HOARE LEA

Stag Brewery, Mortlake

Circular Economy Statement

For Reselton Properties

March 2022

HOARE LEA

Former Stag Brewery.
London.
Reselton Properties Limited.

SUSTAINABILITY
CIRCULAR ECONOMY STATEMENT

REVISION 02 – 09 MARCH 2022

Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
01	10/02/2022	Issue for legal review	J. Young	E. Jolly	G. Jones
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Contents.

Executive summary.

Scope.
This Circular Economy Statement focuses on the work carried out to define a strategic approach to Circular Economy principles for the project and identify high level strategic opportunities early in the development process.

The proposed new scheme.
This 3rd iteration of the scheme seeks to respond directly to the Mayors' reasons for refusal and in doing so also addresses a number of the concerns raised by the LBRuT.

The amendments can be summarised as follows:

- A revised energy strategy is proposed in order to address the London Plan (2021) requirements.
- Several residential blocks have been reduced in height to better respond to the listed buildings along the Thames riverfront and to respect the setting of the Maltings building, identified as a Building of Townscape Merit (BTM) by the LBRuT;
- Reconfiguration of layout of Buildings 20 and 21 has been undertaken to provide lower rise buildings to better respond to the listed buildings along the Thames riverfront; and
- Chalkers Corner light highways mitigation works.

The school proposals (submitted under 'Application B') are unchanged. The Applicant acknowledges LBRuT's identified need for a secondary school at the Site and the Applications continue to support the delivery of a school. It is expected that the principles to be agreed under the draft Community Use Agreement (CUA) will be the same as those associated with the refused school application (LBRuT ref: 18/0548/FUL, GLA ref: GLA/4172a/07).

Overall, it is considered that together, the Applications respond successfully to the concerns raised by the GLA which also reflect some of the concerns raised by stakeholders in respect of the previous schemes and during pre-application discussions on the revised Proposed Development. As a result, it is considered that the scheme now represents a balanced development that delivers the principle LBRuT objectives from the Site.

Summary of the approach to Circular Economy.
The construction and operation of the built environment consumes 60% of all materials in the UK. At the end of life, materials are often diverted from landfill, but in reality, down-cycled, reducing their value.

There is growing industry consensus that the way we design, build, operate and dispose of our buildings and associated facilities needs a major overhaul to obviate waste and increase efficiency. There is an incredible breadth of opportunity that this shift in approach will create across the entire supply chain.

Designing for longevity and adaptability and maximising the use of recycled and renewable materials could reduce greenhouse gas emissions while increasing innovation opportunities and economic growth. Replacing finite and fossil-based materials with responsibly managed renewable materials can decrease carbon emissions whilst reducing dependency on finite resources.

Before considering future waste elimination and sustainable waste management practices though, opportunities for retaining and refurbishing /re-purposing existing buildings, materials and other resources on site have been assessed by the design team to maximise the residual value of existing structures and conserve resources by reducing the need for new materials.

An assessment was made of the existing site to gauge what, if any, elements of the existing structures and hard landscaping could be retained, reused, reclaimed or recycled. The majority of the existing buildings that exist on this former brewery site are of little townscape significance since they were built as industrial buildings using utilitarian materials.

The Maltings building (Block 04), the Former Hotel building (Block 05 West) and the Former Bottling Building (Block 05 East) will be retained and temporary works will be installed to maintain the structural integrity of the existing walls. A new lower ground is proposed for Block 05 West and Block 05 East.

A pre-demolition audit will be undertaken to investigate how recycling of construction, demolition and excavation material can be maximised. This will highlight specific elements of the existing buildings and hardstanding on the Site which can be re-used or recycled/recovered, including but not limited to crushing existing concrete for reuse at the Proposed Development.

New buildings developed on the site will follow best practice principles in their design and construction with the overarching aims of reducing material usage, minimising waste, and embedding longevity, flexibility and adaptability. It is expected that the different building typologies will lead to a variance in the final strategies adopted across the site. Furthermore, advances in innovation and best practice over time combined with effective feedback loop mechanisms are expected to lead to continuous improvement as the design and construction develops.

A project-specific Waste Management Strategy has been developed for the operation of the development making all necessary allowances to ensure that waste arisings can be accommodated under a full occupancy scenario. The strategy considers the flow of waste from waste generator (i.e. residents/tenants) through to storage and collection. This Waste Management Strategy considers the potential impacts that may arise from waste generated during the operational phase, with the overall aim of developing a strategy for legislative compliance and good practice in waste separation, storage, and collection.

The Waste Management Strategy prepared for the Proposed Development includes a review of the local, regional and national policy and best practice guidance to be used in the waste strategy. The predicted waste volumes from the proposed residential uses and office uses in Application A have been based on the guidance outlined in LBRuT's Refuse and Recycling Storage Requirements SPD (2015). For non-residential areas, the total general and recyclable waste arising for the development has been forecasted using BS 5906:2005, across land uses at the site. Following policy and best practice guidance the type and quantum of general waste & recycling storage bins have been proposed and sited at waste stores strategically located across the site.

A sustainable procurement plan will be produced which outlines the benchmarks expected to be met by construction partners and the entire supply chain regarding sustainable development, including circular economy principles relating to recycled content.

Designing for adaptability is another key principle of the circular economy, and the design includes, but is not limited to, the following measures to reduce waste arising at replacement or end of life stages:

- Allowance for all major plant to be dismantled and removed.
- All services infrastructure through the buildings to be designed within designated risers. All risers to be accessible.
- High quality, robust materials palette proposed.
- Windows and retail fascias to be removable and replaceable independent of building frame.
- Shell and core units proposed for commercial areas allowing flexibility for the tenant fit out.

A Whole Life-cycle Carbon assessment (WLC) has also been undertaken for the Proposed Development in line with the guidance given in the draft guidance provided by the GLA in the *Whole Life-Cycle Carbon Assessments guidance Pre-consultation draft,* April 2020. This assessment included an analysis of the anticipated embodied carbon associated with the materials which will be utilised at the Proposed Development. Information provided by the WLC assessment will further inform the design team during the detailed and technical design stages. A summary of the assessment can be found in Appendix A. This should be read in conjunction with the GLA WLC Assessment Template issued in Microsoft Excel Format.

1. Development description.

1.1 The proposals.

This Circular Economy Statement has been prepared by Hoare Lea on behalf of Reselton Properties Limited ("the Applicant") in support of two linked planning applications ("the Applications") for the comprehensive redevelopment of the former Stag Brewery Site in Mortlake ("the Site") within the London Borough of Richmond upon Thames (LBRuT).

The Applications seek planning permission for:

Application A:
"Hybrid application to include the demolition of existing buildings to allow for comprehensive phased redevelopment of the site:

- Planning permission is sought in detail for works to the east side of Ship Lane which comprise:
  - Demolition of existing buildings (except the Maltings and the façade of the Bottling Plant and former Hotel), walls, associated structures, site clearance and groundworks
  - Alterations and extensions to existing buildings and erection of buildings varying in height from 3 to 9 storeys plus a basement of one to two storeys below ground
  - Residential apartments
  - Flexible use floorspace for:
    - Retail, financial and professional services, café/restaurant and drinking establishment uses
    - Offices
    - Non-residential institutions and community use
    - Boathouse
  - Hotel / public house with accommodation
  - Cinema
  - Offices
  - New pedestrian, vehicle and cycle accesses and internal routes, and associated highway works
  - Provision of on-site cycle, vehicle and servicing parking at surface and basement level
  - Provision of public open space, amenity and play space and landscaping
  - Flood defence and towpath works
  - Installation of plant and energy equipment
- Planning permission is also sought in outline with all matters reserved for works to the west of Ship Lane which comprise:
  - The erection of a single storey basement and buildings varying in height from 3 to 8 storeys
  - Residential development
  - Provision of on-site cycle, vehicle and servicing parking
  - Provision of public open space, amenity and play space and landscaping
  - New pedestrian, vehicle and cycle accesses and internal routes, and associated highways works"

Application B:
"Detailed planning permission for the erection of a three-storey building to provide a new secondary school with sixth form; sports pitch with floodlighting, external MUGA and play space; and associated external works including landscaping, car and cycle parking, new access routes and other associated works"

Together, Applications A and B described above comprise the 'Proposed Development'.

