Temple Group Ltd

One Battersea Bridge
Whole Life Carbon Assessment
October 2024

WHOLE LIFE CARBON ASSESSMENT REVISION 2

temple

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Executive Summary

This Whole Life-cycle Carbon Assessment (WLCA) has been produced to respond to the new London Plan (2021) Policy SI 2 and following the Greater London Authority's WLCA Guidance. The WLCA supports the planning application for the proposed redevelopment of the site (the 'Proposed Development') at 1 Battersea Bridge Road, SW11 3BZ (the 'Site'). The Site is located within the administrative area of the London Borough of Wandsworth (LBW). It is understood that the Proposed Development will comprise the erection of a mixed-use development up to 28 storeys comprising of residential units, community use, commercial use, landscaping and all associated works.

The key purpose of a WLCA is to identify the sources of greenhouse gas (GHG) emissions (as carbon dioxide equivalents) from across the Proposed Development's whole life-cycle, to enable quantification at an early stage and facilitate consideration as to where and how emissions reductions can be made. This will help contribute to lower GHG emissions and help meet targets set in policy and legislation.

The WLCA has been based on data obtained that is specific to the project, such as the site location, construction activities, material quantities and types, operational energy and water use. These have been provided following a discussion with members of the Project Team, during the pre- application stage of the project. Where particular information was not able to be specified at this stage, assumptions and omissions have been clearly stated.

Building life cycle modules included within the assessment follow those set out in BS EN 15987 and the Royal Institute of Chartered Surveyors Professional Statement 'Whole Life Carbon Assessment for the Built Environment':

- Modules A1-A3. Product stage;
- Modules A4-A5. Construction process stage;
- Modules B1-B7. Use stage;
- Modules C1-C4. End of life stage.

The assessment has followed the principles of BS EN 15978 and has used both the GLA guidance and RICS as the methodology for assessment. This has been facilitated through the use of GLA approved One Click LCA software.

The results of the WLCA are presented as GHG emissions per unit of the development's gross internal area (kg CO_2e/m^2 GIA), and this has been compared to benchmarked figures stated in the GLA guidance derived from other projects.

The results of the WLCA analysis shows that the Proposed Development is expected to produce **861 $kgCO_2e/m^2$** across its lifecycle (excluding B6, B7, & module D).

This assessment has calculated **616 $kgCO_2e/m^2$ GIA** for modules A1-A5, and a further **291 $kgCO_2e/m^2$ GIA** for modules B-C (excluding B6 and B7). This is below GLA benchmark provided for residential land use, meaning that this scheme is GLA policy compliant.

When operational energy and water emissions are included in the calculation above the total emissions are expected to be **32,920 TCO_2e** over 60 years. It should be noted that generic material data has been

used for this assessment and using lower embodied carbon material and those with higher recycled content would lead to substantial carbon reductions.

A supporting GLA spreadsheet showing the breakdown of data is provided in **Appendix A** that will also be submitted electronically.

In accordance with the WLCA Guidance, a Post Construction Stage assessment will be undertaken and submitted to the GLA upon commencement of RIBA Stage 6 and prior to the building being handed over. This will be submitted along with any associated evidence.

1.0 Introduction

This report details the Whole Lifecycle Carbon (WLC) Assessment in support the planning application for the proposed redevelopment of the site (the 'Proposed Development') at 1 Battersea Bridge Road, SW11 3BZ (the 'Site'). The Site is located within the administrative area of the London Borough of Wandsworth (LBW). This WLC assessment has been prepared in response to the Greater London Authority (GLA) London Plan 2021 Policy SI 2: Minimising Greenhouse Gas Emissions.

