EUSTON TOWER

Strategy for Material Recovery

December 2023

British Land

The Euston Tower Material Recovery Strategy
Made for British Land by GXN

December 2023

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Introduction

1.1 Background and Purpose

1.1.1 General

The construction sector is known as the one third industry. Responsible for 37% of global energy-related carbon emissions and 33% of global waste, there are few industries more injurious to the planet than the construction industry.

In London it's even more influential. The construction industry consumes 400mt of material every year and generates 10mt of construction and demolition waste, comprising 54% of all London's waste.

It is clear that buildings and cities have a large role to play in addressing this damage. Extending the life of buildings and recovering and reusing materials at the end of their life can help reduce the demand for virgin materials and waste arising in the built environment.

This document is the Material Recovery Strategy, and forms part of the holistic circular economy strategy for the redevelopment of Euston Tower. It is an appendix to the Circular Economy Statement that forms part of the full planning application.

1.1.2 Purpose of this document

The purpose of this strategy document is to:

- Identify the materials in the existing building quantitatively and qualitatively
- Develop solutions that minimise waste, avoid carbon emissions, and generally maintain or increase the value/utility of materials
- Tell a circular economy story through the reuse and upcycling of materials from the existing tower
- Establish best in class routes for handling the deconstruction materials.

Figure 1.1 (Opposite) Statistics for construction materials and waste in London. Data from GLA's Design for a Circular Economy

400mt

materials consumed annually by built environment sector in London

54%

of total London waste

10mt

construction and demolition waste generated annually in London

1.2 Aspirations and Targets

1.2.1 A holistic approach

The vision for Euston Tower is to create a world leading science, technology and innovation building and public realm for Camden and the Knowledge Quarter that inspires, connects and creates opportunities for local people and businesses.

The disused tower represents an ideal opportunity to achieve this vision, by transforming the tower and its surrounds to be highly sustainable and fit for the future, while offering a number of benefits to its direct users and to the community.

A tiered approach to developing a holistic sustainability framework is proposed for the proposed development. Planning Policy and British Land's ambitious sustainability brief are used to establish a high quality baseline, including many aspirations that relate directly to the Circular Economy. This is underpinned and verified by targeting leading certification schemes, with the proposed development aspiring for BREEAM "Outstanding" certification, seeking credits across the materials and waste categories.

Best in class sustainable solutions are proposed throughout the scheme, cutting across all aspects of the Sustainability Brief, with a strong focus on solutions that avoid carbon emissions, reduce waste, and promote the circular economy. These concepts are held up as inspirations that guide decision making on the project.

Together the proposed development aims to be an exemplar of circular economy thinking and design for office buildings, both considering working with existing buildings and materials, and avoiding premature obsolescence and waste in the future.

1.2.2 Targets and KPIs

The key targets and KPIs relating to material recovery are outlined in Figure 1.3. As a response to planning policy, the proposed development is committed to the following targets to minimise waste in deconstruction and construction:

- Targeting 98% of demolition waste to be upcycled, recycled, or downcycled, exceeding policy target
- Targeting 96% of construction waste to be upcycled, recycled, or downcycled, exceeding policy target
- Targeting 95% of excavation waste to beneficial use, meeting policy target.

The project brief targets are highly ambitious, generally exceeding the planning policy targets with regard to circular economy. It is recognised that some of the targets will prove challenging to achieve, however, it is the intention of the proposed development to strive towards the project brief targets as far as technically, practically and economically possible.

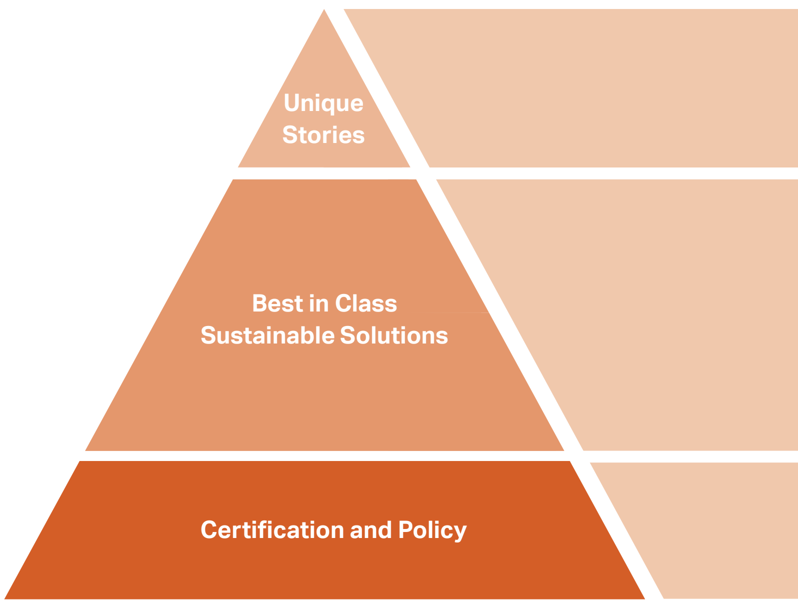
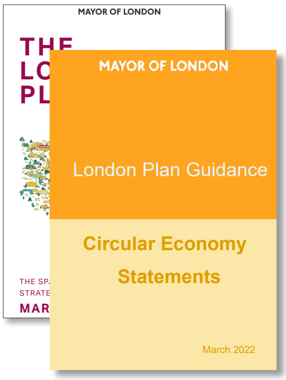
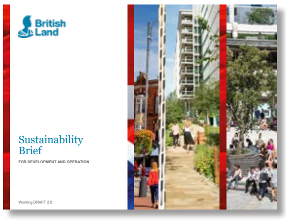


Figure 1.2 The proposed development's approach to delivering a sustainable building for now and the future

