycle engineering, and using Sphera's Managed LCA Content (MLC) Database 2023.2 (Sphera, 2023). MLC database and its datasets exclude capital goods and infrastructure – except for electricity modelling. Similar variations in methods and databases may exist across other EPDs used as upstream inputs.
Electricity	The electricity used at manufacturing sites is modelled using the residual electricity mix on the market. Electricity is modelled using Ecoinvent datasets for each generation source in the composition detailed below. The New Zealand residual electricity mix is made up of hydro (56.6%), geothermal (19.7%) natural gas (12.5%), wind (6.55%), coal (4.25%), biomass (0.266%) and biogas (0.160%). The composition of the residual electricity is modelled based on published data for the year 2021-04-01 to 2022-03-31

	(BraveTrace, 2023). Onsite consumption (3.00%), and the medium voltage (1kV-60kV) grid's transmission and distribution losses (3.17%) are calculated based on data from the Ministry of Business, Innovation & Employment (MBIE, 2023). The emission factor for the New Zealand residual grid mix for the GWP-GHG indicator is 0.156 kg CO2-eq./kWh (based on EF3.1)
Carbonation	No carbonation is considered in any module. LCA modelers should consider this independently based on the geometry and environment of the structure.

System Boundaries

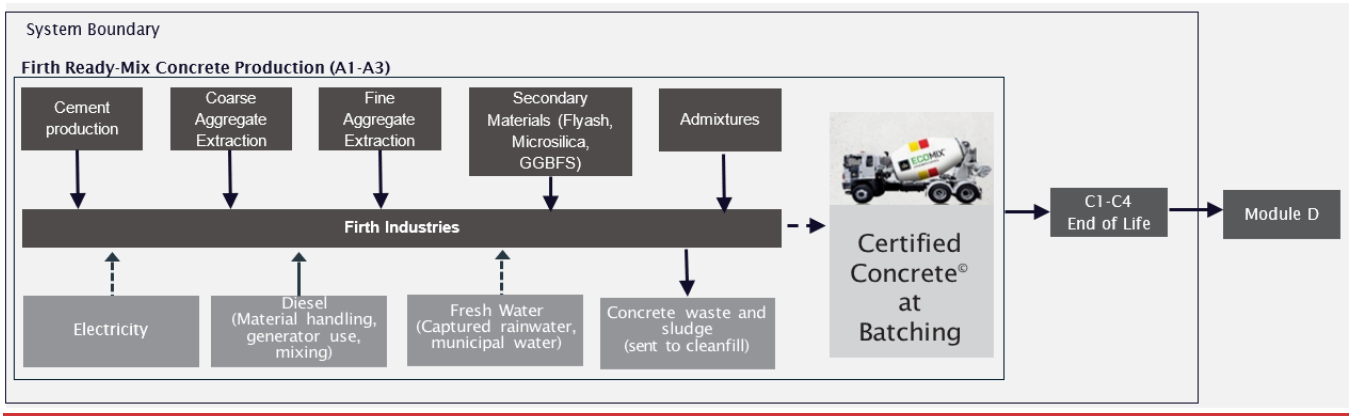
The scope of LCA for this EPD is cradle-to-gate (A1-A3) with modules C1-C4 and module D. Modules A4 and A5 are best modelled at the project level by the EPD users. Emissions from construction installation (A5) were excluded as Firth does not have operational control over the installation of products at the construction site. In addition, the following life cycle stages were also excluded: distribution (A4) and use stages (B1-B7).

Table 4: Modules included in the scope of the EPD.

Product Stage			Construction Stage		Use Stage							End of Life Stage				Resource Recovery Stage
Raw Material Supply	Transport	Manufacturing	Transport to Site	On Site Processes	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
X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
GLO	GLO	NZ	-	-	-	-	-	-	-	-	-	NZ	NZ	NZ	NZ	NZ

ND = Module not declared; GLO = Global; NZ = New Zealand

Figure 1: Modules Considered in this EPD.



GBBFS – Ground granulated blast furnace slag.

Product stage (A1-A3)

Module A1: Raw material supply

This module includes:

- Extraction, transport, and manufacturing of raw materials.
- Generation of electricity from primary and secondary energy resources, also including their extraction, refining and transport. This includes energy needed for raw material supply and energy for manufacturing in core process.

Module A2: Transportation

Transport of materials to the manufacturing site and internal transport, considering actual transport modes and distances. It's assumed there is no loss during the transportation of materials.

Module A3: Manufacturing

Manufacturing of concrete, which includes the following steps:

- Batching, where cement, aggregates, sand and water are weighted and measured according to the mix design.
- Mixing, where usually dry elements are mixed first, and water is added gradually. Mixing time may vary depending on the concrete mix design. Admixtures or additives can be added during the mixing step.
- Transport and treatment of waste and wastewater generated from the manufacturing processes.

