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Statement of Verification

BREG EN EPD No.: 000510   Issue 02

This is to verify that the

Environmental Product Declaration

provided by:

Brewster Brothers Ltd

is in accordance with the requirements of:

EN 15804:2012+A2:2019

and

BRE Global Scheme Document SD207

This declaration is for:

One tonne of recycled sand/aggregate/6F5/ or silt/clay

BRE / Global Verified EPD

Company Address

Brewster Brothers Ltd
Drumshoreland Road
Pumpherston
Livingston
EH53 0LG
Scotland

BREWSTER BROTHERS
Rethinking our resources

F. Baker
Signed for BRE Global Ltd

Emma Baker
Operator

08 March 2024
Date of this Issue

06 July 2023
Date of First Issue

05 July 2028
Expiry Date

BRE / Global Verified EPD

ECO PLATFORM EPD VERIFIED

Environmental Product Declaration

EPD Number: 000510

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE Product Category Rules for Type III environmental product declaration of construction products to EN 15804+A2 PN 514 Rev 3.0

Commissioner of LCA study	LCA consultant/Tool
Brewster Brothers Ltd Drumshoreland Road Pumpherston Livingston EH53 0LG SCOTLAND	LCA Consultant: EcoReview Ireland LCA tool: Ecochain

Declared/Functional Unit	Applicability/Coverage
One tonne of recycled sand/aggregate/6F5/ or silt/clay	Product specific

EPD Type	Background database
Cradle to Gate with options	Ecoinvent v 3.6

Demonstration of Verification
CEN standard EN 15804 serves as the core PCR [a]

Independent verification of the declaration and data according to EN ISO 14025:2010	
☐ Internal	☒ External

(Where appropriate [b])Third party verifier: Roger Connick

a: Product category rules
b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Comparability
Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A2:2019. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A2:2019 for further guidance

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Information modules covered

Product			Construction		Use stage								End-of-life				Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building							
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction – Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, Recovery and/or Recycling potential
☑	☑	☑	☑	☑	☐	☐	☐	☐	☐	☐	☐	☑	☑	☑	☑	☑

Note: Ticks indicate the Information Modules declared.

Manufacturing site(s)

Brewster Brothers Ltd
Drumshoreland Road
Pumpherston
Livingston
EH53 0LG
SCOTLAND

Brewster Brothers Ltd
Gartshore Works
Main St
Twechar
Glasgow G65 9TW
SCOTLAND

Construction Product:

Product Description

The recycled materials are manufactured at the Brewster Brothers Recycling Facilities in Pumpherston, Livingston and Gartshore Works Twechar, Scotland. The material components are aggregates, sands and silt/clay arising from construction demolition wastes, and non-hazardous soil and granular excavation waste. The materials produced are aggregates, fine to coarse sands, Type 1 (a blend of sand and gravel), 6F5, and silt/clay for use in civil engineering sub-base materials, as set out below. Sands and aggregates can also be used in ready-mixed concrete.

Products arising from recycling:

- 6F5
- 0-2mm soft sand
- 0-4mm sharp sand
- 4-10mm gravel
- 10-20mm gravel
- 20-40mm gravel
- Type 1 (a blend of above sand and gravel)
- Filter cake silt/clay

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Technical Information

Property	Value, Unit
Properties of recycled sand/aggregates/Type 1/6F5 will vary according to type of material, particle size and particle shape	N/A
Properties of recycled silt/clay will vary according to type of material, particle size and particle shape	N/A

The recycled aggregates are manufactured to comply with BS EN 12620 'Aggregates for Concrete' and Specification for Highway Works, Series 500, 600 and 800 [6], and BS EN 13242 Aggregates for unbound and hydraulically bound materials for use in civil engineering work and road construction.

The Reference Service Life Is assumed to be equal to the lifetime of the structure in which the aggregate is used. The service life is expected to be greater than 60 years, and reasonably expected to be up to 100 years. Silt/clays used are considered to be returned to the soil system upon use, and therefore they are considered to have an indefinite service life, with no discernible end of life.