Circular Economy Targets for Material Recovery



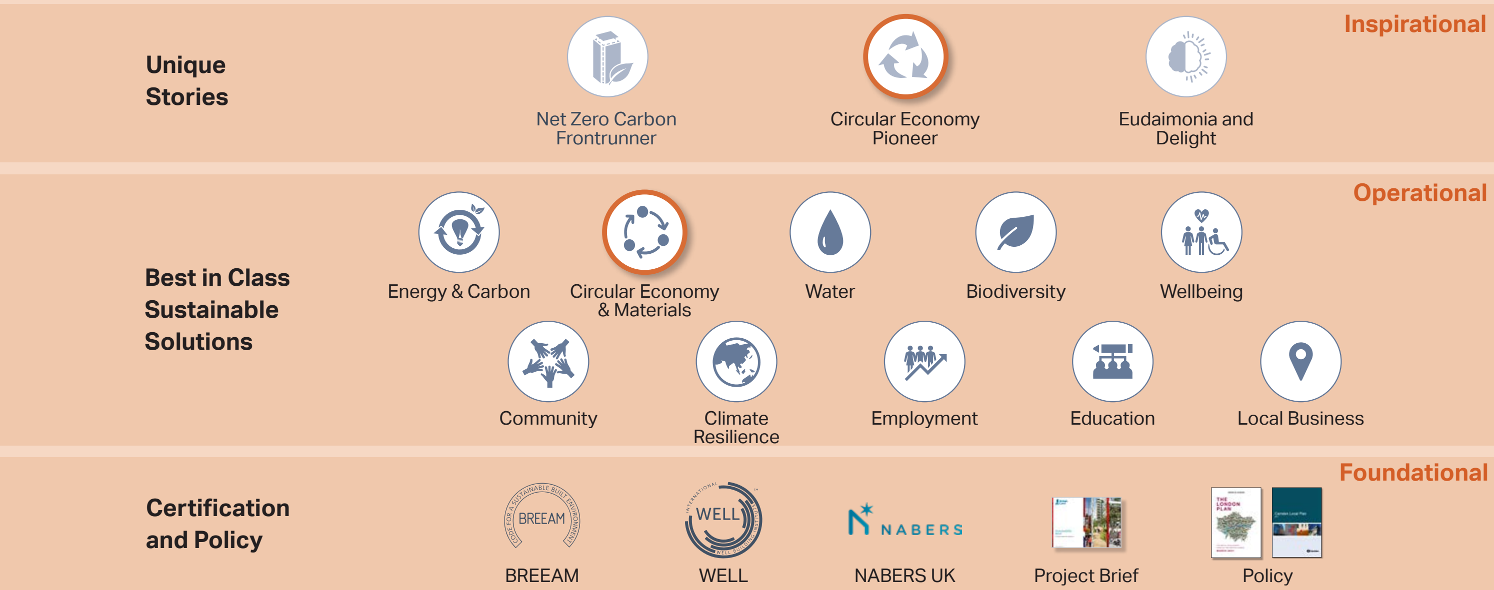


Policy SI 7 (and SI 8)
Reducing waste and supporting the circular economy
- Design for deconstruction and reuse of materials
- Divert waste from landfill (via reuse, recycling or recovery)
- Demolition and construction waste - 95% to reuse, recycling, recovery
- Excavation 95% 'beneficial use'
- Use efficient demolition equipment.

Policy SI 7
LPG Circular Economy Statement
- Circular Economy Statement (incl. pre-demolition audit, pre-redevelopment audit, and GLA Template)
- Follow GLA design approaches for existing and new buildings.

Project Brief
The British Land Sustainability Brief 2030
- Waste diverted from landfill and incineration to be minimum 100% (by mass)
- Waste recycled via upcycling to be minimum 90% (by mass)
- Waste recycled via downcycling to be maximum 10% (by mass)
- Report quantity of waste reused, composted or recycled.

Figure 1.3 *Circular economy targets relating to material recovery for the proposed development*



1.3 Approach

1.3.1 Integrated approach to carbon and materials

The overarching principles that have been developed for the material strategy are shown in Figure 1.4.

Carbon emissions and waste reduction
The first principle is an integrated approach to carbon and resources. A focus is put on the larger material fractions that can be reused or recycled, especially the materials that are still heavily reliant on raw material extraction and/or the material fractions with carbon-intensive production, such as concrete, glass, and aluminium. Decisions are made based on how best to minimise carbon emissions and avoid waste.

Material transparency and provenance
The second principle is to provide transparency around the process by being able to demonstrate where waste materials have gone, and how they've been reused/recycled. This entails mapping out and keeping close engagement with all links in the waste chain to capture the steps along the way. It enables the design team to make informed decisions to best support material reuse and recycling at the highest value.

Innovation for Greater London
The third principle is to drive innovation for Camden, Greater London, and beyond. This is achieved by exploring alternative routes for recovering materials, compared to what is currently established as standard practice. By innovating and prototyping approaches on some of difficult-to-handle materials, the proposed development seeks to help the industry accelerate its transition towards a circular economy. Key to the project team is sharing any learnings, and the findings from these prototype processes will be shared for others to build on.

Overarching Approaches for the Material Recovery Strategy

Material Transparency and Provenance

Being able to demonstrate where waste materials have gone, and how they've been reused / recycled

Carbon Emissions and Waste Reduction

Reducing carbon emissions and waste through strategic reuse / recycling of waste

Innovation for Greater London

Innovation and trialling to help the industry accelerate its transition towards a circular economy

Figure 1.4 Overarching approaches for material recovery strategy

1.3.2 A material reuse and recycling hierarchy

The material strategy hierarchy adopted for the proposed development can be seen in Figure 1.5. Here the "Reuse Some Stuff" layer is added to guide how to best take advantage of the existing resources on site.

The materials removed in the deconstruction have been thoroughly analysed and the guiding hierarchy has been used to establish the best end of life route for each material. The hierarchy preferences reuse, upcycling, and recycling, with downcycling as a last resort (save for landfill). Given the quality of the existing materials, the proposed development has focussed on establishing routes for the key deconstruction materials.

A definition of these pathways can be found in Figure 1.6.

1.3.3 Process for assessing end of life strategy

To evaluate strategies for the material end of life routes, a Pre-demolition Audit has been prepared, supported by the building surveys carried out for the Feasibility Study, and complemented by a Matterport scan of the existing building.

From the Pre-demolition Audit, the material quantities and conditions have been assessed, and from a map of local waste chains, standard and best practice material end of life routes are evaluated. The key recoverable products are identified through the these steps.

This process is detailed in Section 2 of this document.

Material Reuse and Recycling Hierarchy

Figure 1.5 Material reuse and recycling hierarchy

End of Life Route Definitions

Reuse

Reusing maintains value and functionality.
Direct or indirect reuse of products, components, or materials with little or no loss of value and minor interventions to the material. This entails checking, cleaning, repairing, and refurbishing whole items or parts.

Upcycling

Upcycling increases value.
Upcycling is transforming products, components, or materials into higher quality and/or higher value items. This entails transforming and re-manufacturing in ways that reduces demand for extracting raw materials from the environment.

Recycling

Recycling maintains value and quality.
Recycling is the process of recovering materials for the original or alternative purposes. The materials recovered feed back into the manufacturing process as crude feedstock.

Downcycling

Downcycling diminishes value and quality.
If a process results in an output of lower value and/or quality, this is referred to as downcycling. It is the least preferable (save for landfill) route, but can still be better than standard practice for certain products and materials.

Figure 1.6 End of life route definitions

Identifying End of Life Routes for Deconstruction Materials

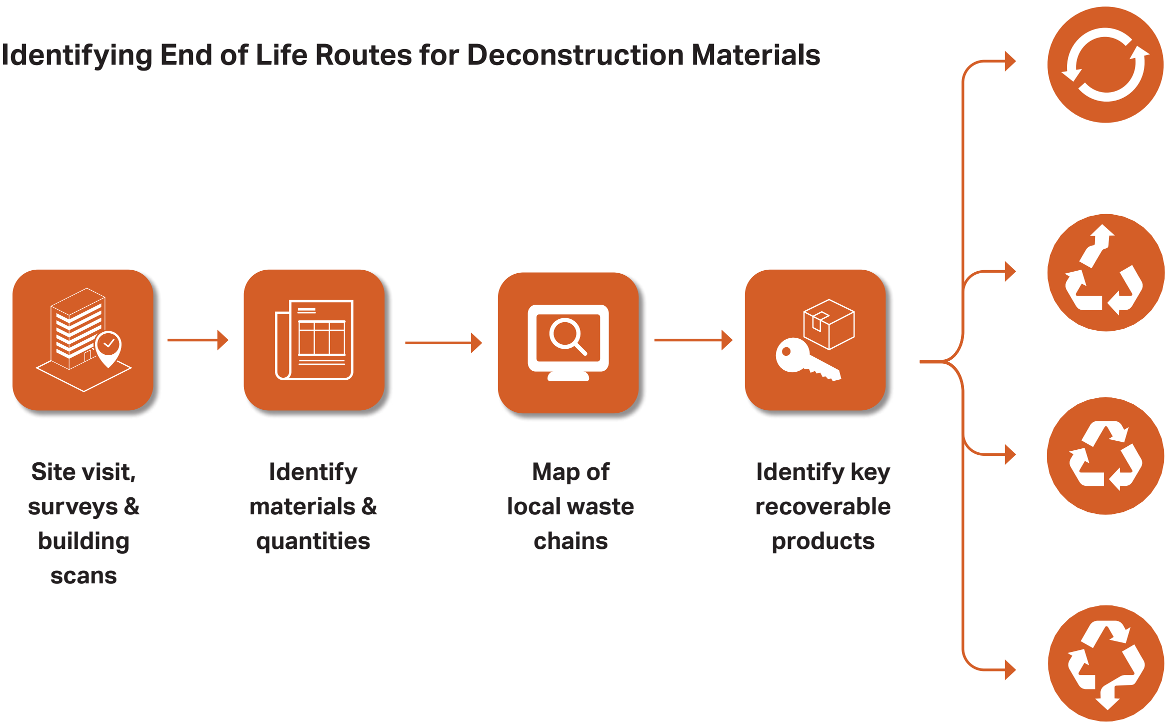


Figure 1.7 Process for identifying end of life routes for deconstruction materials

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Euston Tower

Holistic Approach

2.1 Surveys and Scans

2.3.1 General

Many of the original drawings and documentation for the existing building have been lost. Several intrusive and non-intrusive surveys have been conducted, along with several site visit surveys to provide information of the existing building.

