Niagara Ready Mix

Ready Mixed Concrete

An Environmental Product Declaration

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About this EPD

This is a Type III environmental product declaration (EPD) for ready mixed concrete as produced by Niagara Ready Mix at the company's facility in Thorold, ON. The results of the underlying LCA are computed using SimaPro 10.2.0.1 (1). This EPD and underlying LCA have been verified to conform to the NSF sub-category PCR for concrete (2), ISO 21930:2017 (3) as well as ISO 14020:2000 (4), and ISO 14040/44:2006 LCA standards (5), (6).

This EPD is certified by ASTM to conform to the NSF PCR and ISO 21930:2017, as well as to the requirements of ISO 14020, ISO 14025 (7), and ASTM International's General Program Instructions (8). This EPD is intended for business-to-business audiences.

General Summary

EPD Commissioner and Owner	**Niagara Ready Mix** 1134 Old Thorold Rd. Thorold, ON, Canada. L2V 3Y5 https://www.niagarareadymix.com/ Niagara Ready Mix company personnel have provided LCI and meta data in support of this EPD. *The owner of the declaration is liable for the underlying information and evidence*.
Product Description & Applicability	Concrete is an essential construction material widely used for structural and non-structural applications across residential, commercial, and infrastructure projects. It is commonly applied in foundations, slabs, columns, walls, pavements, and civil works where strength and durability are required. Its versatility allows it to be cast in a wide range of forms and reinforced to meet specific structural and performance requirements.
Product Category Rules (PCR)	NSF International, Product Category Rules for Environmental Product Declarations. PCR for Concrete V2.3. February 2025. Extended 12 months per PCR EXT2025-102. (2)
Date of Issue & Validity Period	April 21, 2026 – 5 years
Declared Unit	1 cubic meter (m^3) of ready mixed concrete

EPD and Project Report Information

Program Operator	ASTM International
Declaration Number	EPD 1167
Declaration Type	Cradle-to-gate (modules A1 to A3). Facility and product-specific.
Applicable Regions	North America
Content of the Declaration	This declaration follows Section 9; NSF International, Product Category Rules for Environmental Product Declarations. PCR for Concrete V2.3. (2).
This EPD was independently verified by ASTM in accordance with ISO 14025 and the reference PCR: Internal / External X	Tim Brooke ASTM International 100 Barr Harbor Drive PO Box C700 West Conshohocken PA 19428-2959, USA cert@astm.org Thomas P. Gloria, Ph. D. Industrial Ecology Consultants 35 Bracebridge Rd. Newton, MA
Notes	The EPD results reported herein are computed SimaPro version 9.5.0.2 (1), along with relevant background datasets from ecoinvent 3.5, US LCI, and supplier-specific EPDs where applicable.
Project Report	A Cradle-to-Gate Life Cycle Assessment of Ready-Mixed Concrete Manufactured by Niagara Ready Mix (9).
LCA Report and EPD Prepared by: Athena Sustainable Materials Institute	Athena Sustainable Materials Institute 280 Albert Street, Suite 404 Ottawa, Ontario, Canada K1P 5G8 info@athenasmi.org www.athenasmi.org

Product Description

This EPD reports environmental transparency information for various ready mixed concrete mixes as manufactured by Niagara Ready Mix at their facility in Thorold, ON. Table 1 below outlines the declared products covered by this EPD.

Table 1: List of Declared Products from Niagara Ready Mix

#	Mix Design Name	#	Mix Design Name
1	SuperEarth 15MPa NA 20mm	26	SuperEarth 20MPa R2 20mm
2	SuperEarth 20MPa NA 20mm	27	SuperEarth 25MPa NA R3 20mm
3	SuperEarth 25MPA NA 20mm	28	SuperFlow 25MPa F2 20mm
4	SuperEarth 30MPA NA 20mm	29	SuperFlow 30MPa F1 20mm
5	SuperEarth 35MPA NA 20mm	30	SuperFlow 35MPa C1/A1 20mm
6	SuperEarth 40MPA NA 20mm	31	SuperEarth-Flow 35MPa C1/A1 20mm
7	SuperEarth 25MPA F2/C4/A4 20mm	32	SuperFlow+ 35MPa C1/A1 20mm
8	SuperEarth-MAX 25MPA F2 20mm	33	SuperEarth-Flow+ 35MPa C1/A1 20mm
9	SuperEarth 30MPA F1 20mm	34	SuperFlow 35MPA C1/A1 13.2mm
10	SuperEarth-MAX 30MPA F1 20mm	35	SuperEarth-Flow 35MPA C1/A1 13.2mm
11	SuperEarth 32MPA C2 20mm	36	SuperFlow+ 35MPA C1/A1 13.2mm
12	SuperEarth-MAX 32MPA C2 20mm	37	SuperEarth-Flow+ 35MPA C1/A1 13.2mm
13	SuperEarth 35MPA C1 20mm	38	Silica Fume 35MPa C1/A1 20mm
14	SuperEarth-MAX 35MPA C1 20mm	39	SuperResist 30MPa F1 20mm
15	SuperEarth 45MPA C1 20mm	40	SCC 25MPa F2 20mm
16	SuperEarth-MAX 45MPA C1 20mm	41	SuperEarth 32MPA C2 Curb Machine
17	SuperEarth 50MPA CX-L 20mm	42	SuperSet 35MPa C1/A1 20mm 75% @ 24Hr
18	SuperEarth-MAX 50MPA CX-L 20mm	43	SuperTight 25MPa R2 20mm
19	SuperColour 32MPa NA C2 20mm	44	35MPa C1/A1 Shotcrete 10mm
20	SuperReveal 32MPa C2 10mm Exposed	45	SuperShrink 35MPa C1/A1 20mm
21	SuperDrive 32MPa C2 20mm	46	SuperShrink+ 35MPa C1/A1 20mm
22	SuperFloor 25MPa NA N-CF 20mm	47	30MPa MTO General Use 20mm
23	SuperFloor 30MPa NA 20mm	48	30MPa MTO 13.2mm Form and Pump
24	SuperFloor 32MPa NA 20mm	49	35MPA MTO General Use 20mm
25	SuperEarth 15MPa R1 20mm	50	35MPa MTO Tall Wall 20mm

Note: “NA” = Non Air-Entrained. All other mixes include air entraining admixture.

