HODKINSON

Whole Life Cycle Carbon Emissions Assessment

Mr & Mrs Bradley Ross

Sevenoaks, 101a High street

Final

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BSc (Hons)

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Our team of technical specialists offer advanced levels of expertise and experience to our clients. We have a wide experience of the construction and development industry and tailor teams to suit each individual project.

We are able to advise at all stages of projects from planning applications to handover.

Our emphasis is to provide innovative and cost-effective solutions that respond to increasing demands for quality and construction efficiency.

Executive Summary

This Whole Life Cycle Carbon Emissions (WLCCE) Assessment for the proposed development at Sevenoaks 101a High Street, Hampton, London, TW12 2SX in the London Borough of Richmond, has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, appointed by Mr & Mrs Bradley Ross. It has been produced to demonstrate that the Applicant has considered Whole Life Carbon in the design of the proposed development.

The proposed development will comprise of the full demolition of the existing house and outbuildings and erection of a new eco family home, alongside associated works including driveway alterations and landscaping. This includes the specification of an innovative hybrid and steel frame, which reduces the overall carbon emissions.

The proposed demolition and redevelopment provide a more sustainable long-term solution, both in terms of operational energy and overall environmental impact. Therefore, the loss of the existing dwelling is justified, and the proposal aligns with Policy 2 of the Emerging Local Plan.

WLCCE are the carbon emissions resulting from the construction and the use of a building over its entire life, through four stages described as life-cycle modules, as shown in Figure i;

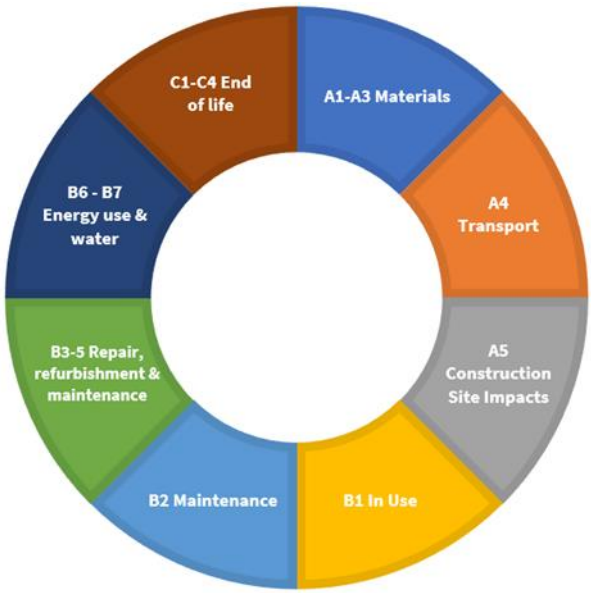

Figure i: Life cycle modules included within WLCCE assessment

They capture a building's operational carbon emissions from both regulated and unregulated energy use, as well as its embodied carbon emissions. Embodied emissions are those associated with 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. The assessment provides a picture of a building's carbon impact on the environment.

This assessment has been undertaken in compliance with guidance released by the Greater London Authority *"Whole Life-Cycle Carbon Assessments guidance – March 2022"*. The methodology has followed the principles of BS EN 15978 and has used both the GLA guidance and RICS (2017) as the methodology for assessment. This has been facilitated through the use of One Click LCA software.

The total emissions are expected to be **970 $kgCO_2/m^2$ GIA** over 60 years excluding sequestered carbon or **786 $kgCO_2/m^2$** when sequestered carbon is included.

> 544 $kgCO_2/m^2$ for modules A1-A5 (excluding sequestered carbon).

> 426 $kgCO_2/m^2$ for modules B-C.

When operational energy and water emissions are included in the calculation above the total emissions are expected to be 2,191 $kgCO_2/m^2$ GIA over 60 years.

Although not required to undertake a formal WLCCE assessment, the Applicant has opted to do in order to fully understand the implications of their design. As part of this assessment, they have been compared to the benchmarks set by GLA. Whilst not wholly appropriate (as these are for major application), the proposed development is performing better than GLA benchmarks for Modules A1-A5 and total emissions, demonstrating an exemplar commitment to sustainability.

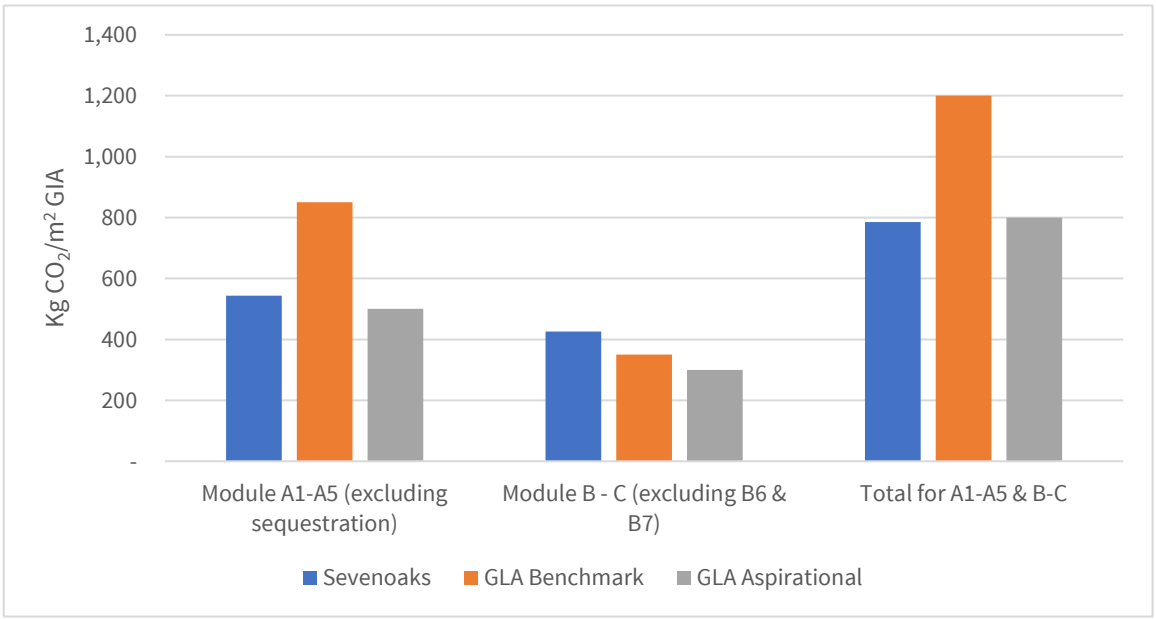

Figure ii: Total $kgCO_2/m^2$ Gross Internal Floor Area (GIA) performance compared to GLA Benchmarks