Background to Submission.
The Applications follow earlier planning applications which were refused by the Greater London Authority. The refused applications were for:

- a) Application A – hybrid planning application for comprehensive mixed use redevelopment of the former Stag Brewery site consisting of:
  - i. Land to the east of Ship Lane applied for in detail (referred to as 'Development Area 1' throughout); and
  - ii. Land to the west of Ship Lane (excluding the school) applied for in outline (referred to as 'Development Area 2' throughout).
    - Application B – detailed planning application for the school (on land to the west of Ship Lane).
    - Application C – detailed planning application for highways and landscape works at Chalkers Corner.

The LBRuT (the Council) originally resolved to grant planning permission for Applications A and B but refuse Application C.

Following the LBRuT's resolution to approve the applications A and B, the Mayor called-in the applications and became the determining authority. The Mayor's reasons for calling in the applications were set out in his Stage II letter (dated 4 May 2020) but specifically related to concerns regarding what he considered was a low percentage of affordable housing being proposed for the Site and the need to secure a highways solution for the scheme following the LBRuT's refusal of Application C.

Working with the Mayor's team, the Applicant sought to meaningfully respond to the Mayor's concerns on the applications. A summary of the revisions to the scheme made and submitted to the GLA in July 2020 is as follows:

- Increase in residential unit provision from up to 813 units to up to 1,250 units;
- Increase in affordable housing provision from (up to) 17%, to 30%;
- Increase in height for some buildings of up to three storeys;
- Change to the layout of Blocks 18 and 19, conversion of Block 20 from a terrace row of housing to two four storey buildings;
- Reduction in the size of the western basement, resulting in an overall car parking spaces reduction of 186 spaces and introduction of an additional basement storey under Block 1;
- Internal layout changes and removal of the nursing home and assisted living in Development Area 2;
- Landscaping amendments, including canopy removal of four trees on the north west corner of the Site; and
- Alternative options to Chalkers Corner in order to mitigate traffic impacts through works to highway land only and allow the withdrawal of Application C.

Application A was amended to reflect these changes.

Notwithstanding this, and despite GLA officers recommending approval, the Mayor refused the applications in August 2021.

The Mayor's reasons for refusal in respect of Application A were:

- height, bulk and mass, which would result in an unduly obtrusive and discordant form of development in this 'arcadian' setting which would be harmful to the townscape, character and appearance of the surrounding area;
- heritage impact. The proposals, by reason of its height, scale, bulk and massing would result in less than substantial harm to the significance of several listed buildings and conservation areas in the vicinity. The Mayor considered that the less than substantial harm was not clearly and convincingly outweighed by the public benefits, including Affordable Housing, that the proposals would deliver;
- neighbouring amenity issues. The proposal, by reason of the excessive bulk, scale and siting of Building 20 and 21 in close proximity to the rear of neighbouring residential properties in Parliament Mews and the rear gardens of properties on Thames Bank, would result in an unacceptable overbearing and unneighbourly impact, including direct overlooking of private amenity spaces. The measures in the Design Code would not sufficiently mitigate these impacts; and
- no section 106 agreement in place.

Application B was also refused because it is intrinsically linked with Application A and therefore could not be bought forward in isolation.

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Overall, it is considered that together, the Applications respond successfully to the concerns raised by the GLA which also reflect some of the concerns raised by stakeholders in respect of the previous schemes and during pre-application discussions on the revised Proposed Development. As a result, it is considered that the scheme now represents a balanced development that delivers the principle LBRuT objectives from the Site.

1.2 Site context.

The site plan shows the former Stag Brewery Site is bounded by Lower Richmond Road to the south, the river Thames and the Thames Bank to the north, Williams Lane to the east and Bulls Alley (off Mortlake High Street) to the west. The Site is bisected by Ship Lane. The Site currently comprises a mixture of large-scale industrial brewing structures, large areas of hardstanding and playing fields. The figure below shows the development proposals.

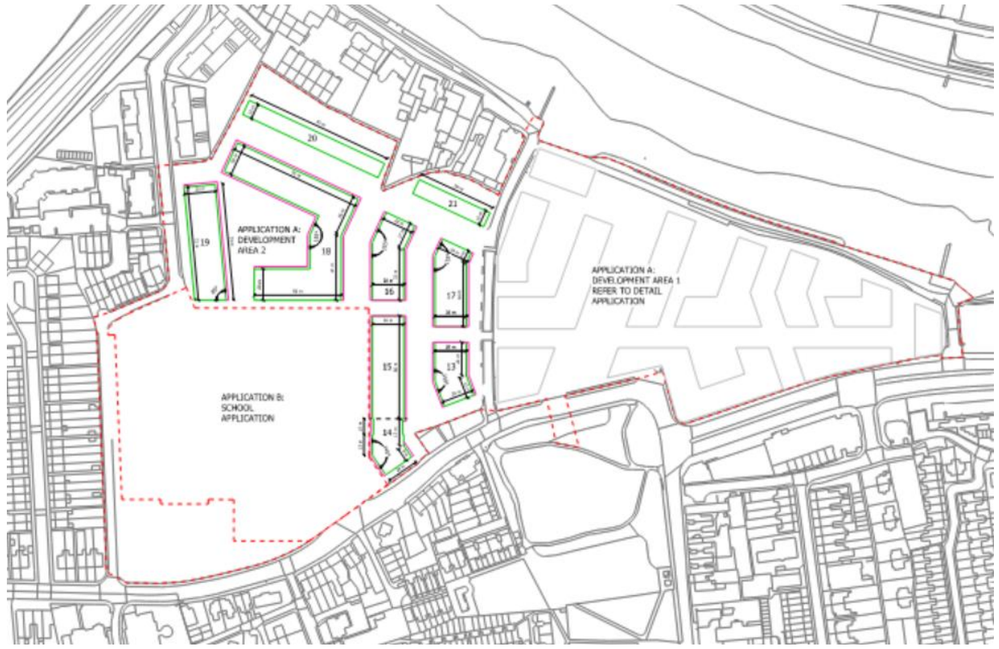

Figure 1: Site plan.

Table 1: Proposed area schedule.

Space use		GIA (m^2)		
		Application A Development Area 1	Application A Development Area 2	Application B
Domestic	Private residential	52,877	34,439	-
	Affordable	4,841	20,523	-
Non-domestic	Flexible Use	4,840	-	-
	Office	4,547	-	-
	Cinema	1,606	-	-
	Hotel	1,765	-	
	School	-	-	9,319

2. Method statement.

The circular economy statement will report on how the design proposals have been adopted in the design approach, the circular economy principles, up to the current Stage 2 design.