Product Material Composition and Relevant Standards

The material content of all covered products varies significantly by product type. Generally, the concrete mixes consist of the following materials in order of greatest mass:

1. Coarse and/or fine aggregates
2. Cement
3. Supplementary cementitious materials (such as slag cement and silica fume)
4. Additives (such as admixtures and pigments)

The plant's concrete products comply with the following standards:

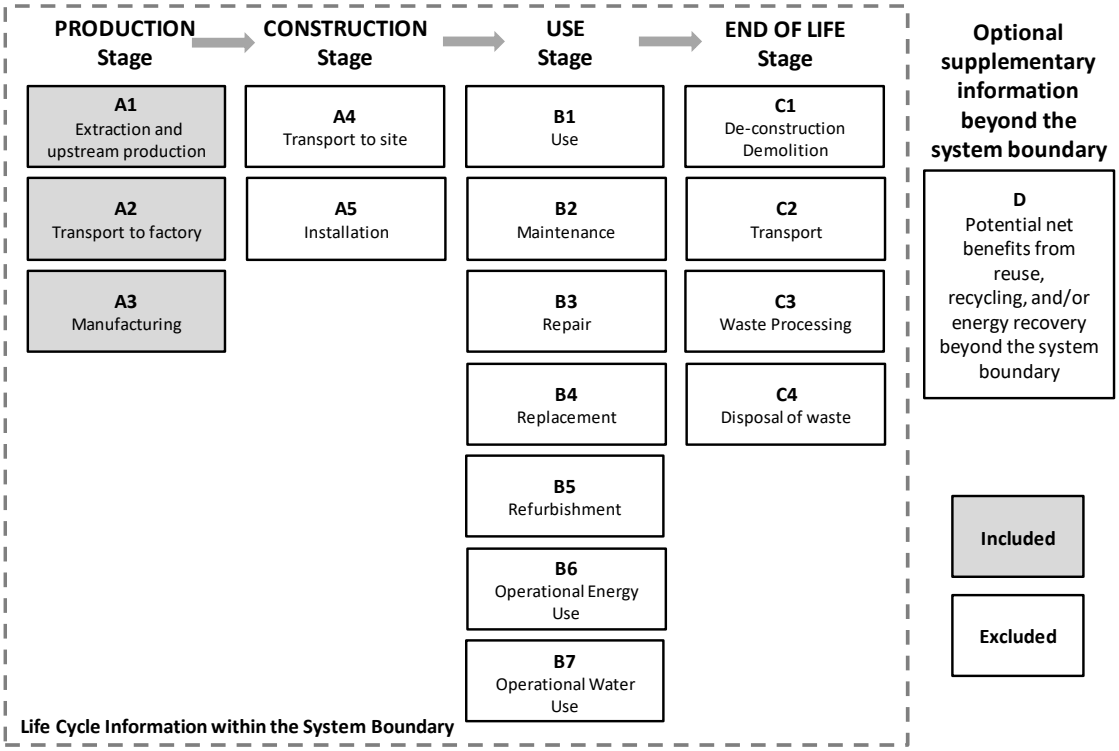
- ASTM C94/C94M-23 Standard Specification for Ready-Mixed Concrete (10).

Declared Unit

The declared unit is one cubic meter (m^3) of ready mixed concrete.

System Boundary

This is a cradle-to-gate EPD covering the production stage (A1-A3) as depicted in the figure below. The production stage includes extraction of raw materials (cradle) through the manufacture and transport of concrete mixes ready for shipment (gate).



Items *excluded* from the system boundary include:

- Production, manufacture, and construction of manufacturing capital goods and infrastructure,
- Production and manufacture of production equipment, delivery vehicles, and laboratory equipment,
- Personnel-related activities (travel, furniture, and office supplies),
- Energy and water use related to company management and sales activities that may be located either within the factory site or at another location.

Cut-off Criteria

The cut-off criteria per ISO 21930, Section 7.1.8 (3) have been followed. Per ISO 21930, 7.1.8, all input/output data required were collected and included in the LCI modelling. No substances with hazardous and toxic properties that pose a concern for human health and/or the environment were identified in the framework of this EPD.

Data Collection
Gate-to-gate input/output flow data were collected for the following processes for the company's 2024 fiscal year (April 2024 to March 2025):

- Facility operations (fuel and electricity use, waste, and total production)
- Product-specific formulation, packaging information & annual production

Allocation Rules

The allocation rules generally conform to ISO 14044 section 4.3.4.1 and 4.3.4.2 (6) and ISO 21930 (3) section 7.2.5 Allocation for co-products.

Given the wide range of products manufactured by Niagara Ready Mix, it was not possible to collect waste generation and energy and fuel use data specific to each product. Instead, these inputs and outputs were allocated over the total production of all declared products on a "volume" basis. Additionally, allocation related to transport is based on the mass of transported inputs and outputs.

Data Quality Requirements and Assessment

Data Quality Requirements	Description
Technology Coverage	Data represents the prevailing technology in use at Niagara Ready Mix's Thorold, ON plant. Whenever available, for all upstream and core material and processes, both International and North American typical or global average industry LCI datasets were utilized. Technological *representativeness is characterized as "high".*
Geographic Coverage	The geographic region considered is US. *Geographical representativeness is characterized as "high".*
Time Coverage	Gate-to-gate input/output flow data were collected for the following processes for the company's 2024 fiscal year (April 2024 to March 2025): • Facility operations (fuel and electricity use, waste, and total production) • Product-specific formulation, packaging information & annual production *Temporal representativeness is characterized as "high".*
Completeness	All relevant, specific processes, including inputs (raw materials, intermediate products, energy, and ancillary materials) and outputs (emissions and production volume) were considered and modeled in SimaPro to complete the production profile for Niagara Ready Mix's concrete mixes. The completeness of the foreground process chain in terms of process steps was rigorously assessed.
Reproducibility	Internal reproducibility is possible since the data and the models are stored and available in Athena's Niagara Ready Mix's LCI database developed in SimaPro, 2025. External reproducibility is not possible as the source LCI data and subsequent LCA background reports are confidential.
Transparency	Activity datasets are disclosed in the table below.
Uncertainty	A *sensitivity check* was performed to assess the reliability of the reported LCA results and conclusions by determining how they are affected by value choices in the data or assumptions on calculation of LCIA and energy indicator results. The results of the sensitivity analysis are documented in the project report.

