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| | |
|---|---|
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| Project Title: | Enviroglass PAS 2050 Product Footprint |
| Document Title: | Product Emissions Report |
| Date / Revision: | 29th May 2015 v1.1 |

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# Enviroglass
# Product Emissions Report

## Contents

# Enviroglass
# Product Emissions Report

## Version Record

| Version | Date | Revision | Author |
|---|---|---|---|
| v0.1 | 15/9/2014 | Initial version for review by Carbon Trust | JE |
| v1.0 | 25/5/15 | Draft final version incorporating FPX data | JE |
| v1.1 | 29/5/15 | Final vesion addressing CT Certifier comments<br>Footnotes relating to the materiality of packaging removed (pages 10 / 12)<br>References to reference (at 1.3), a certification date (at 1.4), and a product reference number (at 3) removed<br>Data added at 3.2 fro FPX<br>Adjustment to data for elctricity for cruching (page 12) corrected [CT email 8/4/15 refers] | JE |

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# Enviroglass
# Product Emissions Report

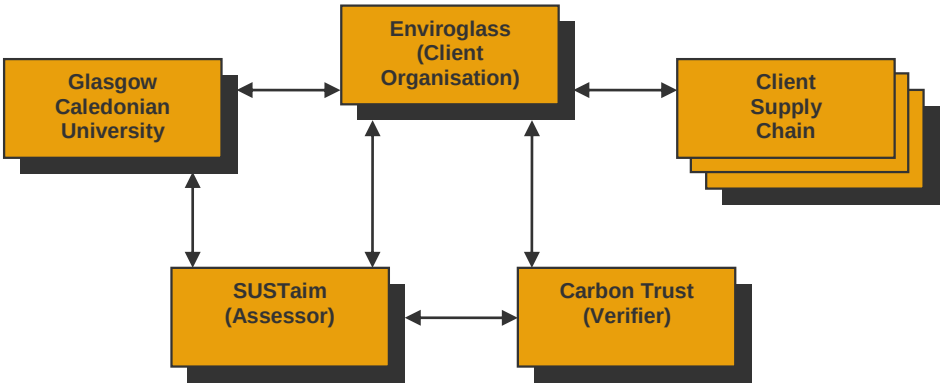
## Introduction

This report has been prepared for two purposes. For Glasgow Caledonian University (SUSTaim's client) as one of the outputs from their *Natural Energy Efficiency and Sustainability* (NEES) Project, and as the *Product Emission Report* for the footprinting of a glasscrete paving slab for Enviroglass who GCU have been supporting through the NEES Project.

The Carbon Trust *Code of Good Practice for Product Greenhouse Gas Emissions and Reduction Claims* requires that claims relating to the life cycle GHG emissions of products are supported by the publication of a 'Product Emissions Report' which provides context and explains the basis for the claim being made. The Product Emissions Report may cover one or more products. Where more than one product is covered, the report only needs to cover common references to several products once, and detail the information that is specific to each individual product.

The Product Emissions Report is required to provide an overview of the method, assumptions, limitations and results of the assessment for the product(s) it covers. The Report is also required be of sufficient detail to allow the reader to understand the complexities and trade-offs inherent in the assessment of the life cycle GHG emissions of products following the requirements set out in the Code.

### Project team




### Product







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# Enviroglass
# Product Emissions Report

## 1 Background Information

### 1.1 Name of the Company

**Enviroglass**, a Community Enterprise Company owned and operated by:

**Shetland Amenity Trust**
Garthspool
Lerwick
Shetland
ZE1 0NY

Telephone: +44 (0)1595 694688
Fax: +44 (0)1595 693956

www.enviroglass.co.uk
www.shetlandamenity.org

The Project Sponsor is: Sita Goudie, Environmental Improvement Officer

### 1.2 Specifications and/or other documents against which the company has been assessed for conformity

The company has been assessed for conformity against BSI PAS 2050:2010, and the Code of Good Practice for product GHG emissions and reductions claims.

### 1.3 Name and Accreditation Reference of the independent, third party verifier

The Carbon Trust has verified the company's conformity with the requirements of BSI PAS 2050:2010, and the Code of Good Practice for product GHG emissions and reductions claims.

## 2 Company policy in relation to climate change

### 2.1 Company policy and strategy

Action 1: Increase efficiency/lower impacts of production processes.

Action 2: Continue to work with local authority to offer best value glass recycling in the islands.

Action 3: Work with raw material suppliers to promote/increase recycling rates within the islands.

Action 4: Work with GCU to footprint paving products for use with promotions.

See appendix C for Enviroglass Environmental Policy

## 3 Product emissions declarations: Supporting information

### 3.1 Product(s) assessed in conformity with PAS 2050 on which claims are made

Enviroglass Kleber **14.56kg** per $1m^2$ of 50mm thick slab (OPC product)
Enviroglass Kleber **11.33kg** per $1m^2$ of 38mm thick slab (OPC product)
Enviroglass Quida **20.16kg** per $1m^2$ of 50mm thick slab (White Cement product)

Enviroglass Quida **15.84kg** per 1m$^2$ of 38mm thick slab (White Cement product)
Enviroglass Swarta, Roe, Rudda, Gruna, and Linga **16.89kg** per 1m$^2$ of 50mm thick slab (Coloured product)
Enviroglass Swarta, Roe, Rudda, Gruna, and Linga **13.24kg** per 1m$^2$ of 38mm thick slab (Coloured product)

### 3.2 Product emissions: Full life cycle GHG emissions for the product

*Most recent quantitative result of the assessment reported as a single figure, and taking account of all the phases of the product's life cycle, in compliance with the specification of the PAS 2050*

Kg per 1m$^2$ of 50mm thick slab

| | OPC product | White Cement product | Coloured product |
|---|---|---|---|
| Raw materials: | 13.6416 | 19.1688 | 15.9152 |
| Manufacturing: | 0.2784 | 0.3912 | 0.3248 |
| Distribution/ retail: | Na | Na | Na |
| Consumer use: | Na | Na | Na |
| Disposal: | Na | Na | Na |

Kg per 1m$^2$ of 38mm thick slab

| | OPC product | White Cement product | Coloured product |
|---|---|---|---|
| Raw materials: | 10.6134 | 15.0234 | 12.4852 |
| Manufacturing: | 0.4332 | 0.3066 | 0.2548 |
| Distribution/ retail: | Na | Na | Na |
| Consumer use: | Na | Na | Na |
| Disposal: | Na | Na | Na |

### 3.3 Optional: GHG emissions for individual phases of a product's life cycle

Not applicable

### 3.4 Optional: GHG emissions results based on different scenarios of life cycle management

Not applicable

### 3.5 Date of assessment for results specified in 3.2 - 3.4

September 2014

## 4 Product emissions reduction: Supporting information

### 4.1 Product(s) assessed in conformity with PAS 2050 on which claims are made

14.56kg per 1m$^2$ of 50mm thick slab (OPC product)
11.33kg per 1m$^2$ of 38mm thick slab (OPC product)
20.16kg per 1m$^2$ of 50mrem thick slab (White Cement product)
15.84kg per 1m$^2$ of 38mm thick slab (White Cement product)
16.89kg per 1m$^2$ of 50mm thick slab (Coloured product)
13.24kg per 1m$^2$ of 38mm thick slab (Coloured product)

### 4.2 Baseline emissions

No previous assessments have been conducted on this product, and no reduction claim is being made with this assessment. This assessment constitutes the baseline for this product.