The circular economy statement will aim to respond to the policy SI7 of the London Plan (2021) that states:

- Referable applications should promote circular economy outcomes and aim to be net zero-waste.
- A circular economy statement should be submitted, to demonstrate:
  - How all materials arising from demolition and remediation works will be re-used and/or recycled;
  - How the proposal's design and construction will reduce material demands and enable building materials, components and products to be disassembled and re-used at the end of their useful life;
  - Opportunities for managing as much waste as possible on site;
  - Adequate and easily accessible storage space and collection systems to support recycling and re-use;
  - How much waste the proposal is expected to generate, and how and where the waste will be managed in accordance with the waste hierarchy;
  - How performance will be monitored and reported.

This assessment will be undertaken with regard to the pre-consultation draft GLA guidance for producing circular economy statements.

It is intended that, with the level of detail currently available for the masterplan, the circular economy statement will focus on the work carried out to assess opportunities for re-use of any materials, buildings or resources on site. It will also describe any strategic ways that the masterplan will promote circular economy measures.

The circular economy statement will be informed by the following documents already provided for the planning submission and will be supported by information gathered from the project team:

- Design and Access Statements
- Energy Strategy
- Whole Life-Cycle Carbon Assessment (see Appendix A)
- Environmental Impact Assessments
- Sustainability Statements and/or Sustainability Checklists
- Sustainability Assessment Method Reports (BREEAM)
- Site Waste / Resource Management Plan

The circular economy statement will seek to meet the contents described in the GLA guidance document for the scheme in sufficient detail for the detailed and outline stages of the masterplan appropriately.

Sustainability certification is also being pursued, in the form of BREEAM assessment for the non-domestic elements of the site. A BREEAM pre-assessment exercise has been undertaken via workshops in conjunction with the project team. This exercise has assisted in more detailed consideration of specific targets for these elements of the scheme.

It is proposed that additional workshops will be held during the detailed design stages to explore further opportunities to incorporate key circular economy principles into aspects of the design, procurement and construction process.

As the proposals move toward construction stage, early engagement will be sought with contractors to assist in refining strategies for delivery. To aid this, the following documents will be considered for preparation:

- A Pre-Demolition Audit for the development to gauge which elements of the existing structures and hardstanding on site can be retained, reused, reclaimed or recycled.
- A Sustainable Procurement Plan, setting out aims and targets for procuring products sustainably and locally where feasible.

Robust data collection plans will be implemented through design and construction to facilitate ongoing monitoring against intended outcomes.

Given the scale of the development and the likely phased nature of the programme over several years, it is expected that the strategies and approach will evolve over time.

3. Circular Economy approach.

Consumption of natural resources has historically followed a linear approach, heightened by the industrial revolution which, while lifting the living standards of millions, also dramatically increased pressure on environmental resources.

Under the traditional take>make>use>dispose model, raw materials are collected, then transformed into products that are used until they are finally discarded as waste. Apart from failing to capture value over the lifetime of products, this approach also produces a range of negative externalities that include resource scarcity, unsustainable levels of water extraction, rising carbon emissions, and widespread ecosystem pollution.

In a circular economy, built environment assets are designed so that whole buildings, materials, components and parts can be continually and easily adapted, deconstructed for re-use or recycled.

The built environment sector is a major consumer of natural resources. There is growing industry consensus that the way we design, build, operate and dispose of our buildings and associated facilities needs a major overhaul to obviate waste and increase efficiency. There is an incredible breadth of opportunity that this shift in approach will create across the entire supply chain.

It is recognised that in order to implement Circular Economy principles most effectively, it is helpful to explore strategic opportunities as early in the development process as possible.

Considerations around resource and material efficiency and responsible sourcing have been considered within the overarching sustainability strategy from the early stages in line with BREEAM requirements.

It is acknowledged that the approach to circular economy will evolve as the design evolves, or in response to wider considerations and feedback from the GLA or other stakeholders.

As a site-wide strategy, the project has formulated commitments around the promotion of sustainable use of materials comprising several targets around materials and waste including consideration given to material recycled content, use of timber, diversion of construction waste from landfill, maximising the use of recycled or secondary aggregates giving preference to solutions available closer to the site, construction resource efficiency and an overarching ambition to reduce the project's supply chain carbon intensity from materials and manufacturing relative to standard industry performance to be achieved through measures including:

- "Smart" material choices (prioritisation of durable, biodegradable, recycled / recyclable materials and materials that can be reused or re-purposed, where possible);
- Incorporation of modular elements for higher levels of design flexibility and adaptability;
- Procurement of products as a service – leasing access to a solution instead of buying it;
- Product life extension through improved maintenance, remanufacturing, repairing and upgrading/ upcycling; and
- Closed loop / take back – working with manufacturers who take back used products to recover the value by using them to make new products.

An effective incorporation of Circular Economy principles represents an opportunity for the site and the UK as a whole. With its system-wide perspective, the Circular Economy has the potential to help us make better decisions about resource use, design out waste, provide added value for business and society, and proceed along a secure route to society-wide prosperity and environmental sustainability for future generations.

While specific values and levels of ambition/ benchmarks have been defined for some of the metrics, it is recognised that these are preliminary targets and commitments which will be reviewed and may be adjusted as appropriate during the detailed design of the parts of the scheme for which permission is sought in outline to respond to the specific requirements of each element and ensure that current best practice is being followed and opportunities to innovate are maximised.

There is a clear understanding that in order to achieve the ambitious objectives set for the project the design team will have to engage and collaborate extensively with the supply chain to foster knowledge sharing and fast-track innovative ideas and techniques spanning the design, construction and operation stages thus enabling synergies.

Figure 2 confirms the building layers that should be considered as per GLA guidance. Please refer to section 6 for details as to how each of these layers is being considered.

Layer	Summary and constituent elements	RICS reference
Site	The geographical setting, urban location and external works	NRM 8
Substructure	Excavations, foundations, basements and ground floors	NRM 1
Superstructure	Load-bearing elements above plinth including roof supporting structure	NRM 2.1, 2.2 and 2.4 - frame, upper floors, stairs
Shell/Skin	The layer keeping out water, wind, heat, cold, direct sunlight and noise	NRM 2.3, 2.5, 2.6 - roofs, external walls, windows and external doors
Services	Installations to ensure comfort, practicality, accessibility and safety	NRM 5
Space	The layout internal walls, ceilings, floors, finishes, doors, fitted furniture	NRM 2.7, 2.8 and NRM 3
Stuff	Anything that could fall if the building was turned upside down	N/a
Construction Stuff	Any temporary installations/works/ materials, packaging and equipment	NRM 0

Figure 2: GLA building layers (Guidance Section 2.3).

3.1 Existing site.

The majority of the existing buildings that exist on this former brewery site were built as industrial buildings using utilitarian materials.

Retained buildings

There are three existing buildings the Maltings, the Hotel and the Bottling Works, that are proposed to be retained and adapted to alternative uses within the proposal.

The proposal for the former Maltings building incorporates entire internal re-configuration along with several sensitive amendments to the existing building facades. Since the building is currently void of internal floors above ground floor level, it is proposed that the interior of the building is entirely stripped out to make way for new floor levels and internal finishes that meet current building control standards.

Due to the poor condition and quality of the northern elevation of the existing Bottling building facade, it is proposed that the south and west facades of the building will be retained in their entirety and that the north and east facades will be largely demolished and rebuilt to an extended footprint.

The hotel element is proposed to be introduced within the former hotel building since the proposed hotel rooms can utilise the existing rhythm of windows on the facade without need to alter the existing openings.

The office element is proposed to be located within the former Bottling building element and to utilise the larger scale, industrial type window openings within the retained South facade of this building. The introduction of these new uses within the existing building envelope will result in very minimal impact on the existing facade.

A pre-demolition audit will be undertaken to investigate how recycling of construction, demolition and excavation material can be maximised. This will highlight specific elements of the existing building and hard landscaping on the Site which can be re-used or recycled/recovered.