Note that the losses during Firth's concrete manufacturing are waste materials from cleaning concrete bowls. The waste material is composed of 78% sludge and 22% concrete. Sludge is

a combination of water and concrete associated with cleaning concrete bowls - 30% concrete and 70% water. A scale factor is used to estimate the total input of materials and water for each product.

End-of life stage (C1-C4)

The end-of-life stage (modules C1-C4) and resource recovery stage (module D) includes deconstruction, transport of waste stream, recycling treatment processing, and final waste disposal.

The main scenario for the end-of-life modelling is the most probable scenario for end-of-life, assuming that 80% of post-consumer concrete is disposed of into landfill and 20% is recycled (BRANZ, 2013). The scenarios included are currently in use and are representative for one of the most probable alternatives. Additional scenarios are also provided for modules C3, C4, and D based on 100% recycling and 100% landfill.

Note that due to data limitations regarding concrete end-of in New Zealand (modules C1-C4) are, default values in section 4.8.4 in PCR 2019:14 v2.0.1 (EPD International, 2025b) are used (see Table 4).

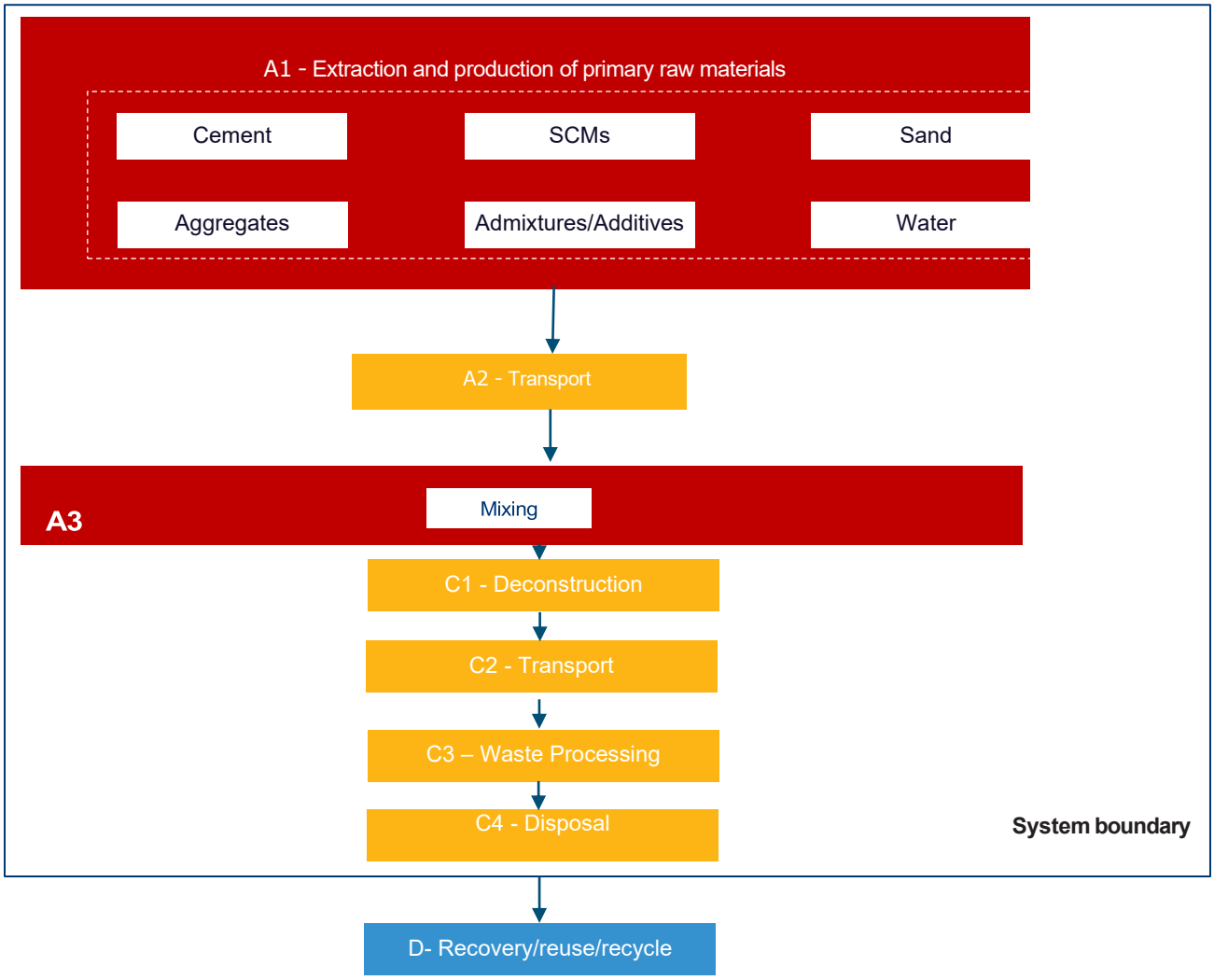
Table 5: End-of-life scenarios

Process	**Unit (expressed per declared unit - 1 m^3 of concrete)**		
Scenario	**Main (20% recycling and 80% landfill)**	**100% recycling**	**100% landfill**
Collection process specified by type	1 m^3 of concrete collected with mixed construction waste		
Recovery system specified by type	0.2 m^3 for recycling	1 m^3	0 m^3
Disposal specified by type	0.8 m^3 modelled as inert material in landfill	0 m^3 modelled as inert material in landfill	1 m^3 modelled as inert material in landfill
Assumptions for scenario development	C1: Demolition/deconstruction – diesel use of 10 kWh/tonne C2: 80 km of transport by 16-32 tonne lorry (EURO 5) C3: ○ Loading and unloading at sorting facility – diesel use of 1.8 kWh/tonne ○ Mechanical sorting – electricity use of 2.2 kWh/tonne ○ Crushing of concrete – diesel use of 2.0 kWh/tonne C4: Compacting of inert construction waste for landfills (including backfilling) – diesel use of 1.6 kWh/tonne		

Where recycling is implemented, module D is assessed assuming the secondary material available replaces primary non-specific basecourse aggregates.

The processes included in the LCA are presented in a process diagram in Figure 2 below.

Figure 2: System Boundary



Data Quality Assessment