### 4.3 Date of assessments of baseline stated in 4.1

Not applicable, since this is the baseline assessment.

### 4.4 Claimed GHG emission reduction for the product

None claimed, since this is the baseline assessment.

### 4.5 Time over which reduction has taken place

Not applicable, since this is the baseline assessment.

Description of drivers of reduction claims

### 4.6 Description of the high-level actions that have been implemented, or which are planned to be implemented, to reduce the life cycle GHG emissions of the product(s) listed in this report

Toward the end of the baseline year Enviroglass replaced their mechanical glass crushing plant with new cyclonic imploders, in conjunction with a new conveyor and sieve system. The glass imploders use significantly less energy than their predecessors, by the process of implosion rather than mechanical grinding. Insufficient data has been obtainable for aggregate crushing following the process change due to additional glass throughput to clear glass that was stockpiled during the process down time. Product emissions related to glass crushing have been used from the baseline year therefore, unmodified following the change.

### 4.7 Explanation of banked results

No results will be banked with this assessment.

### 4.8 Explanation of baseline updates

The baseline has been updated from the initial assessment in 2013 to adjust for:

A. A change to recycled glass processing in September 2013 which saw the replacement of mechanical glass crushing machinery with cyclonic glass imploders, associated sieves, and conveyors.

B. A change to the slab casting process in January 2014 which saw the replacement of electrically powered glasscrete mixing and single vibration with a load-all mixing machine and a semi-automated casting process based around a mechanised conveyor including mould preparation, matrix pouring, vibration (two stage), and de-moulding.

### 4.9 Explanation of impact of force majeure

Not applicable.

# 5 Boundaries and data: Supporting information

| *5.1 Product Reference Number(s)* | *5.2 Emissions assessment boundaries and the basis for the boundary decisions* | *5.3 Sources of secondary data which have been used for the assessment* |
|---|---|---|
| **Product references 1 and 2**: 1m$^2$ of 50mm thick glasscrete slab | PAS 2050: 2010 rules used to specify boundaries. Specific boundaries and categorisations are described below. | **General: Standard emissions factors and general inputs:**<br>• Enviroglass and supplier primary data.<br>• Carbon Label Company Emissions Factor Database v6.0, drawing on ecoinvent data v1.3, Dukes Digest 2006, International Energy Agency 2004, IPCC 2001 and Defra 2007, Continuing Survey of Road Goods Transport. |
| | **1 Raw material** includes recycled glass (including used glass bottle transport), cement, mineral dyes and other ingredients' and packaging materials' production. | **Raw materials**<br>• Enviroglass and Shetland Islands Council primary data, for transport, mixing, casting, and packaging materials.<br>• Data for mineral dyes from Carbon Trust.<br>• Carbon Label Company Emissions Factor Database v6.0. |
| | **2 Manufacturing** includes glass crushing, mixing and casting paving slabs; packaging. | **Production**<br>• Enviroglass and Shetland Islands Council primary data for all activity data.<br>• Carbon Label Company Emissions Factor Database v6.0. |
| | **3 Distribution** none | **Distribution**:<br>• Not applicable<br>**Retail Store**:<br>• Not applicable |
| | **4. Use** none | **Use:**<br>• Not applicable |
| | **5. Disposal** none | **Disposal:**<br>• Not applicable |

# 6 Disclaimer about uncertainty of results

The emissions figures provided in this report have been calculated in accordance with the requirements of the PAS 2050 method, using the primary and secondary sources of data specified above. Based on the PAS 2050 method of assessment we believe that our assessment has identified 95% of the likely GHG emissions associated with the full life cycle of the product(s) covered in this report. However, readers should be aware that even primary sources of data are estimates and are subject to variation over time, and the figures given in this report should be considered as our best estimates, based on reasonable cost of evaluation.

# Enviroglass
# Product Emissions Report

## Appendix A - Summary data for calculation

| | |
|---|---|
| Functional unit: | 1m$^2$ of glasscrete paving slab, cast to 38mm or 50mm thickness |
| Footprint basis: | Business to Business (cradle to gate)[1] |
| Base year:[2] | 2013 |
| Excluded Co-products: | High quality aggregate substitute |
| | Garden glass |
| | Shot-blast medium |
| | Other bespoke castings: |
| | Cast counter tops |
| | Fire places |
| | Sleepers |
| | Stepping stones |
| | Pin kerbs |

| **Variants (38 and 50mm)** | **OPC** | **White** | **Coloured** |
|---|---|---|---|
| Kleber (grey) | ✓ | | |
| Quida (near white) | | ✓ | |
| Swarta (dark grey) | | | ✓ |
| Roe (red) | | | ✓ |
| Rudda (terracotta) | | | ✓ |
| Gruna (green) | | | ✓ |
| Linga (purple) | | | ✓ |

| **Glasscrete batch matrix** | **OPC** | **White** | **Coloured** |
|---|---|---|---|
| Ordinary Portland Cement | 150kg | - | 150kg |
| White Cement | - | 150kg | - |
| Potable Water (108Ltr)[3] | 108kg | 108kg | 108kg |
| Glass aggregate (all in)[4] | 942kg | 942kg | 942kg |
| Dye (mineral pigment powder) | - | - | 8kg |
| Total per 0.4m$^3$ batch | 1200kg | 1200kg | 1208kg[5] |
| Wastage (spillage & cleaning)[6] | <1% | <1% | <1% |

| **Surface treatments** | | | |
|---|---|---|---|
| Smooth - unexposed | cast[7] | cast | cast |
| Smooth - exposed (etch) | 0.5Ltr/m$^2$ | 0.5Ltr/m$^2$ | 0.5Ltr/m$^2$ |
| Yorkstone | cast | cast | cast |
| Anti-slip (Kleber 50mm) | cast | - | - |

[1] The majority of sales of Enviroglass paving slabs during the baseline year were to retail customers from the factory (B2C). The footprint has been assessed as a B2B product however, for comparability with other paving slab footprints as agreed with Carbon Trust.

[2] A process change occurred (to glass crushing) in September 2013. Adjustments have been made to the contribution to the footprint of different electricity usage following the plant change by applying instead the electricity consumption for the 12 months prior to the change. A further change (to slab casting) occurred in January 2014. Adjustments have been made to the contribution of different electricity usage to the footprint following the plant change by applying instead the electricity consumption for the 6 months following to the change. There is no seasonal variability to production output or to the materials or energy used. There are no biogenic emissions.

[3] 1Ltr = 1kg at @ 4degC.

[4] *All in* aggregate includes fines from the crushing process in addition to larger aggregate, which replace sand in the glasscrete matrix.

[5] Variation in the batch quantity due to the addition of mineral dyes (<0.67%) are not considered to be material to the footprint.

[6] Mixing, pouring and cleaning wastage estimated at <10kg/batch, and not considered to be material to the footprint.

[7] Surface treatments achieved by casting use different mould surface profiles, and are not material to the footprint therefore.