The proposed demolition and redevelopment provide a more sustainable long-term solution, both in terms of operational energy and overall environmental impact. Therefore, the loss of the existing dwelling is justified, and the proposal aligns with Policy 2 of the Emerging Local Plan.

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1. INTRODUCTION

1.1 This Whole Life Cycle Carbon Emissions (WLCCE) Assessment for the proposed development at 101a High Street, Hampton, London, TW12 2SX within the London Borough of Richmond has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, appointed by Mr & Mrs Bradley Ross. It has been produced to demonstrate that the Applicant has considered Whole Life Carbon in the design of the proposed development.

1.2 The proposed development will comprise of the demolition of the existing house and outbuildings and erection of a new eco family home, alongside associated works including driveway alterations and landscaping.

1.3 National Building Regulations for new development account for a building's operational carbon emissions. As methods and approaches for reducing operational emissions have become better understood, and as targets have become more stringent, these emissions are now beginning to make up a declining proportion of a development's carbon emissions. Attention now needs to turn to WLCCE to incorporate embodied carbon emissions, enabling a better understanding of the environmental impact of the proposed development.

1.4 The assessment of the proposed development endeavours to help the design team understand, at concept design stage, the lifetime consequences of their design decisions.

2. DEVELOPMENT OVERVIEW

Site Location

2.1 The proposed development site at Sevenoaks is a family home located in the London Borough of Richmond. The location, 101a High Street, Hampton, London, TW12 2SX, is shown in Figure 1 below.

Figure 1: Site Location – Map data © 2024 Google

2.2 The site is currently occupied by an Arts and Crafts style Tudor Home. Sevenoaks is in a conservation area in Hampton, adjacent to a number of Grade II listed buildings. The site has a large front and rear garden with brick boundary walls.

Proposed Development

2.3 The proposed development is described as follows:

"Demolition of existing house and outbuildings and erection of new eco family home, alongside associated works including driveway alterations and landscaping."