These surveys, along with dedicated site visits, have been used as the basis for assessing material quantities and conditions for the Pre-demolition Audit, and act as a basis for this strategy.

2.3.2 Facade

A condition survey of the existing facade was conducted in 2018, compromising five abseil drops at select locations on the tower. Due to insufficiencies in the existing documentation, later site visit surveys were conducted to visually assess condition and better understand the existing systems build ups.

2.3.3 Structure

An extensive structural investigation was commissioned to Sandberg at the end of 2019 to test the reinforced concrete elements for concrete strength and condition, and to confirm the location of reinforcement and existing concrete cover. Testing covered 13 storeys including the ground floor and basement. In 2021, targeted excavation work was conducted under the existing tower's foundation to reveal the distribution, quality, and composition of the existing piles.

2.3.4 Others

A full asbestos survey was carried out in 2020 ahead of the strip out works, which identified some asbestos that needed to be removed, some of which was completed during the strip out works. The remaining asbestos located within risers and basement plant rooms will be removed upon full strip out works under any main works development.

A Matterport survey was commissioned in 2021 to capture a 3D photo-realistic scan of all levels of the existing tower. The scan was carried out by Plowman Craven. A survey model of the full tower was prepared along with the Matterport scans.

3D Scan of a Typical Floorplan using Matterport

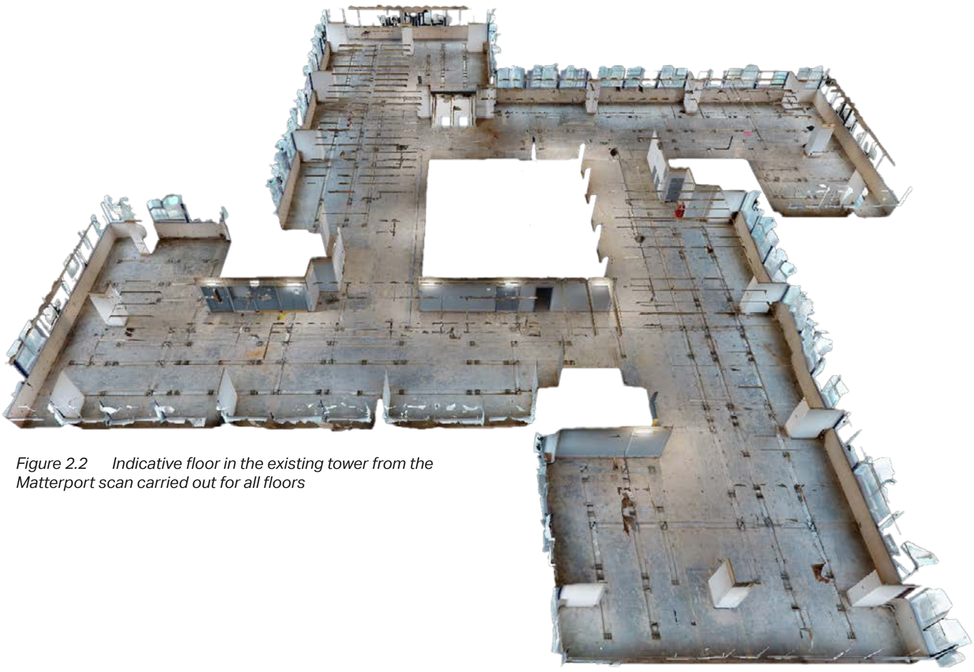

Figure 2.2 Indicative floor in the existing tower from the Matterport scan carried out for all floors

Structural Survey of Euston Tower

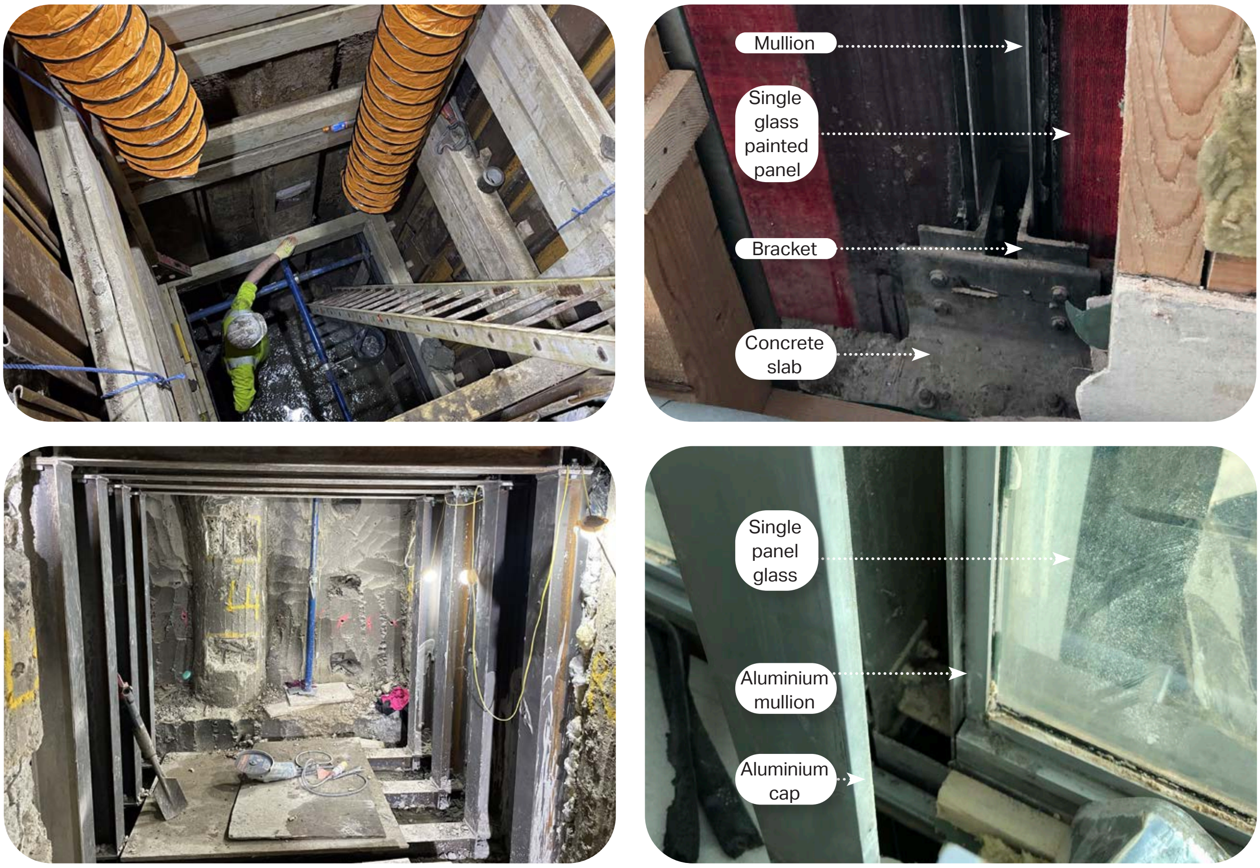

Figure 2.1 Images from structural survey of pile foundation (left) and facade survey (right)

2.2 Pre-demolition Audit

2.2.1 General

A Pre-demolition Audit (PDA) was conducted in accordance with GLA Circular Economy Statement Guidance. The audit was undertaken on the 6th of January 2022 and 10th February 2022 by Katherine Adams and Gilli Hobbs of Reusefully Ltd.