Reuse
- Use of re-usable hoardings, in non-aesthetic locations.
- Any suitable material from the existing hard-standings and existing industrial buildings will be considered for re-use.
- Excavated material for filling. In order to create a consistent Site level (i.e. to increase the ground floor levels), it is estimated that excavation activities will result in a total of approximately 163,652m^3 of material to be removed from the Site. It is envisaged that of this total volume approximately 26,528m^3 will be re-used on Site (for Site levelling purpose).

Recycle/ recover
- Materials present on the site in the form of industrial buildings and equipment will be sent for recycling.

Figure 3: Existing site birds eye view

3.2 New development.

New buildings developed on the site will follow best practice principles in their design and construction with the overarching aims of reducing material usage, minimising waste, and embedding longevity, flexibility and adaptability.

The following focus areas will be continually reviewed to maximise opportunities to embed circular economy principles:

- Lean design principles
- Material efficiency
- Adaptability
- Flexibility
- Low carbon construction
- Offsite / modular construction
- Design for Manufacture and Assembly (DfMA)
- Dry construction techniques minimising wet trades on-site
- Minimisation of demolition / excavation waste
- Re-use of materials on-site
- Recycled content
- Material circularity
- Material procurement via leasing frameworks
- Responsible procurement
- Sustainable sourcing
- Local sourcing
- Supply chain engagement
- Tenant engagement
- Structural and fabric resilience
- Life-cycle assessments
- Disassembly and demountability

It is expected that advances in innovation and best practice over time combined with effective feedback loop mechanisms will lead to continuous improvement as the design and construction develops.

Active engagement will continue to be required for key stakeholders engaged in the design and procurement of materials for the site and the waste management of materials taken off site. These include, but are not limited to:

- Main contractor and sub-contractors
- Lead architect
- Structural engineer
- Civil engineer
- Landscape architect
- Operational waste consultant

3.3 Municipal waste during operation.

The Waste Management Strategy has taken into account the need to lessen the overall impact of waste generation through the recycling of materials from the operational phase of Former Stag Brewery.

The proposals set out in this strategy meet the requirements of relevant waste policy and follow applicable guidance. The strategy considers the flow of waste from waste generator (i.e. residents/tenants) through to storage and collection. The strategy outlines how the development has been designed to be sustainable and forward- thinking in its approach to waste and recycling, whilst remaining workable during operation.

Sufficient storage for the segregation and storage of at least three waste streams (recycling, food and residual waste) in both individual units and communal bin stores will be provided to enable effective waste segregation and promote higher recycling and composting rates.

Residential Waste
Residential units will incorporate sufficient internal waste storage containers to promote the separation of recyclable materials at source. Residents will manually transport waste down to the waste store via the passenger lifts.

The Facilities Management Team and LBRuT waste team will liaise to coordinate the refuse & recycling collection process and agree the collection days / times and process. On the specified collection day, the Facilities Management Team will move the appropriate bins from the storage area(s) on the Basement Level to the Refuse Stores located on the Ground Floor.

Sufficient space within each of the waste presentation storage area has been provided to accommodate residual waste and recyclables containers based on two collections per week as agreed with LBRuT.

Building Number	Capacity Requirement (litres)	Indicative Number of 1100 litre bins for refuse based on collection twice a week	Indicative Number bins for recycling based on collection twice a week
2	18970	9	6 x 1100 litre bins
3	8470	4	4 x 1100 litre bins
4	3150	2	2 x 1100 litre bins
5	No Residential	0	0
6	3850	2	2 x 1100 litre bins
7	13370	7	6 x 1100 litre bins
8	15190	7	6 x 1100 litre bins
9	2590	2	2 x 360 litre bins
10	5040	3	2 x 1100 litre bins
11	8470	4	4 x 1100 litre bins
12	6510	3	2 x 1100 litre bins

Figure 4: Residential storage volumes, Development Area 1

Development Area 2 will be collected once per week as agreed with LBRuT due to the proportion of affordable housing in this Development Area.

Commercial Waste
Each commercial occupier will be required to provide waste storage areas within their demise which have sufficient capacity to separately store waste and recyclables. Frequency of collection will be determined a ta a later date following discussions with the appointed waste collection contractors.

3.4 Waste during demolition and construction.

Waste management during both the demolition and construction periods will be undertaken in accordance with a Site Waste Management Plan. An early stage Site Waste Management Plan has been included with the planning submission.

Detailed information will be provided at subsequent stages by the Principal Contractor, once details and methods associated with the demolition, excavation and construction phases are known.

Waste management procedures and documentation information will identify the types and quantities of waste produced during every stage of the project, as well as opportunities to reduce, reuse and recycle construction process waste. A waste hierarchy approach will be followed with the intention first to minimise waste generation, followed by reuse or recycling off-site.

All relevant contractors will be required to investigate opportunities to minimise and reduce waste generation in line with WRAP's 'Halving Waste to Landfill' initiative through:

- Agreements with material suppliers to reduce the amount of packaging or to participate in a packaging take-back scheme;
- Implementation of a 'just-in-time' material delivery system to avoid materials being stockpiled, which increases the risk of their damage and disposal as waste;
- Use of standard size components in design detailing to eliminate risk at source where possible to do so;
- The pre-assembly and pre-fabrication of elements wherever practicable to minimise waste generation on-site;
- Attention to material quantity requirements to avoid over-ordering and generation of waste materials;
- Re-use of materials wherever feasible, e.g. the Government has set broad targets for the use of reclaimed aggregate, and in keeping with best practice, contractors will be required to maximise the proportion of materials recycled;
- Segregation of waste at source where practical;
- Re-use and recycling of materials off-site, where re-use on-site is not practical (e.g. through use of an off-site waste segregation facility and re-sale for direct re-use or re-processing);
- Skips will be colour coded and signposted to reduce risk of cross contamination and covered to prevent dust and debris blowing around the site, these will be cleared on a regular basis; and
- Burning of waste or unwanted materials will not be permitted on-site.

Materials and other arisings will be stored safely and efficiently, prior either for reuse on site or removal. Any materials to be reclaimed / reused will be done so in accordance with the Waste & Resources Action Programme (WRAP) protocol.

Contractor energy use on and off-site will be reduced where possible:

- Using alternatives to diesel/petrol powered equipment;
- Incorporating sources of renewable energy, to offset the use of main utilities;
- Selecting and specifying energy efficient plant and equipment; and
- Implementing staff training for initiatives to turn off plant and equipment when not in use.

The energy consumption of the project will be monitored, through submetering or reading of utility bills, to allow comparison against best practice benchmarks, and improved where possible.

An appropriate person (i.e. the Principal Contractor) will be responsible for confirming the exact details of on-Site waste management practices, in agreement with LBRuT.

4. Strategic approach summary – GLA Circular Economy Statement Guidance table 1.

Table 2: Strategic approach.