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Main Product Contents

Material/Chemical Input	%
Construction demolition wastes, and non-hazardous soil and granular excavation waste	100

Manufacturing Process

Construction demolition waste is delivered to the recycling plant. Larger sized feedstock is fed into a crusher, and the output of this is either set aside as the 6F5 product, or is fed into the main screening plant. After initial screening any material > 80mm in size is returned to the crusher, and material <80mm in sizes goes through a wash and screen process, where metals (for recycling) are also extracted using magnets. After the screening and washing process, the wetted materials are separated into a >4mm coarse fraction (gravel), and a <4mm fine fraction solution (sand, silt/ silt/clay aggregates and silt). The coarse material is then graded to create three different gravel products (4-10mm, 10-20mm, 20mm-40mm). The fine fraction is graded into two sand products (0-2mm soft sand, and 0-4mm sharp sand). Sands and graves can be blended to provide Type 1 material, if requested. A further process treats the washings to flocculate and settle out a silt/clay from the washings, which is then dewatered in a filter press. In addition to the silt/clay obtained from the washings, organics are removed via density separation (i.e. floated off) and further processed by air density separation into green waste (for composting) and plastics (for recycling or use in EfW).

The end-of-waste point of the raw material, i.e. the demolition waste, is reached at the point within the processing when the aggregates and silt/clay have met the technical requirement set out in the SEPA End of Waste guidance, and are dispatched from the site for a certain use.

Process flow diagram
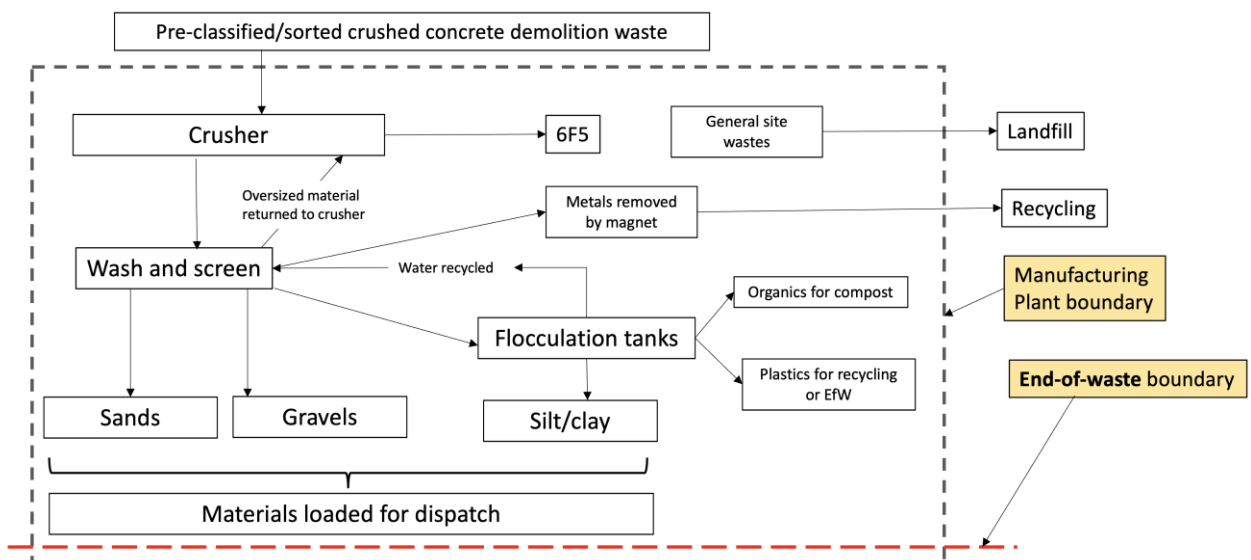
Construction Installation

There are zero impacts in the installation phase

Use Information

The use phase is not considered in this LCA

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End of Life

For the recycled sand/aggregate/Type 1/6F5, in the end of life phase, it is assumed that 90% of the material is recycled, and 10% goes to landfill. For the recycled silt/clay, it is assumed that silt/clays are neither recycled nor landfilled at the end of life, as once used, they form an intrinsic part of the natural soil system, permanently.