The PDA was carried out at a point in time when the degree of deconstruction of the existing tower was uncertain (prior to the Feasibility Study) and therefore initially accounted for all existing materials above ground. The quantities reflected in this report consider the extent of retention commensurate with the design proposal. Specifically retention of the existing substructure (14,369 tonnes of concrete and steel equivalent to 1,683 tCO_2e) as well as the central core (2,898 tonnes of concrete and steel equivalent to 552 tCO_2e).

2.2.2 Source data and assumptions

The PDA consisted of a non-invasive visual survey of the building along with the Matterport files, and facade and structural surveys. Certain areas were inaccessible, such as the ground floor units, and not all floors were visited. Hence, construction details and materials have been inferred based on typical practice. Survey notes and photographs were taken, and plans of the buildings were supplied (though not detailed floor layouts). In addition, demolition and original architectural and engineering drawings were used.

On the basis of information gathered and provided, an analysis of materials arising from a full demolition has been undertaken (noting that this is *not* the preferred option for the proposed development), with results reported in both weight and volume. The weight has been calculated using standard density figures for the materials identified. The Inventory of Carbon and Energy (ICE) database has been used for calculating the embodied carbon emissions related to the materials. The embodied carbon assumptions are listed in the PDA in Appendix A to the Circular Economy Statement.

2.2.3 Outputs from the PDA

The outputs of the PDA provided the team with the following:

- An understanding of the types and amounts of products and materials arising during the demolition
- Key parameters for products and elements to identify opportunities for reuse
- Advise on optimising the management of products and materials from the demolition, and recommendations to the design team and demolition contractor in line with the waste hierarchy i.e. maximise reuse and recycling and minimise waste to landfill
- Details of the embodied carbon of the materials resulting from possible demolition
- Technical advice on the reuse of products and recycling of material on site
- Data to help with populating the Resource Management Plan and in support of the BREEAM assessment and the Greater London Authority Circular Economy Statement
- Advise on targets for reuse and recycling for products and materials arising during the demolition.

Capturing and Documenting Existing Materials

PRE-DEMOLITION AUDIT REPORT

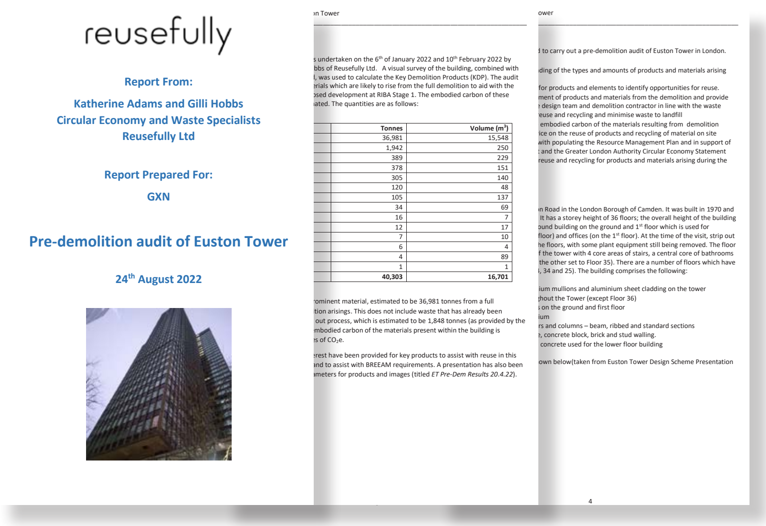

Figure 2.3 Pre-demolition Audit report. Refer to Appendix A of the Circular Economy Statement

REMOVED MATERIALS

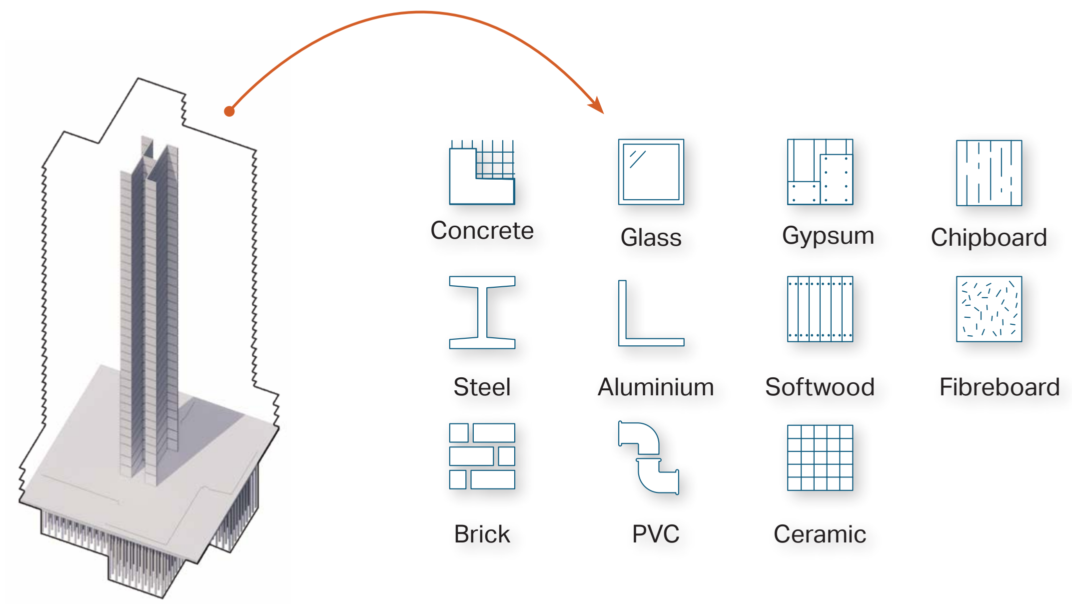

Figure 2.4 The central core and substructure are retained as part of the proposed development

2.2.4 Stripped out materials

The majority of the interior finishes, fit-out and services have already been stripped out of the existing building.

Information has been provided by the contractor, on the amount and type of waste that has been produced from the strip out process to December 2021. This has been logged on to BRE's SmartWaste system and this is captured in the Pre-demolition Audit.

As of the 21st of December 2021, 1,848 tonnes of waste had been produced and besides the 0.06 tonnes sent to disposal, the remainder (100%) has been diverted from landfill. The quantities of the materials along with the route of treatment have been captured. Figure 2.6 shows the destinations of the stripped out materials.

Out of the stripped materials, 4% were reused. This accounts for the existing carpets that were reused by community organisations via Globechain.

Most of the materials were sent to waste transfer stations such as Westminster Waste, Suez, and Powerday for further sorting or recycling.

Other routes included the following:

- Metals (41%) were sent directly to metal recycling sites
- Concrete was also sent directly for recycling
- Plasterboard/gypsum and tiles/ceramics (17%) were sent to recovery
- Mixed construction waste and timber (39%) was sent to energy recovery.