Aspect	Steering approach	Strategy implemented	Target	Supporting analysis / studies / surveys / audits
Circular economy approach for the existing site	BREEAM Wst01 requirement: A pre-demolition audit will need to be carried out where demolition is required. A compliant SWMP will need to be produced. Waste targets for non-hazardous construction waste generated from the building (excluding demolition and excavation waste) need to be set at no more than 3.4m^3 or 3.2tonnes per 100m^2 of gross internal floor area. In addition at least 70% by volume or 80% by tonnage for non-hazardous construction waste and 80% by volume or 90% by tonnage for demolition waste will need to be diverted from landfill. GLA target: 95% diversion from landfill.	A pre-demolition audit will be undertaken to identify opportunities for reuse, recycling or recovery, disposal and opportunities for reuse within development works. Current opportunities identified for the development include: **Reuse** – Use of re-usable hoardings, in non-aesthetic locations. – Any suitable material from the existing hard-standings and existing industrial buildings will be considered for re-use. – Excavated material for filling. In order to create a consistent Site level (i.e. to increase the ground floor levels), it is estimated that excavation activities will result in a total of approximately 163,652m^3 of material to be removed from the Site. It is envisaged that of this total volume approximately 26,528m^3 will be re-used on Site (for Site levelling purpose). **Recycle/ recover** – Materials present on the site in the form of industrial buildings and equipment will be sent for recycling. –	95% diversion from landfill (The higher value out of the GLA target and BREEAM target).	Pre-Demolition Audit
Circular economy approach for the new development	The new buildings developed on the site will follow best practice principles in their design and construction with the overarching aims of reducing material usage, minimising waste, and embedding longevity, flexibility and adaptability. The following focus areas will be reviewed to maximise opportunities to embed circular economy principles: – Lean design principles – Material efficiency – Adaptability – Flexibility – Low carbon construction – Offsite / modular construction – Design for Manufacture and Assembly (DfMA) – Dry construction techniques minimising wet trades on-site – Minimisation of demolition / excavation waste – Re-use of materials on-site – Recycled content – Material circularity – Material procurement via leasing frameworks – Responsible procurement – Sustainable sourcing – Local sourcing – Supply chain engagement – Tenant engagement – Structural and fabric resilience – Life-cycle assessments – Disassembly and demountability	It is expected that advances in innovation and best practise over time combined with effective feedback loop mechanisms will lead to continuous improvement as the development design and construction progresses. Consideration for circular economy implementation will be required at each stage, with the overarching circular economy ambitions embed in the brief for detailed design and construction. Active engagement will continue to be required for key stakeholders engaged in the design and procurement of materials for the site, and the waste management of materials taken off site. These include, but are not limited to: – Main contractor and sub-contractors – Lead architect – Structural engineer – Civil engineer – Landscape architect – Operational waste consultant	95% diversion from landfill at end of life (GLA target)	Sustainable Procurement Plan Pre-Demolition Audit Sustainability strategy Architecture reports Structural technical report Operational Waste Management Strategy BREEAM Pre-assessment Pre-construction engagement with main contractor and supply chain.

Aspect	Steering approach	Strategy implemented	Target	Supporting analysis / studies / surveys / audits
Circular economy approach for municipal waste during operation	A project-specific Operational Waste Management Strategy has been prepared in accordance with relevant requirements, in order to embed and enable sustainable waste management in operation. This Strategy provides an overview of how the Scheme has been designed to consider the flow of waste through the development, from waste generator (i.e. residents/tenants) through to storage and collection, in a sustainable manner during its operation. The Strategy outlines how the Scheme has been designed to be sustainable and 'forward-thinking' in its approach to waste and recycling, whilst remaining 'workable' during the operation of the Scheme.	Waste arisings and storage requirements are based upon figures produced by the waste consultant. This guidance was seen as the most relevant as it is proposed that the borough is the primary waste collection contractor for Former Stag Brewery. As such waste arisings have been forecast for general and recyclable waste.	65% diversion from landfill notionally targeted (including energy recovery & acknowledging requirements for 50:50 waste storage for general & recycled waste)	Operational Waste Management Strategy Waste Storage and Collection Requirements & Calculations Waste Streams - Definitions and Responsibilities

5. Key commitments for Former Stag Brewery – GLA Circular Economy Statement Guidance table 2.

*Related BREEAM credits. Note, in some instances numerical targets proposed here are beyond BREEAM requirements.

Table 3 Key Commitments.

Building "Layer" (as per GLA guidance)	Site	Substructure	Superstructure	Shell/ skin	Services	Space	Stuff	Construction stuff	Summary	Challenges	Counter-actions + who + when	Plan to prove and quality
	SECTION A: CONSERVE RESOURCES											
Minimising the quantities of materials used	Regularised block layouts where possible have been considered.	Seeking to embed cement replacement with alternatives.	Lean design principles targeted. Post tensioned slabs to reduce concrete fraction to be considered at the appropriate stage of design.	Consideration of high quality materials palette. (Mat 01)*	Where possible, items are to be prefabricated or assembled off-site. Including services.	Limit any finishes installed prior to leasing to absolute minimum for speculative spaces. Residential finishes to be robust to promote longevity in use.	To be considered with tenant as part of incoming fit-outs. Residential areas to determine life-cycle costs of equipment supplied by developer.	Suppliers will agree to reduce packaging, to use reusable packaging, or to operate a packaging take-back scheme; 'just-in-time' material delivery to minimise stockpiling and related risk of damage and disposal as waste; close attention to material quantity requirements to avoid over-ordering and generation of waste; reuse of materials where feasible.	**Lean design principles adopted, and elements pre-fabricated off-site where possible. Refinement of material quantities will be reviewed as design proceeds.**	Ensuring sub/structure material quantities are minimised whilst dealing with below ground site constraints	Ensure structural design is optimised for substructure and superstructure (Structural engineer)	Material efficiency review exercise at next stage of design. Bill of quantities analysis against material benchmarks.

Building "Layer" (as per GLA guidance)	Site	Substructure	Superstructure	Shell/ skin	Services	Space	Stuff	Construction stuff	Summary	Challenges	Counter-actions + who + when	Plan to prove and quality
Minimising the quantities of other resources used (energy, water, land)	A Whole Life Carbon Assessment has been undertaken (Appendix A), taking a holistic view to reducing embodied and operational carbon emissions. Site is a brownfield site that is being redeveloped.	A Whole Life Carbon Assessment has been undertaken (Appendix A), taking a holistic view to reducing embodied and operational carbon emissions	A Functional Adaptation Strategy Study considering Feasibility, Accessibility, Versatility, adaptability, convertibility, expandability and refurbishment potential will be produced, with a Plan to be produced in technical design stages. (Wst 06)* A Whole Life Carbon Assessment has been undertaken, taking a holistic view to reducing embodied and operational carbon emissions	A Functional Adaptation Strategy Study considering Feasibility, Accessibility, Versatility, adaptability, convertibility, expandability and refurbishment potential will be produced, with a Plan to be produced in technical design stages. (Wst 06)* A Whole Life Carbon Assessment has been undertaken, taking a holistic view to reducing embodied and operational carbon emissions	Residential areas will target a water consumption of 105 l/p/day or less. The development is being designed to be highly energy efficient, as confirmed within the Energy Strategy, submitted in support of the Planning Application. A Whole Life Carbon Assessment has been undertaken, taking a holistic view to reducing embodied and operational carbon emissions (Appendix A)	Non-residential units designed to accommodate a variety of uses. Column layout provides large spans and partition walls not yet defined. The spaces will be inherently flexible and adaptable to allow the tenant to fit out to their needs. Mix of residential units to meet expectations of wide range of peoples needs.	To be considered with tenant as part of incoming fit-outs. Residential occupants will be informed of features promoting efficient use of the dwellings.	The contractor will be required to monitor and report energy and water use during construction works on-site. (Man 03)*	**A Functional Adaptation Strategy Study and Plan will be developed.** **Monitoring and reporting of energy and water use during construction works.**	Maturity of the market /design solutions. Specific site constraints driving bespoke solutions.	Ensure structural design is optimised (Structural engineer) Pre-construction supply chain engagement	Review exercise at next stage of design.