Life Cycle Assessment Calculation Rules

Declared / Functional unit description

One tonne of recycled sand/aggregate/Type 1/6F5, or silt/clay

System boundary

Cradle to Gate with options

Data sources, quality and allocation

Specific primary data has been taken from the Brewsters Brothers' production facility at Pumpherson, Livingston, Scotland. In accordance with EN 15804 +A2, data from the most recent full calendar year has been used, being 2022. Please note that no data was used in the LCA modelling from the Gartshore Works site, since it was being developed at the time of modelling. However, it is a replica site of the Pumpherson site with the same machinery, processes and product range.

The background dataset is taken from Ecoinvent v3.6 (2019). These datasets are complete within the context used and conform to the system boundary and criteria for the exclusion of inputs and outputs according to the requirements of EN 15804 +2.

100% of the sands/aggregates/Type 1/6F5 and silt/clay produced at the Brewsters Brothers' production sites are covered by this EPD.

Allocation of impacts to products are made on a mass basis, per tonne of product.

The dataset is representative for the production processes used in 2022, in the country of production, United Kingdom. The data Quality Level, according to Table E.1 of EN 15804 +A2, Annex E, is as follows:

Geographical representativeness: Very Good.
Technical representativeness: Very Good.
Time representativeness: Good.

Cut-off criteria

All relevant inputs and outputs – such as emissions, energy and materials - have been taken into account in this LCA. And in accordance with EN15804+A2:2019. The study covers at least 95% of the materials and energy per module and at least 99% of the total use of materials and energy of each unit process. Long term emissions have been excluded from the study.

End-of-Waste Criteria - The end of waste criteria for recycled aggregates from inert waste, as defined by the Scottish EPA, is applied. This at the point where the material is "dispatched from the site for a certain use". The general cut-off criteria used are 1 % of renewable and non-renewable primary energy usage and 1 % of the total mass input of that unit process. The total of neglected input flows per module, are a maximum of 5 % of energy usage and mass.

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LCA Results

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts – Sand/Aggregate/Type 1/6F5			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CFC11 eq	mol H^+ eq	kg $(PO_4)^{3-}$ eq
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	2.27E+00	2.27E+00	1.22E-03	8.08E-04	5.16E-07	6.52E-03	1.81E-05
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	4.81E+00	4.80E+00	2.58E-03	1.71E-03	1.09E-06	1.38E-02	3.84E-05
	Waste processing	C3	9.50E+00	9.45E+00	3.75E-02	1.38E-02	1.65E-06	7.63E-02	1.91E-04
	Disposal	C4	1.06E+00	1.05E+00	8.52E-03	4.70E-04	3.27E-07	8.99E-03	1.76E-05
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	1.17E+00	1.16E+00	2.43E-03	8.70E-04	1.94E-07	8.66E-03	2.54E-05

GWP-total = Global warming potential, total;
GWP-fossil = Global warming potential, fossil;
GWP-biogenic = Global warming potential, biogenic;
GWP-luluc = Global warming potential, land use and land use change;

ODP = Depletion potential of the stratospheric ozone layer;
AP = Acidification potential, accumulated exceedance; and
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

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LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts – Sand/Aggregate/Type 1/6F5			EP-marine	EP-terrestrial	POCP	ADP-mineral&metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m³ world eq deprived	disease incidence
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	1.29E-03	1.44E-02	5.53E-03	6.27E-05	3.43E+01	9.72E-02	1.44E-07
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	2.73E-03	3.05E-02	1.17E-02	1.33E-04	7.26E+01	2.05E-01	3.05E-07
	Waste processing	C3	2.82E-02	3.10E-01	8.61E-02	2.44E-05	1.43E+02	2.04E+00	8.85E-06
	Disposal	C4	3.04E-03	3.36E-02	9.69E-03	1.13E-05	2.48E+01	1.07E+00	1.72E-07
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	2.63E-03	2.96E-02	8.37E-03	3.70E-05	1.60E+01	6.06E+00	1.16E-07

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
EP-terrestrial = Eutrophication potential, accumulated exceedance;
POCP = Formation potential of tropospheric ozone;
ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;

ADP-fossil = Depletion potential of the stratospheric ozone layer;
WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
PM = Particulate matter.

