ELEMENT SUSTAINABILITY

FIRST STREET, MANCHESTER

LIFE CYCLE ASSESSMENT

DECEMBER 2024

REF: 2024.118



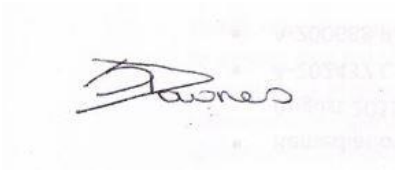
ELEMENT SUSTAINABILITY – ISSUE NOTES

Project No: 2024.118

Title: First Street, Plot 9b
Life Cycle Assessment (RICS Methodology)

Client: Vita Meadow Limited

Status: Final

Version:	1.0	
Date:	December 2024	
Prepared by: 	Checked by: 	Approved by: 
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Version	Version Details	Date Issued	Issued by:
1.0	Draft for client comment	2nd December 2024	CA

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1. INTRODUCTION

Element Sustainability have been commissioned by Vita Meadow Limited to undertake a Life Cycle Assessment (LCA) of the proposed First Street, Plot 9b, Purpose Built Student Accommodation scheme (PBSA), in Manchester. In order to understand what impact, the scheme will have on the environment, regarding both embodied and whole life carbon. This also enables comparisons to be made against industry benchmarks.

For the purpose of this assessment only the development site has been included, thereby excluding the construction compound site.

The purpose of this assessment is to assess the whole life carbon impact of the proposed scheme, in line with the Royal Institute of Chartered Surveyors (RICS) Professional Statement 2nd edition (incorporating all life cycle modules), and to separately report on the upfront embodied carbon (lifecycle modules A1–A5), whole life cycle carbon (lifecycle modules A-C, excluding B6, B7 and D), and life cycle module D.

The primary metric used to analyse the Global Warming Potential (GWP) of the scheme is expressed in terms of carbon dioxide equivalent (CO_2e), often referred to as carbon emissions. Whole Life-Cycle Carbon (WLC) emissions are the carbon emissions resulting from the materials, construction, and the use of a building over its entire life, including its demolition and disposal.

2. PROJECT DETAILS

2.1 Project Details

The mandatory asset-related technical characteristics for the project are set out within Table 2.1 as per the requirements of the RICS Professional Statement.

Table 2.1 - Key Project Details

Category	Project Details
Project Name	Plot 9b First Street
Asset type	New construction – Purpose Built Student Accommodation (PBSA)
Development Proposal	Erection of a purpose-built student accommodation (PBSA) building (Sui Generis), alongside ancillary amenity space, landscaping, secure cycle parking and other associated works; and use of Land east of River Street as a construction compound.
Gross Internal Area	27,146.8m^2
Number of Storeys	33 floors (including ground)
Location	Plot 9b, First Street, Manchester M1 5GG
Anticipated start-on-site and completion dates.	TBC

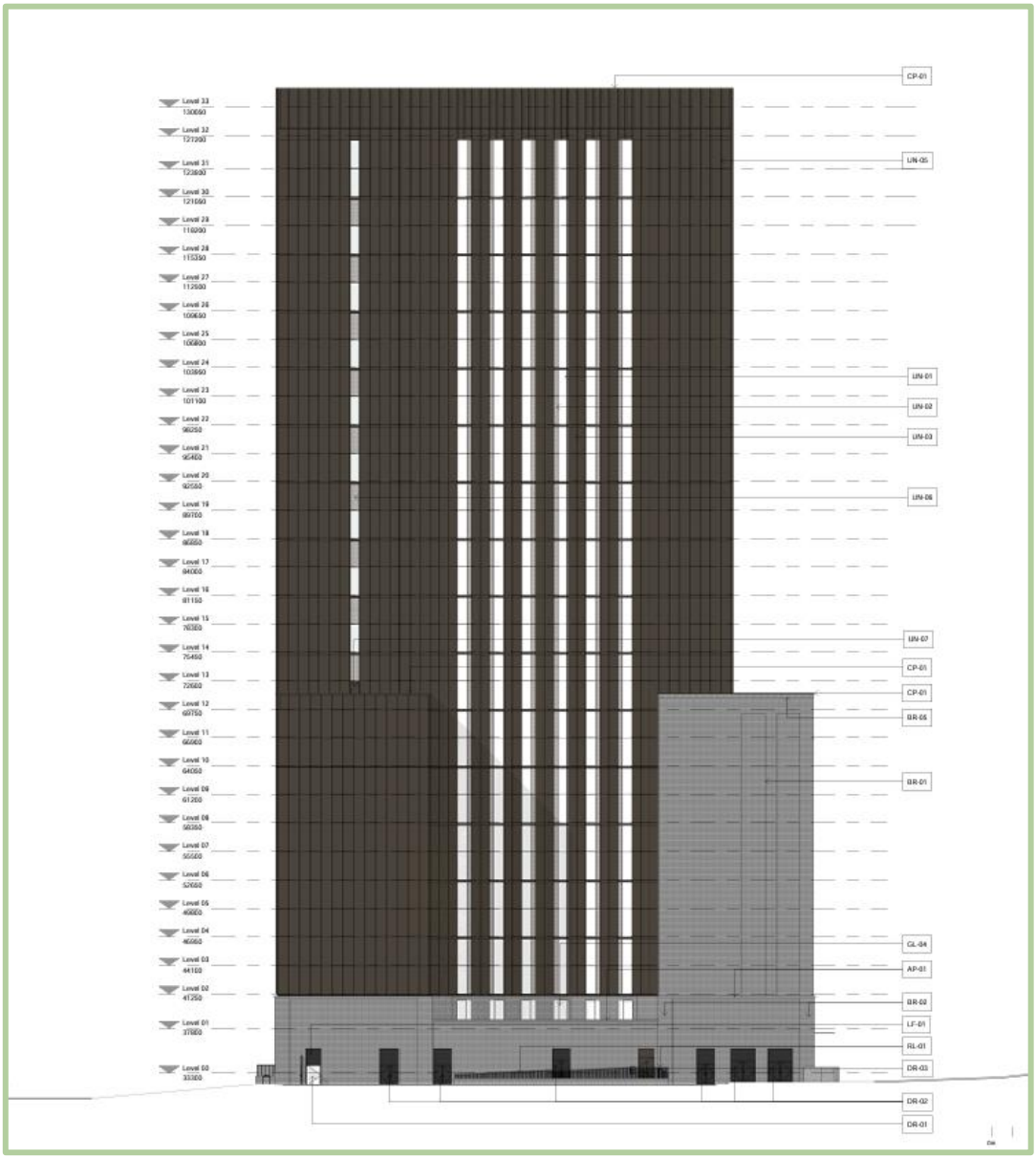
The mandatory assessment details for the project are set out within Table 2.2 as per the requirements of the RICS Professional Statement.