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| Slab area per batch | OPC | White | Coloured |
|---|---|---|---|
| 38mm | 17m$^2$ | 17m$^2$ | 17m$^2$ |
| 50mm | 13.5m$^2$ | 13.5m$^2$ | 13.5m$^2$ |

| Annual castings[8] | OPC | White | Coloured | Non-slab |
|---|---|---|---|---|
| Mass | 2,828kg | 5,147kg | 15,818kg | 1,732kg |
| Area 38mm | 29.79m$^2$ | 69.84m$^2$ | 65.30m$^2$ | - |
| Area 50mm | 8.64m$^2$ | 3.04m$^2$ | 126.77m$^2$ | - |
| Production (by mass) | 11.08% | 20.16% | 61.97% | 6.79% |

| Annual product packaging materials for slabs | |
|---|---|
| 32Nr wooden pallets | scavenged from local businesses, recycled therefore |
| 0.672kg steel | 0.021kg steel banding per pallet (virgin steel EU) |
| 28.8kg polyethylene | 0.9kg shrink wrap per pallet (virgin LDPE film EU) |

| Packaging allocation[9] | OPC | White | Coloured | Non-slab |
|---|---|---|---|---|
| Allocation | 11.08% | 20.16% | 61.97% | 6.79% |
| Steel banding | 0.0745kg | 0.1355kg | 0.4164kg | 0.0456kg |
| Shrink wrap | 3.1910kg | 5.8061kg | 17.8474kg | 1.9555kg |

| Glass aggregate processed | | |
|---|---|---|
| 520.9Tonnes | Glass delivered to production site by SIC,[10] of which: | |
| 20.03Tonnes | 3.84% | Basic aggregate substitute (all in) used for castings |
| 159.5 | 30.62% | All In glass aggregate substitute sales |
| 4.6Tonnes | 0.88% | Garden glass sales |
| 120.15Tonnes | 23.06% | Shot blast medium sales |
| 175.78Tonnes | 33.76% | Processed glass held in stockpile |
| 40.84Tonnes | 7.84% | Production waste sent to EfW (mostly labels and caps) |
| Nil | 0% | Waste disposed of elsewhere |
| Nil | 0% | Unprocessed glass held in stockpile (balance of glass to site) |

| Production fuel allocations[11] | | |
|---|---|---|
| 1,200Ltr diesel[12] | 0% | aggregate drying, for aggregate co-products only - following the initial crushing stage, and disregarded therefore |
| 28.64Ltr diesel | 3.58% | of 800Ltr total used by production site vehicles, including occasional slab deliveries |
| 38kg propane | 0% | not used for cast products |

| Glass crushing process - electricity[13] |
|---|

[8] From 25,525kg of casting matrix produced in the 2013 baseline year.
[9] Packaging allocated to castings based on the total mass (kg) of each casting type produced
[10] Glass bottles collected by Shetland Islands Council and delivered to production site at no cost as a waste product
[11] Allocations based on the 3.84% of total glass used for casting, less the 6.79% of that use for non-slab castings i.e. 3.58%
[12] Aggregate drying is only used for co-products, which are excluded from the paving slab footprint (i.e. high quality aggregate substitute, garden glass, and shot-blast medium)

| | | |
|---|---|---|
| 0.01513Kwhr/kg (glass) electricity[14] | 3.58% | of the 8,464Kwhr total electricity used for all glass crushing, allocated to the 20.03T used for slab casting, over the 362 days until a process change in September 2013 (23.5766Kwhr/d average) |
| 0.01837Kwhr/kg (glass) electricity | 3.58% | adjusted allocation from 8,464Kwhr total electricity used for glass crushing over 362 days until a process change in September 2013, taken from 10,281Kwh usage for the 403 days following the change (25.5122Kwhr/d average) |
| **Slab casting process - electricity**[15] | | |
| 0.00184Kwhr/kg (glasscrete matrix) electricity | 93.21% | of the 397Kwhr total electricity used for all casting, allocated to the 20.03T of glass used for slab casting, over the 362 days until September 2013 (0.9076Kwhr/d average) |
| 0.07739Kwhr/kg (glasscrete matrix) electricity[16] | 93.21% | adjusted allocation from 1,047Kwhr total electricity used for slab casting, allocated to the 12.61T of glass used for slab casting, over 192 days following a casting process change in January 2014 (5.4531Kwhr/d average) |

| | | |
|---|---|---|
| **Transport** - road | | |
| 7,217Ltr diesel | | For kerbside glass collection (14,784.4km) |
| 2.49Ltr diesel | 3.58% | of total 68.42Ltr total used by waste contractor lorries for delivery of process waste to EfW plant – 11 number of trips in 2013 for 16.1km trips @ 4.25km/ltr diesel |

**Transport** - scheduled inshore ferry services[17], in addition to road transport

| Island collection[18] | Return ferry trips/yr | Glass load on return trip (kg) | Ltr/ hr | Total sailing time/yr (hr) | Fuel used (Ltr) | Fuel allocated to glass (Ltr)[19] | |
|---|---|---|---|---|---|---|---|
| Bressay | 17 | 259.56 | 42 | 5.44 | 228.48 | 2.5% | 5.71 |
| Whalsay | 22 | 904.17 | 135 | 22.00 | 2,970.00 | 14% | 415.80 |
| Yell[20] | 18 | 985.07 | 160 | 11.88 | 1,900.80 | 6.25% | 118.80 |
| Unst | 15 | 1,305.00 | 70 | 4.80 | 336.00 | 16.67% | 56.00 |
| Fetlar | 3 | 58.83 | 70 | 2.46 | 172.20 | 16.67% | 28.67 |
| Fair Isle | 8 | 450.00 | 55 | 42.56 | 2,340.80 | 0.75% | 17.56 |
| Skerries | 2 | 400.00 | 160 | 6.00 | 960.00 | 0.29% | 2.78 |
| | Total | 4,362.63 | | | | Total | 645.32 |

[13] Allocations based on the 3.84% of total glass used for casting, less the 6.79% of that use for non-slab castings i.e. 3.58%

[14] Includes electricity used for conveyors, sieves, fans, and dryer rotation involved in aggregate co-products, which cannot be disaggregated due to the lack of electricity sub-metering data.

[15] Allocations based on the total glass used for casting, less the 6.79% of that use for non-slab castings i.e. 93.21%

[16] A new semi-automated casting line was introduced in late February 2014 following installation, test, and commissioning from January 2014, during which time casting production was halted. The previous largely manual process used minimal electricity, for process lighting, a vibrating table, and occasional frost protection only. Although meter readings were estimated before this process change, the electricity allocated (0.9076Kwhr/d average) appears to be reasonable given the nature of the earlier process.

[17] Primary data from the ferry operator (SIC) has been used, since published emissions factors for ferries are for sea / ocean going vessels which would inflate the transport emissions allocated.

[18] For the Fair Isle and Skerries sailings the number of return ferry trips given is for the roadside glass collection container, which is located at the quayside and is loaded by the ferry's hoist. All other ferry sailings carry the roadside collection vehicle to the outer islands.

[19] The allocation of ferry emissions to glass is based on the percentage of the vessel's capacity that is taken by the glass container or the lorry, allowing for the total vehicles (PCU), passengers, and freight capacity of the vessel/s that operate the relevant route/s.