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LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts – Sand/Aggregate/Type 1/6F5							
			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U^{235} eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	1.50E-01	2.77E+01	7.70E-10	2.91E-08	2.40E+01
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	3.17E-01	5.85E+01	1.63E-09	6.16E-08	5.08E+01
	Waste processing	C3	6.01E-01	1.26E+02	4.26E-09	8.58E-08	1.22E+02
	Disposal	C4	9.71E-02	1.83E+01	6.50E-10	1.36E-08	5.93E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	6.62E-02	1.91E+01	8.75E-10	2.04E-08	1.45E+01

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;

HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

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LCA Results (continued)

Parameters describing resource use, primary energy – Sand/Aggregate/Type 1/6F5			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	4.91E-01	0.00E+00	4.91E-01	3.64E+01	0.00E+00	3.64E+01
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.04E+00	0.00E+00	1.04E+00	7.71E+01	0.00E+00	7.71E+01
	Waste processing	C3	5.72E+00	0.00E+00	5.72E+00	1.52E+02	0.00E+00	1.52E+02
	Disposal	C4	4.09E-01	0.00E+00	4.09E-01	2.63E+01	0.00E+00	2.63E+01
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	5.55E-01	0.00E+00	5.55E-01	1.70E+01	0.00E+00	1.70E+01

PERE = Use of renewable primary energy excluding renewable primary energy used as raw materials;
PERM = Use of renewable primary energy resources used as raw materials;
PERT = Total use of renewable primary energy resources;

PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;
PENRM = Use of non-renewable primary energy resources used as raw materials;
PENRT = Total use of non-renewable primary energy resource

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Parameters describing resource use, secondary materials and fuels, use of water – Sand/Aggregate/Type 1/6F5			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m³
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	3.67E-03
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	7.77E-03
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	6.12E-02
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	2.60E-02
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	1.43E-01

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;

NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

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Other environmental information describing waste categories – Sand/Aggregate/Type 1/6F5			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	8.99E-05	1.67E+00	2.34E-04
	Construction	A5	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND
	Maintenance	B2	MND	MND	MND
	Repair	B3	MND	MND	MND
	Replacement	B4	MND	MND	MND
	Refurbishment	B5	MND	MND	MND
	Operational energy use	B6	MND	MND	MND
	Operational water use	B7	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	1.90E-04	3.53E+00	4.95E-04
	Waste processing	C3	2.73E-04	1.35E+02	8.13E-04
	Disposal	C4	3.80E-05	1.00E+02	1.48E-04
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	8.11E-05	5.70E-01	9.18E-05

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed

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LCA Results (continued)

Other environmental information describing output flows – at end of life – Sand/Aggregate/Type 1/6F5								
			CRU	MFR	MER	EE	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.90E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

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LCA Results

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Parameters describing environmental impacts – Silt/Clay			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CFC11 eq	mol H^+ eq	kg $(PO_4)^{3-}$ eq
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	2.27E+00	2.27E+00	1.22E-03	8.08E-04	5.16E-07	6.52E-03	1.81E-05
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

GWP-total = Global warming potential, total;
GWP-fossil = Global warming potential, fossil;
GWP-biogenic = Global warming potential, biogenic;
GWP-luluc = Global warming potential, land use and land use change;

ODP = Depletion potential of the stratospheric ozone layer;
AP = Acidification potential, accumulated exceedance; and
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

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LCA Results (continued)

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Parameters describing environmental impacts – Silt/Clay			EP-marine	EP-terrestrial	POCP	ADP-mineral&metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m³ world eq deprived	disease incidence
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	1.29E-03	1.44E-02	5.53E-03	6.27E-05	3.43E+01	9.72E-02	1.44E-07
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
EP-terrestrial = Eutrophication potential, accumulated exceedance;
POCP = Formation potential of tropospheric ozone;
ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;

ADP-fossil = Depletion potential of the stratospheric ozone layer;
WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
PM = Particulate matter.