Figure 2.5 Stripped out materials end of life route (totals in tonnes)

Stripped out Material Quantities and Waste Destinations

Material	Quantity (tonnes)	Company
Oils	1	MAG Properties Services Ltd
Mixed Construction & Demolition waste	526.5	Powerday Plc, Suez Recycling & Recovery South East Ltd, Westminster Waste
Plasterboard/Gypsum	222.2	Powerday Plc, Suez Recycling & Recovery South East Ltd, Westminster Waste
Timber	192.9	Powerday Plc, Suez Recycling & Recovery South East Ltd, Westminster Waste
Carpets	69.5	CCORRN (Cambridgeshire Community Reuse and Recycling Network) via Globechain, Hawa Trust via Globechain
Inert	30.0	Recycled Material Supplies Ltd - Sunshine Wharf
Floor Coverings (soft)	26.9	European Metal Recycling – Willesden, Worcester Recycling Croydon Ltd
Tiles & Ceramics	23.8	MSK Waste Management & Recycling Ltd
Concrete	15.0	Recycled Material Supplies Ltd - Sunshine Wharf
Metals	739.5	European Metal Recycling,Southwark Metals Ltd, Suez Recycling & Recovery South East, Westminster Waste
Refrigerants	0.37	MAG Properties Services Ltd

Figure 2.6 *Summary of stripped out materials quantities and waste destinations*

2.2.5 Key demolition products (KDPs)

Overall, there is an estimated 37,420 tonnes (15,540 m^3) of material arising from the deconstruction[1].

The following are the largest key demolition products (KDPs) by mass, as shown in Figure 2.7 and Figure 2.8:

- Concrete 34,237 tonnes
- Steel 1,806 tonnes
- Brick 389 tonnes
- Glass 378 tonnes
- Aluminium 305 tonnes
- PVC 120 tonnes
- Gypsum 105 tonnes
- Softwood 34 tonnes.

When considered by volume, the following are the largest KDPs:

- Concrete 14,405 m^3
- Steel 233 m^3
- Brick 229 m^3
- Glass 151 m^3
- Aluminium 140 m^3
- Gypsum 137 m^3
- Insulation 89 m^3.

The top five materials in the existing building make up 98% of all existing materials (by mass).

The materials are quantified in historical embodied carbon. This approach has been taken to provide a focus on not just the largest material fractions by mass, but also the material streams with largest carbon emissions impact, and therefore the important new material production streams to address.

Each of these KDPs are described in Section 3 detailing their arisings, likely management options, and next steps (where applicable) to support reuse and/or higher value recycling.

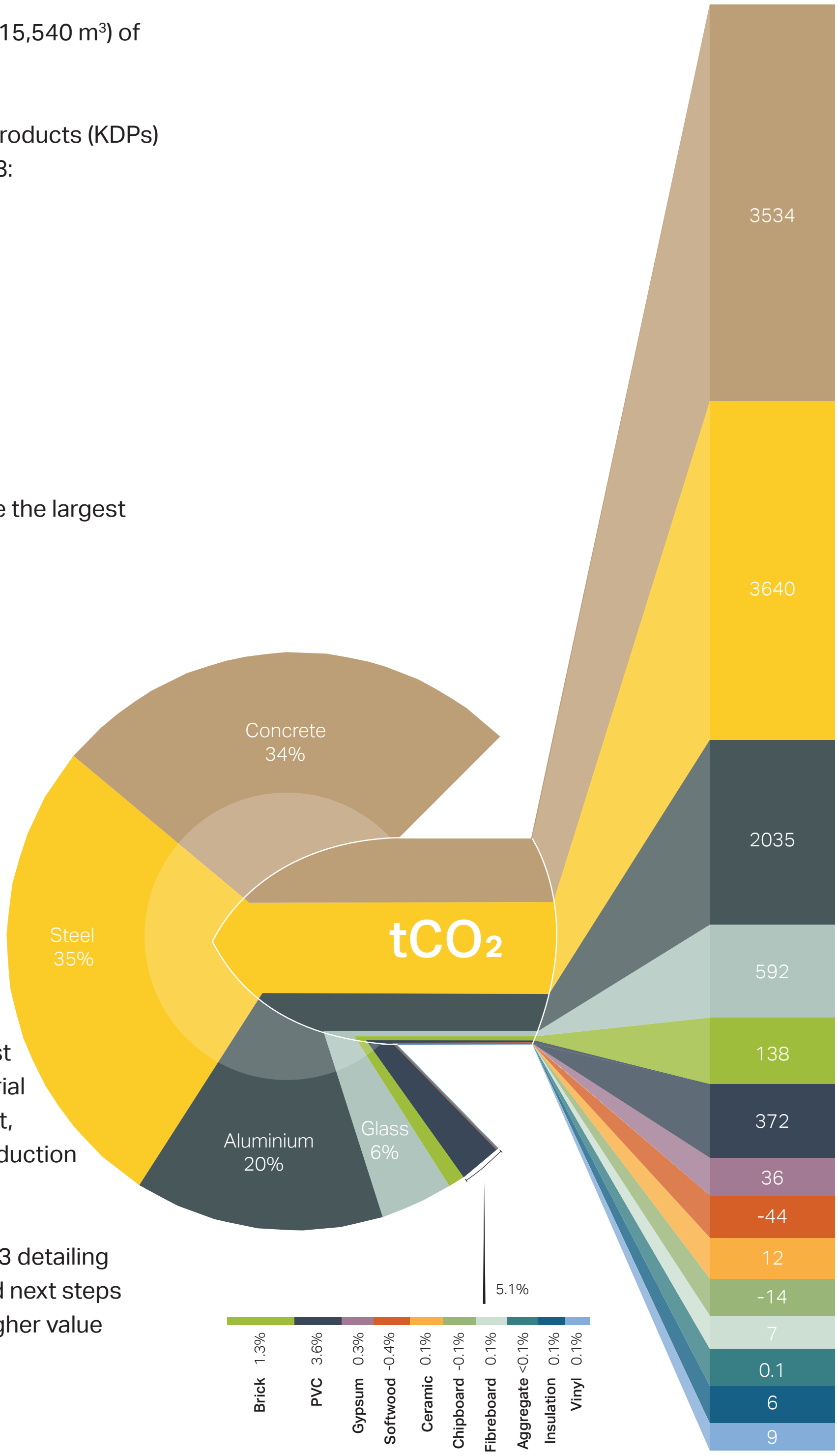

Figure 2.7 Key demolition products (tonnes CO_2e)

[1] *Figures considering retention of the existing central core in the proposed development.*

Overview of Materials, Products, and Quantities

Concrete

Volume: 14,405 m^3
Weight: 34,237 t
Embodied carbon: 3,534 tCO₂e

	Volume	Weight	Impact		Volume	Weight	Impact
Floors slab	5,064 m^3	12,153 t	1,252 tCO_2	Staircase	477 m^3	1,146 t	118 tCO_2
Columns	1,815 m^3	4,355 t	449 tCO_2	Roof deck	345 m^3	691 t	71 tCO_2
Beams	1,681 m^3	4,034 t	416 tCO_2	Blockwork	169 m^3	237 t	22 tCO_2
Walls*	2,810 m^3	6,744 t	695 tCO_2	Mortar	53 m^3	101 t	20 tCO_2
Ribbed slab	1,987 m^3	4,769 t	491 tCO_2	Paving slabs	3 m^3	7 t	1 tCO_2

Steel

Volume: 233 m^3
Weight: 1806 t
Embodied carbon: 3,640 tCO₂e

	Volume	Weight	Impact		Volume	Weight	Impact
Columns rebar	81 m^3	625 t	1243 tCO_2	Glazing Support	2 m^3	17 t	46 tCO_2
Floorslab rebar	34 m^3	266 t	528 tCO_2	Balustrade	1 m^3	10 t	28 tCO_2
Beams rebar	26 m^3	206 t	409 tCO_2	Handrail	1 m^3	8 t	22 tCO_2
Ribbed slab rebar	55 m^3	409 t	855 tCO_2	Studwork Joists	1 m^3	5 t	15 tCO_2
Walls rebar*	27 m^3	210 t	417 tCO_2	Studwork Channel	0 m^3	2 t	5 tCO_2
Steel Deck	3 m^3	27 t	66 tCO_2	Staircase rebar	0 m^3	1 t	2 tCO_2