This EPD follows the requirements for data quality in section 4.6 of PCR 2019:14v2.0.1, including the classification of primary data, representative secondary data and proxy data.

The data quality assessment (DQA) in this EPD is completed in line with EN 15941 and utilises the system for “Data quality level and criteria of the UN Environment Global Guidance on LCA database development”, one of the two systems permitted by EN 15804+A2. See Table 1.

Foreground data on raw material requirements, manufacture and distribution was provided as primary source by Firth Industries for FY24 (2023-07-01 to 2024-06-30).

Use of data with poor or very poor representativeness for product stage:

- Proxy datasets are used in modelling admixtures and silica fume. These data sources from overseas and data reference year is older compared with the reference year of this study.
- These proxy datasets have poor technological, geographic or temporal representativeness. No more representative data is available.
- These datasets together contribute less than 30% of any of the core indicators – except for GWP-luluc (~70%) – see section 4.3 for hotspot analysis.

The EPDs used as data source to model upstream input materials are based on different PCRs compared to the one used in this study. For example, the EPD from Golden Bay Cement is based on PCR v1.3.3 (dated 2024-03-01) (Golden Bay, 2024). Similarly, the EPD from Holcim is based on PCR v1.3.4 (Holcim, 2025a).

The EPD used to model fly ash (based on PCR v1.3.4) used economic allocation to calculate impacts of fly ash from coal fired electricity generation – but with zero economic value. This allocation approach is in line with the technical guidance published by EPD Australasia (2025). The EPD used to model GGBFS treated granulated blast furnace slag as a by-product of steel production and allocated zero environmental impacts (Holcim, 2025c). This is however not aligned with the allocation approach recommended in the technical guidance published by EPD Australasia (2025), which suggests allocating 1.3% of steel production’s impacts using economic allocation.

EPDs used to model admixtures are based on a different EPD programme - Institut Bauen und Umwelt e.V. (IBU), which use different standards and characterisation factors – such as IBU PCR 11.2017 Part B for concrete admixtures (EFCA, 2021a; EFCA, 2021b).

Hence, these upstream EPDs are not fully compliant with the LCA rules to which our EPD is verified. However, we acknowledge that the effects of using different PCRs and LCA rules have minimal effects on our EPD.