As required by the NSF PCR Section 9.3 (2), the following table outlines the background datasets used in the production of the LCA model.

Material/ Process	Data Source
Type IL (GUL) Cement	*Amrize Bath Cement Plant Environmental Product Declaration. ASTM International, October 2021* (11). and *St. Mary's. St Mary's Cement Plant Environmental Product Declaration. NRMCA. October 2021* (12).
Slag Cement	*SCA Industry Average EPD Environmental Product Declaration. ASTM. July 2021.* (13).
Silica Fume	Burden free, as specified in NSF PCR Section 7. (2)
Admixtures	Product-specific admixture data gathered from: *Euclid Canada Inc. Chemical Admixtures for Concrete Environmental Product Declaration. ASTM. June 2024.* (14).
Coarse and Fine Crushed Aggregate	Ecoinvent 3.5, Nov. 2018 *Gravel, crushed {RoW}| production | Cut-off, U*
Natural Aggregate	Ecoinvent 3.5, Nov. 2018 *Gravel, round {RoW}| gravel and sand quarry operation | Cut-off, U*
Limestone Mineral Filler	Ecoinvent 3.5, Nov. 2018 *Limestone, unprocessed {CA-QC/ON}| limestone quarry operation | Cut-off, U EI3.5*
Pigment	Ecoinvent 3.5, Nov. 2018 *Titanium dioxide {RER/CA-ON}| market for | Cut-off, U*
Water	Ecoinvent 3.5, Nov. 2018 *Tap water {RoW}| market for | Cut-off, U*
Electricity	Ecoinvent 3.5, Nov. 2018 *Electricity, medium voltage {CA-ON}| market for | Cut-off, U*
Diesel	USLCI, Sept. 2015 *Diesel, combusted in industrial equipment/US*
Gasoline	USLCI, Sept. 2015 *Gasoline, combusted in equipment/US*
Natural Gas	USLCI, Sept. 2015 *Natural gas, combusted in industrial boiler/US*
Transportation – Short Haul	USLCI, Sept. 2015 *Transport, combination truck, short-haul, diesel powered/tkm/RNA*
Transportation - Barge	USLCI, Sept. 2015 *Transport, barge, average fuel mix/US*
Waste Treatment – Plant Garbage	Ecoinvent 3.5, Nov. 2018 *Municipal solid waste {CA-QC}| treatment of municipal solid waste, sanitary landfill | Cut-off, U*

Life Cycle Impact Assessment Results: Niagara Ready Mix

This section summarizes the production stage life cycle impact assessment (LCIA) results including resource use and waste generated metrics based on the cradle-to-gate life cycle inventory inputs and outputs analysis. The results are calculated based on one cubic meter (m^3) of each product as produced at Niagara Ready Mix's facility. LCIA category and inventory indicators are listed below in Table 2 below.

It should be noted that LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks (3), (6). Further, many LCA impact categories and inventory items are still emerging or under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting results for these categories – identified with an "*".

Environmental declarations from different programs may not be comparable (7). EPDs are comparable only if they comply with ISO 21930, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works (3).

Table 2: LCIA Category and Inventory Indicators

Impact Category and Inventory Indicators	Abbreviation	Unit	Source of the characterization method
Global warming potential [1)]	GWP 100	kg CO_2 eq.	TRACI 2.1 2012 updated with IPCC 2013, AR5[1)]
Depletion potential of the stratospheric ozone layer	ODP	kg CFC-11 eq.	TRACI 2.1 2012/WMO:2003
Smog formation potential	SFP	kg O_3 eq.	TRACI 2.1 2012
Acidification potential	AP	kg SO_2 eq.	TRACI 2.1 2012
Eutrophication potential	EP	kg N eq.	TRACI 2.1 2012
Abiotic depletion potential, elements	ADP_e	kg Sb eq.	CML-baseline, v4.7 2016
Abiotic depletion potential, fossil	ADP_f	MJ, LHV	CML-baseline, v4.7 2016
Renewable primary resources used as energy carrier (fuel)	RPR_E	MJ, LHV	Cumulative Energy Demand (CED) V1.0, 2019
Renewable primary resources with energy content used as material	RPR_M	MJ, LHV	Cumulative Energy Demand (CED) V1.0, 2019
Non-renewable primary resources used as an energy carrier (fuel)	$NRPR_E$	MJ, LHV	Cumulative Energy Demand (CED) V1.0, 2019
Non-renewable primary resources with energy content used as material	$NRPR_M$	MJ, LHV	Cumulative Energy Demand (CED) V1.0, 2019
Secondary Material	SM	kg	Inventory
Renewable secondary fuels	RSF	MJ, LHV	Inventory
Non-renewable secondary fuels	NRSF	MJ, LHV	Inventory
Recovered energy	RE	MJ, LHV	Inventory
Consumption of freshwater	FW	m^3	Inventory
Hazardous waste disposed	HWD	kg	Inventory
Non-hazardous waste disposed	NHWD	kg	Inventory
High level radioactive waste, conditioned, to final repository	HLRW	m^3	Inventory
Intermediate and low level radioactive waste, conditioned, to final repository	ILLRW	m^3	Inventory
Components for re-use	CRU	kg	Inventory
Materials for recycling	MR	kg	Inventory
Materials for energy recovery	MER	kg	Inventory
Exported energy	EE	MJ, LHV	Inventory
Calcination CO_2 emissions, reporting the emissions associated with calcination	GWP_{calc}	kg CO_2	Inventory

