Carbon Whole Life Cycle Assessment

Pre-Application Stage

266 – 278 Yeading Lane, Hayes

Presented to: Threshold Land & Estates Ltd

Issued: October 2024

Lucion Contract Reference: 117347.635953

Protecting people
and planet

Report Details

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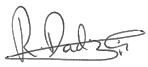
01	Final	22/10/2024	Final	Sophie Long	A. Bailly	
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About Us

Lucion Delta-Simons is part of Lucion, a technology-led environmental services company dedicated to protecting people and the planet. With expert advice, guidance, and a comprehensive array of services, we support you at every stage of your asset lifecycle, helping you mitigate regulatory impact, improve business practices, and ensure safety and environmental protection.

As part of Lucion's group of companies, we can support you with a broader range of holistic services. Through our pool of multidisciplinary experts, we help you navigate complex regulatory frameworks, saving you time and money.

Being part of your sustainable supply chain is a key goal for our team. As a member of the UN Global Compact and a commitment to sustainability, we are the partner of choice for businesses looking to make informed decisions and mitigate risks across your portfolio.

Lucion is carbon neutral. We annually measure and report our Scope 1, Scope 2 and specified Scope 3 carbon emissions, and offset 100% of residual emissions through verified carbon credits, supporting carbon reduction and prevention projects overseas. We are taking steps to reduce our carbon emissions and have committed to setting and achieving near-term and Net Zero Science-Based carbon reduction targets in line with the goals of the Paris Agreement to limit global warming to 1.5°C above pre-industrial levels. Lucion is a signatory of Pledge to Net Zero and Members of the United Nations Global Compact.

If you would like support in understanding your carbon emissions, or those of your supply chain, please get in touch with your Lucion contact above who will be happy to help.

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APPENDIX A - LIMITATIONS

1.0 Introduction

1.1 Appointment

Lucion Delta-Simons Ltd ("Lucion") was instructed by Create Design Ltd on behalf of Threshold Land & Estates Ltd (the "Client") to undertake a Whole Life Carbon Assessment (WLCA) for the redevelopment of an existing building consisting of a two-storey terraced building, at ground floor the building contains 6 retail units and at first floor it contains 5 x 3 bed flats at 226 – 278 Yeading Lane, Hayes, UB4 9AX (the "site").

The proposed re-development is to provide a total of 14 new residential units that comprise as: 10 x 2 bed 3 person apartments, 4 x 3 bed 5 person maisonettes, new shop fronts and signage for existing commercial tenants, parking and communal areas.

1.2 Scope of Works

The original scope of works undertaken for this assessment at pre-application stage is as follows:

Task 1 – Whole Life Cycle Assessment (Pre-application stage)

- The assessment shall be carried out at the pre-planning stage. The assessment will be a building WLCA on the building design in accordance with Greater London Authority (GLA) methodology for the specific building type and WLCA stage;
- 1x no. WLCA kick-off meeting with all relevant design team members: architect, quantity surveyor, M&E engineer, civil engineer, structural engineer; and
- Production of WLCA report & completion of the London Assembly Whole Life-Cycle Carbon Assessment template.

1.3 Site Location & Context

It is understood that the redevelopment of the existing building at 226 – 278 Yeading Lane, Hayes, UB4 9AX (the "site") is to provide a total of 14 new residential units and refurbishment of the ground floor commercial areas where required. The proposed design comprises as follows:

- New shop fronts and signage for existing commercial tenants;
- 1 loading space;
- 2 blue badge parking spaces;
- 2 EV charging points;
- Dedicated refuse holds for the retail/commercial and residential users;
- Biodiversity improvements through green roofs and green walls;
- Roof top amenity space for residents;
- Play area for children on the first floor; and
- Secure cycle parking for all residents', residential visitors, and commercial employees.