Building "Layer" (as per GLA guidance)	Site	Substructure	Superstructure	Shell/ skin	Services	Space	Stuff	Construction stuff	Summary	Challenges	Counter-actions + who + when	Plan to prove and quality
Specifying and sourcing materials responsibly and sustainably	Sustainable procurement plan established across the development. (Mat 03)* Prioritise locally sourced materials where possible	Prioritise certified products / materials, i.e: - EPDs - ISO14001 - BES6001 - FSC - PEFC - CARES (Mat 03)* Concrete GGBS content to be optimised. Target to use materials that can be reused at end of life.	Prioritise products certified with BES6001 'Good' certification. (Mat 03)* Concrete GGBS content to be optimised. Recycled content of structural steel to be maximised. UK average currently approx. 20%. Target to use materials that can be reused at end of life.	Prioritise façade systems with EPDs. Review equivalent façade manufacturers and their associated product stage carbon emissions.	Recycled content of ductwork to be maximised.	Residential fixtures and fittings to consider responsible sourcing of products.	-	Sustainable Procurement Plan to be developed. To be reviewed with contractor during pre-construction supply chain engagement	**Materials to be responsibly sourced, and locally sourced where possible.** **Structural elements to have high recycled content or cement replacement levels.**	Potential cost premium. Higher recycled content targets may limit supply chain. Structural constraints for higher GGBS content.	Ensure structural design is optimised (Structural engineer) Pre-construction supply chain engagement	Review exercise at next stage of design
	SECTION B: DESIGN TO ELIMINATE WASTE (AND FOR EASE OF MAINTENANCE)											
Designing for reusability / recoverability / longevity / adaptability / flexibility	-	-	The following aspects have been or will be considered: - Flexible floorplates layouts / structural grids - Avoidance of toxic treatments and finishes. - Floor to ceiling heights - Placement of the cores. - Standardised components (Mat 05/Wst 06)*	The following aspects have been or will be considered: - Modular assembly of curtain walling - Off-site fabrication - Disassembly strategy - Standardised components (Mat 05/Wst 06)*	The following aspects have been or will be considered: - Flexibility / adaptability - Metering / split tenancies - Standardised components - Disassembly strategy (Mat 05/Wst 06)*	The following aspects have been or will be considered: - Flexible floor plates and layout for tenant fit outs - Adaptable for different needs. (Mat 05 / Wst 06)*	To be considered with tenants as part of incoming fit-outs.	Sustainable Procurement Plan has been developed. To be reviewed with contractor during pre-construction supply chain engagement	**Design spaces for flexibility whilst enabling access to all elements that could be re-used/replaced.**	Avoiding design solutions which constrain disassembly / recoverability.	Disassembly / recoverability review during detailed design (structural engineer, architect, contractor input)	-

Building "Layer" (as per GLA guidance)	Site	Substructure	Superstructure	Shell/ skin	Services	Space	Stuff	Construction stuff	Summary	Challenges	Counter-actions + who + when	Plan to prove and quality
Designing out construction, demolition, excavation, industrial and municipal waste arising	Retained buildings reducing the need for demolition and construction, hence reducing waste generation. Site excavation and demolition waste to be used to raise the level of Ground floor.	Basement areas has been re-considered to reduce the need for excavation. Piled foundations reduce excavation (Mat 06)*	The following have been or will be considered: - Modular construction - DfMA approaches - Supplier take-back schemes (Wst 01/06)*	The following have been or will be considered: - Modular construction - DfMA approaches - Supplier take-back schemes - Just-in-time delivery (Wst 01/06)*	The following have been or will be considered: - Modular construction - DfMA approaches - Supplier take-back schemes - Just-in-time delivery (Wst 01/06)*	The following have been or will be considered: - Supplier take-back schemes - Just-in-time delivery - Minimising Packaging (Wst 01)*	Waste segregation to be provided in residential waste storage areas to allow for recycling.	Accurately forecasting the amount of materials needed, using larger pack sizes to reduce the amount of packaging per unit and by using cardboard packaging instead of plastic where possible.	**Designing out waste through regular / modular design.** **Consideration for just-in-time delivery, reducing packaging, and supplier take-back schemes**	Supplier take-back schemes still an immature market for certain materials in the UK.	Review during detailed design	Review procurement plan with contractor during pre-construction supply chain engagement
	SECTION C: MANAGE WASTE											
Demolition waste (how waste from demolition of the layers will be managed)	Aim to achieve 90% diversion from landfill (Wst 01)* Majority will be brick and concreate, therefore can be crushed and re-used either on site or off site.	Existing sub structure for retained buildings will be re-used and protected. Waste materials will be considered for re-use on the site.	Solid brick walls and potentially some steel will be considered for re-use. Otherwise will be recycled. Clean concrete will be processed back to aggregate for concrete construction.	Mainly bricks. Where possible these will be salvaged and re-used either on or off site. The roofing materials are will be salvaged where possible for re-use on or off site. Where possible any insulation will be recovered at the recycling facility for reprocessing. Contaminated insulation will need to be forwarded for disposal.	Existing services are not suitable for the future uses of the site in either new or retained buildings and will be stripped out and materials segregated and recycled.	N/A	Industrial equipment will be sent for material separation and recycling.	Waste relating to the demolition phase will be managed through the implementation of a SWMP to be submitted prior to above-ground works, with a primary aim to minimise waste during this period. The contractor will support the segregation of recoverable and non-recoverable waste streams and indicative vehicle routes have been mapped, focusing on reducing vehicle milage.	**Pre-demolition audit will be undertaken , targeting 90% of waste diversion from landfill.**	Ensuring 90% of waste is diverted from landfill.	Pre-demolition audit, pre-contract engagement with demolition contractor.	Demolition SWMP records.

Building “Layer” (as per GLA guidance)	Site	Substructure	Superstructure	Shell/ skin	Services	Space	Stuff	Construction stuff	Summary	Challenges	Counter-actions + who + when	Plan to prove and quality
Excavation waste (how waste from excavation will be managed)	Site excavation and demolition waste to be used to raise the level of Ground floor	Concrete will be demolished and crushed for reuse within the site or re-use off-site.	N/A	N/A	N/A	N/A	N/A	N/A	Excavated waste to be re-used on site where possible.	Finding applicable uses for excavated waste.	Opportunities to be investigated for re-use (structural engineer, architect)	
Construction waste (how waste arising from construction of the layers will be reused or recycled)	Aim to achieve 90% diversion from landfill. (Wst 01)* Overall project target waste arising <6.5 ton/100m^2 GIFA of non-hazardous construction waste. (Wst 01)*	Aim to achieve 90% diversion from landfill. (Wst 01)* Overall project target <6.5 ton/m^2 GIFA of non-hazardous construction waste. (Wst 01)*	Aim to achieve 90% diversion from landfill. (Wst 01)* Overall project target <6.5 ton/m^2 GIFA of non-hazardous construction waste. (Wst 01)*	Aim to achieve 90% diversion from landfill. (Wst 01)* Overall project target <6.5 ton/m^2 GIFA of non-hazardous construction waste. (Wst 01)*	Aim to achieve 90% diversion from landfill. (Wst 01)* Overall project target <6.5 ton/m^2 GIFA of non-hazardous construction waste. (Wst 01)*	Aim to achieve 90% diversion from landfill. (Wst 01)* Overall project target <6.5 ton/m^2 GIFA of non-hazardous construction waste. (Wst 01)*	-.	To be reviewed with contractor during pre-construction supply chain engagement	Overarching project targets of 90% diversion from landfill and <6.5 ton/100m^2 GIFA of non-hazardous construction waste	Dealing with the most challenging waste streams commonly sent to landfill.	Pre-construction review with contractor	Final site waste management plan data as used for BREEAM PCR assessment
Municipal and industrial waste (how the design will support operational waste management)	Refuse storage planned in conjunction with site waste management strategy (Wst 03)*	Suitable refuse storage provided to enable segregation and storage of waste. (Wst 03)*	N/A	N/A	N/A	N/A	Space will be provided for segregation of recyclables and bulk items so that they can be collected for recycling.	N/A	Appropriate refuse storage to enable recycling and best practise waste management	Limited segregation for waste collected by the local authority. No food waste collections are available.	-	-

6. Appendix A: Whole life carbon assessment summary.

6.1 Methodology.

6.1.1 Assessment Scope

The assessment of Whole Life Carbon (WLC) emissions consists of the following sections: total operational carbon emissions (regulated plus unregulated); embodied carbon emissions; and any future potential carbon emissions 'benefits', post end-of-life, including benefits from reuse and recycling of building structure and materials.