Aluminium

Volume: 140 m^3
Weight: 305 t
Embodied carbon: 2,035 tCO₂e

	Volume	Weight	Impact		Volume	Weight	Impact
Curtain Walling	36 m^3	90 t	603 tCO_2	Frames	4 m^3	11 t	75 tCO_2
Panels	33 m^3	87 t	580 tCO_2				
Second. Frame	52m^3	78 t	520 tCO_2				
Mullions	9 m^3	23 t	153 tCO_2				
Canopy	6 m^3	16 t	105 tCO_2				

Glass

Volume: 151 m^3
Weight: 378 t
Embodied carbon: 592 tCO₂e

	Volume	Weight	Impact		Volume	Weight	Impact
Facade (Tower)	68 m^3	169 t	244 tCO_2	Doors (2nd)	0.9 m^3	2 t	4 tCO_2
Secondary Glazing	64 m^3	161 t	267 tCO_2	Blue Panels	0.4 m^3	1 t	2 tCO_2
Glass (Lower)	7 m^3	18 t	29 tCO_2	Glass Feature	0.2 m^3	0.5 t	0.8 tCO_2
Windows (lower)	9 m^3	22 t	37 tCO_2	Staircase	0.1 m^3	0.3 t	0.6 tCO_2
Atrium	2 m^3	4 t	7 tCO_2	Clear Panel	0.1 m^3	0.2 t	0.3 tCO_2

Others

Volume: 611 m^3
Quality: 694 t
Embodied carbon: 517 tCO₂e

	Volume	Weight	Impact		Volume	Weight	Impact
Brick	229 m^3	389 t	138 tCO_2	Fireboard	10 m^3	7 t	7 tCO_2
Softwood	69 m^3	34 t	-44 tCO_2	Aggregate	4 m^3	6 t	0 tCO_2
PVC	48 m^3	120 t	373 tCO_2	Insulation	89 m^3	4 t	6 tCO_2
Gypsum	137 m^3	105 t	36 tCO_2	Vinyl	1 m^3	1 t	4 tCO_2
Chipboard	17 m^3	12 t	-14 tCO_2	Ceramic	7 m^3	16 t	12 tCO_2

**Quantity differs from what is recorded in the Pre-demolition Audit as this document accounts for retention of the existing central core in the proposed development.*

Figure 2.8 Overview of volume and tonnes CO_2e of key demolition products by material types and products

2.3 Material Flows

The material flow diagram is used as a structured/methodical framework for decision making. The materials are split up and evaluated at component/product level where the quantities or historical embodied carbon emissions are visualised in the size of the flow. The materials are evaluated at component level rather than total mass in order to provide a better basis for reuse and a more granular evaluation of the end of life routes.

2.3.1 Standard material flow

A business as usual (standard practice) route is specified for each of the materials in the Pre-demolition Audit.

The flow chart in Figure 2.9 illustrates the likely distribution of the material products/components in the six defined end of life routes, with the size of the flow representing the estimated historical embodied carbon emissions.

The standard practice flow is defined to evaluate the impact of using the established waste chains, and also to identify potential areas of improvement.

Concrete
Concrete makes up the majority of the material by embodied carbon (6,029 tCO_2e). The standard practice for treating concrete waste is to downcycle it, by crushing it down for use as recycled aggregate in lower value products such as hard core, fill or in landscaping.

Similarly, brick and ceramics would also be crushed as recycled aggregate for fill.

Steel
Steel makes up the second largest material group arising from the deconstruction, and is a material with high embodied carbon emissions (4,113 tCO_2e). The current standard practice for treating steel is to recycle it as scrap on the global market.

Glass
Though glass is recyclable, the current standard practice for building glass is to downcycle it. Because of the difficulty of providing uncontaminated cullet (crushed glass used as feedstock in flat glass production), most post-consumer building glass waste does not go back into flat glass production, but is instead used in road paint or insulation production.

This process is strictly downcycling.

Aluminium
Aluminium is usually treated in a similar manner to steel, in that it will be sent to a scrap merchant, where it will be sorted, sheared (cutting large pieces), shredded, graded, and baled. Secondary aluminium refiners will typically convert most of the materials into foundry ingot to produce aluminium castings.

If the aluminium alloy is degraded in this process, this would strictly be considered downcycling.

Other
The majority of the smaller material fractions arising from the deconstruction would usually be sent for energy recovery (PVC, softwood, chipboard, fibreboard, insulation and vinyl).

Standard Practice End of Life Routes for Existing Materials

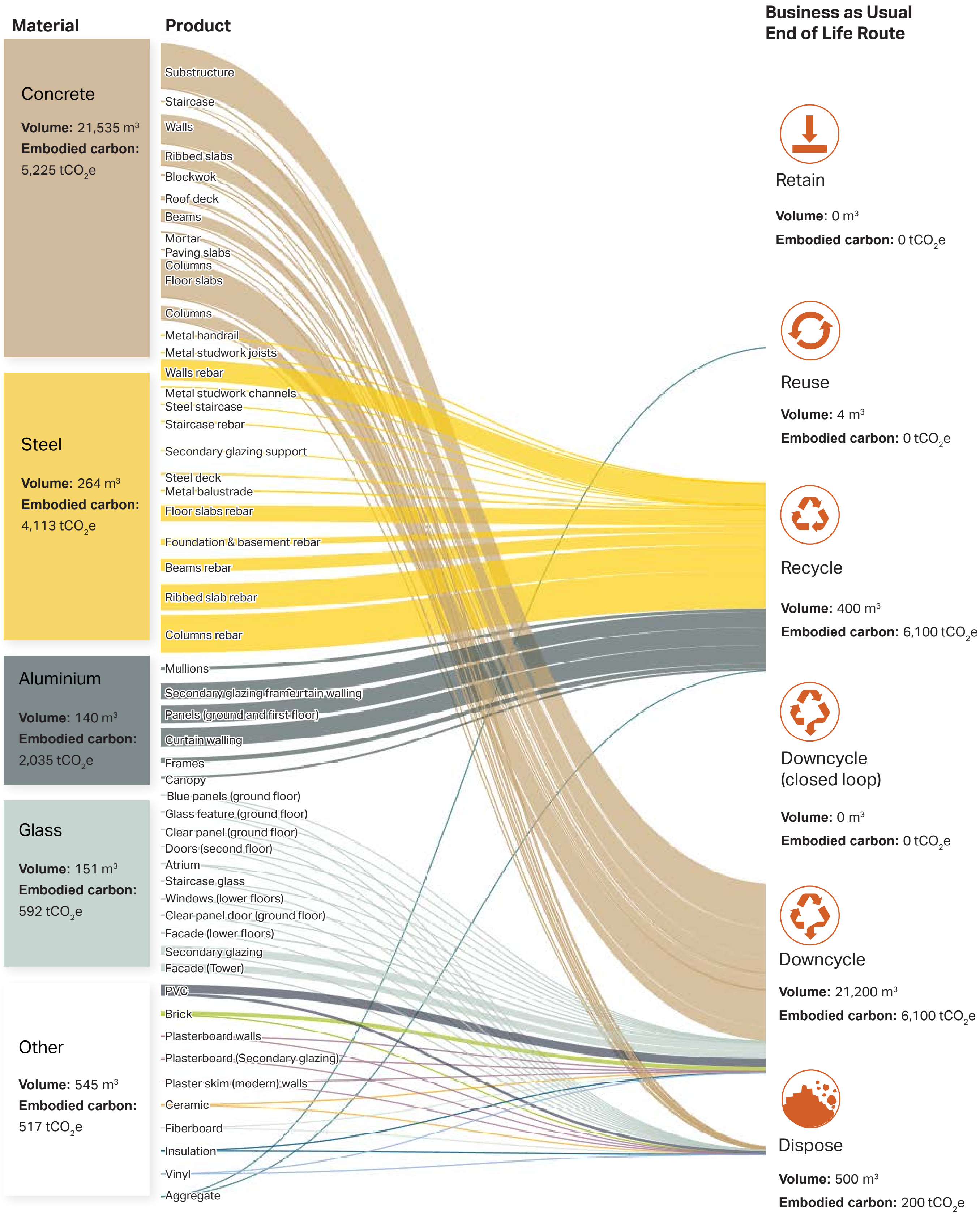

Figure 2.9 Business as usual end of life routes for existing materials (including existing foundation and central core)

2.3.2 Local waste management

To help identify the best end of life routes for the deconstruction products, the local waste chains have been mapped out.