Table 3: Production Stage EPD Results (A1 to A3 Total) – Niagara Ready Mix Concrete Mixes

Impact category and inventory indicators	Unit	SuperEarth 15MPa NA[1] 20mm	SuperEarth 20MPa NA[1] 20mm	SuperEarth 25MPA NA[1] 20mm	SuperEarth 30MPA NA[1] 20mm	SuperEarth 35MPA NA[1] 20mm
		A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total
GWP 100[1) 2)]	kg CO_2 eq	159	167	187	210	217
ODP[1)]	kg SO_2 eq	5.39E-06	5.99E-06	6.77E-06	8.01E-06	9.04E-06
SFP[1)]	kg N eq	19.6	21.1	23.2	26.4	29.3
AP[1)]	kg O_3 eq	0.80	0.87	0.96	1.10	1.24
EP[1)]	kg CFC-11 eq	0.079	0.087	0.096	0.11	0.13
ADPe*[3)]	kg Sb eq	3.05E-05	3.28E-05	3.72E-05	4.26E-05	4.50E-05
ADPf*[3)]	MJ, LHV	1204	1259	1393	1541	1600
RPRE*	MJ, LHV	41.5	43.8	49.1	55	59
RPRM*[4)]	MJ, LHV	4.72	4.91	5.57	6.13	5.91
NRPRE*	MJ, LHV	1344	1435	1586	1796	1957
NRPRM*[4)]	MJ, LHV	0.47	0.49	0.56	0.61	0.59
SM*[4)]	kg	72	91	103	137	186
RSF*[4)]	MJ, LHV	-	-	-	-	-
NRSF*[84)]	MJ, LHV	-	-	-	-	-
RE*[4)]	MJ, LHV	-	-	-	-	-
FW*[4)]	m^3	0.70	0.72	0.77	0.81	0.81
HWD*[4)]	kg	3.20E-03	3.37E-03	3.83E-03	4.29E-03	4.30E-03
NHWD*[4)]	kg	0.026	0.028	0.032	0.036	0.038
HLRW*[4) 5)]	m^3	1.47E-07	1.51E-07	1.53E-07	1.61E-07	1.73E-07
ILLRW*[4) 5)]	m^3	4.75E-07	6.08E-07	6.75E-07	9.04E-07	1.28E-06
CRU*[4)]	kg	0.040	0.042	0.048	0.053	0.051
MR*[4)]	kg	0.035	0.039	0.044	0.052	0.059
MER*[4)]	kg	-	-	-	-	-
EE*[4)]	MJ, LHV	-	-	-	-	-
GWP^*_{calc}	kg CO_2	66	68	77	85	82

[1] "NA" = Non Air-Entrained.

Table 4: Production Stage EPD Results (A1 to A3 Total) – Niagara Ready Mix Concrete Mixes Continued

Impact category and inventory indicators	Unit	SuperEarth 40MPA NA[1] 20mm	SuperEarth 25MPA F2/C4/A4 20mm	SuperEarth-MAX 25MPA F2 20mm	SuperEarth 30MPA F1 20mm	SuperEarth-MAX 30MPA F1 20mm
		A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total
GWP 100[1) 2)]	kg CO_2 eq	245	225	197	230	214
ODP[1)]	kg SO_2 eq	1.03E-05	7.68E-06	7.46E-06	8.16E-06	8.16E-06
SFP[1)]	kg N eq	32.6	25.7	25.2	27.0	27.0
AP[1)]	kg O_3 eq	1.39	1.05	1.05	1.11	1.13
EP[1)]	kg CFC-11 eq	0.15	0.10	0.11	0.11	0.12
ADPe*[3)]	kg Sb eq	5.14E-05	4.46E-05	3.95E-05	4.60E-05	4.33E-05
ADPf*[3)]	MJ, LHV	1783	1643	1466	1677	1576
RPRE*	MJ, LHV	67	59	51	61	56
RPRM*[4)]	MJ, LHV	6.76	7.14	5.66	7.14	6.23
NRPRE*	MJ, LHV	2184	1800	1710	1874	1838
NRPRM*[4)]	MJ, LHV	0.67	0.71	0.56	0.71	0.62
SM*[4)]	kg	212	91	128	111	140
RSF*[4)]	MJ, LHV	-	-	-	-	-
NRSF*[84)]	MJ, LHV	-	-	-	-	-
RE*[4)]	MJ, LHV	-	-	-	-	-
FW*[4)]	m³	0.88	0.88	0.77	0.88	0.81
HWD*[4)]	kg	4.91E-03	4.79E-03	3.96E-03	4.85E-03	4.36E-03
NHWD*[4)]	kg	0.044	0.039	0.034	0.040	0.037
HLRW*[4) 5)]	m³	1.79E-07	1.49E-07	1.59E-07	1.54E-07	1.62E-07
ILLRW*[4) 5)]	m³	1.45E-06	5.35E-07	8.61E-07	6.83E-07	9.27E-07
CRU*[4)]	kg	0.058	0.061	0.049	0.061	0.053
MR*[4)]	kg	0.067	0.051	0.049	0.054	0.053
MER*[4)]	kg	-	-	-	-	-
EE*[4)]	MJ, LHV	-	-	-	-	-
GWP^*_{calc}	kg CO_2	94	99	79	99	87

[1] "NA" = Non Air-Entrained.