2.4 Figure 2 below illustrates the proposed site layout.

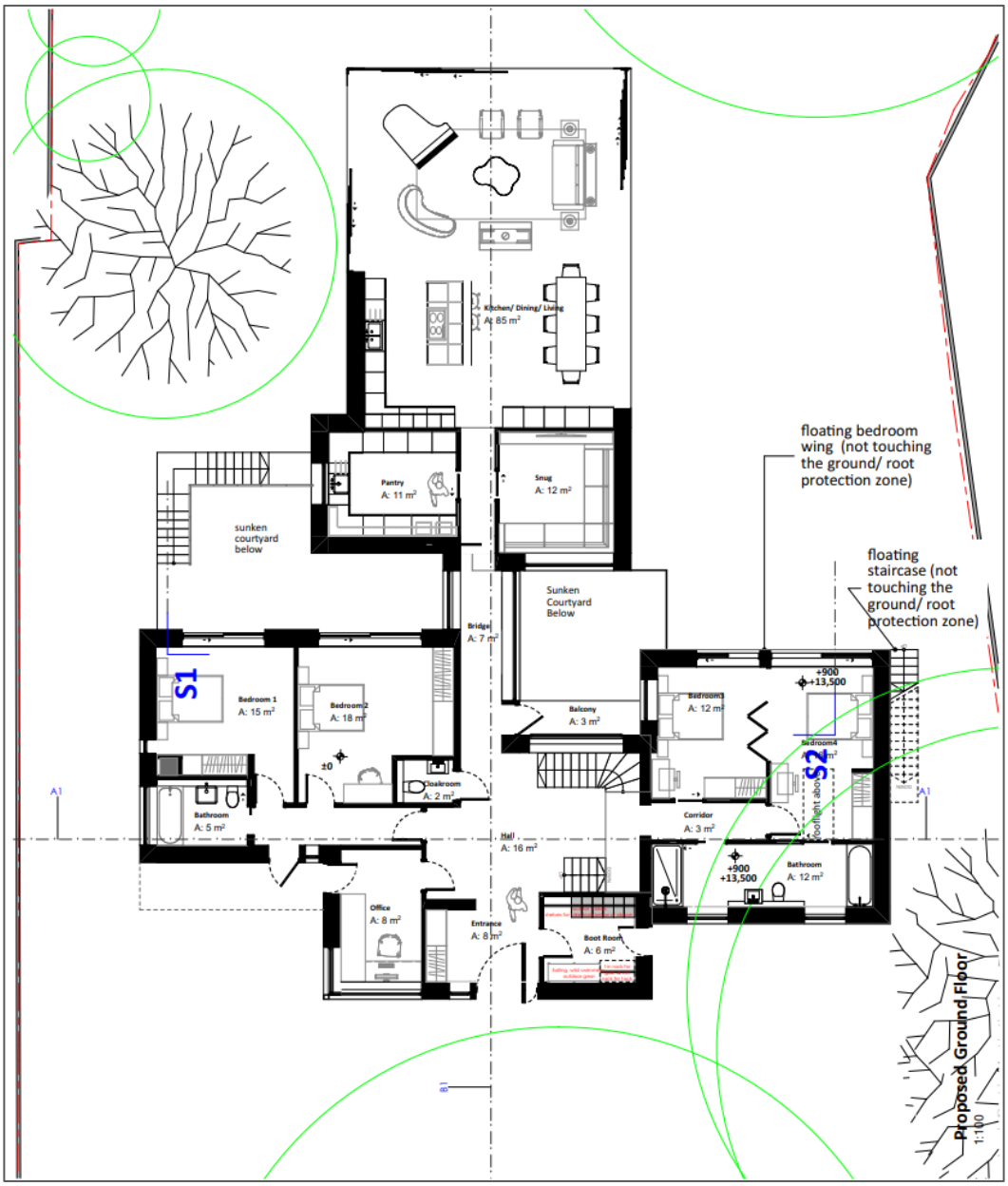

Figure 2: Proposed Site Layout – Holland Green (September 2024)

Floor Area

2.5 The total Gross Internal Floor Area (GIA) for the proposed development is 467 m^2. The principles noted within this report apply to this GIA.

3. POLICY AND REGULATIONS

Regional Policy: The London Plan

London Plan (2021)

3.1 The London Plan sets out an integrated economic, environmental, transport and social framework for the development of London. The following policies are considered relevant to the proposed development and this Statement:

3.2 **Policy SI 2 Minimising Greenhouse Gas Emissions, states:**

'Development proposals referable to the Mayor should calculate whole life-cycle carbon emissions through a nationally recognised Whole Life-Cycle Carbon Assessment and demonstrate actions taken to reduce life-cycle carbon emissions:

Operational carbon emissions will make up a declining proportion of a development's whole life-cycle carbon emissions as operational carbon targets become more stringent. To fully capture a development's carbon impact, a whole life-cycle approach is needed to capture its unregulated emissions (i.e., those associated with cooking and small appliances), its embodied emissions (i.e., those associated with raw material extraction, manufacture and transport of building materials and construction) and emissions associated with maintenance, repair and replacement as well as dismantling, demolition and eventual material disposal). Whole life-cycle carbon emission assessments are therefore required for development proposals referable to the Mayor. Major non-referable development should calculate unregulated emissions and are encouraged to undertake whole life-cycle carbon assessments. The approach to whole life-cycle carbon emissions assessments, including when they should take place, what they should contain and how information should be reported, will be set out in guidance'.

Local Policy: London Borough of Richmond Upon Thames Local Plan

3.3 The London Borough of Richmond Upon Thames' Local Plan was adopted in July 2018, which replaced the previous policies within the Core Strategy and Development Management Plan. The Plan sets out policies and guidance for the development of the borough until July 2033. There are no relevant Whole Life Carbon policies within this adopted plan.

Local Policy: London Borough of Richmond Upon Thames Local Plan 2024

3.4 The new Local Plan is anticipated to be adopted in 2024, at which point it will supersede the existing Local Plan (2018) and the Twickenham Area Action Plan (2013).

3.5 Whilst the emerging plan is a material consideration, only limited weight can be given to the plan prior to Examination and Modifications stages. The below policies have been considered in this statement:

> **Policy 2. Spatial Strategy: Managing change in the borough** sets out a presumption in favour of refurbishment. Whilst there will be circumstances where demolition may be more appropriate, in general, because of the substantial embodied energy savings made in repurposing existing buildings, compared with the ultra-high embodied energy costs of demolition and rebuild, the reuse and/or refurbishment of existing buildings is preferred.

> **Policy 3. Tackling the Climate Emergency (Strategic Policy)** requires developments to adopt a circular economy approach and minimise embodied carbon.

> **Policy 7. Waste and the Circular Economy** requires all developments, including conversions and changes of use to provide adequate refuse and recycling storage space and facilities for the separate collection of dry recyclables (card, paper, mixed plastics, metals, glass) and food, which allows for ease of collection and which residents and occupiers can easily access. Furthermore, all development proposals are required to adopt a circular economy approach to building design and construction to reduce waste, to keep materials and products in use for as long as possible, and to minimise embodied carbon. Policy 7 also notes that all development resulting in the creation of 10 or more dwellings or 500sqm or more non-residential GIA must undertake a Whole Life-Cycle Carbon assessment proportionate to the scale of development and demonstrate that whole life-cycle carbon savings have been maximised.

Guidance Documents

3.6 Guidance has been released by the Greater London Authority *"Whole Life-Cycle Carbon Assessments guidance – March 2022".* It outlines how to prepare a WLCCE assessment which should accompany all referable Planning Applications in line with London Plan Policy SI 2 *'Minimising Greenhouse Gas Emissions'*. Although this application is not referable and is therefore not required to meet Policy SI 2, this guidance has been used to conduct the assessment, as it is considered best practice.

3.7 In addition, the following guidance is available to conduct assessments:

> **BS EN 15978:2011 -** *Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method.*

> **ISO 14040:2006 -** *Environmental management — Life cycle assessment — Principles and framework.*

> **RICS Professional Statement Whole life carbon assessment: 2017 -** *Whole life carbon assessment for the built environment.*

3.8 The above documents have been used to complete the WLCCE assessment, further planning reports submitted alongside this report will also be used and/or referenced within this assessment

4. WHOLE LIFE CYCLE CARBON EMISSIONS ASSESSMENT

4.1 Undertaking WLCCE assessments is a way to fully understand and minimise the carbon emissions associated with building designs over the entire life cycle of the building. This will be done at the proposed development to quantify the WLCCE that will be released, considering not only operational and embodied emissions but also demolition, construction, and refurbishment and replacement cycles.