[20] Of the Yell sailings, 15 of the trips also collect from Unst, and 3 from Fetlar.

| Emissions factors applied | Factor | Units | Source |
|---|---|---|---|
| Ordinary Portland Cement | 0.8863192 | $kgCO_2e/kg$ | CEMEX Verified PAS2050:2011 |
| White Cement | 1.3855972 | $kgCO_2e/kg$ | Aalborg EPD verified |
| Water (potable) | 0 | | Footprint Expert 4.1 |
| Glass aggregate (all in) | *calculated* | $kgCO_2e/kg$ | Recycled - transport & processing |
| Dye (mineral pigment)[21] | 4.2 | $kgCO_2e/kg$ | From CT data (email 21/3/14) |
| Release agent[22] | - | | Excluded, as not material |
| Surface etching agent[23] | - | | Excluded, as not material |
| Surface sealer[24] | - | | Excluded, as not material |
| Casting frost inhibiter[25] | - | | Excluded, as not material |
| Polyethylene - packaging | 2.160 | $kgCO_2e/kg$ | Footprint Expert 4.1 LDPE film virgin EU |
| Steel banding - packaging | 2.890 | $kgCO_2e/kg$ | Footprint Expert 4.1 Virgin EU |
| Wood palette - packaging | - | | Recycled / reused |
| Diesel - road transport & aggregate drying | 0.35239 | $kgCO_2e/ltr$ | DEFRA average bio-fuel diesel 2013 |
| Marine grade oil - sea transport | 2.9343 | $kgCO_2e/ltr$ | DEFRA mineral gas oil 2013 |
| Electricity | 0.44548 | $kgCO_2e/Kwhr$ | DECC UK grid average 2013 |
| Waste - labels, caps, and material packaging | 0.021 | $kgCO_2e/kg$ | DECC Municipal waste to EfW combustion 2013 |

[21] It has not been possible to obtain emissions data for the Armcon mineral pigments that are used for matrix colouring. The powdered pigments (black, red, and brown) contain mostly iron oxide, with some calcium carbonate, carbon, manganese dioxide, and silica. An emissions factor of 4.2 $kgCO_2e/kg$ has been used on the advice of Carbon Trust for comparability with similar coloured slab products.

[22] *Armcon CRA 3* non oil-based release agent; applied in a spray mist in very small quantities, <1g per mould and not regarded as material to the footprint.

[23] *Armclean* surface etch, applied by sponge in very small quantities, and not regarded as material to the footprint.

[24] *Armseal* acrylate copolymer liquid sealant; surface applied with a dry cloth in very small quantities, and not regarded as material to the footprint.

[25] *Armset XL* accelerating admixture for Portland cement mixes, based on inorganic calcium salt. Used rarely - only in exceptionally cold weather, and not regarded as material to the footprint.

## Appendix B - Supply chain and data sources

| Supply/Service | Organisation | Contact details | Notes |
|---|---|---|---|
| Collects and delivers waste container glass from throughout Shetland | Shetland Islands Council | Gremista, Lerwick, Shetland, ZE1 9HH<br>Libby Clark 01595 745162 | Weighbridge records provided for glass before delivery. Records provided of vehicle distances travelled and fuel used. |
| Operates ferry services to outer Shetland islands | Shetland Islands Council | Gremista, Lerwick, Shetland, ZE1 9HH<br>Libby Clark 01595 745162 | Records provided of glass carried, sailing distances and fuel used. Data obtained for vessel load capacities. |
| Ordinary Portland Cement | CEMEX Rugby | CEMEX House, UK Operations, Evreux Way, Rugby, Warwickshire CV21 2DT<br>Paul Fletcher 01788 517319 | CEMEX Verified PAS2050:2011 footprint provided. |
| White Cement | CEMEX Rugby | CEMEX House, UK Operations, Evreux Way, Rugby, Warwickshire CV21 2DT<br>Paul Fletcher 01788 517319 | Aalborg EPD verified footprint provided. |
| Dyes, sealer, acid, release agent, moulds | Armcon | Armcon Business Park, London Road South, Poynton, Cheshire, SK12 1LQ<br>Mike Streton 01625 856685 | Emissions factor for mineral dyes applied from secondary data provided by Carbon Trust. |
| Continuous pallet cover (LDPE shrink-wrap) | Rajapack | Unit 1, Marston Gate, Ridgmont, Bedford, Bedfordshire, MK43 0YL<br>01525 289748 | |
| Water | Business stream | Scottish Water Business Stream Ltd, 7 Lochside View, Edinburgh, EH12 9DH<br>0845 602 8855 | Measured quantity per casting batch provided by Enviroglass. |
| Electricity | Scottish Hydro | SSE Energy Supply Ltd, 55 Vastern Road, Reading, Berkshire, RG1 8BU<br>0800 980 8752 | Readings provided by Enviroglass. Glass processing and slab casting metered separately. |
| Fuel for burner & onsite vehicles | Aberdeen Oils | Affric House, Beechwood Park, Inverness, IV2 3BW<br>01463 220223 | Delivery notes provided by Enviroglass. |

# Appendix C - Client Organisation, Environmental Policy

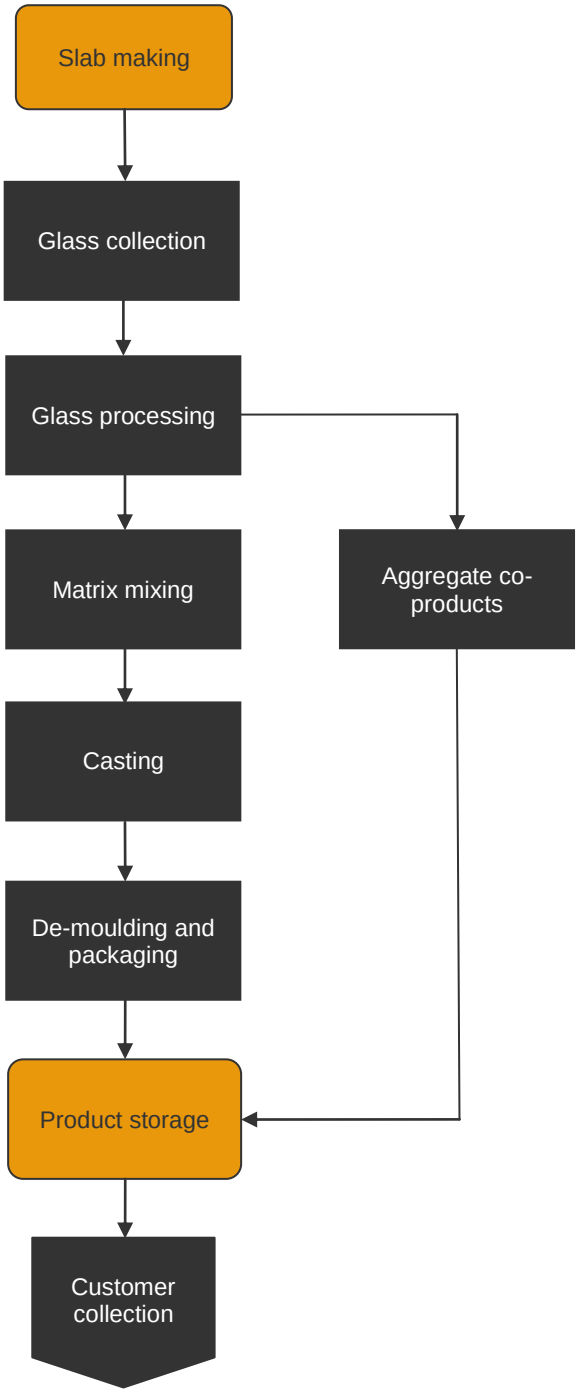
Shetland Amenity Trust is a champion for Shetland's Heritage and Culture - with a wide remit spanning Woodlands, Archaeology, Recycling and Waste Minimisation, Environmental Improvement, Interpretation, Biological Recording, Place Names, Historic Building Restoration and Holiday Accommodation, Museum & Archive provision and Environmental Education.