Table 6: Data quality assessment

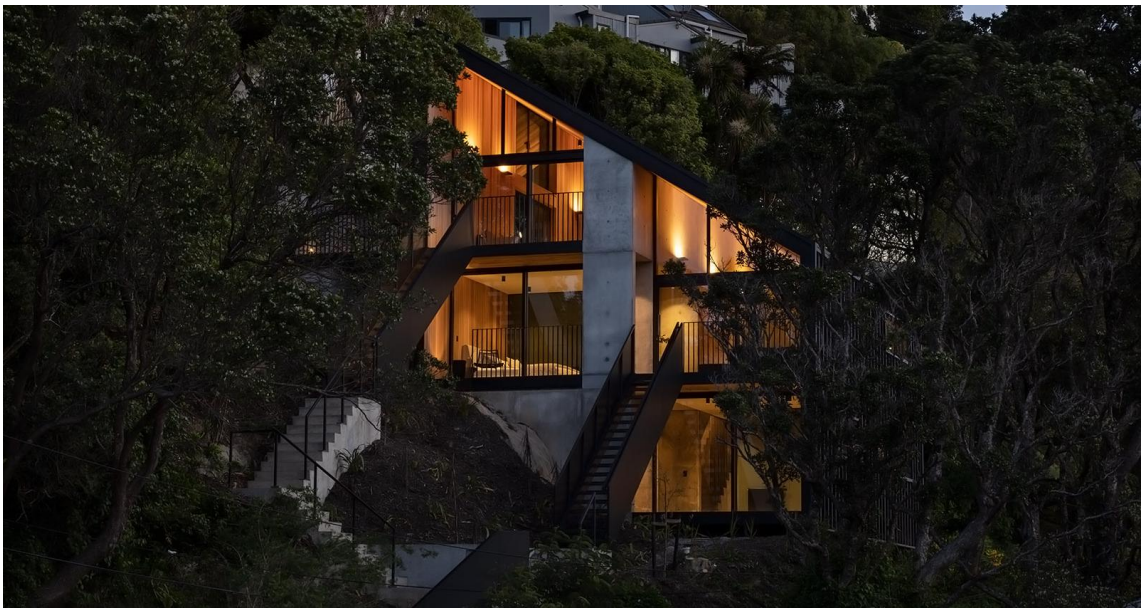
Process	Geographical representativeness	Technical representativeness	Time representativeness
Aggregate	Good	Good	Very Good
Sand	Good	Good	Very Good
Cement	Very Good	Very Good	Very Good
Fly ash	Very Good	Very Good	Very Good
Silica fume	Poor	Poor	Poor
Admixtures	Poor	Poor	Poor
Water	Good	Very Good	Very Good
Electricity	Very Good	Very Good	Very Good
Stationary diesel	Good	Good	Very Good
Raw material transport	Good	Good	Very Good
Module C1	Fair	Fair	Fair
Module C2	Fair	Good	Fair
Module C3	Fair	Fair	Fair
Module C4	Fair	Fair	Fair
Module D	Very Good	Good	Very Good

The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.

The EPDs used to model admixtures do not report the share of specific/primary data (EFCA, 2021a; EFCA, 2021b). Hence, the share of primary data for these upstream EPDs have been conservatively assumed to be 0%. Therefore, please note that the reported share of primary data is associated with uncertainty, as EPDs used as data source lack information on the share of primary data.

Table 7: Share of primary data

Process	Source type	Source	Reference year	Data category	Share of primary data, of GWP-GHG results for A1-A3
Generation of electricity and fuel used in manufacturing of product	Database	Ecoinvent version 3.11, BraveTrave (2023)	2024	Primary data	0.3%
Stationary diesel	Database	EPD owner, Ecoinvent version 3.11	2024	Primary data	0.3%
Transport of raw materials to manufacturing site	Database	EPD owner, Ecoinvent version 3.11	2024	Primary data	3.30%
Production of Cement	EPD	Ultracem EPD (EPD-IES-0024200:001)	2024	Primary data	81.4%
Production SCMs	EPD	Envirocore 201 EPD (EPD-IES-0024216:001), Envirocore 100 EPD (EPD-IES-0024214:001)	2024	Secondary data	0.0%
Total share of primary data of GWP-GHG results for A1-A3					**85.3%**



Life Cycle Assessment (LCA) Indicators

The potential environmental impacts, use of resources and waste categories included in this EPD are listed in the table below. All tables from this point will contain abbreviations only.

The information presented represents the best estimate of the environmental footprint at the time of running the calculator. To maintain quality requirements of NZS3104, mix designs may vary modestly to ensure statistical control. Small changes in mix design may result in small changes in the calculated environmental performance.

The characterization factors from the Ecoinvent EN15804 based on EF 3.1 are used. Long-term storage (>100 years) is not taken into consideration in the impact estimate.

The use of the EPD results for modules A1-A3 without considering the results for modules C1-C4 and D is discouraged.

Table 7: Environmental impact indicators

Impact Category	Abbreviation	Unit
Core Environmental Impacts Indicators		
Global Warming Potential, total	GWP-total	kg CO_2 equivalents
Global warming potential (fossil)	GWP-fossil	kg CO_2 equivalents
Global warming potential (biogenic)	GWP-biogenic	kg CO_2 equivalents
Global warming potential (Land use/ land transformation)	GWP-luluc	kg CO_2 equivalents
Ozone Depletion	ODP	kg CFC11-eq.
Acidification potential	AP	mol H^+ eq.
Eutrophication – aquatic freshwater	EP - freshwater	kg P equivalent
Eutrophication – aquatic marine	EP - marine	kg N equivalent
Eutrophication – terrestrial	EP – terrestrial	mol N equivalent
Photochemical ozone creation potential	POCP	kg NMVOC equivalents
Abiotic depletion potential (elements)[1,2]	ADPE	kg Sb equivalents
Abiotic depletion potential (fossil fuels)[1]	ADPF	MJ net calorific value
Water Depletion Potential[1]	WDP	m^3 equivalent deprived
Additional environmental impact indicators [5]		
Global warming potential- excluding biogenic uptake, emissions, and storage [3]	GWP-GHG	kg CO_2 equivalents
Respiratory inorganics	PM	Disease incidence
Ionizing radiation - human health [4]	IRP	kBq U235eq
Eco-toxicity – freshwater [1,2]	ETP-fw	CTUe
Human toxicity, cancer [1,2]	HTP-c	CTUh