Table 2.1 - Key Assessment Details

Category	Assessment Details
Assessed by	Element Sustainability Limited
Date of Assessment	11th November 2024
Project Phase	Concept Design – Planning Stage
Assessment Scope	Fully fitted

Figures 2.1 below demonstrates the proposed north elevation for the scheme:

Figure 2.1 – Proposed Elevation



3. LIFE CYCLE ASSESSMENT

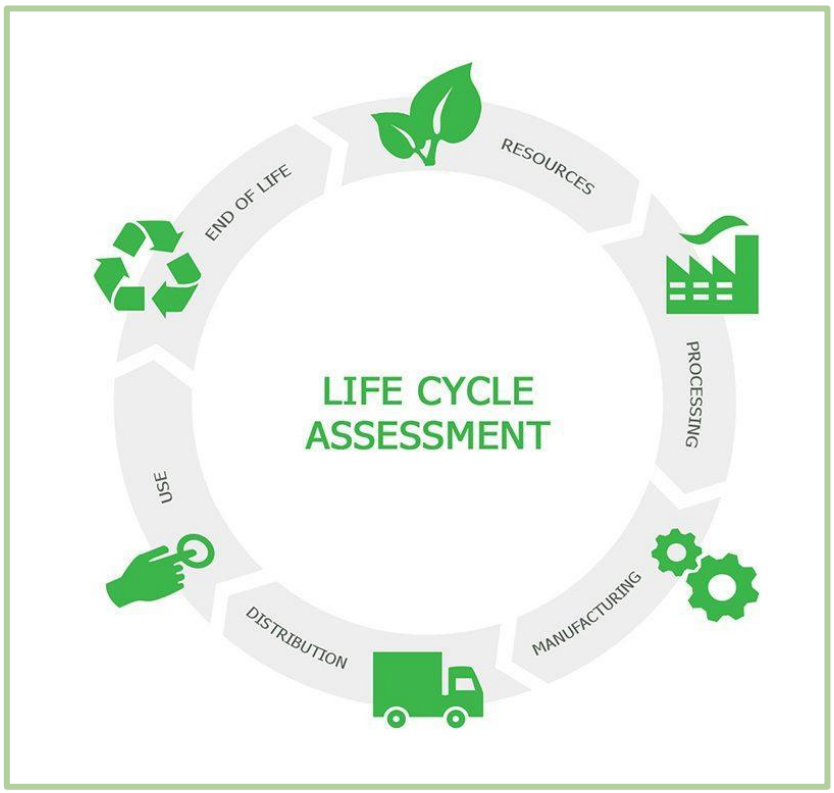
3.1 Definition

Building Life Cycle Assessment (LCA) is a science-based methodology for quantifying the lifetime environmental impacts of a building. It is used to measure and reduce the embodied, and whole-life carbon of a building. The embodied carbon refers to the emissions arising from the extraction, manufacture, transportation, installation, maintenance and disposal of all building materials.

Typically, the assessment is used to calculate the overall environmental footprint of a product and then identify design measures to reduce the carbon emissions associated with each stage of the project's lifecycle.

The following image shows a LCA model that would apply to a scheme within the built environment.

Figure 3.1 – Lifecycle Stages of a Building



Source: OneClickLCA

3.2 Methodology

The RICS Professional Statement mandates a whole life approach to reducing carbon emissions within the built environment. It is intended to standardise whole life carbon assessments and enhance consistency in outputs, by providing specific practical guidance for the interpretation and implementation of the methodology stipulated by EN 15978. This assessment has been conducted in line with the RICS Professional Statement.