Shetland's environment is at the heart of Shetland Amenity Trust's activities and we are committed to sustainable practices in all our areas of work. This includes undertaking the following actions:

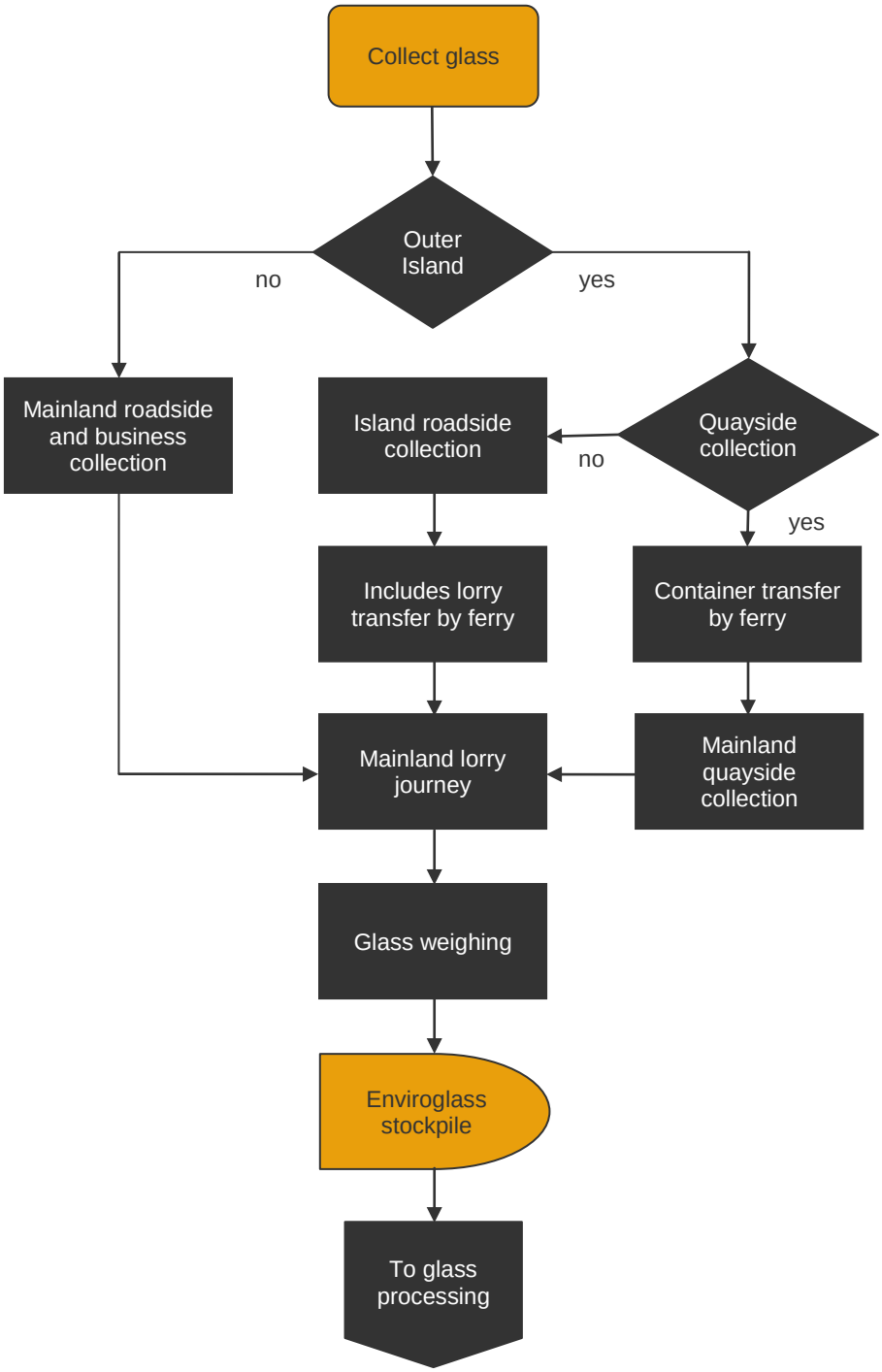
- We comply with the requirements of environmental legislation and approved codes of practice.
- We build environmental considerations into core decision making.
- We play an active role in several groups committed to the strategic protection of Shetland's heritage and culture.
- We are often the lead organisation in Shetland's many strategic environmental initiatives.
- We continuously seek to improve our environmental performance.
- We raise awareness, encourage participation and train employees in sustainable business practices.
- We liaise with the local community.
- We promote waste minimisation, reuse and recycling of waste wherever possible.
- We assist others to use resources and access/enjoy Shetland's heritage and culture in an environmentally sustainable way.
- We record, protect, plant and encourage natural flora and fauna.
- We are a member of several schemes, including Green Tourism Business and Tidy Business, and have received several awards in recognition of our environmental commitment and sustainable practices.

If you would like to help us please enquire about participation in our environmental schemes. If you are a visitor to the isles, ask for details of our responsible visitor charter. We are also happy to hear of any ways in which we could improve our service.