This assessment has been undertaken in line with the draft GLA guidance for undertaking WLC Assessments and therefore in line with the RICS Professional Statement: Whole Life Carbon Assessment for the Built Environment.

Operational carbon emissions

In line with the draft GLA guidance, the operational carbon emissions are calculated based on the Part L assessments undertaken for the Proposed Development as part of the Energy Strategy for planning. This encompasses carbon emissions related to both regulated and unregulated energy uses (in line with Part L definitions), accumulated over a 60-year study period.

Embodied carbon assessment and end-of-life emissions

To assess the embodied carbon for the project, a Life Cycle Assessment (LCA) tool – One Click LCA – has been used to make allocations for the anticipated materials quantities in an inventory analysis. The materials are represented within the model by using materials with associated Environmental Product Declarations (EPDs). EPDs are produced by manufacturers and identify the carbon emissions of a product. By scheduling the materials proposed for the development, the overall carbon emissions can be approximated.

It should be noted here that the LCA tool has a limited database of materials. In the scenario where a specified material isn't included in the database, the most similar material in terms of material composition is selected instead.

In line with standard UK practice, the LCA process and results included by this report have been assessed in line with BS 15978:2011 and the RICS Professional Statement: Whole Life Carbon assessment for the built environment. All EPDs used have been produced in line with the requirements of BS EN 15804:2012. Hence, each material has been assessed against the following lifecycle stage:

- A1-A3: Product stage
- A4: Material transportation to site
- B4-B5: Replacement and maintenance
- C1-C4: End of life

Together with these stages, the contribution of life cycle stage A5 has also been explored separately, giving an estimate of the emissions related to the construction. I.e. the electrical consumption and waste disposal.

In line with the draft GLA guidance, the assessment includes the following elements:

- Demolition
- Facilitating works
- Substructure
- Superstructure (frame, upper floors, roof, stairs and ramps, external walls, windows and external doors, internal walls and partitions, internal doors)
- Finishes
- Fittings, furnishings and equipment
- Building services
- Prefabricated buildings and building units
- Work to existing building
- External works (hard and soft landscaping, fencing, fixtures, drainage, services)

6.1.2 Current and future carbon emissions

In line with the guidance given in the draft GLA guidance to Whole Life Carbon assessments, the assessment has been undertaken based on two sets of carbon emissions:

SAP 10

The first set of figures is based on the current status of the electricity grid and provides a point-in-time assessment. For materials manufactured in the UK, SAP 10 emission factors are used in line with the GLA's Energy Assessment Guidance. Products sourced from outside the UK use data appropriate to the local energy grid at that location. This set of figures is used in the comparison to the WLC benchmarks.

Decarbonisation

It is also important to consider the potential longer-term decarbonisation of the electricity grid and how this may impact on design decisions. The second set of figures is therefore based on the expected decarbonisation of the electricity grid over the lifetime of the development (i.e. 60 years).

The RICS WLC guidance (2017) and the GLA WLC guidance (2020) documents makes reference to use of the "slow progression' scenario *from the latest Future Energy Scenarios* (FES) developed by the National Grid and makes reference to the 2015 edition of FES.

This edition has been revised each year, with the latest edition 2019 accounting for more recent developments in the future performance of the National Grid. As noted in Figure 5, the actual performance of the national grid (black line) deviated from the FES 2016 'Slow Progression' scenario and is inaccurate.

Therefore, for this Whole Life Carbon Assessment, the National Grid's 2019 edition of the 'Steady Progression' scenario was chosen as this more closely maps the departments of Business Energy and Industrial Strategy (BEIS) declared grid carbon projection.

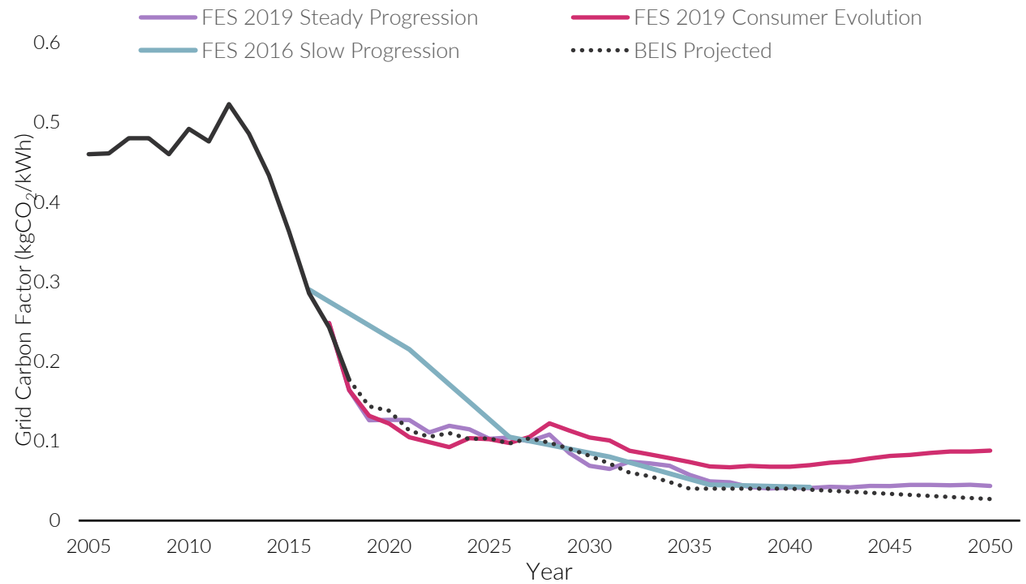

Figure 5: National Grid Future Energy Scenarios projection comparisons.

6.2 Inputs.

This section sets out the inputs used in the Whole Life Carbon assessment.

Operational carbon assessment

Operational carbon emissions are estimated as part of the Energy Strategy, submitted in support of the planning application. The assessment of operational carbon emissions has been based on the methodology set out in Part L of the building regulations, and a total of regulated and unregulated carbon emissions is reported.

- Residential areas: Operational carbon emissions are based on SAP calculations in line with Part L1A methodology.
- Non-residential areas: Operational carbon emissions are based on BRUKL calculations of regulated and unregulated energy.

Embodied Carbon and end-of-life assessment

Table 4 lists the building elements covered by the assessment, in line with the Royal Institute of Chartered Surveyors (RICS) Professional Statement: Whole Life Carbon assessment for the built environment.

Table 5 provides the life-cycle modules included in the assessment and commentary on the data source.

Table 4 Data used in the embodied carbon assessment.