One Click LCA Software was used to undertake this life cycle assessment, as it is a compliant and recognised tool to conduct life cycle assessments, in accordance with the following standards:

- BS EN 15978: 2011 – Sustainability of Construction Works – Assessment of Environmental Performance of Buildings - Calculation Method;
- ISO 14040 2006: Environmental Management – Lifecycle Assessment – Principles and Framework; and,
- ISO 14044 2006: Environmental Management – Lifecycle Assessment – Requirements and Guidelines.

The construction materials and quantities specified for this model were provided by the design team or extracted from the necessary plans and specification documents provided, as listed below:

- 1207-TGA-MT-01001-MX-P01 Mat 01 Options Appraisal Matrix
- BREEAM NC CD LCA RFI - FUT comments
- Collated concrete and rebar quantities - ROC Consulting
- TPM Copy of BREEAM NC CD LCA RFI

All assumptions used to complete the assessment are listed within Section 3.4 of this report.

The LCA templates selected for assessment match the details of the materials provided and, where certain material templates were not available, a similar product was then selected from those available within the extensive One Click database.

One Click LCA default scenarios were used to facilitate the carbon calculations for this scheme, as set out below:

- Service life values were set to the 'RICS 2nd Edition Default Service Life';
- Transportation distances for materials were set to reflect UK construction best practice;
- The 'End of Life' calculation method used reflects market scenarios, which utilises the most typical method for that material in the market;
- Country specific end of life scenarios were set to 'United Kingdom – RICS V2'; and
- The study period was set at sixty years in line with the methodology outlined in the RICS Professional Statement.

The LCA undertaken for this report will demonstrate the environmental impact of the proposed scheme in terms of its Global Warming Potential (GWP), which represents the impact of all greenhouse gases on a carbon dioxide basis emitted as a direct result of the building.

3.3 Scope

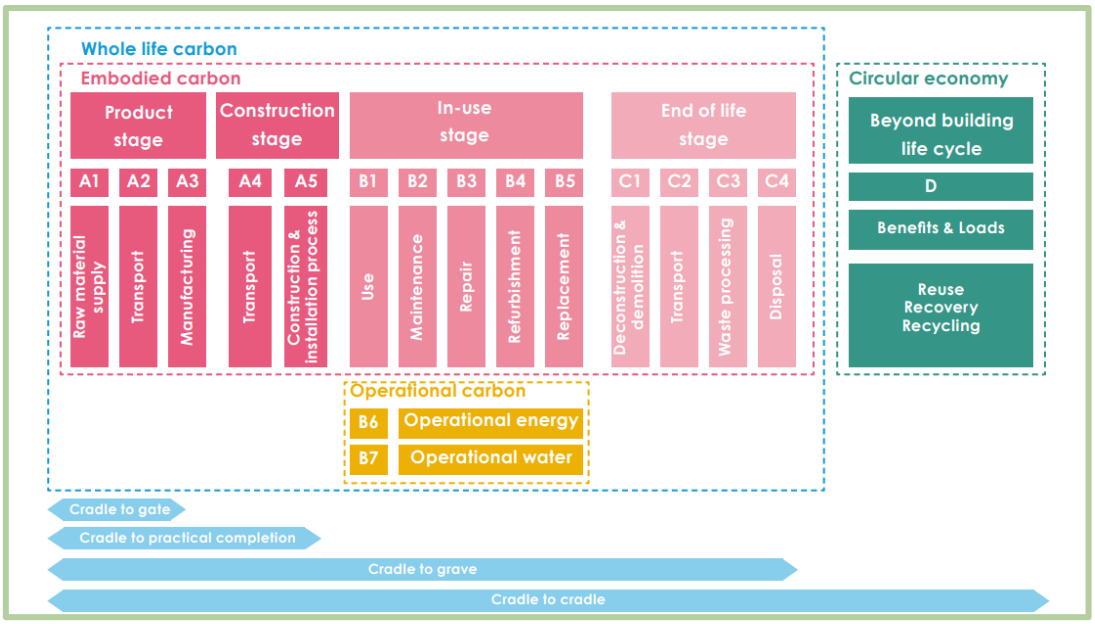
The LCA undertaken for this report will cover the RIBA Stage 2 design and be assessed in accordance with the RICS Professional Statement 2nd Edition (2023). Consequently, all lifecycle modules have been included.

The assessment scope has therefore considered the following elements:

- Demolition;
- Facilitating Works;
- Substructure;
- Superstructure;
- Finishes;
- Fittings, Furnishings and Equipment;
- Public Health;
- Heating, Ventilation and Air Conditioning (HVAC);
- Electrical Installations;
- On Site Renewable Energy; and,
- External Works.

The 'study boundary' has been defined, as per the life cycle modules set out in Figure 3.2 below:

Figure 3.2 – EN 15978 Assessment Scope



Source: LETI Embodied Carbon Primer.

The focus of this assessment is on the environmental impacts of the project, in particular the embodied carbon of the materials sourced, and energy consumed in the manufacturing, transportation, assembly, in use and the end-of-life stages of the scheme.