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LCA Results (continued)

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Parameters describing environmental impacts – Silt/Clay							
			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U^{235} eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	1.50E-01	2.77E+01	7.70E-10	2.91E-08	2.40E+01
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;

HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

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LCA Results (continued)

Parameters describing resource use, primary energy – Silt/Clay								
			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	4.91E-01	0.00E+00	4.91E-01	3.64E+01	0.00E+00	3.64E+01
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

PERE = Use of renewable primary energy excluding renewable primary energy used as raw materials;
PERM = Use of renewable primary energy resources used as raw materials;
PERT = Total use of renewable primary energy resources;

PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials;
PENRM = Use of non-renewable primary energy resources used as raw materials;
PENRT = Total use of non-renewable primary energy resource

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LCA Results (continued)

Parameters describing resource use, secondary materials and fuels, use of water – Silt/Clay			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m³
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	3.67E-03
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	-0.00E+00

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;

NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

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LCA Results (continued)

Other environmental information describing waste categories – Silt/Clay			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	8.99E-05	1.67E+00	2.34E-04
	Construction	A5	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND
	Maintenance	B2	MND	MND	MND
	Repair	B3	MND	MND	MND
	Replacement	B4	MND	MND	MND
	Refurbishment	B5	MND	MND	MND
	Operational energy use	B6	MND	MND	MND
	Operational water use	B7	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed

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LCA Results (continued)

Other environmental information describing output flows – at end of life – Silt/Clay							
			CRU	MFR	MER	EE	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Construction process stage	Transport	A4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Construction	A5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use stage	Use	B1	MND	MND	MND	MND	MND	MND
	Maintenance	B2	MND	MND	MND	MND	MND	MND
	Repair	B3	MND	MND	MND	MND	MND	MND
	Replacement	B4	MND	MND	MND	MND	MND	MND
	Refurbishment	B5	MND	MND	MND	MND	MND	MND
	Operational energy use	B6	MND	MND	MND	MND	MND	MND
	Operational water use	B7	MND	MND	MND	MND	MND	MND
End of life	Deconstruction, demolition	C1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	C2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Waste processing	C3	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Disposal	C4	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential benefits and loads beyond the system boundaries	Reuse, recovery, recycling potential	D	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

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Scenarios and additional technical information

Scenarios and additional technical information – Sand/Aggregate/6F5

Scenario	Parameter	Units	Results
A4 – Transport to the building site	Transport of the Sand/Aggregate/6F5 from the Brewster recycling plants to construction sites		
	Fuel type / Vehicle type	Litres of diesel per km	0.1 litre
	Distance:	km	14.7
	Capacity utilisation (incl. empty returns)	%	60
	Bulk density of transported products	kg/m³	1,500
A5 – Installation of product on building site	Placement of Sand/Aggregate/6F5 on place on construction site. Construction/installation on site assumes no ancillary materials or additional energy is required, and there are no material installation losses.		
C1 to C4 End of life	It is assumed that for sands/gravels, 90% are recycled, and 10% go to landfill.		
	C1	tonne	0
	C2, transport to recycling or landfill	km	14.7
	C3, waste processing	tonne	0.90
	C4, landfill	tonne	0.10
Module D	As the raw material in this LCA is 100% recycled already, to avoid attributing the benefit of recycling twice (I.e. double counting), an environmental load is applied in module D in this LCA to represent the loss of recycled material to landfill disposal.		

Scenarios and additional technical information – Silt/Clay

Scenario	Parameter	Units	Results
A4 – Transport to the building site	Transport of the Silt/Clay from the Brewster recycling plants to construction sites		
	Fuel type / Vehicle type	Litres of diesel per km	0.1 litre
	Distance:	km	14.7
	Capacity utilisation (incl. empty returns)	%	60
	Bulk density of transported products	kg/m³	1,500
A5 – Installation in the building	Placement of Silt/Clay on place on construction site. Construction/installation on site assumes no ancillary materials or additional energy is required, and there are no material installation losses.		
C1 to C4 End of life	It is assumed that silt/clays are neither recycled nor landfilled at the end of life, as once used, they form an intrinsic part of the natural soil system, permanently.		
	C1	tonne	0

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Scenarios and additional technical information – Silt/Clay			
Scenario	Parameter	Units	Results
	C2	km	0
	C3	tonne	0
	C4	tonne	0
Module D	It is assumed that silt/clays are neither recycled nor landfilled at the end of life, as once used, they form an intrinsic part of the natural soil system, permanently. Thus there are no loads nor benefits beyond the system boundary.		

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