4.2 The London Plan has introduced a requirement (Policy SI 2 *'Minimising Greenhouse Gas Emissions'*) for all new referable developments to calculate and reduce WLCCE, this is both embodied and operational carbon:

> **Operational carbon** is the energy required to heat and power a building;

> **Embodied carbon** is the emissions associated with raw material extraction, the manufacture and transport of building materials, and construction; and the emissions associated with maintenance, repair and replacement, as well as the dismantling, demolition and eventual material disposal.

4.3 A WLCCE assessment also includes an assessment of the potential savings from the reuse or recycling of components after the end of a building's useful life. These elements are reported to provide the total carbon impact of a building or development.

4.4 While this planning application is neither major nor referable, the Applicant is committed to demonstrating that the proposed development aligns with GLA benchmarks. Additionally, they will strive to reduce the development's emissions towards the aspirational benchmark through material selection and building circularity measures, as outlined in the "Measures Implemented" section of this report.

4.5 Undertaking a WLCCE assessment provides a full overview of the material and construction of a building using science-based metrics whilst also identifying the overall best combined opportunities for reducing lifetime emissions, and also helps to avoid any unintended consequences of focusing on operational emissions alone.

Methodology

4.6 WLCCE assessments are sensitive to changes in design and specification and therefore detailed design will impact the results as the scheme progress. As noted in the GLA guidance, WLCCE assessments should be conducted at the following stages in order to maximise design efficiencies:

- Pre application;
- Stage 1 submission (RIBA 2/3);
- Post construction (RIBA 6).

4.7 This assessment is considered to be the Stage 1 submission and has been completed for the proposed development using the drawings provided by HollandGreen and energy calculations from the Energy Statement submitted for planning provided by Hodkinson Consultancy (August 2024).

4.8 A set of WLCCE benchmarks have been developed by the GLA. An 'aspirational' set of benchmarks have also been devised for applicants that wish to go further. Both sets of benchmarks are included in this assessment and are being reported on. Although the Development is not required to compare itself against these benchmarks, they have been used to determine the performance of the scheme against other (major) schemes in London.

Study Period

4.9 The reference study period (RSP) is 60 years, this is based on the principles outlined in BS EN 15978: 2011, section 7.3 and the RICS guidance. RSPs are fixed to enable comparability between whole life carbon results for different projects. It ensures that the assessment is representative of typical service life of different building elements.

Operational Carbon

4.10 Operational energy is the inputted energy required for all heating and power needs. It can be split into two variants:

- **Regulated emissions** are assessed using the Government's approved methodology for Building Regulations Part L compliance; the Standard Assessment Procedure (SAP) for residential units.
- **Unregulated emissions** are energy use as a direct result of user behaviour. This includes cooking, white goods (fridges, washing machines, etc), and plug-in electrical loads (televisions, laptops, lamps, etc).

4.11 Both of the above elements have been accounted for in this WLCCE assessment, these were provided by the calculations completed for the Energy Statement submitted for planning (Hodkinson Consultancy, August 2024). For clarity, as unregulated energy demands are largely reliant on the behaviour of occupants, they have been considered a fixed entity in the calculations in accordance with the guidance.

Residential

4.12 The estimated annual energy demand for the proposed development has been calculated using Standard Assessment Procedure (SAP) methodology. SAP calculates the Regulated energy demands associated with hot water, space heating and fixed electrical items.

4.13 The unregulated energy demands, discussed further in *Be Seen*, have been calculated using the methodology outlined in the SAP 10.2 document. This calculates the CO_2 emissions associated with appliances and cooking and are calculated using the BRE methodology.

Potable Water Use

4.14 The carbon impact associated with water use during the operation of the proposed development is also required to be reported, in accordance with the RICS guidance. Water consumption is based on Building Regulations Part G 'enhanced consumption' of 110 litres/per person/per day (including external water use) and multiplied by the intended full occupancy of the development annually.

4.15 Five occupants have been assumed based upon the expected number of residents. This gives an estimated annual water consumption of 277 m^3 for the entire development for 60 years. An additional allowance has been added to the calculations for the ongoing water required for maintenance.

Embodied Carbon

One Click LCA

4.16 OneClick LCA is the software that has been used to conduct the WLCCE assessment. This is a web-based piece of design software for buildings and infrastructure approved for use by the GLA.

4.17 OneClick LCA consists of a large database of generic and average Life Cycle Indicator (LCI) data, and global Environmental Product Declaration (EPDs). The most suitable option for each material (where available) was chosen from the database in OneClick. The material LCI data has been chosen to be representative of the typical UK supply chain.

4.18 The life cycle stages (or modules) included within the WLCCE assessment as standard are shown in Figure 3 below.

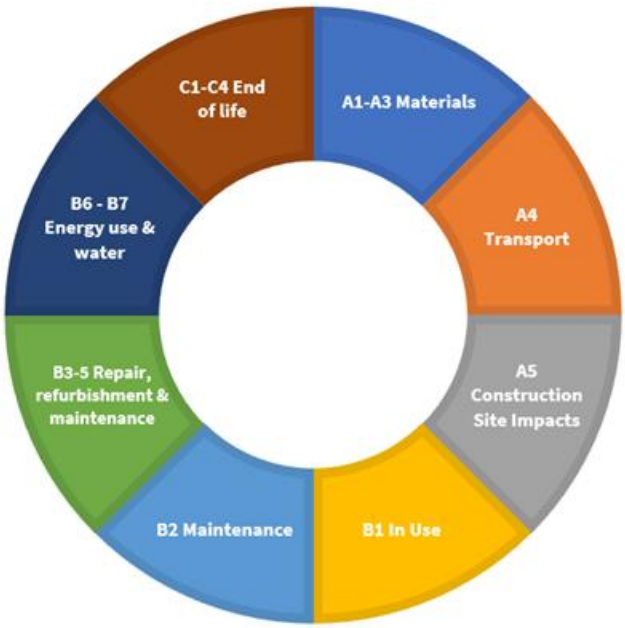

Figure 3: Life cycle modules

Construction Impacts

4.19 In addition to embodied carbon in the materials used for construction, greenhouse gas (GHG) emissions will be created by transportation of materials to site and operation of onsite plant and machinery. Guidance from RICs indicates 1.4 tonnes of CO_2e per £100,000 of project value, this is further referenced and approved by the BRE. The project value has been provided by the Applicant, which has allowed the construction transport GHG emissions to be included.