3.4 Assumptions

This assessment is being conducted during RIBA Stage 2 (concept design); therefore, design detail is limited and will be considered further as the scheme progresses through to the Technical Design Stage. A number of assumptions were consequently used in order to complete the baseline assessment. The RICS Professional Statement has provided reasonable assumptions, based on UK average industry standard practice, which must be used during early design phase whole life carbon assessments (WLCA's) that are to act as baselines for progressive reporting. This data should be refined during later project phases and replaced by more

comprehensive and product specific information as it becomes available. In addition to this, where information was not available generic data inputs were used and are explained below:

The assumptions used for this assessment are outlined in Table 3.2 below.

Table 3.1 – Assessment Assumptions

Level 1 Group Element	Building Component	Material	Source	Template Selected
Preconstruction/ Demolition	Where a project is initiated on a brownfield site, emissions from any demolition that has already occurred via a previous site owner or event must still be considered within the scope of the WLCA and be reported in A5.1, if demolition occurs within three years of the sale or new proposal.		RICS PS 2nd Edition	Average pre-construction demolition Assumed 27146.8 (GFA)
Superstructure	Roof – Rigid insulation	polyisocyanurate (PIR)/ rigid polyurethane (PU)	RICS PS 2nd Edition	PIR (polyisocyanurate foam) insulation panels, unfaced, generic
Superstructure	External wall (series core wall)– RC cast in situ	C40/50 concrete with 25% cement replacement	RICS PS 2nd Edition	Ready-mix concrete, generic, C40/50 (5800/7300 PSI), XC1, 25% GGBS in cement, CEM II/B-S portland-slag cement, 2391 kg/m3 (One Click LCA (2024))
Superstructure	External wall (series core wall) Concrete reinforcement	Concrete reinforcement bars - 96% recycled content in UK	RICS PS 2nd Edition	Reinforcement steel (rebar), generic, 97% recycled content (typical), A615. Assumed 100kg/m^3 as per One Click LCA average quantities of

				reinforcement quantities
Superstructure	External wall (series core wall) Concrete reinforcement	Mineral wool	RICS PS 2nd Edition	Glass wool insulation panels, unfaced, generic, L
Substructure	Foundations	Ready mix concrete C40/50 with 35% GGBS	ROC Consulting quantities	In the absence of a C40/50 concrete template with 35% GGBS – the following was used instead: Ready-mix concrete, generic, C40/50 (5800/7300 PSI), XC1, 25% GGBS in cement, CEM II/B-S portland-slag cement, 2391 kg/m^3 (One Click LCA (2024))
Hard landscaping	Surface Type 1	Yorkstone Flags	TPM Quantities	In the absence of specific yorkstone/ templates. Sandstone pavers were used to, 15x15x85 cm, 195.8 kg/m2, 2621 kg/m3 (Pierres et Marbres de Wallonie ASBL)
Hard landscaping	Walls	Granite clad - Inner concrete support wall clad with stone vertical pieces and stone copings Royal white granite	One Click LCA	Assumed 2m high by 300mm width Template selected - Granite (IStructE)
Building services	On site renewable energy generation	PV	One Click LCA	Assumed Photovoltaic monocrystalline panel, per m^2, 14.5 kg/m^2, 224 Wp (One Click LCA) 1 panel - Assumed 1.9m2 x 97 panels (as per Plot 9B -

				Sbem Inputs Summary 30.10.24)
Public health	Drainage and rainwater	Sewage water drainage piping	One Click LCA	Sewage water drainage piping network, per m^2 GIFA (residential buildings)
Electrical Installations	Electrical power	Electricity distribution	One Click LCA	Electricity distribution system, cabling and central, for all building types, per m^2 GFA
Electrical installations	Internal lighting	Lighting system	One Click LCA	Lighting system for single room occupancy buildings per m^2
Electrical installations	Emergency lighting	Emergency lighting system	One Click LCA	Emergency lighting system for office buildings per m^2
Water Usage	Water supply	Water	CIBSE Guide G – Public health and plumbing engineering	Water supply, UK 2023 Assume 200 litres per person per day – CIBSE guidance recommendation x number of 861 studios (for no. of residents). Converted into m^3 = 61303.2m^3
Construction site activities	Construction site scenarios	Average construction site activities	One Click LCA	Average construction site activities Assumed 27,146.8 m^2 of GIA
Emissions and Removals	Carbonisation	Carbonisation of cementitious materials	One Click LCA	Carbonisation of concrete in building structures, 70 years, per m^3 Assumed 11070.73m3 as per Collated concrete and rebar quantities - ROC Consulting

Maintenance, annual	Maintenance Scenarios	Building level maintenance scenario	One Click LCA	Average maintenance per m^2 GIA
Repair	Repair	in the UK repair impacts should be assumed as equivalent to 25% of B2 maintenance impacts for the relevant items, except for MEP, where 10% of A1–A3 impacts should be assumed– in accordance with the CIBSE TM65 methodology.	RICS Professional Statement	Accounted for in the results of this report Assumed 25% of B2 maintenance impacts and 10% of A1–A3 impacts.