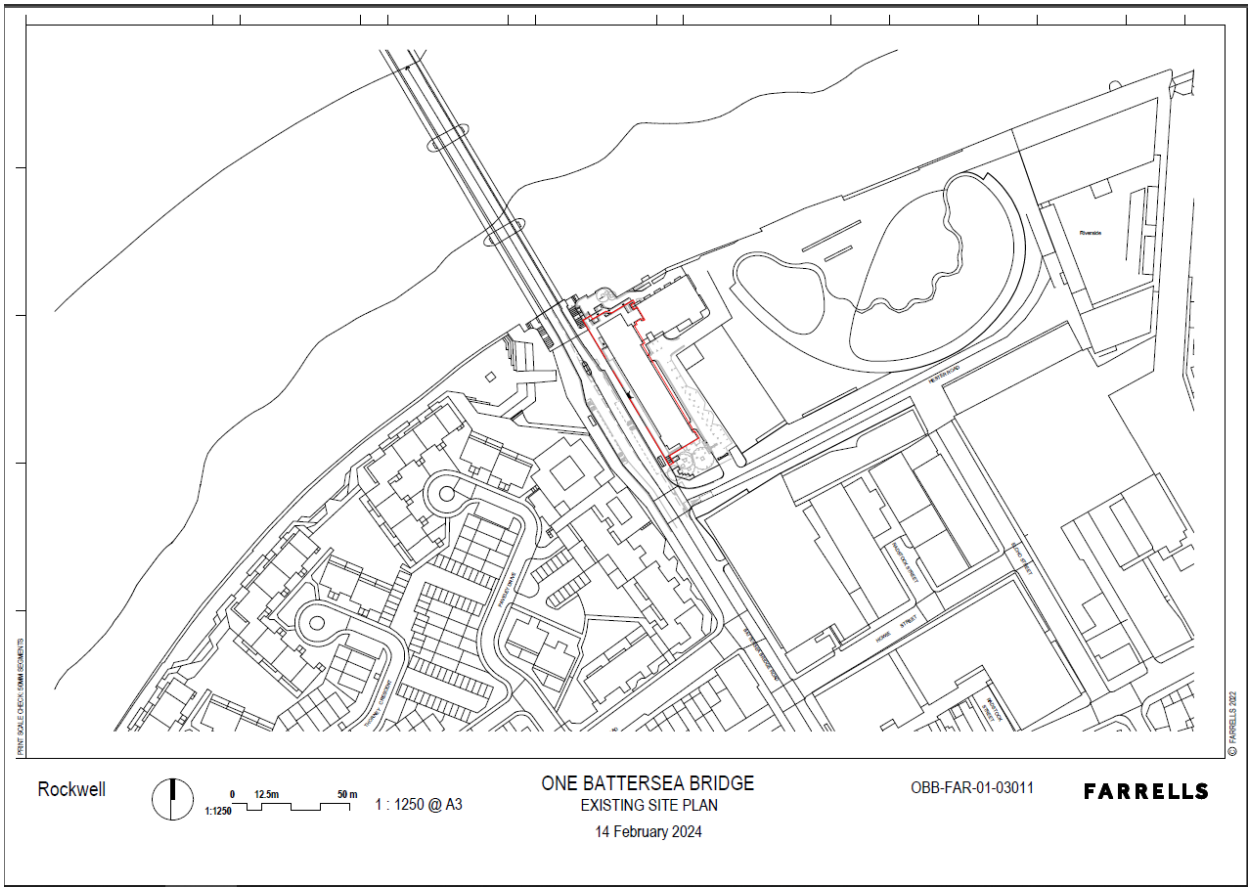
This report outlines measures that will be taken during the design, construction, operational and end of life stages to reduce WLC emissions and their environmental impact. The WLC Assessment should be read in conjunction with the GLA Whole Life Carbon Assessment Template' spreadsheet provided in **Appendix A**, and the Circular Economy Statement, produced by Temple to account for London Plan 2021 Policy SI 7: Reducing waste and supporting the Circular Economy and submitted alongside this Application.

1.1 Project Description

It is understood that the Proposed Development will comprise the comprehensive redevelopment of the site to include demolition of existing building and erection of a part 10 storey, part 28 storey building (plus ground floor and basement levels) comprising residential use (Class C3), office use (Class E), community use (Class F2), and a restaurant (Class E), with associated car parking, cycle parking, public realm, landscaping and other associated works.

The Site is approximately 0.115 hectares (ha). It is located in southwest London adjacent to Battersea Bridge at Ordnance Survey (OS) National Grid Reference (NGR) TQ 27095 77248. The Site is bound to the north by the River Thames, to the east by Thameswalk Apartments and commercial space, to the south by the Royal College of Art, and to the west by Battersea Bridge Road. The total area within the red line boundary is approximately 0.115 hectares (**Figure 1**).

Figure 1 Plan of Site with red line boundary



The proposed Gross Internal Area (GIA) is 21,806 sqm, comprising 20,086 sqm of residential space, with the remaining 1,721 sqm being mixed-use office / commercial use / community use / shared use.