The ambition is to use the local waste map as a means of informing the best routes for treatment, and assist with the ambition of proving transparency around the material strategy. In order to understand the standard practice routes of waste treatment, a focus has been put on mapping as many of the relevant links in the waste chain as possible.

The local waste map seen in Figure 2.10 shows the potential waste streams for the main material groups, glass, steel, concrete and other mixed construction waste. This mapping exercise is a starting point at understanding the waste streams, and will be expanded once a demolition contractor is appointed.

The decision tree in Figure 2.11 is applied across the various material streams to ensure the waste is treated at the highest value and as locally as possible. In collaboration with partners from the waste chain, the existing materials and components have been evaluated using the decision tree to move them as far up the value chain as possible.

Sketch Local Waste Management Map

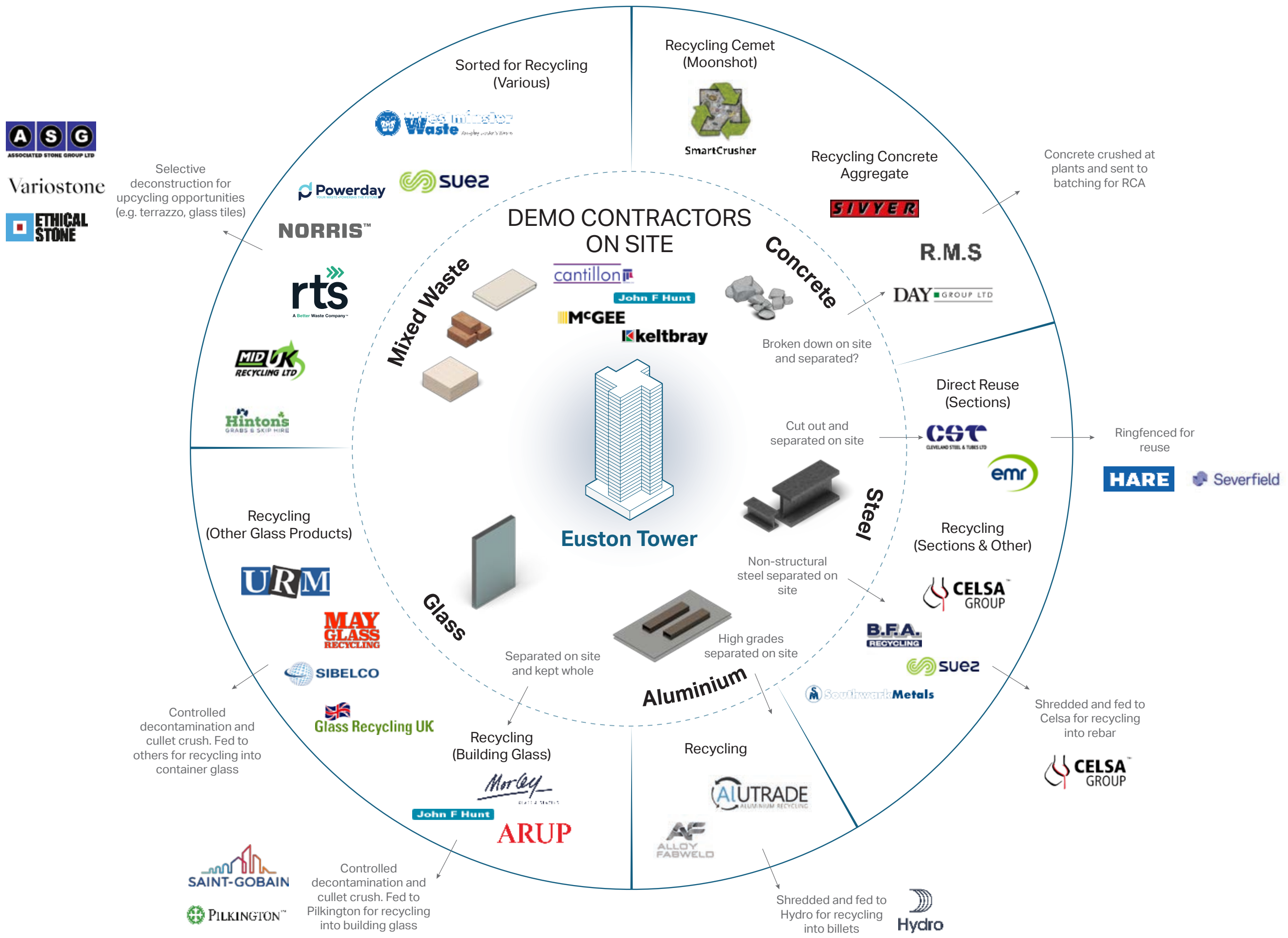

Figure 2.10 Early sketch of a local waste map used to understand waste stream destinations