3.5 The Contingency Factor

When costing projects, it is common for contingencies to be used to reflect uncertainties. For WLCAs there are similar uncertainties, particularly during the early design phase when far less is known about the final design and materials.

This uncertainty is managed by developing a WLCA uncertainty factor, which is made up of three component parts.

1. A contingency factor
2. A carbon data uncertainty factor
3. A quantities uncertainty factor

3.5.1 The Contingency Factor

The contingency factor used for this assessment is aligned with the early design information listed in Table 3.2 below, which was extracted from the RICS Professional Statement.

Table 3.2 – RICS Professional Statement Default Contingency Factors

RICS project phase	RIBA stage	Default contingency factor to apply to all life cycle stages and modules	Additional uncertainty factors
Early design	0-2	**15%**	-
Technical design and construction	3-5	6%	Carbon data uncertainty factor and quantities uncertainty factor
Post-completion	6	0%	Carbon data uncertainty factor and quantities uncertainty factor

In order to account for uncertainty and lack of detailed or complete information, particularly during the early design phases, the contingency factor has been applied to the results for each life cycle information module and element category and reported separately in Section 4 of this report.

3.5.2 The Carbon Data Uncertainty Factor

During early design stages, it is best to use generic data to represent products and materials, as it is generally not clear the exact products that will be used, and from where and which manufacturers they will be sourced. There is therefore considerable uncertainty as to whether the dataset chosen will accurately represent the product that is finally selected, and **it is therefore inappropriate to use the carbon data uncertainty factor during the early design phase.**

3.5.3 The Carbon Data Confidence Score Approach

Carbon data confidence scores are calculated for each of the key products used in the asset. Key products are identified as the ten most impactful products or materials in terms of the percentage of the asset's embodied carbon impact (modules A1–A5, B1–B5, C1–C4).

However, this is only required during the technical design, construction and post-completion phases, the asset carbon confidence score produced using this method must be reported in the WLCA report, together with the percentage of the asset's overall upfront and embodied carbon for which the key products are responsible.

3.5.4 The Quantities Uncertainty Factor

A quantities uncertainty factor for key products (the most impactful products and materials used) provides an indication of the uncertainty associated with the quantities used for the WLCA.

However, this is only required during the technical design, construction and post-completion phases, when the quality of the quantities data must be assessed for each of the key products: the ten products or materials that cause the greatest impact for the asset.

3.5.5 The Whole Life Cycle Uncertainty Factor

The total percentage figure to be added to the WLCA is therefore a combination of the contingency factor, the carbon data uncertainty factor and the quantities uncertainty factor. For the purpose of this assessment, only the contingency factor will be used to determine the level of uncertainty in line with the minimum requirements of the RICS Professional Statement. It is however advised that the entire whole life cycle uncertainty factor is calculated at the Technical Design Stage to entirely align with the RICS Professional Statement methodology.

3.6 Limitations

The One Click LCA predictions of embodied impacts conducted in One Click LCA software, by their very nature, cannot be exact. It is not possible to track all the impacts associated with a product or service back through history. One Click LCA software has been built and tested to enable informed decisions when comparing design options. Generic environmental impact coefficients do not necessarily correspond to those of individual brands of the same product or service due to differences within industries and in the way these products and services are delivered.

Due to the nature of Whole Life Carbon Assessments, certain assumptions and default values can be used, to fill any gaps throughout the early design stages. Therefore, the service life of the materials inputted have been

based on the latest guidance from the RICS Professional Statement, which in practise may vary from these values and could well be extended. Thereby reducing the overall environmental impact associated with Life Cycle Module B4 – Replacement.

4. LCA RESULTS

4.1 Embodied Carbon

Embodied carbon impacts arise from sourcing, manufacturing and installing the materials and components that make up a built asset (life cycle modules A1-A5).

As predictive energy modelling is not available, a compliant upfront carbon and embodied carbon assessment has been carried out, and therefore the in-use stage results have been excluded, including the operational modules B6-B7. The operational modules need to be assessed by a suitably qualified professional using the guidance outlined in either CIBSE's TM54 to evaluating operational energy performance of buildings, NABERS, ASHRAE Standard 90.1, the Passive House Planning Package (PHPP) or a local equivalent operational energy estimation method.

In the UK, the results of Part L 2021 calculations cannot be used as they are not a prediction of energy consumption.

4.1.1 Embodied Carbon Assessment

The results of the embodied carbon assessment are based on the information provided by the design team and are presented in table 4.1 below.

Table 4.1 – Embodied Carbon Life Cycle GWP Impact

	Decarbonised Total $kgCO_2e$	Decarbonised Total $kgCO_2e/m^2$
First Street, Plot 9b	12,774,740	471

4.2 Whole Life Carbon

Whole life carbon emissions are the sum total of all assets relating to GHG emissions and removals, and both operational and embodied carbon, over the life cycle of an asset, including its disposal (modules A0–A5, B1–B7, B8 optional, C1–C4, all including biogenic carbon, with A0 assumed to be zero for buildings). Overall whole life carbon asset performance includes separately reporting the potential benefits or loads from future energy or material recovery, reuse, and recycling and from exported utilities (modules D1, D2).