4.20 A Site Waste Management Plan (SWMP) will be produced ahead of any demolition and construction works by the appointed Main Contractor. The location of the waste handling site that materials will be taken to, will vary dependent upon their specific make up, of which is yet to be confirmed. Waste facility sites in the London Borough of Richmond may be used amongst others as appropriate. Wherever possible, all materials taken off site will be recycled. Waste segregation will take place during construction as far as the site allows logistically to give the highest possible recycling rates.

4.21 A target benchmark where at least 95% (by volume) of non-hazardous construction and demolition waste is diverted from landfill will be set.

Carbon Sequestration

4.22 Sequestered carbon in timber has been included in the WLCCE assessment as all timber will be sustainably sourced.

Data Sources

4.23 The assessment has utilised multiple data sources described above and is based on the level of detail available at the current stage of design. The following data sources have been used:

Table 1: Data Sources

Data	Data source
Material types and volumes (A1-A3)	Material types were provided by the applicant in the Pre-application document and drawings. Initial structural quantities were provided by the structural engineer. Where material types and volumes were not available from these sources, the One Click LCA Carbon tool was used to estimate values.
Transport data (A4)	Default values provided by One Click.
Construction site impacts (A5)	Construction value provided by applicant and baseline target provided by BRE. Waste estimates were provided by the Applicant.
Refrigerants (B1)	A Refrigerant quantity has been estimated based on the use of approximately 6kg of R32 within the Air Source Heat Pumps with annual leakage of 2% and 1% end of life leakage rate with a 99% end of life recovery (as per TM65).
Maintenance (B2)	B2 emissions have been calculated at 10kgCO_2/m^2, as per GLA guidance.
Repair and Replacement data (B3-B4)	An assumption has been made based on GLA guidance that assumes B3 emissions are 25% of the total B2 emissions for the site. Default values provided by RICS and One Click EPD database for products inputted into software for B4 emissions.
Refurbishment (B5)	At present One Click does not have ways to consider B5 emissions. However, based on the information provided for B3 and B4 it is likely that these have emissions have been accounted for.
Operational energy (B6)	Energy consumption based on energy calculations by Hodkinson Consultancy (August, 2024).
Operational water (B7)	Water consumption based on Building Regulations Part G 'Enhanced Consumption' of 110 l/pp/d and multiplied by the intended full occupancy of the development.

Data	Data source
End of life (C1-C4)	Default values provided by One Click based on the information within the EPD database.
Building areas	Building areas were provided by the architect - 467 m^2
Number of occupants	Residential- 5
Assessment period	60 years

4.24 For clarity, all assumptions made within the WLCCE assessment have been noted within this report. The assessment and comments made throughout should be taken within the context of carbon and energy use only.

5. MEASURES IMPLEMENTED

Measures Implemented

5.1 The proposed development has modelled potential measures throughout the design stage to improve sustainability and reduce WLCCE.

Innovative Design

5.2 A hybrid timber and steel frame has been proposed which is the highest standard for 'passive house' type buildings. Timber is the predominant superstructure material, with steel used sparingly, where it is necessary. The timber is a lightweight, renewable and recyclable material, as opposed to blockwork that is heavy and can only downcycle to make hardcore or go to landfill.

5.3 In conjunction with the structural design, the specification of wood fibre insulation over traditional PIR or mineral wool insulation demonstrates a 2 $kgCO_2/m^2$ savings across all modules.

5.4 Primary steelwork, although energy intensive to extract from ore and refine, once turned into construction steel is typically recovered and recycled at a rate of 95-98% once the building is demolished, hence it is an infinitely recyclable material, and the initial carbon/energy burden of mining and refining is locked into that material for generations to come.

5.5 We evaluated the structural design provided to us by Element Structures (August 2024) and compared it to a conventional design for this type of house. Our analysis shows that the innovative design resulted in a savings of 60kgCO_2/m^2 across all modules. This is a substantial saving and is the main reason the Proposed Development is performing so well, when compared to benchmarks.

Material Reuse

5.6 The re-use of existing brickwork at ground floor level and aggregate from the demolition works within the sub-structure works (as backfill) has allowed for 4 kgCO_2/m^2 savings across all modules.

5.7 Reusing many of the on-site materials in their current form is challenging due to their age, wear, and the construction techniques used, which make disassembly or removal without damage impractical. As a result, retaining these materials in their highest usable state is difficult, when considering the design of the proposed development. A practical approach, balancing embodied carbon goals and other project considerations, involves reusing and downcycling materials on-site where feasible, and identifying local reuse opportunities for materials that cannot be retained on-site.

5.8 There will be the potential to recycle the demolished aggregate that arise on site, and for the recycled aggregate to be utilised on the new project. However, this is limited in its usage to backfill only as it is not suitable to be used within structural concrete. This saving has been accounted in the assessment.

5.9 Rammed earth was explored early in pre-application discussions, however, due to the limited soil available on-site, most materials for the rammed earth construction would need to be sourced from off site. This requirement would offset the potential embodied carbon benefit typically associated with rammed earth.

Circular Economy Principles

5.10 Where possible, materials proposed will have the option to be taken apart through mechanical and reversable fixings to allow for future reuse. Permanent fixing of products, such as by glue and cement mortar, will be minimised where feasible, to enable end of life deconstruction and salvage of building elements. Fixings will be easily accessible, where possible, for disassembly.