Impact Category	Abbreviation	Unit
Human toxicity, non-cancer [1,2]	HTP-nc	CTUh
Potential soil quality index [1]	SQP	Pt
Parameters describing resource use		
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	PERE	MJ, net calorific value
Use of renewable primary energy resources used as raw materials	PERM	MJ, net calorific value
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PERT	MJ, net calorific value
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	PENRE	MJ, net calorific value
Use of non- renewable primary energy resources used as raw materials	PENRM	MJ, net calorific value
Total use of non- renewable primary energy resources (primary energy and primary energy resources used as raw materials)	PENRT	MJ, net calorific value
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ, net calorific value
Use of non-renewable secondary fuels	NRSF	MJ, net calorific value
Use of net fresh water	FW	m^3
Other environmental information describing waste categories		
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed[6]	NHWD	kg
Radioactive waste disposed/stored	RWD	kg
Environmental information describing output flows		
Components for reuse	CRU	kg
Materials for recycling	MFR	kg
Materials for energy recovery	MER	kg
Exported Energy, electrical	EEE	MJ per energy carrier
Exported Energy, thermal	EET	MJ
Biogenic carbon content		
Biogenic carbon content- product	BCC-prod	kg
Biogenic carbon content- packaging	BCC-pack	kg

Notes-Applicable to Table 7 above and environmental indicators following

1. The results of this environmental impact indicator shall be used with care as the uncertainties about these results are high or as there is limited experience with the indicator.

2 The results of the impact categories abiotic depletion of minerals and metals, land use, human toxicity (cancer), human toxicity, noncancer and ecotoxicity (freshwater) may be highly uncertain in LCAs that include capital goods/infrastructure in generic datasets, in case infrastructure/capital goods contribute greatly to the total results. This is because the LCI data of infrastructure/capital goods used to quantify these indicators in currently available generic datasets sometimes lack temporal, technological and geographical representativeness. Caution should be exercised when using the results of these indicators for decision-making purposes.

3 This indicator should be identical to GWP-total except that the CF for biogenic CO_2 is set to zero. It has been included in the EPD following the PCR (EPD International, 2025b). In this study it is calculated by subtracting the value of Climate change – biogenic (GWP-biogenic) from the value of Climate change – total (GWP-total) since the ecoinvent Excel LCIA results do not include the indicator.

4 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 from some construction materials is also not measured by this indicator.

5 Please note that some EPDs used to model upstream input materials such as admixtures and silica fume do not include additional environmental impact indicators. Hence, a generic chemical dataset was used to estimate the impacts of these indicators. While the overall effect is minimal, we advise that these results shall be used with care as there are uncertainties

6 The reported impacts for NHWD may be influenced by the inclusion of capital goods/infrastructure and supply chain modelling choices in ecoinvent datasets. In particular, the reported impacts may be affected by wastewater treatment, which may be modelled as non-hazardous waste treatment within the ecoinvent supply chain.

Environmental Performance

The following section presents the results for each Life Cycle Assessment module.
Please note that when interpreting the results:

- The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.
- The results of the end-of-life stage (modules C1-C4) should be considered when using the results of the product stage (modules A1-A3).