Figure 1. Proposed Location

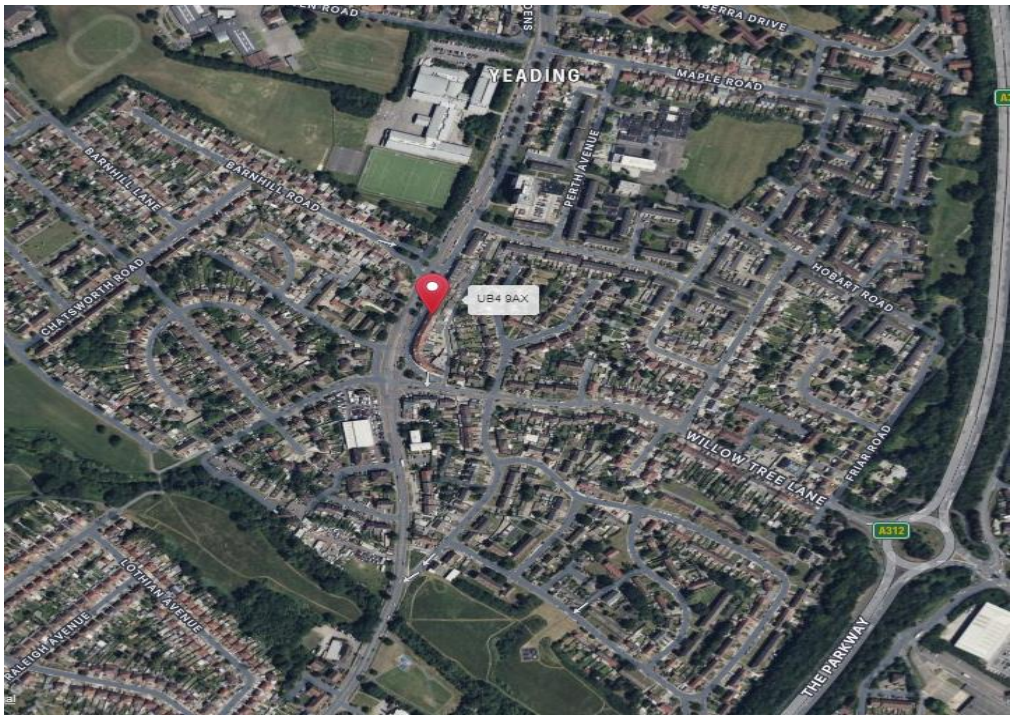


Figure 2. Proposed Site Plan

1.4 Limitations and Assumptions

It is the responsibility of the design team to provide data input required to model the WLCA to a sufficient standard. Lucion have taken the data provided in good faith and have conducted its own verification against industry standards, designed drawings and building specifications.

Lucion are not responsible for the submission of the London Assembly Whole Life-Cycle Carbon Assessment Template to the Greater London Authority, this responsibility lies with the Client.

WLCA's undertaken at the early design stage may present some challenging results. It should be noted that the WLCA process is iterative and within the early design stage, estimations and assumptions are used due to a lack of detailed information. It should be the aim of the design team to continuously improve this level of data availability to provide more accurate and representative WLCA results as the design develops.

A major amendment, EN 15804+A2, was approved to the EPD standard EN 15804, which changes EPDs significantly and has become mandatory since July 2022. With the amendment of EN 15804 being issued, namely EN 15804+A2, a change of the impact category array comes along. The categories which are taken into consideration are almost identical, however, the measurement units they are represented by, are different from the ones in EN 15804+A1. The changes from the EN 15804+A2 amendment will make it impossible for EPDs that only have EN 15804+A2 emissions to be used in WLCA calculations together with the regular EN 15804+A1 EPDs. A1 data cannot be simply converted into +A2 data.

1.5 Inclusions and Exclusions

Emissions have been calculated for building element categories that are applicable to the project, as per the RICS PS. Table 1 details which building elements have been included. Building elements have been broken down according to the RICS New Rules of Measurement (NRM) classification system level 2 sub-elements.

Table 1 – Category Inclusions and Exclusions

Element group	Building element (NRM level 2)	Included (Y/N)	Commentary
Demolition	0.1 Toxic/hazardous/contaminated material treatment	N	-
	0.2 Major demolition works	N	-
0 - Facilitating works	0.3 & 0.5 Temporary/enabling works	N	-
	0.4 Specialist groundworks	N	-
1 - Substructure	1.1 Substructure	N	Quantity not provided.
2 - Superstructure	2.1 Frame	N	Quantity not provided.
	2.2 Upper floors incl. balconies	Y	-
	2.3 Roof	Y	-
	2.4 Stairs and ramps	Y	-
	2.5 External walls	Y	-
	2.6 Windows and external doors	Y	-
	2.7 Internal walls and partitions	Y	-
	2.8 Internal doors	Y	-
3 - Finishes	3.1 Wall finishes	Y	-
	3.2 Floor finishes	Y	-
	3.3 Ceiling finishes	Y	-
4 Fittings, furnishings and equipment	4.1 Fittings, furnishings & equipment incl. building-related and non-building-related	N	Information not available at the early design stage.
5 Building services/MEP	5.1–5.14 Services incl. building-related and non-building-related	Y	-
6 Prefabricated Buildings and Building Units	6.1 Prefabricated buildings and building units	N	No pre-fabricated units incorporated into building design.
7 Work to Existing Building	7.1 Minor demolition and alteration works	N	Information not available at the early design stage.
8 External works	8.1 Site preparation works	Y	-

	8.2 Roads, paths, pavings and surfacings	Y	-
	8.3 Soft landscaping, planting and irrigation systems	Y	-
	8.4 Fencing, railings and walls	Y	-
	8.5 External fixtures	Y	-
	8.6 External drainage	N	Information not available at the early design stage.
	8.7 External services	N	Limited external services
	8.8 Minor building works and ancillary building	N	Information not available at the early design stage.