4.2.1 Whole Life Carbon Assessment

The results of the whole life carbon assessment are based on the information provided by the design team and are presented in table 4.2 below. Although the RICS Professional Statement states that Part L 2021 calculations must not be used to calculate operational energy, they *have* been used in this instance to provide a high-level assessment which will need to be assessed in more detail in line with the above methodologies, to allow more accurate comparisons to be made.

The whole life carbon results also take into account both a non-decarbonised grid, and a fully decarbonised grid.

Table 4.2 – Whole Life Cycle GWP Impact

	Decarbonised	Non-Decarbonised
Total – $KgCO_2e$	17,292,511	28,694,168
Normalised – $KgCO_2e/m^2$	637	1,057

The total decarbonised GWP impact per life cycle module is presented in Table 4.3.

The decarbonisation of WLC is included in this assessment to enable users to understand how impacts may change in the future.

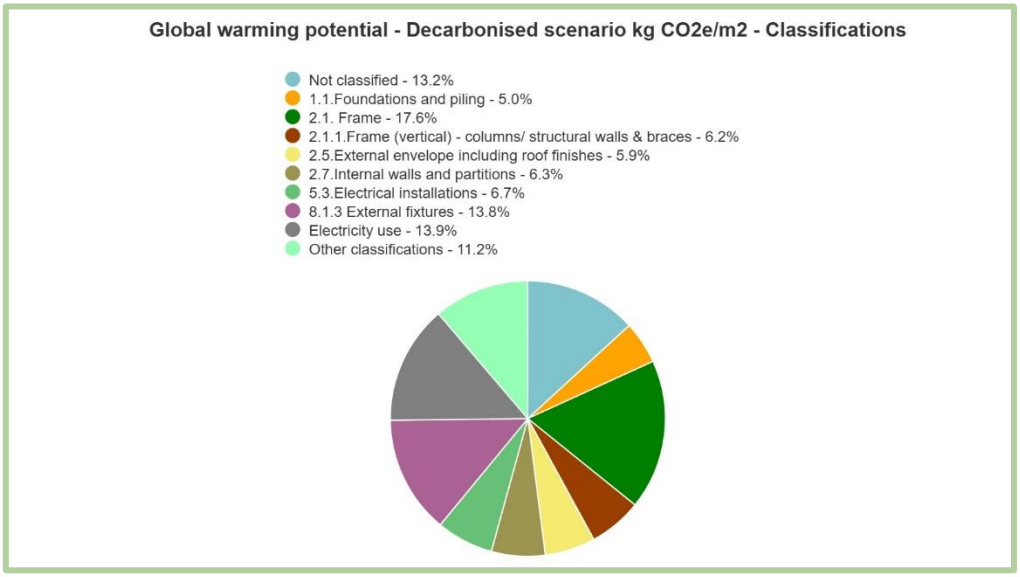
The scenarios for embodied carbon decarbonisation are very uncertain, and likely to vary for different materials and sources. For this reason, a default factor of 50% has been chosen for most embodied impacts (although not all), in order to reflect potential reductions, while not requiring considerable work for assessors to review decarbonisation roadmaps for different materials.

Table 4.3 - GWP Impact Per Life Cycle Modules - Decarbonised

Module	Total – $KgCO_2e$	Normalised – $KgCO_2e/m^2$
A1-A3 (sequestered carbon)[1]	-10,587	-0.39
A1-A3	10,116,797	373
A4	249,479	9
A5	2,419,051	89
B1	-373,540	-13
B2	137,091	5
B3	1,045,952	38
B4	1,657,312	61
B6	2,462,757	91
B7	130,033	5
C1-C4	512,260	19
D	-1,148,852	-42
Total	**17,292,511**	**637**

1 Sequestered biogenic carbon (measured as CO_2 is deducted and reported separately for life cycle modules A1–A3 and B5)

Figure 4.1 - GWP Impact Per Life Cycle Module – Decarbonised



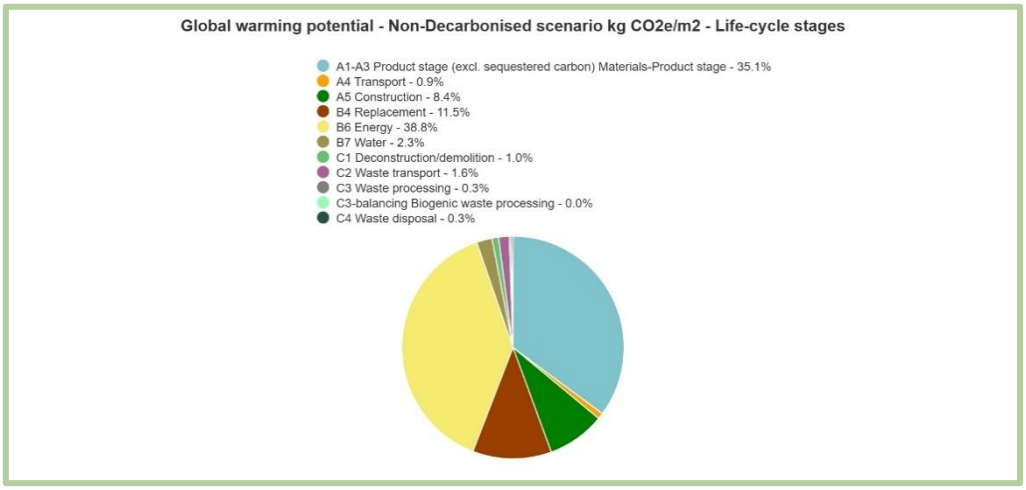
The total non-decarbonised GWP impact per life cycle module is presented in Table 4.4.