5.11 The design of the building's superstructure and substructure does not inherently facilitate design for disassembly. However, for components with shorter lifespans, like services and internal finishes, the focus will be on utilising mechanical connections, ensuring accessibility of connections, and enabling easy replacement without affecting other structural layers.

5.12 The Applicant will commit to selecting materials and systems that are designed ensuring safe disassembly and removal at the end of their service life, thus increasing the amount of material which might be recycled or reuse and reducing the overall environmental impact of the façade system.

5.13 Although still at an early design phase, engagement with the design team has been undertaken to address the end-of-life strategy for the building materials and components. The One Click Building Circularity tool has been used to estimate opportunities for the materials at the end of their life. The results are based on inputs used for the Whole Life Cycle Carbon Emissions Assessment (Hodkinson Consultancy). This confirms 100% of the materials could be 'returned' at the end of their life:

> 0.7% re-used as a material

> 5.8% recycling.

> 68.2% downcycling.

> 7.7% use as energy.

> 17.6% disposal.

Alternative materials

5.14 Following comments from the Council, the 280m^2 of bronze panelling was replaced with a more sustainable option. At present, it has been replaced with an Aluminium façade cladding panel (powder coated) that contains 70% recycled content, which is saving 9 kgCO_2/m^2. Please not that this material change is currently indicative and could change, but the Applicant will strive to use a material that achieves a similar performance.

Operational energy

5.15 Hodkinson Consultancy conducted a study to assess the operational performance of the Proposed Development, comparing a new-build option with a refurbishment alternative. The results demonstrated that the new-build option significantly outperforms the refurbishment in terms of operational efficiency.

5.16 The Development's DER is recorded at -0.09 kgCO_2/yr/m^2, reflecting a 100.83% reduction from the TER of 10.85 kgCO_2/yr/m^2. This achievement is attributed to the integration of heat pumps, photovoltaic panels (PV), and battery storage, enabling the scheme to reach net zero carbon emissions without the need for any offsetting. This significantly exceeds all policy and Part L requirements. A summary of the results of this assessment are outlined in Table 2 below:

Table 2: Operational Energy Comparison

Results	Proposed Development	Refurbishment
	KgCO_2/60 years	
Regulated	-2.710	158,894

Unregulated	83.130	77,096
Total	**80,420**	**235,990**

5.17 The measures implemented have allowed an overall reduction in WLCCE, as demonstrated in the results section below.

6. WHOLE LIFE CYCLE CARBON RESULTS

Benchmark Comparison

6.1 The results when compared to the GLA benchmark values are shown in Table 3 overleaf:

Table 3: Whole Life Carbon Baseline (GLA Guidance)

Modules	Sevenoaks	WLC Benchmark	Aspirational Benchmark
Modules A1 – A5 (excluding sequestered carbon)	**544 $kgCO_2/m^2$ GIA**	<850 $kgCO_2/m^2$ GIA	<500 $kgCO_2/m^2$ GIA
Modules B – C (excluding B6 and B7)	**426 $kgCO_2/m^2$ GIA**	<350 $kgCO_2/m^2$ GIA	<300 $kgCO_2/m^2$ GIA
Carbon sequestering	**-214 $kgCO_2/m^2$ GIA**	n/a	n/a
Total for A1-A5 & B-C (including sequestered carbon)	**786 $kgCO_2/m^2$ GIA**	<1200 $kgCO_2/m^2$ GIA	<800 $kgCO_2/m^2$ GIA
Total for A-C (including B6 and B7, and sequestered carbon)	**2,191 $kgCO_2/m^2$ GIA**	n/a	n/a

6.2 It must be noted that no benchmark has been set by the GLA for operational and energy use (life cycle stages B6-B7) due to insufficient data at present. The results for these have therefore been omitted from the totals in the graph above.

6.3 The total emissions are expected to be **970 $kgCO_2/m^2$ GIA** over 60 years excluding sequestered carbon or **786 $kgCO_2/m^2$** when sequestered carbon is included.

> 544 $kgCO_2/m^2$ for modules A1-A5 (excluding sequestered carbon).

> 426 $kgCO_2/m^2$ for modules B-C.

6.4 When operational energy and water emissions are included in the calculation above the total emissions are expected to be 2,191 $kgCO_2/m^2$ GIA over 60 years.

6.5 As outlined in the methodology, a set of WLCCE benchmarks have been developed by the GLA in which applicants are required to compare against their own results as part of the assessment and which the GLA will refer to in its review of these assessments. An 'aspirational' set of benchmarks have also been devised for applicants that wish to go further. Both sets of benchmarks are included in this assessment are being reported on. Whilst these benchmarks are more suitable for multiple dwellings, they have been used in the absence of more appropriate benchmarks.

6.6 The expected WLCCE meet the GLA benchmark for Modules A1-A5 and the total emissions. The B-C emissions exceed the benchmarks due to the increased use of timber on the project. Whilst this has delivered excellent benefits under Modules A1-A3, it currently has a poor End of Life value (C1-C4) as the industry assumes all timber will be incinerated at the end of its useful life.