2.0 Whole Life Carbon Assessment

2.1 Purpose

The purpose of the Whole Lifecycle Carbon Assessment is to provide a true picture of the impact that the associated carbon emissions of a product, service or process have on the environment over their entire life cycle. The Whole Lifecycle Assessment approach considers the carbon impacts from demolition of, and preparation of the site, through extraction of materials and construction and on through the operational life of the building to its eventual decommissioning and deconstruction.

Embodied emissions are considered to be those corresponding to the raw material extraction, manufacture and transport of building materials, construction and the emissions associated with maintenance, repair and replacement as well as dismantling demolition and eventual material disposal. Whilst operational carbon emissions are those associated with the regulated and unregulated energy consumption of the building. Additionally, a WCLA further includes a review of the potential carbon emissions 'benefits' from the reuse or recycling of components after the end of a building's useful life.

This process is intended to standardise whole life carbon assessments in line with the methodology in EN 15978 to achieve coherent and comparable results that can be used to benchmark the whole life carbon performance of the current design against possible design options and to other built assets. Even at an early stage it is still beneficial to gauge coherence in the calculations where more detailed project-specific information might not yet be available, as appropriately timed and sequenced carbon assessments help identify carbon reduction opportunities as well as monitor the project's progress in achieving wider sustainability and climate change related goals.

2.2 Methodology

BS EN 15978: 2011

This assessment has been undertaken in accordance with the nationally recognised appraisal framework BS EN 15978: 2011 (Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method), which concerns the environmental impacts of the built environment within the UK. The standard outlines framework principles that guide whole life cycle assessments to be able to describe the environmental impacts of built projects formulated on life-cycle assessment. This is inclusive of:

- Carbon emissions associated with pre-construction demolition;
- Carbon savings associated with the retention, reuse and recycling of existing structures and materials that are already on-site;
- Operational carbon emissions (both regulated and unregulated);
- Embodied carbon emissions; and
- Future potential carbon savings post end-of-life, including savings from reuse and recycling of building structure and materials.

RICS Guidance

The Royal Institute of Chartered Surveyors (RICS) released a professional survey Whole Life Carbon Assessment (WLCA) for the built environment (2nd edition, September 2023) (RICS Professional Statement) underpinning the principles of BS EN 15978: 2011 with the aim serve as a guide to practically implement and quantify environmental impacts of builds throughout a whole life carbon assessment whilst avoiding subsequent discrepancies of LCA results. The RICS PS outlines provides a solution to the shortcoming of the building industry to properly account for the embodied carbon emissions.

Additional industry effort has been placed on reducing operational emissions through targets in building regulations (Part L) and local authority planning requirements. Accounting for both operational and

embodied carbon emissions simultaneously is a key principle of the WLC assessment, highlighting the importance of complying with the RICS PS guidance.

Greater London Authority (GLA)

In response to the aspirations for London to become a Net Zero city, the GLA's Policy SI 2 – '*Minimising Greenhouse Gas Emissions*'[1] requires for all referrable developments to undertake a nationally recognised WLCA. A WLCA requirement is not subject to the Mayor of London's net zero-carbon target; but planning applicants are required to calculate operational and embodied emissions and demonstrate actions taken to reduce life-cycle carbon emissions. Planning applicants should follow ensure that the GLA's Energy Assessment Guidance to assess and reduce operational emissions is assessed as part of the WLCA process.

2.3 Industry Standards

UKGBC

The UK Green Building Council (UKGBC) published the Net Zero Carbon Buildings: a framework definition, which outlines key principles to drive the transition to a net zero built environment. The framework sets out definitions and principles around two approaches to net zero carbon, which are of equal importance. New buildings and major refurbishments targeting net zero carbon for construction should be designed to achieve net zero carbon for operational energy considering the overarching principles:

- Establishing a net zero carbon scope;
- Reducing construction impacts by;
- Reducing operational energy;
- Increasing renewable energy supply; and
- Offsetting remaining carbon.

Royal Institute of British Architects (RIBA) 2030 Climate Challenge

RIBA has developed voluntary performance targets for operational energy use, water use and embodied carbon.

Originally launched in October 2019, RIBA 2030 Climate Challenge has now been re-issued as Version 2 (2021) with refined and updated targets that encompass development in the knowledge base of performance trajectories – particularly in the embodied carbon field. The embodied carbon targets in Version 2 are now aligned with LETI and others.