Table 5: Production Stage EPD Results (A1 to A3 Total) – Niagara Ready Mix Concrete Mixes Continued

Impact category and inventory indicators	Unit	SuperEarth 32MPA C2 20mm	SuperEarth-MAX 32MPA C2 20mm	SuperEarth 35MPA C1 20mm	SuperEarth-MAX 35MPA C1 20mm	SuperEarth 45MPA C1 20mm
		A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total
GWP 100[1) 2)]	kg CO_2 eq	272	252	274	240	324
ODP[1)]	kg SO_2 eq	9.48E-06	9.37E-06	1.03E-05	1.01E-05	1.19E-05
SFP[1)]	kg N eq	29.9	29.7	32.1	31.7	36.0
AP[1)]	kg O_3 eq	1.23	1.23	1.33	1.35	1.50
EP[1)]	kg CFC-11 eq	0.12	0.12	0.13	0.14	0.16
ADPe*[3)]	kg Sb eq	5.53E-05	5.17E-05	5.66E-05	5.05E-05	6.64E-05
ADPf*[3)]	MJ, LHV	1942	1811	1961	1741	2297
RPRE*	MJ, LHV	73	67	73	63	106
RPRM*[4)]	MJ, LHV	8.90	7.80	8.56	6.70	10.4
NRPRE*	MJ, LHV	2123	2061	2231	2127	2559
NRPRM*[4)]	MJ, LHV	0.89	0.78	0.85	0.67	1.04
SM*[4)]	kg	111	141	155	205	157
RSF*[4)]	MJ, LHV	-	-	-	-	-
NRSF*[84)]	MJ, LHV	-	-	-	-	-
RE*[4)]	MJ, LHV	-	-	-	-	-
FW*[4)]	m^3	1.02	0.94	0.99	0.85	1.21
HWD*[4)]	kg	5.96E-03	5.35E-03	5.87E-03	4.85E-03	7.03E-03
NHWD*[4)]	kg	0.049	0.045	0.049	0.043	0.060
HLRW*[4) 5)]	m^3	1.52E-07	1.60E-07	1.62E-07	1.77E-07	1.62E-07
ILLRW*[4) 5)]	m^3	6.23E-07	8.82E-07	9.56E-07	1.39E-06	9.22E-07
CRU*[4)]	kg	0.076	0.067	0.073	0.057	0.089
MR*[4)]	kg	0.063	0.062	0.068	0.066	0.077
MER*[4)]	kg	-	-	-	-	-
EE*[4)]	MJ, LHV	-	-	-	-	-
GWP^*_{calc}	kg CO_2	124	108	119	93	144

Table 6: Production Stage EPD Results (A1 to A3 Total) – Niagara Ready Mix Concrete Mixes Continued

Impact category and inventory indicators	Unit	SuperEarth-MAX 45MPA C1 20mm	SuperEarth 50MPA CX-L 20mm	SuperEarth-MAX 50MPA CX-L 20mm	SuperColour 32MPa NA[1] C2 20mm	SuperReveal 32MPa C2 10mm Exposed
		A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total
GWP 100[1) 2)]	kg CO_2 eq	274	329	263	377	356
ODP[1)]	kg SO_2 eq	1.16E-05	1.20E-05	1.16E-05	1.90E-05	1.05E-05
SFP[1)]	kg N eq	35.4	36.6	35.8	35.2	48.8
AP[1)]	kg O_3 eq	1.52	1.51	1.54	2.46	1.98
EP[1)]	kg CFC-11 eq	0.17	0.15	0.17	0.45	0.18
ADPe*[3)]	kg Sb eq	5.73E-05	6.80E-05	5.62E-05	7.65E-05	5.88E-05
ADPf*[3)]	MJ, LHV	1968	2324	1900	2989	3030
RPRE*	MJ, LHV	91	93	73	185	80
RPRM*[4)]	MJ, LHV	7.61	10.6	7.08	10.5	9.37
NRPRE*	MJ, LHV	2403	2590	2386	3201	3233
NRPRM*[4)]	MJ, LHV	0.76	1.06	0.71	1.05	0.94
SM*[4)]	kg	232	161	257	65	116
RSF*[4)]	MJ, LHV	-	-	-	-	-
NRSF*[84)]	MJ, LHV	-	-	-	-	-
RE*[4)]	MJ, LHV	-	-	-	-	-
FW*[4)]	m^3	1.00	1.19	0.92	1.14	1.06
HWD*[4)]	kg	5.51E-03	7.20E-03	5.24E-03	6.81E-03	6.27E-03
NHWD*[4)]	kg	0.050	0.060	0.048	0.054	0.051
HLRW*[4) 5)]	m^3	1.84E-07	1.62E-07	1.89E-07	2.23E-07	1.57E-07
ILLRW*[4) 5)]	m^3	1.57E-06	9.36E-07	1.76E-06	1.60E-06	7.43E-07
CRU*[4)]	kg	0.065	0.091	0.061	0.090	0.080
MR*[4)]	kg	0.074	0.079	0.075	0.064	0.066
MER*[4)]	kg	-	-	-	-	-
EE*[4)]	MJ, LHV	-	-	-	-	-
GWP*$_{calc}$	kg CO_2	106	148	98	146	130

[1] "NA" = Non Air-Entrained.

Table 7: Production Stage EPD Results (A1 to A3 Total) – Niagara Ready Mix Concrete Mixes Continued