## Appendix D - Slab making process overview

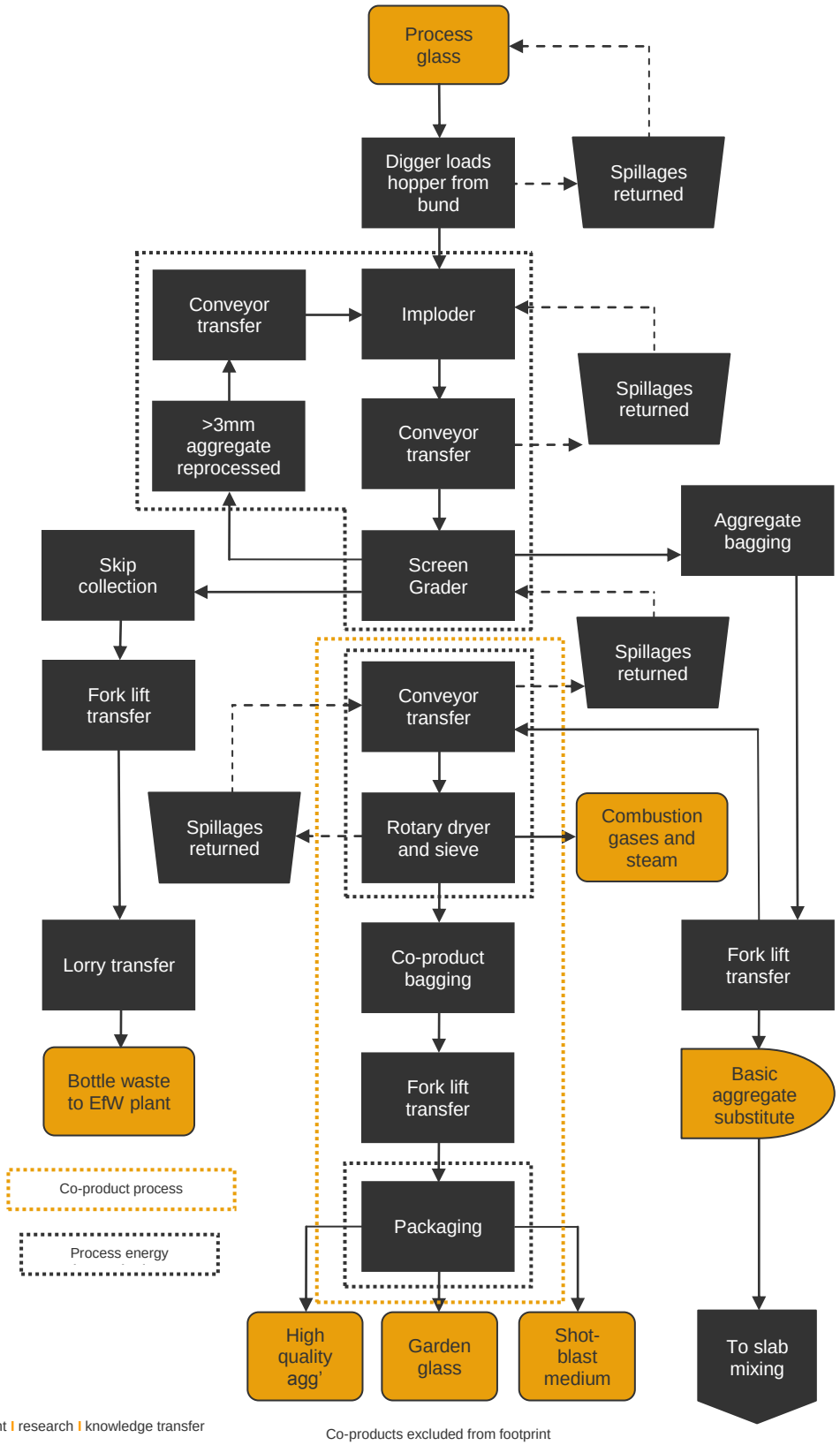


## Appendix E - Glass collection flow chart



# Enviroglass
# Product Emissions Report

## Appendix F - Glass process flow chart






Co-products excluded from footprint

# Enviroglass
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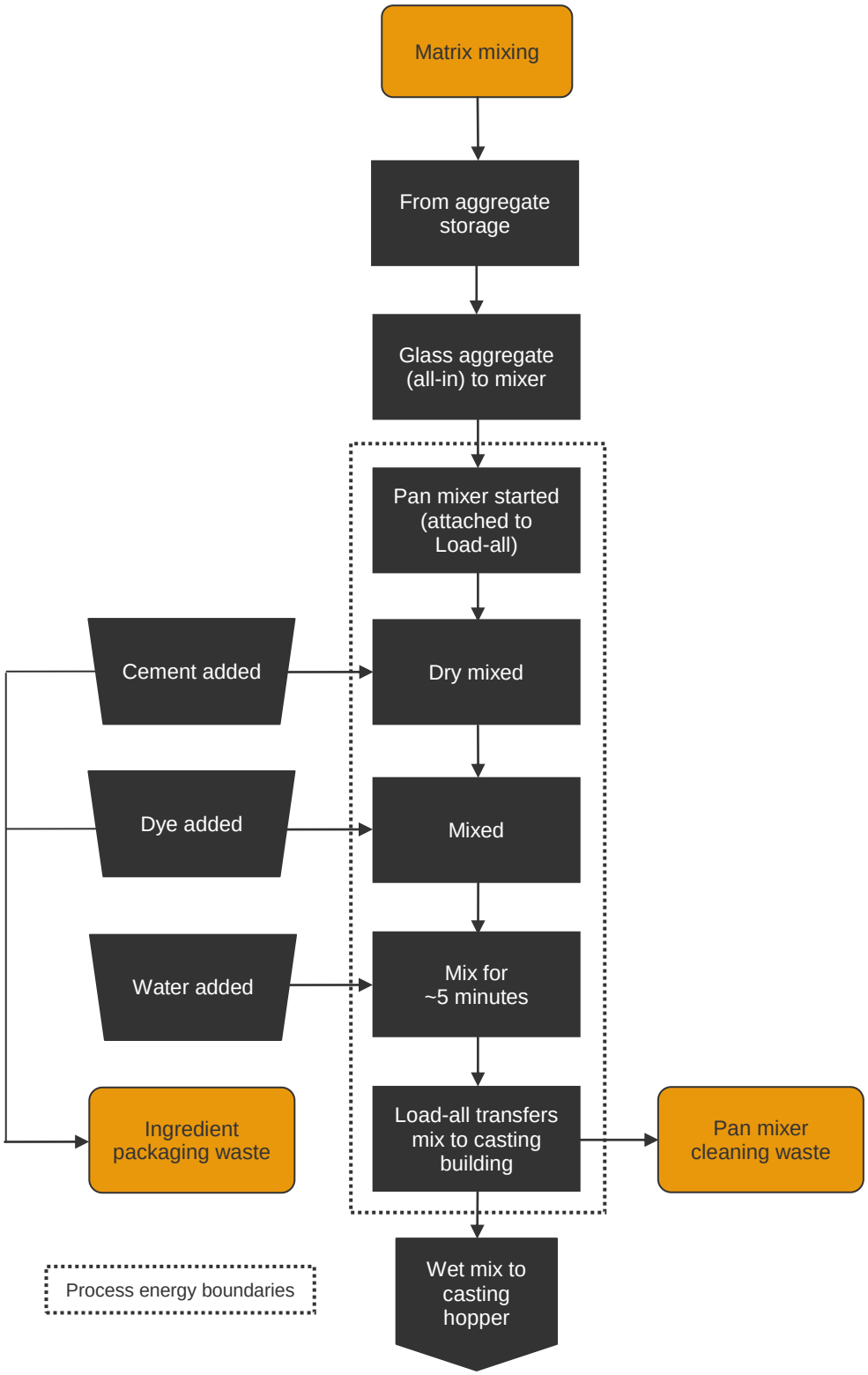
## Appendix G - Mixing process flow chart