As the targets are for performance outcomes of buildings in operation, RIBA advocates that buildings in design today should, as a minimum, adopt the 2025 targets.

The London Energy Transformation Initiative (LETI)

LETI is a network of over 1000 built environment professionals that are working together to put the UK on the path to a zero-carbon future. LETI, who first published embodied carbon targets in 2020 and In May 2021, released a suite of documents relating to defining and aligning whole life carbon and embodied carbon targets. LETI introduced a letter banding rating system to allow for quick comparison of ambition across various typologies. The LETI position is that for buildings that are currently in the design stage:

- Average design achieves an E;
- Good design achieves a C (LETI 2020 target);
- LETI 2030 design target achieves an A; and
- The RIBA 2030 Climate Challenge built performance is equivalent of a B rating.

[1] Greater London Authority (GLA's) Policy SI 2: the_london_plan_2021.pdf

Note: It is important to note that the RIBA targets are performance targets to be realised in buildings completed in 2020, 2025 and 2030 (known as Built Targets), whereas the LETI targets relate to year of design (known as Design Targets).

2.4 Life Cycle Modules

The WLC assessment covers the all-modules A, B and C set out in BS EN 15978 and the RICS PS in the life of a typical project described as life-cycle modules. The reference study period (i.e. the assumed building life expectancy) for the purposes of the assessment is 60 years.

To provide a holistic view of the Global Warming Potential (GWP), the whole life carbon assessment accounts for all components relating to the project during all life stages. Embodied carbon emissions are attributed to four main categories taken from BS EN 15978 and RICS PS. These main categories are listed in Table 1 below. The carbon emissions within each module can be broadly divided from a calculation perspective into embodied and operational carbon.

Table 2 – WLCA Life Cycle Stages

Life Cycle Stage		Description
Product Sourcing & Construction Stage	A1-A3 Materials*	Includes raw material extraction and processing, transportation to manufacturer and manufacturing.
	A4 Transportation*	Impacts and aspects associated with the transportation of materials to a construction site.
	A5 Construction*	The use of energy during the site operations, production processes of fuel and energy and water as well as handling of waste.
Use Stage	B1 In Use	Emissions arising as a result the use of an installed product.
	B2 – B3 Maintenance & Repair	Emissions arising as a result of the maintenance of building systems, structure and equipment.
	B4* – B5 Replacement	Emissions arising as a result of the replacement of building systems, structure and equipment.
	B6 Operational Energy Use*	Energy consumption 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, regulated and un-regulated energy.
	B7 Operational Water Use	Consumption of potable and non-potable water consumption.
End of Life Stage	C1 – C4 End of Life	Impacts of deconstruction associated with de-construction, demolition, transport to waste processing, waste processing and disposal.
Benefits and Loads Beyond System Boundary	D External Impacts	Reuse, recovery and recycling potential, expressed as a net benefit. Often referenced as circular economy.

* RICS minimum requirements for life cycle stage reporting as per the RICS PS.

2.5 OneClick Modelling Software

This WLCA has used the OneClick LCA in house database, where data is reviewed, verified, curated and integrated from various public and private sources. All of the data within the database undergoes a rigorous ten-point verification using a process that has been reviewed by Building Research Establishment (BRE). The WLCA tool reports the results in $kgCO_2$ for the required stages in line with EN 15978.

2.6 Data Sources

To complete the WLCA the design team have provided the following information:

- Design Drawing Summary (718-CDA-ZZ package);
- 226-278 Yeading Lane_WLCA_Quantity_Details_040924.xlsb;

- Design and Access Statement;

NOTE: Due to the stage of the project, not all information was available during the analysis. In most cases assumptions could be made however, in some instances, elements had to be excluded from the assessment. This WLCA complies with the minimum requirements as detailed in Table 1.

2.7 Suitably Qualified LCA Specialist

This report has been undertaken by Sophie Long, a suitably qualified third party, prior to the submission of planning for the development. Sophie has received certified training on the OneClick LCA tool used to complete this options appraisal and has completed at least three different building LCA's for paying customers in the last two years. After completing a master's degree in Ecological Economics, Sophie has had a wide range of experience working within the construction sector, which has equipped her with the skills to be able to interpret complex information such as construction documentation.

3.0 Detailed Results

The following chapter presents the results of the WLC Assessment. It highlights the significantly contributing materials and identifies opportunities to reduce embodied carbon emissions.

3.1 Scope

This report has been produced in accordance with the mandatory requirements of the RICS PS - Whole Life Carbon Assessment (WLCA) for the built environment (2nd edition, September 2023). The WLCA is following the RICS methodology that has identified the elements that are present and in-scope in the building, based on section 2.5 of this report and the RICS New Rules of Measurement (NRM)[2].