Table 4.4 - GWP Impact Per Life Cycle Modules – Non - Decarbonised

Module	Total – $KgCO_2e$	Normalised – $KgCO_2e/m^2$
A1-A3 (sequestered carbon)[2]	-10,587	-0.39
A1-A3	10,116,797	373
A4	249,479	9
A5	2,419,051	89
B1	-373,540	-13
B2	271,468	10
B3	1,045,952	38
B4	3,311,910	122
B6	11,184,481	412
B7	651,523	24
C1-C4	868,698	32
D	2,307,478	-85
Total	**28,693,322**	**1,057**

2 Sequestered biogenic carbon - measured as CO_2 is deducted and reported separately for life cycle modules A1–A3 and B5.

Figure 4.2 - GWP Impact Per Life Cycle Module – Non - Decarbonised



It is evident from the results displayed in Figure 4.1 above, that the life cycle modules B6 (regulated energy), A1-A3 (materials) and B4 (replacement) will have the most significant impact throughout the lifecycle of the project. Demonstrating the significant impact that the decarbonisation of the electricity grid could have on the overall life cycle impact of the project.

Life cycle modules A1 to A3 are likely to have high carbon emissions due to the high energy production processes associated with materials such as concrete and steel. However, the embodied carbon associated with the cementitious materials has been significantly reduced through the specification of cement replacement alternatives, in the form of ground granulated blast furnace slag (GGBS).

The environmental impact associated with the replacement emissions (module B4) considers the anticipated replacement of building components, including any emissions from the replacement process. The building components which are expected to be replaced the most relate to the building services.
To obtain a more accurate representation of the operational energy (module B6), a TM54: Operational Energy Performance analysis will need to be conducted in accordance with the Chartered Institution of Building Services Engineers (CIBSE) criteria. This is the central methodology for all energy performance assessments, including energy performance modelling, for all building types.

4.3 Whole Life Carbon - The Contingency Factor

The contingency factor used for this assessment is aligned with the early design information listed in Section 3 of this report, which was extracted from the RICS Professional Statement. For ease of reference a 15% contingency has been applied to the non-decarbonised data as presented in Table 4.4.

The total non-decarbonised GWP impact per life cycle module is presented in Table 4.4.

Table 4.4 - GWP Impact Per Life Cycle Modules – Non - Decarbonised

Module	Total – $KgCO_2e$	Normalised – $KgCO_2e/m^2$	Total with Contingency Factor - $KgCO_2e/m^2$	Normalised with Contingency Factor – $KgCO_2e/m^2$
A1-A3 (sequestered carbon)[3]	-10,587	-0.39	-11,654	0.42
A1-A3	10,116,797	373	11,128,476	410
A4	249,479	9	274,480	10
A5	2,419,051	89	2,660,956	98
B1	-373,540	-13	-410,894	15
B2	271,468	10	298,615	11
B3	1,045,952	38	1,150,547	42
B4	3,311,910	122	3,643,101	134
B6	11,184,481	412	12,302,929	453
B7	651,523	24	716,675	26
C1-C4	868,698	32	955,568	35
D	-2,307,478	-85	-2,538,226	-93
Total	**28,693,322**	**1,057**	**31,562,654**	**1,163**

3 Sequestered biogenic carbon - measured as CO_2 is deducted and reported separately for life cycle modules A1–A3 and B5.

5. BENCHMARKING

Embodied carbon benchmarks and targets are a developing knowledge area; it is anticipated that, as the quantity of more accurate and detailed information becomes available, target figures may be updated.

Following the release of the Embodied Carbon Primer in 2020, the Low Energy Transformation Initiative (LETI) has been consulting with industry groups, including CIBSE, Royal Institute of British Architects (RIBA), IStructE, the Greater London Authority (GLA) and the Whole Life Carbon Network to align definitions, scopes, measurement methodologies and targets.

LETI have since produced the Climate Emergency Design Guide and Embodied Carbon Target Alignment publications. The latter document has been produced to provide alignment in Embodied Carbon measurements and comparisons.

Targets have been created for both upfront embodied carbon and whole life cycle embodied carbon which are expressed in terms of $kgCO_2/m^2$. The following lifecycle modules are required to compare accurately with these targets:

- Upfront embodied carbon: A1-A5 excluding carbon sequestration (biogenic carbon).
- Life cycle embodied carbon: A1-A5, B1-B5 and C1-C4 including carbon sequestration (biogenic carbon). This excludes operational information (B6-B7) and systems beyond the building life boundary (D).

Table 5.2 presents the upfront embodied carbon and life cycle embodied carbon performance of the First Street Plot 9b scheme.