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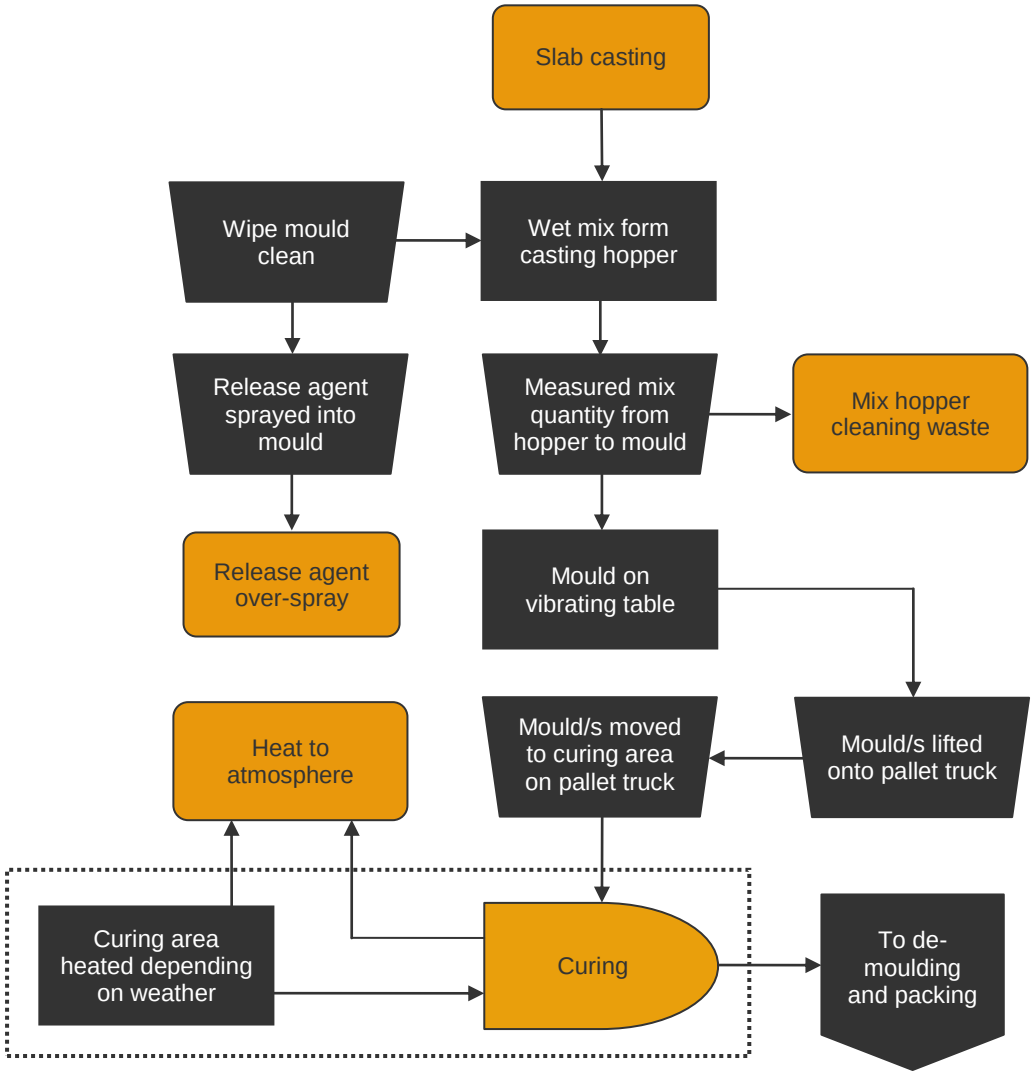
## Appendix H - Casting flow chart (baseline process)