The duration of the LCA study is 60 years and will include not only the declared building as a quantity but also details of the function, duration, quality, and maintenance of the building.

As the proposed development is part refurbishment, part new build, this WLCA will be treated as new projects, and must report against all life cycle stages and will ensure that any demolition/deconstruction or alterations to facilitate the retrofit/refurbishment works, including removals and/or stripping out of elements, are treated as preconstruction works and reported in the separate sub-module A5.1. Retained elements from the original building are assumed to have no impact from their previous manufacture included in the A1–A5 assessment of a retrofit/refurbishment, as per the RICS PS guidance.

For a completed project that is part retrofit/refurbishment and part new build, this report includes the following in $kgCO_2e/m^2$ and tonnes CO_2e (tCO_2e):

- Total project impacts;
- Impacts for the refurbished GIA (including demolitions or alterations within this GIA);
- Impacts for the new, additional GIA (including demolitions or alterations within this GIA);
- Any external works within the site boundary; and
- Upfront carbon impacts related to external works required outside the site boundary.

Estimated operational energy consumption has been provided

3.2 Modelling Summary

3.2.1 Overview

The building design has resulted in **1,103,105** $kgCO_2e$. This value is inclusive of all life cycle stages.

Table 3 – Building Modelling Summary

Main Elemental Group	Sub-Elemental Group	Construction Design	Quantities
Substructure	1.1 Substructure	Strengthening material where necessary to accommodate for additional load	Quantity not provided.
Superstructure	2.1 Frame	Light weight steel frame to first and second floor	Quantity not provided.
	2.2 Upper floors including balconies	New first floor from fabricated from timber joists (over existing concrete slab) suspended from steel hangers. New second floor and roof fabricated from concrete slabs supported on steel beams. Metal and glass balustrading to private and shared amenity spaces.	First floor joists -750m^2. Second floor concrete slabs- 650m^2. Concrete roof slab- 305m^2. Metal balustrading - linear 110.6m and area of 102.5m^2. Area of Glass screen balustrading linear 54m and area of 81 m^2.

[2] RICS New Rules of Measurement 3rd Edition https://www.rics.org/profession-standards/rics-standards-and-guidance/sector-standards/construction-standards/nrm#tabs-6fc5409ee0-item-d51d514bfa-tab

	2.3.1 Roof Structure	Timber trusses and joists	
	2.3.3 Roof Covering	Composite timber decking to communal amenity area, play space, and private residential terraces and balconies. Extensive green roof to cycle shed. Grass communal amenity space. Pebble ballast to other flat roofs. Resin bonded rubber flooring to play area. Slate tiles on pitched roofs	Composite decking -247m^2. Green roof - 41m^2. Grass amenity space 33m^2. Pebble ballast- 150m^2. Rubber flooring- 36m^2. Slate tiles -450m^2.
	2.3.4 Rooflights, skylights and openings	Generic rooflights	4m^2 in total.
	2.4 Stairs & ramp structures	New precast concrete stair from first to second floor and ground to roof as part of the main core. Timber hardwood internal maisonette stairs	Proposed escape stairs - 24m^2. Residential stairs - 4 x 6m^2 =24m^2.
	2.5.1 External Walls	Proposed brick slips to first and second floors. Metsec framing system. Profiled ceramic feature panels.	Proposed brick slips 420m^2. Ceramic tiles 30m^2.
	2.5.3 Solar or Rainscreen	Perforated aluminium panels to core tower enclosure and north escape stair screen.	170m^2.
	2.6 External Windows	Aluminium double-glazed residential windows, Full height glazed shop fronts including glazed doors and glazed spandrels.	Residential windows 197m^2. Glazed shopfronts 135m^2. Doors 20m^2.
	2.7 Internal Walls	Party walls between flats and corridor.	Party walls linear 216m – 648m^2 area. Internal residential walls linear 288m^2 -864m^2 area.
Finishes	3.1 Wall Finishes	Wall finishes to residential - emulsion paint and ceramic tiles to bathrooms & kitchens. Wall finish to corridors & residential lobby - emulsion paint on plasterboard.	Area of residential painted walls - 2100m^2. Area of tiles - 450m^2. Area of painted corridors - 625m^2.
	3.2 Floor Finishes	Ceramic tiles to residential lobby. Vinyl /lino floor to corridors and common circulation areas. Dwellings - hardwood flooring to living space and internal circulation. Carpeting to bedrooms. Ceramic tiles to bathrooms	Residential lobby - 60m^2. Communal corridors -135m^2. Dwellings - 608m^2 of hardwood flooring. 350m^2 of carpet. 75m^2 of ceramic tiles.
	3.3 Ceiling Finishes	Residential lobby - emulsion paint on plasterboard. Communal corridors - emulsion paint on plasterboard. Dwellings - emulsion paint on plasterboard.	Residential lobby - 60m^2. Communal corridors -135m^2. Dwellings - 1500m^2.
External Works	8.2 Roads, paths, paving & surfaces	Porous coloured tarmac to access point and yard to the rear. All other paving as existing	544m^2.
	8.3 Soft landscaping, planting & irrigation	Soft landscaping is limited to roof areas. Planting of smaller species of trees and shubs / plants in corten steel plant boxes plus an area of green wall.	5 small trees- 11m2, 24m2 of plants/shrubs. 33m2 of grass lawn. 38.5m2 of green wall
	8.4 Fencing, railings & walls	Roof plant enclosures, cycle storage enclosure, and commercial refuse hold enclosure - all composite timber slats with a lightweight painted steel frame	Roof plant - 39m2. Cycle storage - 15 linear metres- area 37.5m2. Commercial refuse-hold 12 linear m
	8.5 External Fixtures	Stainless Steel Sheffield stands	9no