1.2 Assessment Aims

WLC emissions are those that are released from the construction and operation of a building over its entire life, and end-of-life (demolition and disposal). This includes both regulated and unregulated energy use and, and embodied carbon. Embodied carbon emissions are those associated with raw material extraction, manufacture and transport of building materials, construction and the emissions arising from maintenance, repair and replacement as well as dismantling, demolition and disposal. The WLC assessment also assesses any potential 'benefits' from any material reuse or recycling at the end of a building's useful life.

Efforts to decrease operational carbon, accounted for through the National Building Regulations and UK Government and London Mayor's net zero carbon targets, have been successful and now operational emissions are beginning to make up a declining proportion of a development's carbon emissions. The WLC assessment is required to capture the total carbon impact of a building on the environment.

Calculation and reduction of WLC emissions offers a wealth of benefits including[1]:

- *"Ensuring that a significant source of emissions from the built environment are accounted for which is necessary in achieving a net zero-carbon city;*
- *Achieving resource efficiency and cost savings by encouraging the re-use of existing materials instead of new materials and the retrofit and retention of existing structures and fabric over new construction;*
- *Identifying the carbon benefits of using recycled material and the benefits of designing for future reuse and recycling to reduce waste and support the circular economy;*
- *Encouraging a 'fabric first' approach to building design thereby minimising mechanical plant and services in favour of natural ventilation;*
- *Considering operational and embodied emissions simultaneously to find the optimum solutions for the development over its lifetime;*
- *Identifying the impact of maintenance, repair and replacement over a building's life-cycle which improves life-time resource efficiency and reduces life-cycle costs, contributing to the future proofing of asset value;*
- *Encouraging local sourcing of materials and short supply chains, with resulting carbon, social and economic benefits for the local economy; and*
- *Encouraging durable construction and flexible design, both of which contribute to greater longevity, reduced obsolescence of buildings and avoiding carbon emissions associated with demolition and new construction."*

[1] Whole Life-Cycle Carbon Assessments guidance | GLA (london.gov.uk)

2.0 Relevant Legislation, Policies and Guidance

2.1 Legislation

2.1.1 Climate Change Act (2008)[2] (2050 Target Amendment) Order 2019

The Climate Change Act 2008 sets up a framework for the UK to achieve its long-term goals of reducing greenhouse gas emissions by 100% by 2050 over the 1990 baseline, amended in 2019 from 80%. The Act introduces a system of carbon budgeting which constrains the total amount of emissions in a given time period.

2.2 National Policy

2.2.1 The National Planning Policy Framework (NPPF)[3]

The NPPF 2023 describes ways in which the challenge of climate change can be met. Paragraph 159 states that:

"New developments should be planned for in ways that:

> *[...]*
>
> *b) can help to reduce greenhouse gas emissions, such as through its location, orientation, and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards."*

2.3 Regional Policy

2.3.1 The London Plan (2021)4

The London Plan from the Greater London Authority (GLA) sets out an integrated economic, environmental, transport and social framework for the development of London. It calls for more sustainable infrastructure and states that "*The Mayor is committed to London becoming a zero-carbon city. This will require reduction of all greenhouse gases, of which carbon dioxide is the most prominent*." The following policies are considered relevant to the proposed development:

Policy SI 2 Minimising greenhouse gas emissions

"A - Major development should be net zero-carbon. This means reducing greenhouse gas emissions in operation and minimising both annual and peak energy demand in accordance with the following energy hierarchy:

1) be lean: use less energy and manage demand during operation

2) be clean: exploit local energy resources (such as secondary heat) and supply energy efficiently and cleanly

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[2] Climate Change Act 2008 (legislation.gov.uk)

[3] National Planning Policy Framework - Guidance - GOV.UK (www.gov.uk)

[4] The London Plan 2021 | London City Hall

3) be green: maximise opportunities for renewable energy by producing, storing and using renewable energy on-site.

4) be seen: monitor, verify and report on energy performance.

B - Major development proposals should include a detailed energy strategy to demonstrate how the zero-carbon target will be met within the framework of the energy hierarchy.