Impact category and inventory indicators	Unit	SuperDrive 32MPa C2 20mm	SuperFloor 25MPa NA[1] N-CF 20mm	SuperFloor 30MPa NA[1] 20mm	SuperFloor 32MPa NA[1] 20mm	SuperEarth 15MPa R1 20mm
		A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total
GWP 100[1) 2)]	kg CO_2 eq	276	257	290	303	166
ODP[1)]	kg SO_2 eq	9.66E-06	7.82E-06	8.93E-06	9.34E-06	5.89E-06
SFP[1)]	kg N eq	30.3	25.6	28.4	29.5	21.1
AP[1)]	kg O_3 eq	1.25	1.03	1.14	1.18	0.87
EP[1)]	kg CFC-11 eq	0.13	0.098	0.11	0.11	0.088
ADPe*[3)]	kg Sb eq	5.55E-05	4.97E-05	5.67E-05	5.94E-05	3.22E-05
ADPf*[3)]	MJ, LHV	1975	1844	2062	2145	1269
RPRE*	MJ, LHV	87	78	89	93	43.9
RPRM*[4)]	MJ, LHV	8.93	8.81	10.1	10.5	4.81
NRPRE*	MJ, LHV	2158	1886	2104	2187	1444
NRPRM*[4)]	MJ, LHV	0.89	0.88	1.00	1.05	0.48
SM*[4)]	kg	111	39.9	45.6	47.7	90
RSF*[4)]	MJ, LHV	-	-	-	-	-
NRSF*[84)]	MJ, LHV	-	-	-	-	-
RE*[4)]	MJ, LHV	-	-	-	-	-
FW*[4)]	m^3	1.07	1.05	1.16	1.20	0.72
HWD*[4)]	kg	5.98E-03	5.68E-03	6.50E-03	6.80E-03	3.31E-03
NHWD*[4)]	kg	0.050	0.046	0.053	0.055	0.031
HLRW*[4) 5)]	m^3	1.52E-07	1.35E-07	1.35E-07	1.35E-07	1.54E-07
ILLRW*[4) 5)]	m^3	6.30E-07	1.02E-07	1.03E-07	1.03E-07	6.06E-07
CRU*[4)]	kg	0.077	0.076	0.086	0.090	0.041
MR*[4)]	kg	0.063	0.052	0.059	0.062	0.038
MER*[4)]	kg	-	-	-	-	-
EE*[4)]	MJ, LHV	-	-	-	-	-
GWP*$_{calc}$	kg CO_2	124	122	140	146	67

[1] "NA" = Non Air-Entrained.

Table 8: Production Stage EPD Results (A1 to A3 Total) – Niagara Ready Mix Concrete Mixes Continued

Impact category and inventory indicators	Unit	SuperEarth 20MPa R2 20mm	SuperEarth 25MPa NA[1] R3 20mm	SuperFlow 25MPa F2 20mm	SuperFlow 30MPa F1 20mm	SuperFlow 35MPa C1/A1 20mm
		A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total
GWP 100[1) 2)]	kg CO_2 eq	195	215	218	238	291
ODP[1)]	kg SO_2 eq	6.36E-06	7.08E-06	7.72E-06	8.52E-06	1.06E-05
SFP[1)]	kg N eq	22.1	24.0	25.4	27.5	32.7
AP[1)]	kg O_3 eq	0.90	0.97	1.05	1.14	1.36
EP[1)]	kg CFC-11 eq	0.086	0.093	0.11	0.12	0.14
ADPe*[3)]	kg Sb eq	3.79E-05	4.23E-05	4.32E-05	4.76E-05	5.90E-05
ADPf*[3)]	MJ, LHV	1442	1575	1595	1729	2076
RPRE*	MJ, LHV	52	57	67	74	95
RPRM*[4)]	MJ, LHV	6.23	6.95	6.73	7.42	9.22
NRPRE*	MJ, LHV	1554	1696	1777	1927	2314
NRPRM*[4)]	MJ, LHV	0.62	0.69	0.67	0.74	0.92
SM*[4)]	kg	65	72	101	112	140
RSF*[4)]	MJ, LHV	-	-	-	-	-
NRSF*[84)]	MJ, LHV	-	-	-	-	-
RE*[4)]	MJ, LHV	-	-	-	-	-
FW*[4)]	m^3	0.82	0.87	0.88	0.94	1.11
HWD*[4)]	kg	4.13E-03	4.61E-03	4.56E-03	5.03E-03	6.24E-03
NHWD*[4)]	kg	0.033	0.037	0.039	0.043	0.053
HLRW*[4) 5)]	m^3	1.43E-07	1.44E-07	1.52E-07	1.54E-07	1.59E-07
ILLRW*[4) 5)]	m^3	3.72E-07	4.01E-07	6.28E-07	6.87E-07	8.32E-07
CRU*[4)]	kg	0.053	0.060	0.058	0.064	0.079
MR*[4)]	kg	0.042	0.047	0.050	0.055	0.069
MER*[4)]	kg	-	-	-	-	-
EE*[4)]	MJ, LHV	-	-	-	-	-
GWP*$_{calc}$	kg CO_2	87	97	94	103	128

[1] "NA" = Non Air-Entrained.

Table 9: Production Stage EPD Results (A1 to A3 Total) – Niagara Ready Mix Concrete Mixes Continued

Impact category and inventory indicators	Unit	SuperEarth-Flow 35MPa C1/A1 20mm	SuperFlow+ 35MPa C1/A1 20mm	SuperEarth-Flow+ 35MPa C1/A1 20mm	SuperFlow 35MPA C1/A1 13.2mm	SuperEarth-Flow 35MPA C1/A1 13.2mm
		A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total
GWP 100[1) 2)]	kg CO_2 eq	234	287	231	293	79
ODP[1)]	kg SO_2 eq	1.02E-05	1.04E-05	1.01E-05	1.07E-05	3.46E-06
SFP[1)]	kg N eq	32.0	32.4	31.6	32.9	10.8
AP[1)]	kg O_3 eq	1.38	1.34	1.36	1.37	0.46
EP[1)]	kg CFC-11 eq	0.15	0.13	0.15	0.14	0.052
ADPe*[3)]	kg Sb eq	4.88E-05	5.90E-05	4.88E-05	5.96E-05	1.65E-05
ADPf*[3)]	MJ, LHV	1708	2046	1678	2087	574
RPRE*	MJ, LHV	78	80	63	94	25.8
RPRM*[4)]	MJ, LHV	6.13	9.22	6.13	9.31	2.08
NRPRE*	MJ, LHV	2137	2281	2104	2326	719
NRPRM*[4)]	MJ, LHV	0.61	0.92	0.61	0.93	0.21
SM*[4)]	kg	222	140	222	141	75
RSF*[4)]	MJ, LHV	-	-	-	-	-
NRSF*[84)]	MJ, LHV	-	-	-	-	-
RE*[4)]	MJ, LHV	-	-	-	-	-
FW*[4)]	m^3	0.87	1.06	0.83	1.11	0.29
HWD*[4)]	kg	4.54E-03	6.24E-03	4.54E-03	6.31E-03	1.54E-03
NHWD*[4)]	kg	0.042	0.052	0.041	0.054	0.014
HLRW*[4) 5)]	m^3	1.83E-07	1.59E-07	1.82E-07	1.60E-07	6.11E-08
ILLRW*[4) 5)]	m^3	1.55E-06	8.24E-07	1.54E-06	8.38E-07	5.24E-07
CRU*[4)]	kg	0.053	0.079	0.053	0.080	0.018
MR*[4)]	kg	0.065	0.069	0.065	0.069	0.022
MER*[4)]	kg	-	-	-	-	-
EE*[4)]	MJ, LHV	-	-	-	-	-
GWP*$_{calc}$	kg CO_2	85	128	85	129	28.9