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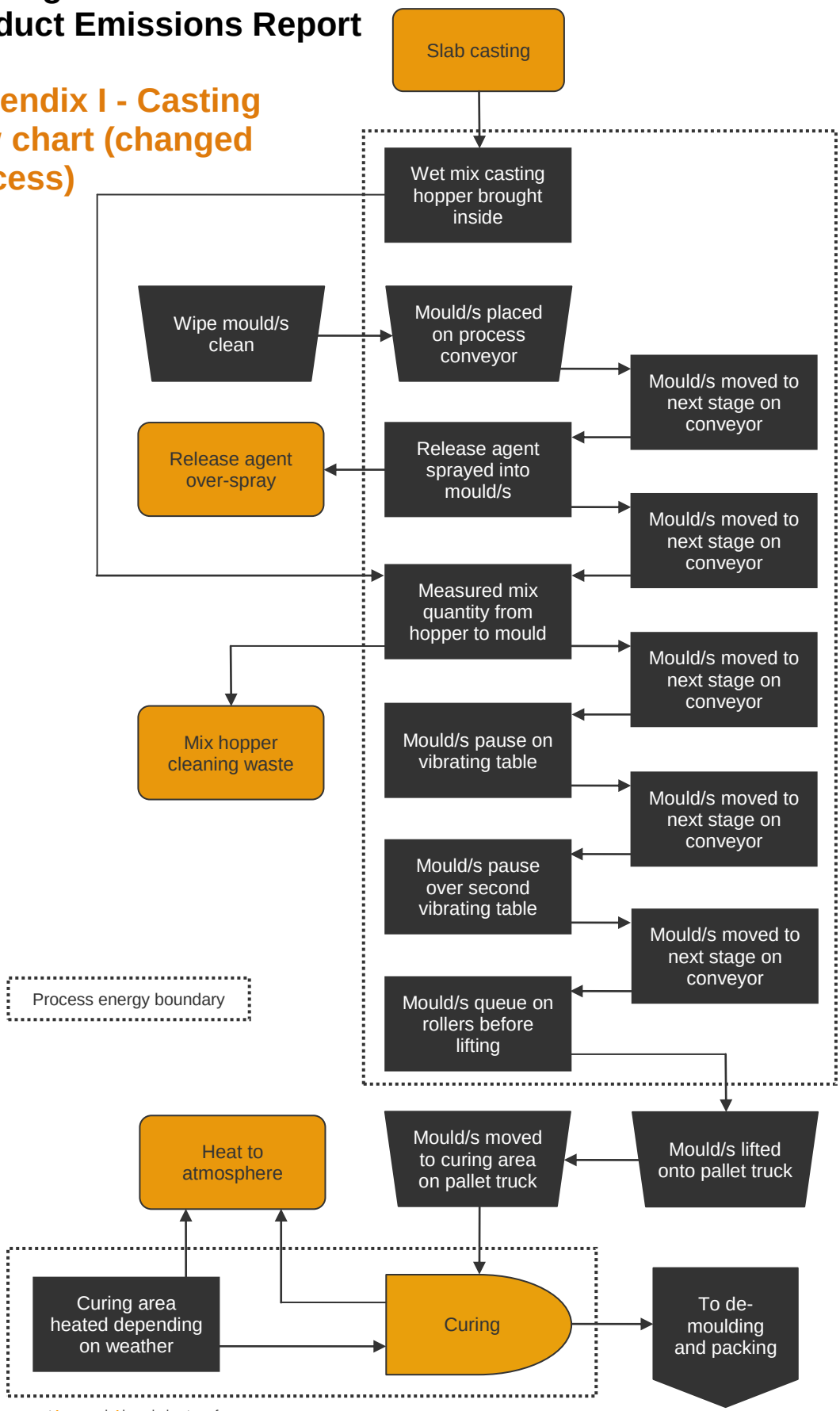
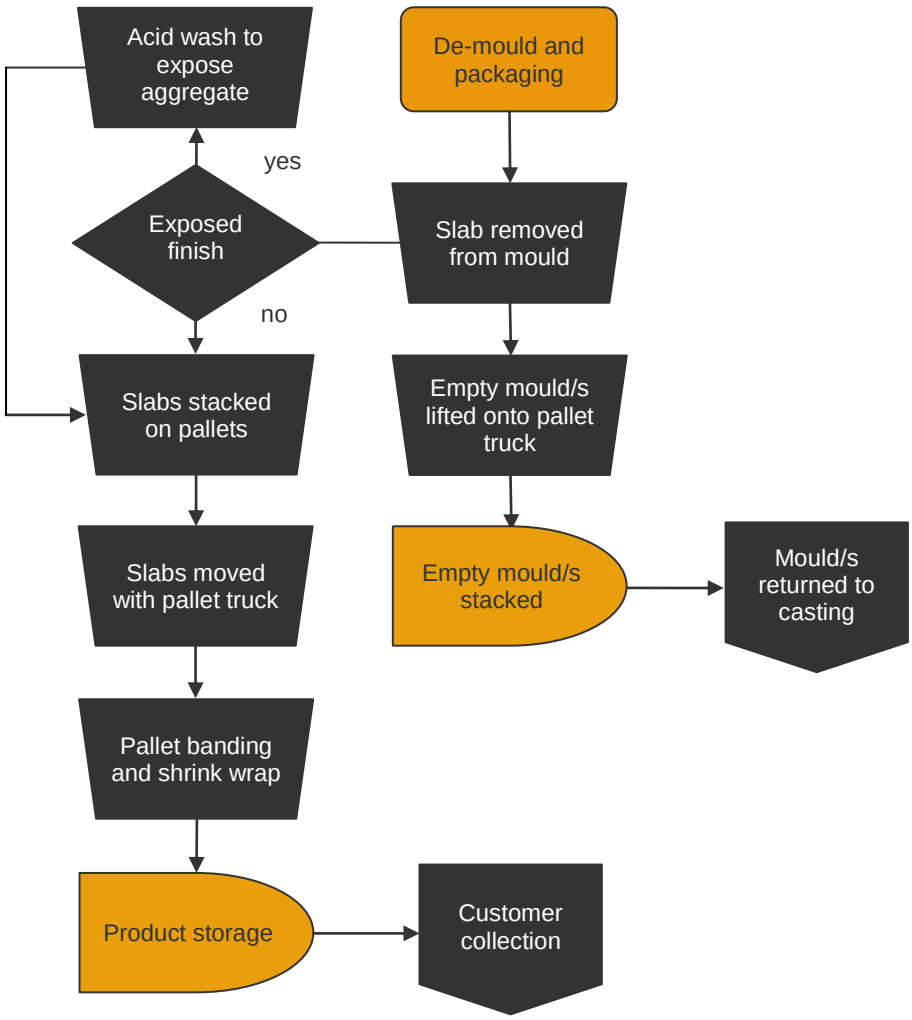
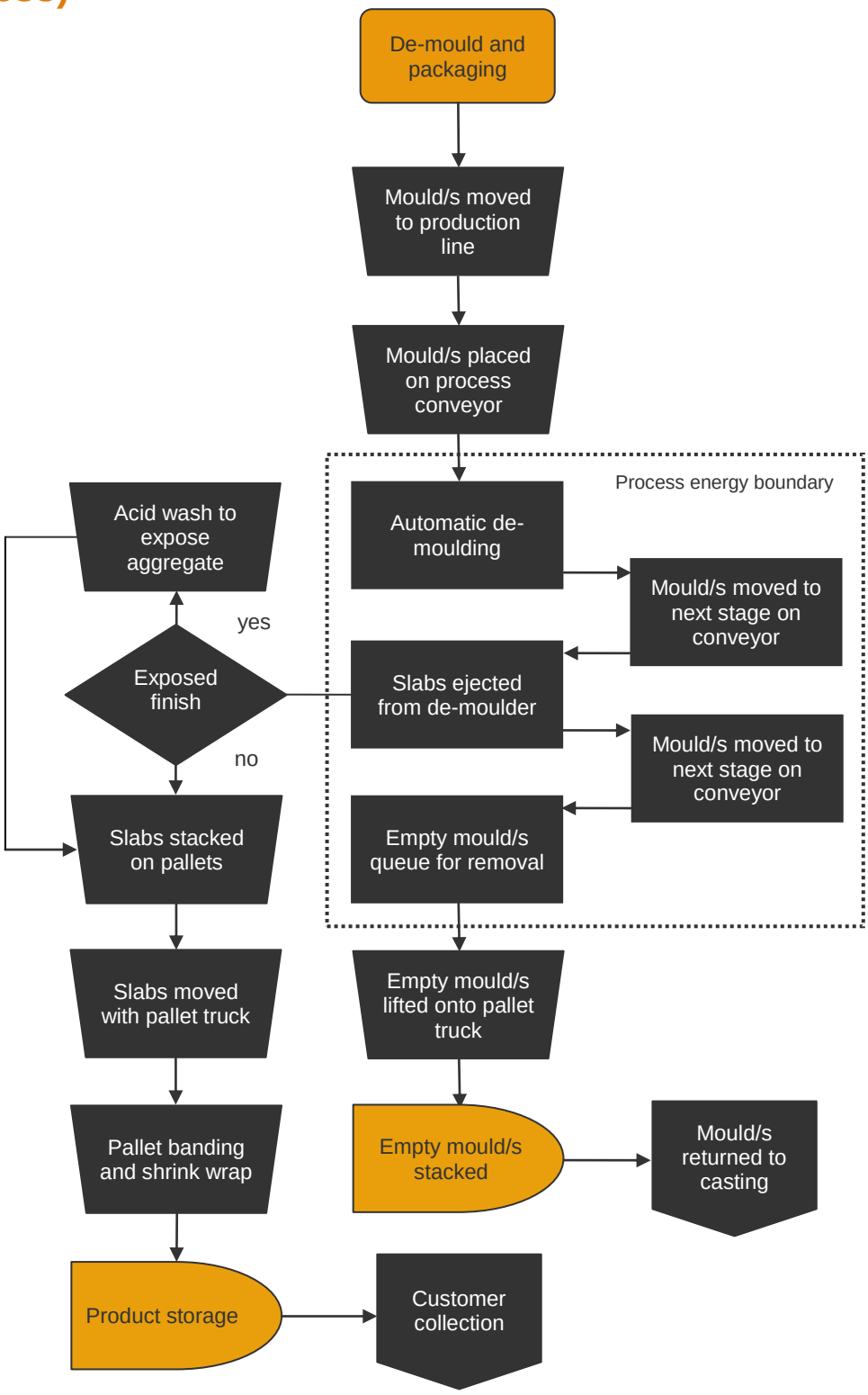
## Appendix I - Casting flow chart (changed process)



# Appendix J - De-mould and packaging flow chart (baseline process)



## Appendix J - De-mould and packaging flow chart (changed process)



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## Appendix K - Images

Roadside glass collection

Outer islands collection (Fetlar)

Glass stockpile - unprocessed

Crushing process overview

Kilworth (glasscrete) mixer

Casting and de-moulding overview