C – A minimum on-site reduction of at least 35 per cent beyond Building Regulations is required for major development. Residential development should achieve 10 per cent, and non-residential development should achieve 15 per cent through energy efficiency measures. Where it is clearly demonstrated that the zero-carbon target cannot be fully achieved on-site, any shortfall should be provided, in agreement with the borough, either:

1) through a cash in lieu contribution to the borough's carbon offset fund, or

2) off-site provided that an alternative proposal is identified and delivery is certain.

D - Boroughs must establish and administer a carbon offset fund. Offset fund payments must be ring-fenced to implement projects that deliver carbon reductions. The operation of offset funds should be monitored and reported on annually.

E - Major development proposals should calculate and minimise carbon emissions from any other part of the development, including plant or equipment, that are not covered by Building Regulations, i.e. unregulated emissions.

F - 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."

Policy SI7 Reducing waste and supporting the circular economy

"Resource conservation, waste reduction, increases in material re-use and recycling, and reductions in waste going for disposal will be achieved by the Mayor, waste planning authorities and industry working in collaboration. Referable applications should promote circular economy outcomes and aim to be net zero-waste. A Circular Economy Statement should be submitted".

2.3.2 Sustainable Design and Construction SPG, 2014

The guidance in this SPG is intended to:

- "provide detail on how to implement the sustainable design and construction and wider environmental sustainability policies in the London Plan;
- provide guidance on how to develop more detailed local policies on sustainable design and construction;
- provide best practice guidance on how to meet the sustainability targets set out in the London Plan; and
- provide examples of how to implement sustainability measures within developments."

2.4 Local Policy

2.4.1 Wandsworth Local Plan 2023-2038 (July 2023)[5]

The Wandsworth Local Plan, published by LBW in July 2023, contains the following with regards to climate change and carbon:

"*LP1 The Design-led Approach (Strategic Policy)*

[…]

> *2. Ensure that the scale, massing and appearance of the development provide a high-quality, sustainable design and layout that enhance and relate positively to the prevailing local character and the emerging character (where the context is changing)."*

"LP10 Responding to the Climate Crisis (Strategic Policy)

Sustainable Construction and Design

A. Developments will be required to achieve high standards of sustainable design and construction in order to mitigate the effects of climate change, and to realise the Council's ambition of becoming zero carbon by 2050. In order to mitigate the effects of climate change and achieve the Council's target of becoming a zero-carbon borough by 2050, development proposals should:

> *1. supporting developments that achieve zero-carbon and demonstrate a commitment to drive down greenhouse gas emissions to net zero*
>
> *2. Submit a Whole Life Cycle Assessment for all major applications*
>
> *3. Incorporate Sustainable Drainage Systems (SuDS) or demonstrate that any proposed alternative sustainable approaches to the management of surface water will be equally effective.*
>
> *4. Use sustainable construction methods and sustainably sourced and recycled materials, and maximise the use of the river for freight.*
>
> *5. Retain existing buildings and their embodied carbon in renewal and regeneration projects where this is a viable option.*
>
> *6. Re-use any demolished materials in-situ where practicable, in order to minimise the transportation of materials and waste, reduce the need for mineral extraction and reduce carbon emissions.*
>
> *7. Incorporate water conservation measures, to meet a maximum water efficiency standard of 110 litres per person per day for homes (including an allowance of five litres or less per person per day for external water consumption). Planning conditions will be applied to new residential development to ensure that the water efficiency standards are met.*
>
> *8. Incorporate green roofs and walls wherever possible […]*

B. Development proposals will be required to meet the following:

[5] https://www.wandsworth.gov.uk/media/large/adopted_local_plan.pdf

1. New non-residential buildings over 100 sqm will be required to meet BREEAM 'Outstanding' standard, unless it can be demonstrated that this would not be technically feasible. New buildings should be designed taking into account changes to the climate over their lifespan.

2. Where proposals are for a change of use to residential, they will be required to meet BREEAM Domestic Refurbishment 'Outstanding' standard, unless it can be demonstrated that this would not be technically feasible.

3. New residential development will be expected to meet the BRE Home Quality Mark or Passivhaus standards wherever practicable.

Reducing Carbon Dioxide Emissions

C. Development proposals will be required to incorporate measures which improve energy conservation and efficiency, as well as contribute to renewable and low carbon energy generation. Proposals will be required to meet the following minimum reductions in carbon emissions:

1. All new major development should achieve zero carbon standards, as set out in the London Plan, with a minimum on-site reduction of 35%.