Building element group	Building element (NRM level 2)	Basis for information
Demolition	0.1 Toxic/hazardous/contaminated material treatment	An allowance for contaminated land removal and treatment been considered within the Environmental Impact Statement.
	0.2 Major demolition works	An allowance for site excavation and demolition works was included in the assessment and used the average intensity of 1.39 kg CO_2e / m3 cleared debris, as developed by OneClick LCA software.
0 Facilitating works	0.3 & 0.5 Temporary/enabling works	Due to the early stage of the design (RIBA Stage 2) this information is not yet available and as such has not been included in the assessment.
	0.4 Specialist groundworks	No specialist ground works were included separately, with individual ground works accounted for in the relevant sub structure / external landscaping sections
1 substructure	1.1 Substructure	The specific foundations quantity was determined by OneClick LCA's carbon designer tool commensurate with the relevant building types. This was informed by the structural engineer for composition & pile depths.
2. Superstructure	2.1 Frame	Material quantity and composition of the frame were calculated using OneClick LCA's carbon designer tool commensurate with the relevant building types. Each frame is calculated using the development dimensions for each building core and compiled in the assessment. The composition was informed by information provided by the structural engineer.
	2.2 Upper floors incl. balconies	Material quantity and composition of the upper floor and balconies were calculated using OneClick LCA's carbon designer tool commensurate with the relevant building type. The composition was informed by information provided by the structural engineer.
	2.3 Roof	Material quantity and composition of the roof were calculated using OneClick LCA's carbon designer tool commensurate with the relevant building type. This data incorporates the development dimensions for each building core and then compiled in the assessment.
	2.4 Stairs and ramps	Material quantity and composition of the stairs were calculated using OneClick LCA's carbon designer tool commensurate with the relevant building type. This data incorporates the development dimensions for each building core and then compiled in the assessment.
	2.5 External walls	The external wall areas were calculated using OneClick LCA's carbon designer tool commensurate with the relevant building type and re-adjusted to match the proposed wall build up provided by the project architect.
	2.6 Windows and external doors	The window and door areas were calculated using OneClick LCA's carbon designer tool commensurate with the relevant building type and re-adjusted to match the proposed wall build up provided by the project architect,
	2.7 Internal walls and partitions	The internal partition areas were calculated using OneClick LCA's carbon designer tool commensurate with the relevant building type
	2.8 Internal doors	The internal doors areas were calculated using OneClick LCA's carbon designer tool commensurate with the relevant building type.
3 Finishes	3.1 Wall finishes	The wall, floor and ceiling finishes were calculated using OneClick LCA's carbon designer tool commensurate with the relevant building type.
	3.2 Floor finishes	
	3.3 Ceiling finishes	
4 Fittings, furnishings and equipment (FF&E)	4.1 Fittings, furnishings & equipment incl. building-related* and non-building-related**	The quantum of FFE for the residential apartments uses benchmark data from previous comparable assessments. The quantum of sanitaryware were calculated based on the area schedule and occupancy, with EPD's matched to the fittings proposed to be installed. FF&E is not applicable to the non-residential uses as these are being built out to a shell-only speculative standard and the detailed use types are unknown.
5 Building services/MEP	5.1–5.14 Services incl. building-related* and nonbuilding-related**	Building services data uses data provided from the Building Services engineers which align with the proposed services strategy for the project. The lengths of duct's, electrical distribution and water distribution were calculated on a m^2 GIA basis using in-built EPD within OneClick LCA.
6 Prefabricated Buildings and Building Units	6.1 Prefabricated buildings and building units	No prefabricated elements are applicable.

Building element group	Building element (NRM level 2)	Basis for information
7 Work to Existing Building	7.1 Minor demolition and alteration works	No minor works were applicable.
8 External works	8.1 Site preparation works	Due to the early stage of the design (RIBA Stage 2) this information is not yet available and as such has not been included in the assessment.
	8.2 Roads, paths, paving and surfacing	Data for roads, paths, paving and surfacing is based on details provided from the landscape architect.
	8.3 Soft landscaping, planting and irrigation systems	Data for Soft landscaping, planting and irrigation systems is based on details provided from the landscape architect.
	8.4 Fencing, railings and walls	Due to the early stage of the design (RIBA Stage 2) this information is not yet available and as such has not been included in the assessment.
	8.5 External fixtures	Due to the early stage of the design (RIBA Stage 2) this information is not yet available and as such has not been included in the assessment.
	8.6 External drainage	Due to the early stage of the design (RIBA Stage 2) this information is not yet available and as such has not been included in the assessment.
	8.7 External services	Due to the early stage of the design (RIBA Stage 2) this information is not yet available and as such has not been included in the assessment.
	8.8 Minor building works and ancillary buildings	No allowance was considered for minor building works and ancillary buildings.

Table 5 Life-cycle modules included in the assessment and commentary on the data source

Module	Description	Commentary of Data Source
A1-A3 Construction Materials	Raw material supply (A1) includes emissions generated when raw materials are taken from nature, transported to industrial units for processing and processed. Loss of raw material and energy are also taken into account. Transport impacts (A2) include exhaust emissions resulting from the transport of all raw materials from suppliers to the manufacturer's production plant as well as impacts of production of fuels. Production impacts (A3) cover the manufacturing of the production materials and fuels used by machines, as well as handling of waste formed in the production processes at the manufacturer's production plants until end-of-waste state.	Calculated using EPD's which align with the exact product (where known) or the most applicable similar product.
A4 Transportation to site	A4 includes exhaust emissions resulting from the transport of building products from manufacturer's production plant to building site as well as the environmental impacts of production of the used fuel.	Transport distances were estimated based on typical average transport distances based on material type & project location, provided by OneClick LCA.
A5 Construction/ installation process	A5 covers the exhaust emissions resulting from using energy during the site operations, the environmental impacts of production processes of fuel and energy and water as well as handling of waste until the end-of-waste state.	Due to lack of site-specific construction data, the climate zone average construction impact was used and sized based upon the scale of the development.
B1-B5 Maintenance and material replacement	The environmental impacts of maintenance and material replacements (B1-B5) include environmental impacts from replacing building products after they reach the end of their service life. The emissions cover impacts from raw material supply, transportation and production of the replaced new material as well as the impacts from manufacturing the replaced material and handling of waste until the end-of-waste state.	Use (B1) include the impact of refrigerant leakage at leakage rate of 3% a year and 98% end of life recovery. Maintenance (B2) and Repair (B3) have not been considered due to accurate data being unavailable at this early stage. Replacement (B4) and Refurbishment (B5) account for the technical service life of the building components "BCIS Life expectancy of building components"
B6 Energy use	The considered use phase energy consumption (B6) impacts include exhaust emissions from any building level energy production as well as the environmental impacts of production processes of fuel and externally produced energy. Energy transmission losses are also taken into account.	Energy consumption taken from the SAP and Energy assessment calculations for the project in line with GLA requirements.
B7 Water use	The considered use phase water consumption (B7) impacts include the environmental impacts of production processes of fresh water and the impacts from wastewater treatment.	Water consumption based on Building Regulations Part G 'Enhanced Consumption' of 105 l/p/d and multiplied by the intended full occupancy of the development, using the EPD for Thames Water.
C1-C4 Deconstruction	The impacts of deconstruction include impacts for processing recyclable construction waste flows for recycling (C3) until the end-of-waste stage or the impacts of pre-processing and landfilling for waste streams that cannot be recycled (C4) based on type of material. Additionally, deconstruction impacts include emissions caused by waste energy recovery.	C1 Deconstruction/demolition) and C2 (Transport) are based on default values. C3 (Waste Processing) and C4 (Disposal) use OneClick LCA's default end of life scenarios.
D External impacts/end-of-life benefits	External benefits for re-used or recycled material types include the positive impact of replacing virgin-based material with recycled material and the benefits of the energy which can be recovered from the materials.	D (End of Life) use OneClick LCA's default end of life scenarios.

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