Results for primary scenario

Per 1 m^3 of Firth Ready-Mixed Concrete

		A1-A3	C1	C2	C3	C4	D
Core Environmental Impact Indicators							
Global Warming Potential, total	kg CO2 eq.	2.97E+02	8.50E+00	2.09E+01	8.05E-01	1.09E+00	-2.08E+00
Global Warming Potential, fossil fuels	kg CO2 eq.	2.97E+02	8.50E+00	2.09E+01	8.04E-01	1.09E+00	-2.09E+00
Global Warming Potential, biogenic	kg CO2 eq.	9.34E-02	1.62E-03	6.29E-03	1.23E-03	2.07E-04	-6.29E-04
Global Warming Potential, land use and land use change	kg CO2 eq.	1.41E-02	8.70E-04	9.45E-03	8.24E-05	1.11E-04	-5.86E-04
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	1.45E-06	1.26E-07	2.81E-07	1.23E-08	1.61E-08	-4.25E-08
Acidification potential, Accumulated Exceedance	mol H+ eq.	6.53E-01	7.60E-02	7.27E-02	6.48E-03	9.72E-03	-4.97E-02
Eutrophication potential, fraction of nutrients reaching freshwater end compartment	kg P eq.	6.32E-03	2.73E-04	2.27E-03	5.42E-05	3.50E-05	-1.40E-04
Eutrophication potential, fraction of nutrients reaching marine end compartment	kg N eq.	2.50E-01	3.54E-02	2.34E-02	2.80E-03	4.53E-03	-1.71E-02
Eutrophication potential, Accumulated Exceedance	mol N eq.	2.99E+00	3.87E-01	2.55E-01	3.06E-02	4.95E-02	-2.48E-01
Formation potential of tropospheric ozone	kg NMVOC eq.	7.27E-01	1.16E-01	1.04E-01	9.29E-03	1.48E-02	-5.40E-02
Abiotic depletion potential for non- fossil resources	kg Sb eq.	1.72E-04	3.06E-06	5.91E-05	7.80E-07	3.91E-07	-4.03E-06
Abiotic depletion potential for fossil resources potential	MJ, net calorific value	1.33E+03	1.11E+02	2.99E+02	1.05E+01	1.42E+01	-3.91E+01
Water (user) deprivation potential, deprivation-weighted water consumption	m3 world equiv.	1.61E+01	2.85E-01	1.77E+00	2.97E-02	3.65E-02	-6.15E-01
Additional environmental impact indicators							
Global Warming Potential, GHG	kg CO2 eq.	2.97E+02	8.50E+00	2.09E+01	8.04E-01	1.09E+00	-2.09E+00
Potential incidence of disease due to PM emissions	Disease incidence	8.69E-03	2.17E-06	2.04E-06	1.67E-07	2.78E-07	-1.35E-03
Potential Human exposure efficiency relative to U235	kBq U235 eq.	4.72E-01	4.71E-02	2.58E-01	4.19E-03	6.03E-03	-1.80E-02
Potential Comparative Toxic Unit for ecosystems	CTUe	8.94E+02	5.99E+00	4.89E+01	1.07E+00	7.67E-01	-3.06E+01
Human toxicity, cancer	CTUh	4.49E-08	8.66E-10	3.41E-09	6.97E-10	1.11E-10	-8.87E-09
Human toxicity, non-cancer	CTUh	3.42E-07	1.36E-08	1.91E-07	1.97E-09	1.74E-09	-8.02E-09
Potential soil quality index	Pt	1.03E+04	0.00E+00	2.96E+02	4.09E-01	0.00E+00	-1.47E+02
Parameters describing resource use							
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	4.59E+02	6.94E-01	4.13E+00	8.35E+00	8.89E-02	-3.45E+00
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ, net calorific value	4.59E+02	6.94E-01	4.13E+00	8.35E+00	8.89E-02	-3.45E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw	MJ, net calorific value	1.26E+03	1.11E+02	2.99E+02	1.05E+01	1.42E+01	-2.46E+01
Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ, net calorific value	1.26E+03	1.11E+02	2.99E+02	1.05E+01	1.42E+01	-2.46E+01
Use of secondary material	kg	3.13E+00	0.00E+00	0.00E+00	4.39E-03	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ, net calorific value	2.63E+02	1.20E-04	1.62E-03	1.18E-05	1.54E-05	-3.36E-04
Use of non-renewable secondary fuels	MJ, net calorific value	2.37E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	m3	2.39E+00	7.09E-03	4.41E-02	8.82E-04	9.07E-04	-4.03E-01
Other environmental information describing waste categories							
Hazardous waste disposed	kg	7.64E-01	7.09E-03	6.55E-01	1.09E-02	9.07E-04	-6.47E-02
Non-hazardous waste disposed	kg	1.72E+01	1.24E-01	1.25E+01	0.00E+00	1.88E+03	-9.34E-01
Radioactive waste disposed	kg	1.85E-01	1.81E+00	1.83E-05	1.37E-01	2.31E-01	-4.39E-06
Environmental information describing output flows							
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	2.31E+01	0.00E+00	0.00E+00	4.69E+02	0.00E+00	-3.77E-04
Materials for energy recovery	kg	2.89E-07	0.00E+00	0.00E+00	1.71E-07	0.00E+00	0.00E+00
Exported electrical energy	MJ	3.61E-04	0.00E+00	0.00E+00	5.41E-05	0.00E+00	0.00E+00
Exported thermal energy	MJ	6.43E-04	0.00E+00	0.00E+00	1.01E-04	0.00E+00	0.00E+00
Biogenic carbon content							
Biogenic carbon content - product	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon content - packaging	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Additional scenarios for modules C3-C4 and D