Table 10: Production Stage EPD Results (A1 to A3 Total) – Niagara Ready Mix Concrete Mixes Continued

Impact category and inventory indicators	Unit	SuperFlow+ 35MPA C1/A1 13.2mm	SuperEarth-Flow+ 35MPA C1/A1 13.2mm	Silica Fume 35MPa C1/A1 20mm	SuperResist 30MPa F1 20mm	SCC 25MPa F2 20mm
		A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total
GWP 100[1) 2)]	kg CO_2 eq	296	248	269	228	268
ODP[1)]	kg SO_2 eq	1.09E-05	1.07E-05	9.77E-06	8.33E-06	9.95E-06
SFP[1)]	kg N eq	32.4	31.8	31.2	27.4	31.5
AP[1)]	kg O_3 eq	1.34	1.36	1.29	1.14	1.31
EP[1)]	kg CFC-11 eq	0.14	0.15	0.13	0.12	0.13
ADPe*[3)]	kg Sb eq	6.20E-05	5.35E-05	5.48E-05	4.53E-05	5.48E-05
ADPf*[3)]	MJ, LHV	2059	1753	1942	1672	1932
RPRE*	MJ, LHV	85	71	76	72	76
RPRM*[4)]	MJ, LHV	9.69	7.11	8.43	6.83	8.30
NRPRE*	MJ, LHV	2304	2158	2181	1899	2190
NRPRM*[4)]	MJ, LHV	0.97	0.71	0.84	0.68	0.83
SM*[4)]	kg	147	217	170	124	147
RSF*[4)]	MJ, LHV	-	-	-	-	-
NRSF*[84)]	MJ, LHV	-	-	-	-	-
RE*[4)]	MJ, LHV	-	-	-	-	-
FW*[4)]	m^3	1.10	0.91	1.02	0.90	1.02
HWD*[4)]	kg	6.56E-03	5.14E-03	5.74E-03	4.68E-03	5.69E-03
NHWD*[4)]	kg	0.055	0.046	0.048	0.040	0.048
HLRW*[4) 5)]	m^3	1.60E-07	1.80E-07	1.59E-07	1.58E-07	1.62E-07
ILLRW*[4) 5)]	m^3	8.62E-07	1.47E-06	8.40E-07	7.92E-07	9.22E-07
CRU*[4)]	kg	0.083	0.061	0.072	0.059	0.071
MR*[4)]	kg	0.072	0.069	0.064	0.054	0.065
MER*[4)]	kg	-	-	-	-	-
EE*[4)]	MJ, LHV	-	-	-	-	-
GWP^*_{calc}	kg CO_2	135	99	117	95	115

Table 11: Production Stage EPD Results (A1 to A3 Total) – Niagara Ready Mix Concrete Mixes Continued

Impact category and inventory indicators	Unit	SuperEarth 32MPA C2 Curb Machine	SuperSet 35MPa C1/A1 75% @ 24Hr 20mm	SuperTight 25MPa R2 20mm	35MPa C1/A1 Shotcrete 10mm	SuperShrink 35MPa C1/A1 20mm
		A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total
GWP 100[1) 2)]	kg CO_2 eq	251	374	214	307	294
ODP[1)]	kg SO_2 eq	9.00E-06	1.12E-05	7.55E-06	1.15E-05	1.06E-05
SFP[1)]	kg N eq	28.9	34.9	25.5	33.2	33.2
AP[1)]	kg O_3 eq	1.19	1.42	1.05	1.39	1.37
EP[1)]	kg CFC-11 eq	0.12	0.14	0.10	0.15	0.14
ADPe*[3)]	kg Sb eq	5.08E-05	7.08E-05	4.25E-05	6.42E-05	6.04E-05
ADPf*[3)]	MJ, LHV	1809	2609	1578	2131	2097
RPRE*	MJ, LHV	66	100	57	103	83
RPRM*[4)]	MJ, LHV	7.89	12.6	6.57	10.0	9.44
NRPRE*	MJ, LHV	2022	2651	1764	2384	2336
NRPRM*[4)]	MJ, LHV	0.79	1.26	0.66	1.00	0.94
SM*[4)]	kg	123	57	104	151	143
RSF*[4)]	MJ, LHV	-	-	-	-	-
NRSF*[84)]	MJ, LHV	-	-	-	-	-
RE*[4)]	MJ, LHV	-	-	-	-	-
FW*[4)]	m^3	0.93	1.50	0.85	1.18	1.09
HWD*[4)]	kg	5.36E-03	8.12E-03	4.46E-03	6.79E-03	6.39E-03
NHWD*[4)]	kg	0.044	0.070	0.037	0.058	0.053
HLRW*[4) 5)]	m^3	1.56E-07	1.35E-07	1.53E-07	1.61E-07	1.59E-07
ILLRW*[4) 5)]	m^3	7.42E-07	9.89E-08	6.47E-07	8.92E-07	8.40E-07
CRU*[4)]	kg	0.068	0.11	0.056	0.086	0.081
MR*[4)]	kg	0.059	0.074	0.050	0.075	0.070
MER*[4)]	kg	-	-	-	-	-
EE*[4)]	MJ, LHV	-	-	-	-	-
GWP^*_{calc}	kg CO_2	110	175	91	139	131