Table 5.1 – First Street Results

	Upfront Embodied Carbon $kgCO_2e/m^2$	Whole Life Cycle Embodied Carbon - $kgCO_2e/m^2$
First Street Plot 9b	471	621

5.1.1 Embodied Carbon Key Performance Indicators

The Climate Emergency Design Guide (2020) states the following broad key performance indicators for non-domestic buildings:

Table 5.2 – LETI Upfront Embodied Carbon Comparison (Non-domestic Buildings)

	Baseline	Best Practice 2020	Best Practice 2030
LETI Target	1000 $kgCO_2/m^2$	<600 $kgCO_2/m^2$	<350 $kgCO_2/m^2$
First Street	621 $kgCO_2/m^2$		

Compared to the non-domestic upfront embodied targets stipulated within The Climate Emergency Design Guide (2020), it is evident that **the proposed scheme is slightly higher than the LETI best practice 2030 target for upfront embodied carbon**.

5.1.2 Embodied Carbon Targets

LETI and the Royal Institute of British Architects (RIBA) have provided more specific targets for a range of building typologies which include:

- Office
- Residential (6+ storeys)
- Education
- Retail

It is stated in the RIBA 2030 Challenge publication that these targets are based on domestic and commercial buildings, but RIBA recognises that there may need to be further refinement by sector and building type in the future. In addition, the targets themselves may need further revision in the coming years as more detailed data and further work in sectoral contributions to carbon emissions in line with science-based targets is undertaken by the industry. RIBA therefore acknowledges the imperfect nature of the targets, but states the urgency for action on carbon emissions, and that there is no time to wait for the perfect set of figures to be developed in order to be used for comparisons.

Therefore, for the purpose of this study, the proposed First Street scheme will be compared to a residential building. It is worth noting that there are only small fluctuations between each bands targets and that this comparison is used to demonstrate a representative comparison for carbon emissions. Figures 5.3 and 5.4 display the LETI targets, which also include the RIBA 2030 Target for life cycle embodied carbon.

Figure 5.3 – LETI Upfront Embodied Carbon Targets Per Typology

Upfront Embodied Carbon, A1-5 (exc. sequestration)

	Band	Office	Residential (6+ storeys)	Education	Retail
	A++	<100	<100	<100	<100
	A+	<225	<200	<200	<200
LETI 2030 Design Target	A	<350	<300	<300	<300
	B	<475	<400	<400	<425
LETI 2020 Design Target	C	<600	<500	<500	<550
	D	<775	<675	<625	<700
	E	<950	<850	<750	<850
	F	<1100	<1000	<875	<1000
	G	<1300	<1200	<1100	<1200

The proposed scheme achieved an **upfront embodied carbon score of 471kgCO_2e/m^2 and therefore this exceeds the LETI 2020 Design Target of <500kgCO_2e/m^2.**

Figure 5.4 details the whole life cycle target bands provided by LETI.

Figure 5.4 – RIBA Life Cycle Embodied Carbon Targets Per Typology

Life Cycle Embodied Carbon, A1-5, B1-5, C1-4

	Band	Office	Residential (6+ storeys)	Education	Retail
RIBA 2030 Build Target	A++	<150	<150	<125	<125
	A+	<345	<300	<260	<250
	A	<530	<450	<400	<380
	B	<750	<625	<540	<535
	C	<970	<800	<675	<690
	D	<1180	<1000	<835	<870
	E	<1400	<1200	<1000	<1050
	F	<1625	<1400	<1175	<1250
	G	<1900	<1600	<1350	<1450

The proposed scheme achieved an estimated **whole life carbon result of 621 $kgCO_2/m^2$ and therefore this improves upon the LETI 2030 Design Target of <625$kgCO_2e/m^2$ for residential buildings (6+ storeys).**

6. CONCLUSION

The purpose of this Life Cycle Assessment is to quantify the environmental impacts of the proposed First Street, Plot 9b PBSA scheme in accordance with the methodology expressed within the RICS Professional Statement – 2nd Edition (2021), and to benchmark the results against industry targets.

The total global warming potential for the scheme has been calculated as follows:

Table 6.1 – Results Summary

	Total – $kgCO_2e$	Normalised- $kgCO_2e/m^2$
Non-Decarbonised Upfront Carbon	12,774,740	471
Non decarbonised Whole Life Carbon Assessment	28,693,322	1,057
Non decarbonised Whole Life Carbon Assessment Plus Contingency Factor (15%)	31,562,654	1,163
Decarbonised Whole Life Carbon Assessment	17,292,511	637
Benchmarking		
	LETI Benchmark - $kgCO_2e/m^2$	First Street - $kgCO_2e/m^2$
Upfront	<500 (LETI 2020 Design Target)	471
Whole life	<625 (LETI 2030 Design Target)	621

When compared against the LETI carbon alignment targets, **the scheme improves upon both the 2020 upfront target and the whole life 2030 targets.**

It is recommended that further life cycle assessments are conducted at the Technical Design stage when increasing levels of detail in the design and specification of the built asset will become available. It is during this stage when uncertainties around the data used are managed using carbon data confidence scores.

It is also recommended that a TM54: Operational Energy Performance assessment is conducted, in order to accurately assess the operational energy of the development, and to align with current best practice operational energy guidance and targets produced by LETI.