Per 1 m³ of Firth Ready-Mixed Concrete		100% Recyling			100% Landfill		
		C3	C4	D	C3	C4	D
Core Environmental Impact Indicators							
Global Warming Potential, total	kg CO2 eq.	4.03E+00	0.00E+00	-1.04E+01	0.00E+00	1.36E+00	0.00E+00
Global Warming Potential, fossil fuels	kg CO2 eq.	4.02E+00	0.00E+00	-1.04E+01	0.00E+00	1.36E+00	0.00E+00
Global Warming Potential, biogenic	kg CO2 eq.	6.16E-03	0.00E+00	-3.14E-03	0.00E+00	2.59E-04	0.00E+00
Global Warming Potential, land use and land use change	kg CO2 eq.	4.12E-04	0.00E+00	-2.93E-03	0.00E+00	1.39E-04	0.00E+00
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	6.17E-08	0.00E+00	-2.12E-07	0.00E+00	2.02E-08	0.00E+00
Acidification potential, Accumulated Exceedance	mol H+ eq.	3.24E-02	0.00E+00	-2.49E-01	0.00E+00	1.22E-02	0.00E+00
Eutrophication potential, fraction of nutrients reaching freshwater end compartment	kg P eq.	2.71E-04	0.00E+00	-6.99E-04	0.00E+00	4.37E-05	0.00E+00
Eutrophication potential, fraction of nutrients reaching marine end compartment	kg N eq.	1.40E-02	0.00E+00	-8.56E-02	0.00E+00	5.66E-03	0.00E+00
Eutrophication potential, Accumulated Exceedance	mol N eq.	1.53E-01	0.00E+00	-1.24E+00	0.00E+00	6.19E-02	0.00E+00
Formation potential of tropospheric ozone	kg NMVOC eq.	4.65E-02	0.00E+00	-2.70E-01	0.00E+00	1.85E-02	0.00E+00
Abiotic depletion potential for non- fossil resources	kg Sb eq.	3.90E-06	0.00E+00	-2.02E-05	0.00E+00	4.89E-07	0.00E+00
Abiotic depletion potential for fossil resources potential	MJ, net calorific value	5.24E+01	0.00E+00	-1.96E+02	0.00E+00	1.77E+01	0.00E+00
Water (user) deprivation potential, deprivation-weighted water consumption	m3 world equiv.	1.48E-01	0.00E+00	-3.07E+00	0.00E+00	4.56E-02	0.00E+00
Additional environmental impact indicators							
Global Warming Potential, GHG	kg CO2 eq.	4.02E+00	0.00E+00	-1.04E+01	0.00E+00	1.36E+00	0.00E+00
Potential incidence of disease due to PM emissions	Disease incidence	8.36E-07	0.00E+00	-6.73E-03	0.00E+00	3.47E-07	0.00E+00
Potential Human exposure efficiency relative to U235	kBq U235 eq.	2.10E-02	0.00E+00	-9.01E-02	0.00E+00	7.53E-03	0.00E+00
Potential Comparative Toxic Unit for ecosystems	CTUe	5.33E+00	0.00E+00	-1.53E+02	0.00E+00	9.59E-01	0.00E+00
Human toxicity, cancer	CTUh	3.49E-09	0.00E+00	-4.43E-08	0.00E+00	1.39E-10	0.00E+00
Human toxicity, non-cancer	CTUh	9.86E-09	0.00E+00	-4.01E-08	0.00E+00	2.18E-09	0.00E+00
Potential soil quality index	Pt	2.05E+00	0.00E+00	-7.34E+02	0.00E+00	0.00E+00	0.00E+00
Parameters describing resource use							
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ, net calorific value	4.18E+01	0.00E+00	-1.73E+01	0.00E+00	1.11E-01	0.00E+00
Use of renewable primary energy resources used as raw materials	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources	MJ, net calorific value	4.18E+01	0.00E+00	-1.73E+01	0.00E+00	1.11E-01	0.00E+00
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ, net calorific value	5.24E+01	0.00E+00	-1.23E+02	0.00E+00	1.77E+01	0.00E+00
Use of non-renewable primary energy resources used as raw materials	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources	MJ, net calorific value	5.24E+01	0.00E+00	-1.23E+02	0.00E+00	1.77E+01	0.00E+00
Use of secondary material	kg	2.19E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels	MJ, net calorific value	5.92E-05	0.00E+00	-1.68E-03	0.00E+00	1.92E-05	0.00E+00
Use of non-renewable secondary fuels	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water	m3	4.41E-03	0.00E+00	-2.01E+00	0.00E+00	1.13E-03	0.00E+00
Other environmental information describing waste categories							
Hazardous waste disposed	kg	5.45E-02	0.00E+00	-3.24E-01	0.00E+00	1.13E-03	0.00E+00
Non-hazardous waste disposed	kg	0.00E+00	0.00E+00	-4.67E+00	0.00E+00	2.35E+03	0.00E+00
Radioactive waste disposed	kg	6.87E-01	0.00E+00	-2.19E-05	0.00E+00	2.89E-01	0.00E+00
Environmental information describing output flows							
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling	kg	2.35E+03	0.00E+00	-1.88E-03	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	8.56E-07	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported electrical energy	MJ	2.70E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported thermal energy	MJ	5.06E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon content							
Biogenic carbon content - product	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biogenic carbon content - packaging	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Abbreviations