Table 12: Production Stage EPD Results (A1 to A3 Total) – Niagara Ready Mix Concrete Mixes Continued

Impact category and inventory indicators	Unit	SuperShrink+ 35MPa C1/A1 20mm	30MPa MTO General Use 20mm	30MPa MTO Form and Pump 13.2mm	35MPA MTO General Use 20mm	35MPa MTO Tall Wall 20mm
		A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total	A1-A3 Total
GWP 100[1) 2)]	kg CO_2 eq	282	263	288	291	281
ODP[1)]	kg SO_2 eq	1.05E-05	9.45E-06	1.06E-05	1.05E-05	1.01E-05
SFP[1)]	kg N eq	33.1	30.1	31.6	32.9	31.8
AP[1)]	kg O_3 eq	1.39	1.24	1.31	1.36	1.31
EP[1)]	kg CFC-11 eq	0.15	0.12	0.13	0.14	0.13
ADPe*[3)]	kg Sb eq	5.69E-05	5.36E-05	6.04E-05	5.96E-05	5.74E-05
ADPf*[3)]	MJ, LHV	2035	1892	2012	2076	2006
RPRE*	MJ, LHV	94	73	83	80	77
RPRM*[4)]	MJ, LHV	8.59	8.37	9.44	9.31	8.96
NRPRE*	MJ, LHV	2311	2109	2250	2313	2235
NRPRM*[4)]	MJ, LHV	0.86	0.83	0.94	0.93	0.89
SM*[4)]	kg	156	127	143	141	135
RSF*[4)]	MJ, LHV	-	-	-	-	-
NRSF*[84)]	MJ, LHV	-	-	-	-	-
RE*[4)]	MJ, LHV	-	-	-	-	-
FW*[4)]	m^3	1.08	1.00	1.09	1.07	1.02
HWD*[4)]	kg	5.89E-03	5.67E-03	6.39E-03	6.31E-03	6.07E-03
NHWD*[4)]	kg	0.051	0.047	0.053	0.052	0.051
HLRW*[4) 5)]	m^3	1.64E-07	1.56E-07	1.59E-07	1.59E-07	1.58E-07
ILLRW*[4) 5)]	m^3	9.74E-07	7.57E-07	8.40E-07	8.31E-07	8.02E-07
CRU*[4)]	kg	0.074	0.072	0.081	0.080	0.077
MR*[4)]	kg	0.068	0.062	0.070	0.069	0.067
MER*[4)]	kg	-	-	-	-	-
EE*[4)]	MJ, LHV	-	-	-	-	-
GWP*$_{calc}$	kg CO_2	119	116	131	129	125

Notes:

[1)] Calculated as per U.S EPA TRACI 2.1, v1.05, SimaPro v.9.5.0.2

[2)] GWP-100 excludes biogenic CO_2 removals and emissions associated with biobased products, including bio-based packaging. Biogenic carbon content of packaging materials is reported separately. 100-year time horizon GWP factors are provided by the IPCC 2013 Fifth Assessment Report (AR5), TRACI 2.1, v1.05.

[3)] Calculated as per CML-IA baseline, V4.7, SimaPro v.9.5.0.2. ADP_f is required in LEED v4.0/v4.1 MR2 Credit: Building Product Disclosure and Optimization – Environmental Product Declarations.

[4)] Calculated as per ACLCA ISO 21930 Guidance (15).

[5)] It should be noted that the foreground system (A3 manufacturing process) does not generate any high-level radioactive waste or low/intermediate level radioactive waste. Radioactive waste is primarily generated from electricity production. High level radioactive waste consists mainly of spent fuel from reactors. Low/intermediate level radioactive waste is primarily generated from routine facility maintenance and operation (3).

LCA Interpretation

The Extraction and Upstream Production module (A1) drives most of the potential environmental impacts. The A1 impacts are primarily driven by cement manufacturing and the associated emissions during the pyroprocessing of limestone in the production of clinker. Transportation (A2) is the second largest contributor to the Production stage EPD results, followed by Manufacturing (A3).

References

1. PRé Sustainability. SimaPro LCA Software. Version 9.5.0.2. 2024.

2. NSF International, Product Category Rule for Environmental Product Declarations. PCR for Concrete, V2.3. February 2025. months per PCRExt 2025-102.

3. ISO 21930:2017 Sustainability in buildings and civil engineering works - Core rules for environmental product declarations of construction products and services.

4. ISO 14020:2000 Environmental labels and declarations.

5. ISO 14040:2006/Amd 1:2020 Environmental Management – Life Cycle Assessment – Principles and Framework.

6. ISO 14044/Amd1:2017/Amd2:2020 Environmental Management – Life Cycle Assessment – Requirements and guidelines.

7. ISO 14025: 2006 Environmental labeling and declarations - Type III environmental declarations - Principles and procedures.

8. ASTM Program Operator Rules. Version: 8.0, Revised April 2020.

9. Athena Sustainable Materials Institute. A Cradle-to-Gate Life Cycle Assessment of Ready-Mixed Concrete Manufactured by Niagara Ready Mix. 2025.

10. ASTM C94/C94M-23 - Standard Specification for Ready-Mixed Concrete.

11. Amrize. Bath Cement Plant Environmental Product Declaration. October 2021. EPD 264. ASTM International.

12. St Mary's Cement. St. Mary's Cement Plant Environmental Product Declaration. November 2021. NRMCAEPD 20048.

13. Slag Cement Association. An Industry Average Environmental Product Declaration for Slag Cement. July 2021. EPD 245. ASTM International.

14. Euclid Canada Inc. A Product-Specific Cradle-to-Gate EPD for Euclid Canada Inc. Chemical Admixtures for Concrete. June 2024. EPD 729. ASTM International.

15. ACLCA 2019, Guidance to Calculating Non-LCIA Inventory Metrics in Accordance with ISO 21930:2017. The American Centre for Life Cycle Assessment. May, 2019.