3.2.2 Operational Energy

Annual predicted regulated and unregulated operational energy consumption has been estimated using predicted energy consumption figures provided as part of the development's Sustainability and Energy Statement completed by Lucion. Consumption was estimated to be 35,374 kWh for regulated and unregulated energy consumption.

3.3 Embodied Carbon Emissions per Building Element

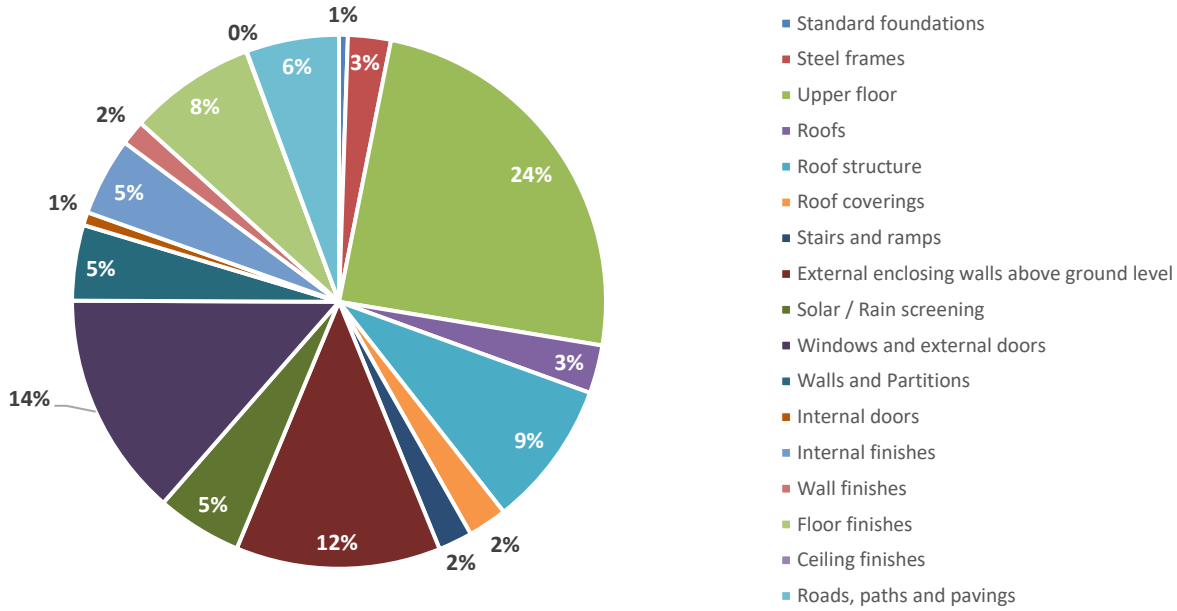
Table 4 and Figure 1 shows the superstructure WLCA for GWP in kg CO_2e by building sub-elements for the proposed building design. Upper floors demonstrate the highest concentrations of CO_2e followed by windows and external doors (14%), external enclosing walls above ground level (12%), roof structure (9%), floor finishes (8%), external works (6%). All other categories contribute less than 5% of total $kgCO_2e$.