2. All non-major new residential development provided in new buildings should achieve a minimum on-site reduction of 35%.

3. Residential development should achieve at least a 10% reduction and non-residential development should achieve at least a 15% reduction through the use of energy efficiency measures.

4. In exceptional circumstances, where it is clearly demonstrated that Parts C.1 and/ or C.2 above cannot be fully achieved on-site, as a last resort, any shortfall to achieve the zero carbon standard in Part C.1 and/ or the on-site threshold in Part C.2 must be addressed by making a financial contribution to the Council's Carbon Offset Fund.

5. Development, including the re-use or extension of existing buildings, should achieve the maximum feasible reductions in carbon emissions and support in achieving the strategic carbon reductions target set out in this Plan, while protecting the heritage and character of the buildings.

[...]

Adapting to Climate Change

G. The Council will expect all development to be fully resilient to the future impacts of climate change in order to minimise the vulnerability of people, property, the public realm and essential infrastructure to its effects. Retrofitting of existing buildings, through the use of low-carbon measures, to adapt to the likely effects of climate change should be maximised and will be supported. However, there are risks of maladaption and it is important that right retrofit and adaption of buildings is undertaken.

Overheating

H. New development should, through its layout, design, construction, materials, landscaping, and operation, minimise the effects of overheating, mitigate the urban heat island effect, and minimise energy consumption in accordance with the cooling hierarchy set out in the Policy SI4 of the London Plan

2.5 Guidance

2.5.1 Whole Life-cycle Carbon Assessments guidance (2022)6

This guidance has been released by the Greater London Authority "*Whole Life-Cycle Carbon Assessments guidance – March 2022*". It outlines how to prepare a WLC assessment which should accompany all referable Planning Applications in line with London Plan Policy SI 2 '*Minimising Greenhouse Gas Emissions*'.

The guidance is accompanied by an assessment template, which provides separate tabs outlining the information that should be submitted at each stage. This template has been provided as a standalone document which should be read in addition to this assessment report.

2.5.2 Royal Institute of Chartered Surveyors (RICS) Whole Life Carbon Assessment for the Built Environment, 2nd edition7

This standard sets out an RICS-approved technical methodology for assessing the carbon impacts from buildings and related infrastructure assets/civil engineering works throughout their life cycle. While this standard is intended for RICS members, one of its key objectives is adoption by the wider industry to enhance the quality, comparability and accuracy of data. For this reason, its adoption by other built environment professionals is encouraged. Active adoption of this standard by clients commissioning WLCAs, and statutory and regulatory authorities, is also encouraged.

"The following are the core principles of undertaking WLCAs in compliance with this standard:

- ***Consistent WLC measurement****: WLCAs need to be reliable and comparable. This requires consistency in the methodology, assumptions and data used. Objectives include increasing the reliability of WLCAs by providing a solid source of reference for the industry and making WLCAs more 'mainstream' by enhancing their accessibility, thereby encouraging greater engagement and uptake by the built environment sector.*

- ***Practical implementation****: This standard emphasises the practical implementation of the existing and widely-accepted environmental performance assessment structure of EN 15978, EN 17472, EN 15643 and EN 15804, but additionally provides guidance on sources of data and assumptions that should be used for all assessments in the UK. This is to facilitate consistency in calculations, even during the early design phase where detailed project-specific information might not yet be available. This will enable the UK industry, together with local authorities and governments, to set targets to reduce WLC and measure their performance against these targets. Where other regions are able to identify relevant sources of data and assumptions to ensure consistency, regional targets could also be set outside the UK.*

- ***Comprehensive modular structure****: The asset life cycle is broken down into different life cycle stages and modules, and buildings and infrastructure are organised into element categories. This*

[6] https://www.london.gov.uk/programmes-strategies/planning/implementing-london-plan/london-plan-guidance/whole-life-cycle-carbon-assessments-guidance

[7] https://www.rics.org/profession-standards/rics-standards-and-guidance/sector-standards/construction-standards/whole-life-carbon-assessment

addresses all aspects that influence WLC in a structured way and enables more granular comparisons than simply at the project level. It also enables flexibility in the size, location and number of assets to be examined without compromising consistency.