Term	Definition
ADP	Abiotic Depletion Potential
AP	Acidification Potential, Accumulated Exceedance
CEN	European Committee for Standardization
DQA	Data Quality Assessment
EFCA	European Federation of Concrete Admixtures Associations
EoL	End-of-Life
EP	Eutrophication Potential
ETP	Potential Comparative Toxic Unit for ecosystems
ff	fossil fuels
fw	fresh water
GGBFS	Ground Granulated Blast-Furnace Slag
GHG	Greenhouse Gas
GWP	Global Warming Potential (Climate Change)
HTP	Potential Comparative Toxic Unit for humans
IBU	Institut Bauen und Umwelt e.V.
IRP	Potential Human exposure efficiency relative to U235
ISO	International Organization for Standardization
LCA	Life Cycle Assessment
LCI	Life Cycle Inventory
LCIA	Life Cycle Impact Assessment
luluc	Land use and land use change
m&m	minerals and metals
NMVOC	Non-Methane Volatile Organic Compound
NZ	New Zealand
ODP	Depletion potential of the stratospheric ozone layer
PM	Potential incidence of disease due to PM emissions
POCP	Formation potential of tropospheric ozone
VOC	Volatile Organic Compound
WDP	Water (user) deprivation potential, deprivation-weighted water consumption

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General Information

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). The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but published in different EPD programmes may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

The results for EN15804+A1 compliant EPDs are not comparable with EN15804+A2 compliant studies as the methodologies are different.

Programme Information	
EPD Programme Operator	EPD International AB Web: www.environdec.com Email: support@environdec.com Post: EPD International AB, Box 210 60, SE-100 31 Stockholm, Sweden
Licensee	EPD Australasia Limited Web: www.epd-australasia.com Email: info@epd-australasia.com Post: EPD Australasia Limited, 6 Cube Court, Richmond 7020, New Zealand
Product Category Rules (PCR)	
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)	
PCR	PCR 2019.14 Construction Products, version 2.0.1 (published on 2025-06-05, valid until 2030-04-07)
c-PCR	c-PCR-003 (to 2019:14) Concrete and concrete elements (EN 16757:2022), version 2025-04-08
PCR Review conducted by	The Technical Committee of the International EPD® System. See www.environdec.com for a list of members.
Review chairs	Rob Rouwette (chair), Noa Meron (co-chair) The review panel may be contacted via the Secretariat: support@environdec.com
Information about EPD owner	
Declaration Owner	Firth Industries Limited Web: www.firth.co.nz Email: info@firth.co.nz Post: 810 Great South Rd, Penrose, Auckland 1741, New Zealand

LCA accountability	Firth Industries Limited Web: www.firth.co.nz Email: info@firth.co.nz Post: 810 Great South Rd, Penrose, Auckland 1741, New Zealand LCA background report created by thinkstep ltd on behalf of Firth Industries Limited Web: www.thinkstep-anz.com Email: info@thinkstep-anz.com Post: 11 Rawhiti Road, Pukerua Bay, Wellington 5026, New Zealand
Geographical Scope	New Zealand
Reference year	2023-07-01 to 2024-06-30
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Verification

External and independent (third-party') verification of the declaration and data, according to ISO 14025:2006, via EPD verification through:	☐ Individual EPD verification without a pre-verified LCA/EPD tool ☐Individual EPD verification with a pre-verified LCA/EPD tool ☒EPD Process Certification* without a pre-verified LCA/EPD tool ☐ EPD Process Certification* with a pre-verified LCA/EPD tool ☐Fully pre-verified EPD tool *EPD process certification involves an accredited certification body certifying and periodically auditing the EPD process and conducting external and independent verification of EPDs that are regularly published. More information can be found in the General Programme Instructions on www.envrondec.com.
Third party verifier, accountable for the Process Certification	Bureau Veritas Certification Sverige AB, Fabriksgatan 13 412 50, Göteborg Is an approved certification body accountable for the third-party verification. The certification body is accredited by SWEDAC, with accreditation number 1236.
Accredited by:	SWEDAC
Procedure for follow-up of data during EPD validity involves third-party verifier	☐ Yes ☒ No

Version History

Date	Version	Description of Change	Reviewer
23/06/2026	1	Original version of EPD	
14/09/2026	2	Editorial updates – version date was updated	Bradley Sabine
21/09/2026	3	Editorial updates – updated the biogenic values.	Robert McKinnon