6.7 These results demonstrates that the development has taken account of relevant policy and reduced emissions as far as reasonably possible based on current information available, as shown in Figure 4 overleaf:

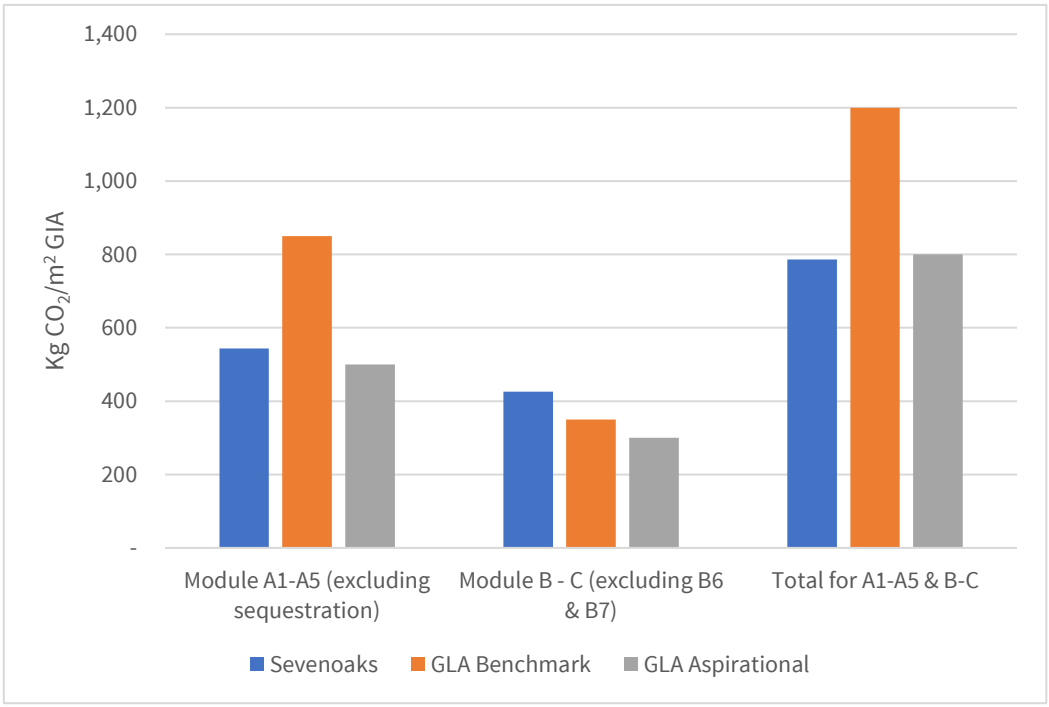

Figure 4: Total $kgCO_2/m^2$ GIA performance compared to GLA Benchmarks

6.8 The full results are as follows:

Table 4: Full WLCCE Results

Category	Global warming potential	Total $kgCO_2e$ over 60 years	Total $kgCO_2e/m^2$ GIA over 60 years
A1-A3	Construction Materials	197,169	422.20
A4	Transport	3,978	8.52
A5	Site operations	52,861	113.19
B1	In Use	13,860	29.68
B2	Maintenance	4,670	10.00
B3	Repair	1,168	2.50
B4	Replacement/Refurbishment	85,095	182.22
B6	Operational energy use	678,341	1,405.20
B7	Operational water use	236	0.51
C1-C4	End of life	94,045	201.38
	Total	**1,109,309**	**2,375.39**
	Carbon Sequestering	-85,934	-184.01
	TOTAL	**1,023,375**	**2,191.38**

6.9 The above results demonstrate that **1,023 tonnes** are expected to be emitted over a 60-year period.

6.10 The operational energy (B6) makes up 61% of the overall emissions for the proposed development; -0% for regulated energy use and 61% for unregulated use. The DER performance comes out as -0.09 $kg/CO_2/yr/m^2$, which represents an 100.83% reduction from the TER of 10.85 $kg/CO^2/yr/m^2$. The use of heat pumps, PV and battery storage has allowed the site to achieve net zero for the development which accounts for the 0% in regulated energy emissions.

6.11 Materials (A1 – A3) make up 18% of the overall emissions. There has already been a big focus on material selection which is why this percentage share is not bigger.

6.12 5% of emissions are a result from the transport of materials to site and construction stages (A4 and A5), whilst this is small in comparison to elements it is still important to reduce transport emissions through the local sourcing of materials and to reduce consumption of energy and water during consumption, where possible.

6.13 There are also impacts, with the in-use life-cycle module B1-B5 making up approximately 9% of all embodied carbon emissions. This is primarily due to materials that will need replacing over the 60-year study period.

6.14 As noted above, C1-C4 emissions are a considerable portion of the overall emissions at 9%. This is due to the increased use of timber in the dwelling. Timber generally performs well under modules A1-A3 but less effectively under C1-C4 due to the complexities of deconstruction, waste processing and disposal.