- ***Integration of WLCAs into project design and delivery for more effective carbon management**: For whole life principles to be integrated into design, procurement and construction processes and beyond – and for project teams to be engaged in a timely fashion – WLCAs should be carried out at key project phases from concept design to project completion. Appropriate timing and sequencing of WLCAs will help identify carbon reduction opportunities and monitor a project's progress in achieving them.*
- ***Aligning cost planning and WLCAs**: Ideally, WLCAs will be undertaken in parallel with life cycle costing within the framework of RICS' New rules of measurement (NRM) or International Cost Management Standard 3 (ICMS 3).*
- ***Interaction with carbon management**: In the UK, this standard could be considered as a nationally recognised and appropriate GHG assessment methodology (which complies with EN 15978, EN 17472 and EN 15643) for GHG quantification, as required in the carbon management approach set out in PAS 2080:2023, where target setting, reduction, reporting and leadership are also considered.*
- ***Integration with tools and building information modelling (BIM)**: The requirements and recommendations provided in this standard can be incorporated into WLC, embodied carbon, operational carbon or life cycle assessment software tools, whether standalone or integrated with BIM, constituting the wireframe for carbon calculation algorithms in the UK and elsewhere. This will improve the comparability and usability of WLCA results, and contribute to achieving greater consistency across different assessment tools and software.*
- ***Assessing, not guessing**: There may be preconceptions, for example, that natural, local or lightweight materials have lower embodied carbon. However, embodied carbon is complex, and it is important to assess whether proposed options will really achieve reductions in upfront, embodied and whole life carbon for a particular asset.*
- ***Carbon cost/benefit**: Assessing WLC is a holistic process where carbon costs and carbon benefits are assessed in relation to each other, in order to optimise overall carbon performance. For example, louvres or insulation may have an operational carbon benefit over an asset's life cycle, which should be assessed in relation to the carbon costs of the original installation, anticipated maintenance and replacement cycles, and end of life."*

2.5.3 Net Zero Whole Life Carbon Roadmap8

The UK Green Building Council (UKGBC) are developing a national whole life carbon roadmap, to build common actions to achieve net zero carbon within the construction, operation and demolition of buildings and infrastructure.

The project will consist of two main elements, developing a science-based trajectory for the reduction of emissions arising from the built environment sector, in line with limiting global temperature rise to below 1.5 degrees, and the production of a report detailing industry actions, government policies and associated mechanisms and process to manage the transition to net zero.

2.5.4 London Energy Transformation Initiative – Climate Emergency Design Guide9

The London Energy Transformation Initiative (LETI) is a network of over 1,000 built environment professionals that are working together to put the UK on the path to a zero carbon future. The voluntary group is made up of developers, engineers, housing associations, architects, planners, academics, sustainability professionals, contractors and facilities managers, with support and input provided by the GLA and London boroughs.

2.5.5 London Energy Transformation Initiative – Embodied Carbon Primer[10]

The LETI Embodied Carbon Primer offers supplementary guidance to the Climate Emergency Design Guide and is intended to provide designers including architects, engineers, interior designers and urban designers with easy-to-follow best practice and toolkits for reducing embodied carbon in buildings.

In addition, the following guidance are 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.

[8] https://www.ukgbc.org/ukgbc-work/net-zero-whole-life-carbon-roadmap/

[9] https://www.leti.uk/_files/ugd/252d09_3b0f2acf2bb24c019f5ed9173fc5d9f4.pdf

[10] https://www.leti.uk/_files/ugd/252d09_8ceffcbcafdb43cf8a19ab9af5073b92.pdf

3.0 Methodology

This assessment calculates WLC emissions in line with the draft guidance published by the GLA and the RICS PS 'Whole Life Carbon Assessment for the Built Environment 2023".

The two metrics (operational and embodied) and the additional life cycle stages, which include demolition, end of life and refurbishment/replacement cycles, have been included in this WLC assessment.

3.1 Study Period

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.

3.2 Operational Carbon

Operational energy refers to the total energy input required for heating and power within a building. The assessment considers both regulated and unregulated emissions, following the Government's approved methodology for Building Regulations Part L compliance.

To evaluate the design of the One Battersea Bridge, simulation models were generated. The estimated energy demand for the residential and commercial units was determined using the Standard Assessment Procedure (SAP10) and CIBSE TM54 Analysis methodologies. SAP 10 allows emission from the domestic spaces to be reported within the Be Seen spreadsheet from results obtained from the SAP calculation. The CIBSE TM54 analysis allows for a more accurate, tailored energy modelling process for estimating regulated and unregulated energy usage. These methodologies were used to calculate the regulated energy demands associated with hot water, space heating, and fixed electrical items, as well as unregulated energy demands.