Table 4 – $KgCO_2e$ per Building Element

Building Element	$kgCO_2e$	Percentage
Standard foundations	1,928.03	1%
Steel frames	9,354.32	3%
Upper floor	88,295.39	24%
Roofs	10,528.74	3%
Roof structure	31,990.24	9%
Roof coverings	8,540.08	2%
Stairs and ramps	7,448.41	2%
External enclosing walls above ground level	44,715.91	12%
Solar / Rain screening	18,659.36	5%
Windows and external doors	49,159.34	14%
Walls and Partitions	16,500.10	5%
Internal doors	2,867.92	1%
Internal finishes	17,040.89	5%
Wall finishes	5,421.93	2%
Floor finishes	27,666.80	8%
Ceiling finishes	116.78	0%
Roads, paths and pavings	20,266.67	6%
Total	**360,500.91**	**100%**

It should be noted that quantities related to the new lightweight steel frame to first and second floors and substructure strengthening works have not been provided. When available, these quantities may drastically change the ordering of the $kgCO_2e$ per building element. Emissions related to building services and site construction activities are not included within Table 4.

Figure 1 – Carbon Emissions per Building Element



3.4 Emissions per Life Cycle Stage

Table 5 below shows the proportional contribution of the different building life cycle stages in relation to carbon for the proposed development over life cycle stages A1-A5, B1-B5 and C1-C4. Operational carbon (B6) contributes the most at 55%, followed by product stage (A1-A3). All other categories contribute to less than 10% of the WLCA emissions.

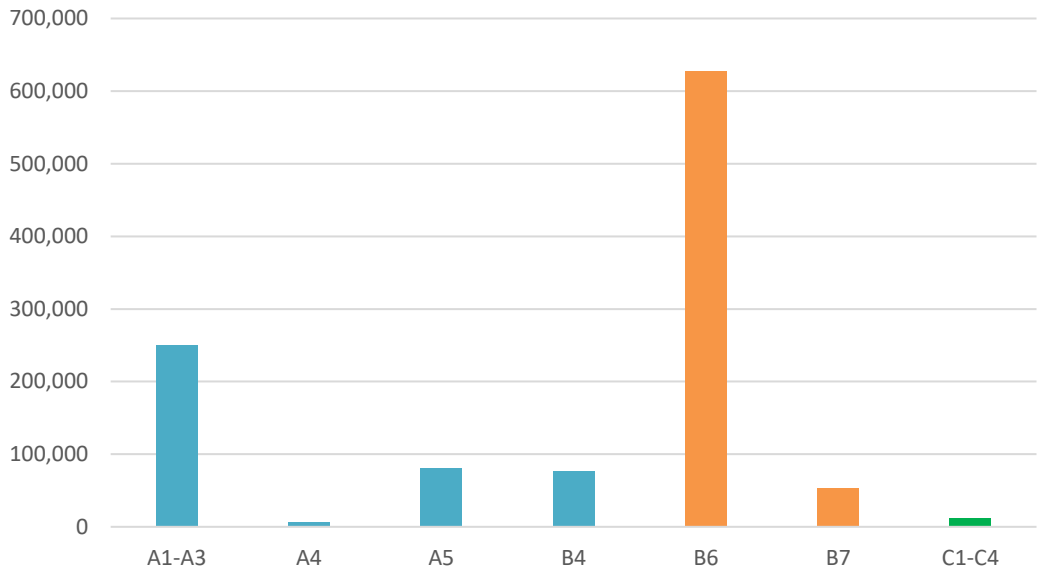
Table 5 – $KgCO_2e$ per Life Cycle Stage

Life Cycle Stage	$kgCO_2e$	Percentage
A1-A3	249,344.99	23%
A4	5,673.56	1%
A5	80,731.19	7%
B4	76,193.88	7%
B6	626,759.63	57%
B7	52,844.80	5%
C1-C4	11,557.29	1%
Total	**1,103,105.33**	**100%**

Figure 2 shows the WLCA for GWP in kg CO_2e by building life cycle stage. Embodied carbon is referenced in blue whilst operation carbon is referenced in orange. B6 Energy demonstrates the highest concentrations of $kgCO_2e$. Regarding embodied carbon only, the product stage (A1-A3) represents the highest concentrations of $kgCO_2e$.

Once quantities for all building materials are provided, the ordering of the highest contributing life cycle stage may drastically change.

Figure 2 – Carbon Emissions per Life Cycle Stage



3.5 Comparisons to Industry Targets

Table 6 shows the embodied carbon results compared to relevant industry benchmarks to provide wider context for the Yeading Lane development. Based on the current design, the intensity ratio for the Yeading Lane development is 518 $kgCO_2e$ per m^2.

Table 6 – Industry Target Comparisons

Framework	$kgCO_2e/m^2$
RIBA 2030 V2 Embodied Carbon (residential)	< 625
LETI Embodied Carbon – A+	345
LETI Embodied Carbon – B	500
LETI Embodied Carbon – C	750
LETI Embodied Carbon – D	970
LETI Embodied Carbon – E	1180

4.0 Recommendations & Next Steps

4.1 Recommendations

The planning stage WLCA results demonstrate the potential environmental impact of a building design. Specifically, the results are based on elemental construction levels and represent the embodied carbon associated with raw material extraction, products, transportation, construction, maintenance and replacement and end of life disposal, based on a 60-year building lifespan. The following section details recommendations that the design team should consider as the building design develops.