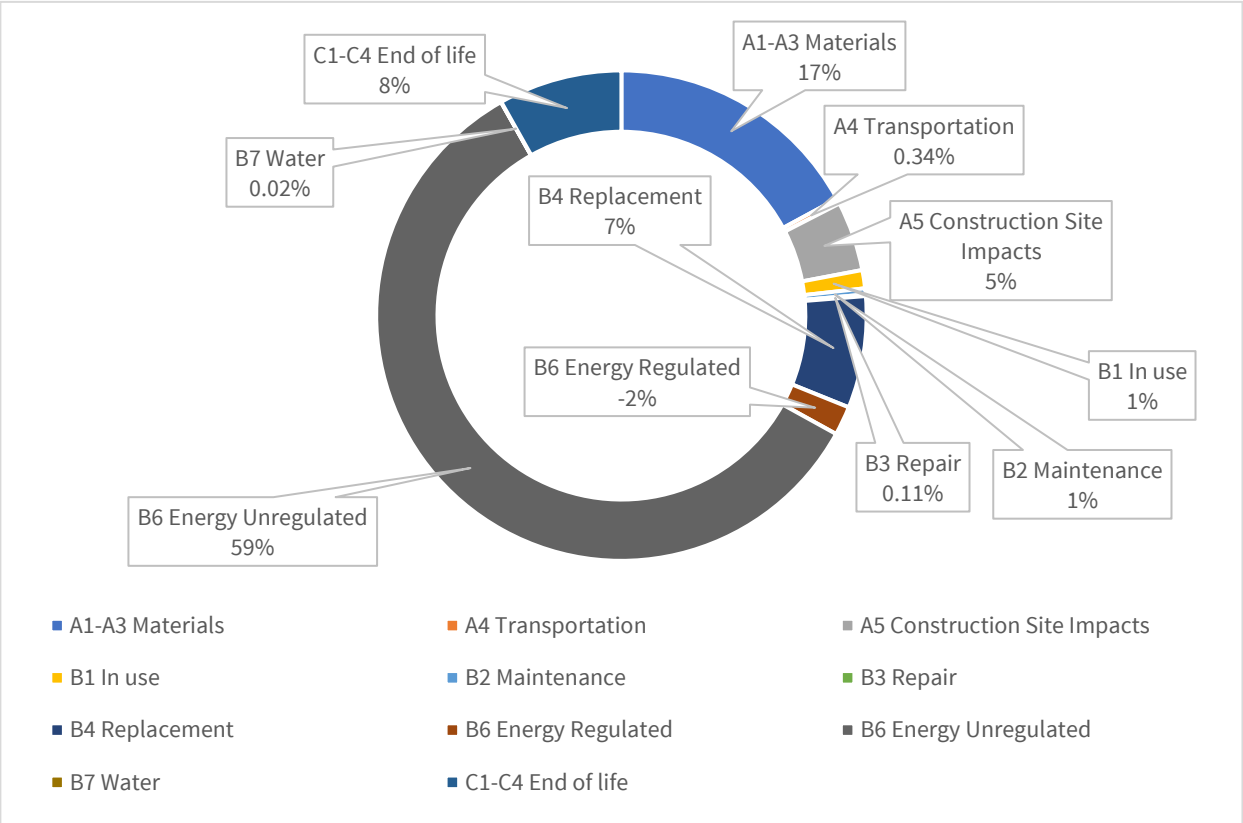

Figure 5: Total kgCO_2e - Life-cycle stages

7. JUSTIFICATION FOR DEMOLITION

7.1 The existing dwelling, constructed in the 1950s, has undergone several modifications and unsystematic extensions over the years. Its current environmental performance is poor, though it could be improved through refurbishment.

7.2 The proposed development seeks to replace this existing dwelling with a five-bedroom home, designed with sustainable, innovative materials, and aiming to achieve Net Zero carbon emissions.

7.3 According to the Energy and Sustainability Report by Hodkinson Consultancy, the proposed energy strategy will result in a Net Zero home without the need for carbon offsetting. This far exceeds all current policy requirements, including Part L. A comparison was made with a refurbishment-only option (as outlined in Section 5), which confirms that refurbishment only works would result in significantly higher operational energy use overall.

7.4 While the embodied carbon for the new build (Module A1-A5) is estimated at approximately 544 $KgCO_2/m^2$, this figure, when viewed in isolation, might appear high. However, the existing building is over 70 years old, exceeding the RICS standard design life of 60 years, and would require significant refurbishment to meet current design and energy standards.

7.5 The proposed demolition of the existing home is considered justified as it enables the construction of a net-zero operational energy building that meets and exceeds current sustainability standards, something that is far less feasible through refurbishment. Retrofitting the existing structure to achieve the same energy efficiency and carbon performance would require extensive modifications, often limited by the original building's design, materials, and age, leading to significantly higher costs and environmental inefficiencies. The proposed development and its sustainable design can ensure an optimised energy performance from the outset, thereby reducing operational carbon emissions to net zero and achieving a future-proof, environmentally responsible solution.

7.6 Additionally, the proposal incorporates the reuse of some select materials from the original building, mitigating waste and further aligning with circular economy principles. This approach presents the most effective, sustainable path to achieving high performance in line with, and beyond, current policy goals.

7.7 Refurbishment of the current dwelling would generate around 200 $KgCO_2/m^2$ in embodied carbon over the next 60 years. However, even with these upgrades, the operational energy performance would still fall short of Net Zero standards.

7.8 While the building is being demolished, it is crucial to note that the new structure is designed with longevity and low-carbon materials in mind. This means that, despite the immediate impact of demolition, the new building will likely require less refurbishment and maintenance over its life cycle. By prioritising durability and repairability, the new design will ultimately improve its embodied carbon performance, ensuring that the long-term environmental benefits outweigh the short-term costs associated with demolition.

8. CONCLUSION

8.1 This Whole Life Cycle Carbon Emissions (WLCCE) Assessment for the proposed development at 101a High Street, Hampton, London, TW12 2SX within the London Borough of Richmond has been prepared by Hodkinson Consultancy, a specialist energy and environmental consultancy for planning and development, appointed by Mr & Mrs Bradley Ross. It has been produced to demonstrate that the Applicant has considered Whole Life Carbon in the design of the proposed development.

8.2 The proposed development will comprise of the demolition of the existing house and outbuildings and erection of a new eco family home, alongside associated works including driveway alterations and landscaping.

8.3 The total emissions are expected to be **970 kgCO_2/m² GIA** over 60 years excluding sequestered carbon or **786 kgCO_2/m²** when sequestered carbon is included.

> 544 kgCO_2/m² for modules A1-A5 (excluding sequestered carbon).

> 426 kgCO_2/m² for modules B-C.

8.4 When operational energy and water emissions are included in the calculation above the total emissions are expected to be 2,191 kgCO_2/m² GIA over 60 years.

8.5 The expected WLCCE are lower than the GLA benchmark for Modules A1-A5 and the total emissions. The B-C emissions exceed the benchmarks due to the increased use of timber on the project. Whilst this has delivered excellent benefits under A1-A3, it currently has a poor End of Life value (C1-C4) as the industry assumes all timber will be incinerated at the end of its useful life.

8.6 The proposed demolition and redevelopment provide a more sustainable long-term solution, both in terms of operational energy and overall environmental impact. Therefore, the loss of the existing dwelling is justified, and the proposal aligns with Policy 2 of the Emerging Local Plan.