Decision Tree for Determining Material End of Life Routes

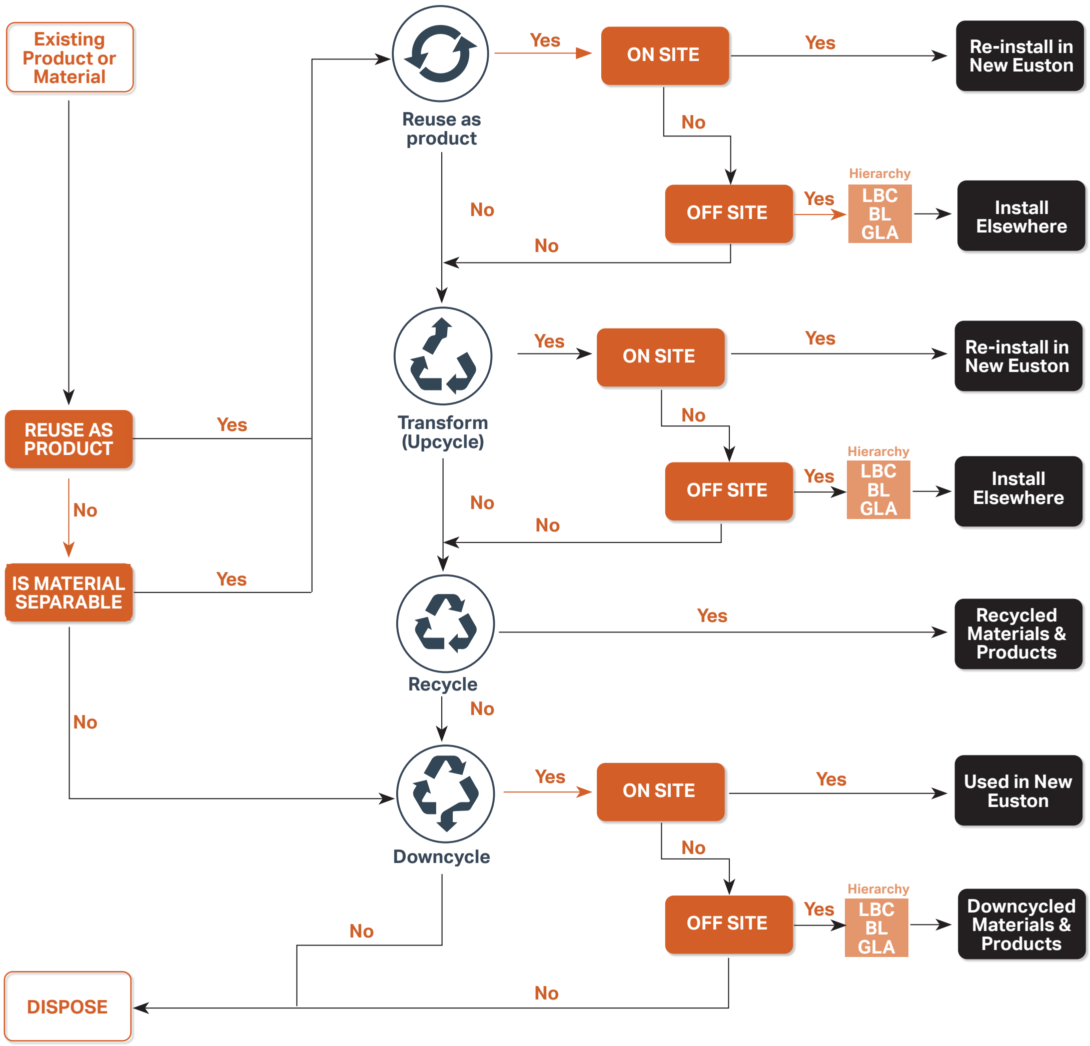

Figure 2.11   Decision tree to evaluate material end of life routes

2.3.3 Proposed material flow

A proposed material flow can be seen in Figure 2.12. The proposed flow brings ca. 14,300 m^3 of material out of downcycling and into higher value end of life routes.

This is one of many possible proposed flows, and can be considered a "best case" scenario if the prototyping trials prove successful.

Concrete and steel
The retention of the foundation, basement and central core brings all of the ca. 6,000 m^3 of the concrete from being downcycled, and 13 m^3 rebar from recycling, to direct reuse in the proposed development.

It is an ambition to test the feasibility of cutting out and reusing some of the existing concrete slabs. If successful, this could *potentially* move a large part of the concrete and rebar from downcycling and recycling into reuse. This is further detailed in Section 3.

Out of the 1,806 tonnes of steel, 96% is found in the rebar. Because of this, there is a limited opportunity to directly reuse the steel from the building, unless it is part of the reused concrete elements. Beyond this, the best use of the existing rebar is to feed it back for recycling in steel production.

The remaining concrete is likely to be crushed down. To use the concrete at highest value, it is suggested that some of this will be used as recycled concrete aggregate (RCA) in new concrete.

It is not currently possible in the UK market[1], to separate out the cement from concrete. Accordingly concrete waste cannot be recycled back into a concrete product. It can only be added as RCA (or similar), and this does not avoid the need for virgin cement which is the carbon-intensive element of concrete making. Therefore, this is indicated as closed loop downcycling in the flow diagram, where RCA could theoretically be continuously "closed loop downcycled" from concrete products.

[1] Engagement has been made with SmartCrusher to understand the potential of their technology becoming available outside of the Dutch market.

Glass
The existing facade glass is not in a condition to be directly reused. The best use is to recycle it back into flat glass production. This would bring the majority of the glass fraction from downcycling up to recycling.

As noted in Section 2.3.1, this is not standard practice. The feasibility of doing so currently being tested. This process is further detailed in Section 3.

Aluminium
The aluminium is mainly found in the existing facade frames. Since it is not possible to reuse the facade directly, in whole or in part, the best route is to feed it back into the aluminium production for new extrusions. Key in this process is ensuring adequate segregation of the aluminium alloys, so that high quality alloys are not contaminated. This process is further detailed in Section 3.

Others
Some of the remaining products, and the smaller items within the glass and concrete fractions, are addressed in Section 4 for reuse and upcycling as products. These are not currently captured in the flow diagram.

Proposed Routes for Existing Materials

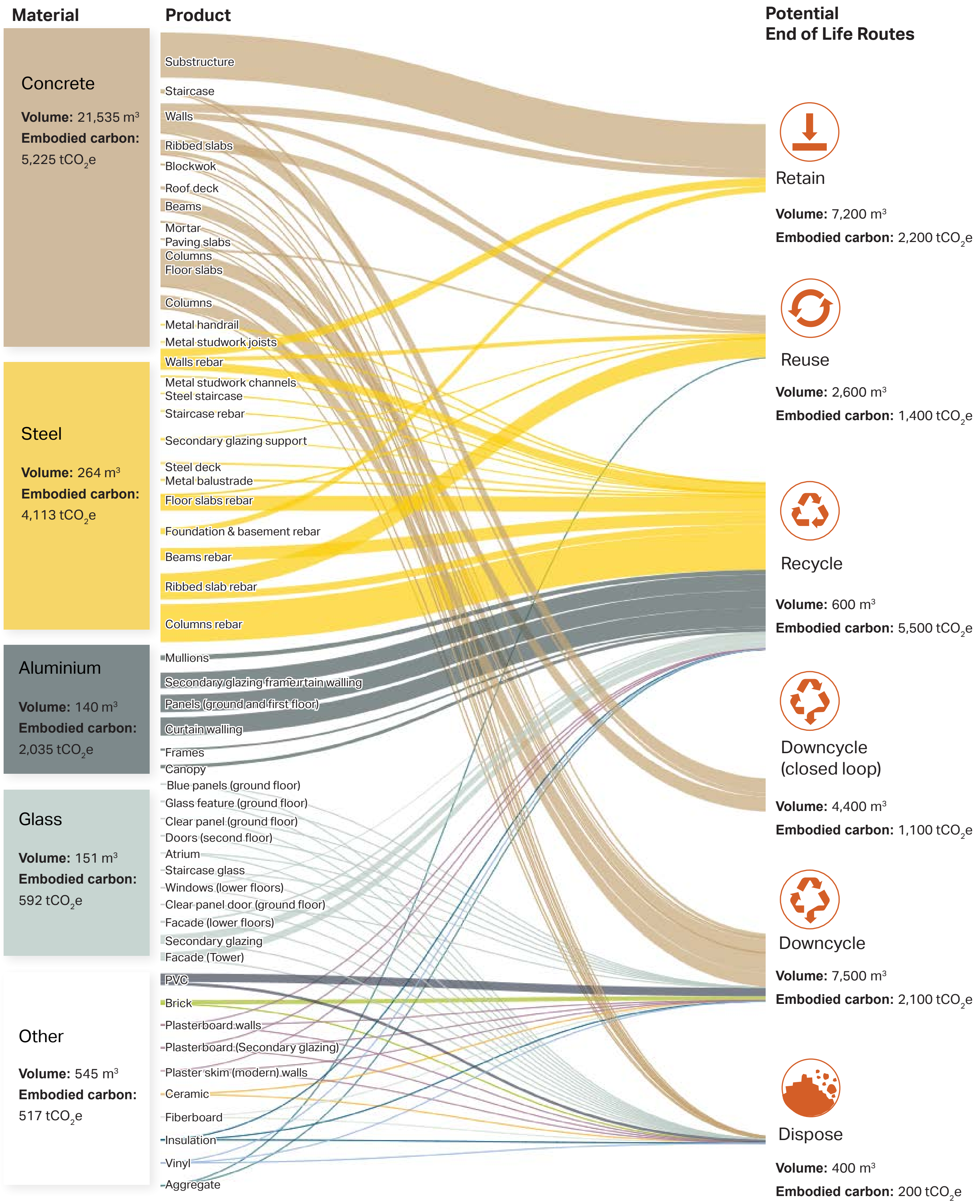

Figure 2.12 Proposed routes for existing materials (including existing foundation and central core)