4.1.1 Suitable Materials

It should be noted that generic information based on the RICS Whole Life Carbon Methodology and industry best practice has been used to model data relating to all life cycle stages. Specifications have only been utilised where information has been provided by the design team. Where a product has not been available on the OneClick database, generic information and industry best practice has been used to influence decision making.

It is likely that at the Technical Design stage WLCA, product specific information will become available. It is recommended that the design team considers the results of the planning stage WLCA and uses this as a tool to influence procurement-based decisions for construction build ups and material specifications.

Where feasible, materials with environmental product declarations (EPD'S) should be considered and building elements that have a lower GWP should be specified. Additionally, innovative materials designs, such as low carbon concrete or carbon-cured concrete technologies, which can significantly reduce the embodied carbon of concrete, could be explored. Structural steel is a major contributor to the GWP and the use of recycled steel or steel with a higher recycled content should be prioritised, as well as exploring the use of alternative materials such as mass timber or reinforced concrete for certain structural elements where feasible and applicable.

Generally, the design team should look to incorporate increased amounts of recycled content in materials to further reduce the environmental impact. This is particularly relevant for the foundations and flooring components.

4.1.2 Compact Design and Offsite Fabrication

It is recommended that the design team establishes environmental metrics such as carbon reduction targets for the project (e.g., $kgCO_2e$ per m^2) and implement performance criteria for materials including durability, energy efficiency and recyclability.

Lightweight design and prefabrication can reduce waste and improve material efficiency. Where feasible, these principles should be considered for additional areas of the building. Additionally, the design team should ensure that the development is designed for efficient use of materials to minimise waste throughout the construction process.

Given that energy use is a significant contributor to GWP, it is recommended that opportunities for further energy efficiency improvements or increased renewable energy integration be explored. In addition, on-site renewable energy generation or the purchase of renewable energy credits to offset operational emissions should be considered.

4.1.3 Communication

Collaboration and communication should be fostered among all relevant stakeholders to ensure team members understand embodied carbon and strive for low environmental impacting options. Specifying materials with low embodied carbon is a crucial step toward more sustainable building practices. By conducting thorough assessments, setting clear goals, selecting appropriate materials, and fostering collaboration, design teams can significantly reduce the environmental impact of their projects and contribute to a more sustainable future.

4.1.4 Engagement

The UKGBC have published the 'NZ WLC Roadmap; Stakeholder Action Plan' which provides a set of recommended industry-wide actions for achieving net zero carbon in the construction, operation and demolition of buildings in the UK.

Within the publication is a 'Contractor Action Plan'. A number of the key 'immediate' actions that can be considered at project level have been outlined below for consideration by the contractor:

- Embed low carbon competency and advocacy across all current and prospective built environment professionals;
- Work to agree a coherent approach to the development, adoption, approaches, and methods for monitoring in-use performance of buildings;
- Support the development of performance-based rating schemes for in-use energy in buildings;
- Support use of Whole Life Carbon (WLC) (and other environmental impacts) as design criteria and to drive design decisions;
- Adopt and promote standard metrics for monitoring and reporting embodied carbon (for both buildings and infrastructure projects);
- Establish a requirement for use of EPD databases in the design process (Built Environment Carbon Database (BECD));
- Develop a performance and disclosure culture across professional service firms, their clients, and supply chains;
- Integrate retrofit competency requirements within professional qualification criteria; and
- Work with wider industry to develop BIM-based building passports dealing with build quality, build standards, embodied and operational carbon.

4.2 Next Steps

Following the circulation of this WLCA, the design team should review and allow the integration of the WLCA into the wider decision-making process. Upon commencement of the detailed planning stage WLCA, more accurate information relating to specifications and quantities should be provided.

Where alternative materials with lower GWP should be considered and implemented, these design decisions should be communicated to the WLC modeller to ensure the model is accurate and reflects the developed design, ensuring up to date benchmarking against the established project targets.

Lucion will assist in the completion of the GLA WLCA tool. However, it should be noted that it is the responsibility of the Client to submit this to the Greater London Authority.

Appendix A – Limitations

Limitations

The recommendations contained in this Report represent Lucion professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Sustainability Consultant.

Lucion obtained, reviewed and evaluated information in preparing this Report from the Client and others. Lucion conclusions, opinions and recommendations has been determined using this information. Lucion does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Lucion has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

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