3.3 Embodied Carbon

3.3.1 One Click LCA

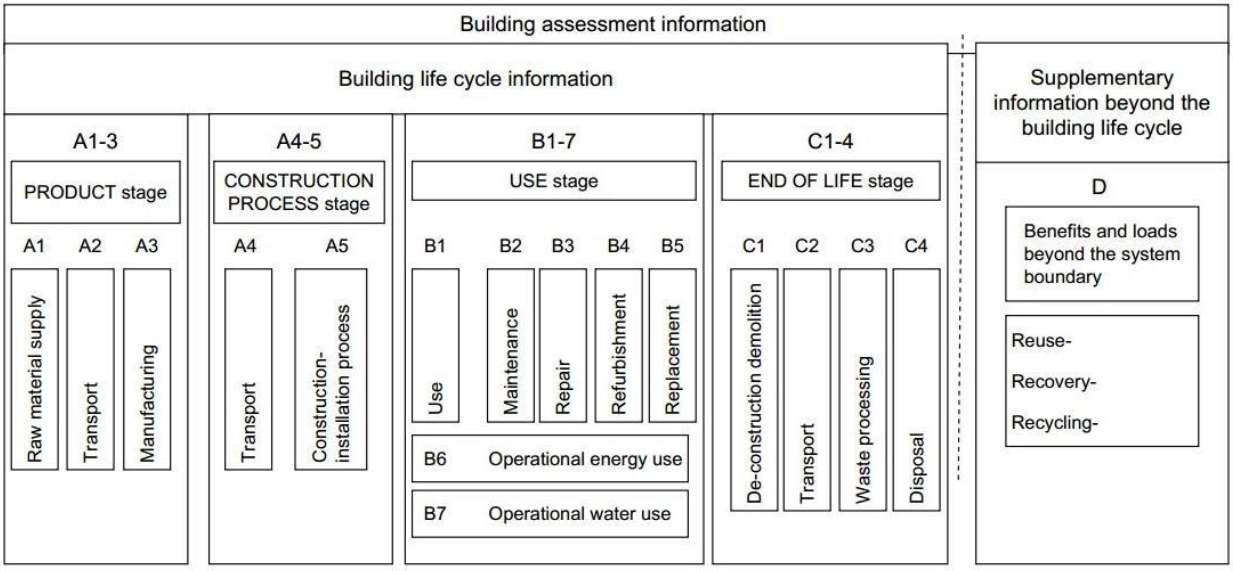
Temple utilised the OneClick LCA tool for conducting the Whole Life Cycle (WLC) assessment. This online Building Life-Cycle Assessment software, developed by the Helsinki-based company Bionova, is widely adopted in the development and construction industry. It is recognized by the Greater London Authority (GLA) and comes with integrated access to extensive local and global Environmental Product Declaration (EPD) databases. For each material, the most suitable option available in the OneClick database was selected.

3.3.2 Approach and Benchmarks

Nationally recognised assessment methodology must be used for the WLC assessment, namely BS EN 15978: 2011; (Sustainability of construction works – Assessment of environmental performance of buildings – Calculation method), which sets out principles and calculation method and is underpinned by the RICS PS. To maintain compliance with Policy SI 2 of the London Plan, the assessment must be in line with the stated documents.

BS EN 15978 and the RICS PS categorise the life of a typical project into life cycle modules, shown in **Figure 2**.

Figure 2 Whole lifecycle modules



- Product (module A1 – A3) and construction stages (module A4 – A5): The product stage includes the carbon emissions arising during the extraction of raw materials from the earth, transportation to manufacturing facility/facilities and the energy used for manufacturing into construction materials. The transportation to site, and construction of the materials into buildings make up the construction stage;
- In-Use Stages (module B1 – B5): Quantifies emissions arising from the operational water and energy usage and the embodied carbon associated with any maintenance, repair, replacement and refurbishment required;
- End of Life Stages (module C1 – C5): This covers the deconstruction and/or demolition of the building, accounting for the on-site activity of the demolition contractors and the transportation to waste processing before eventual disposal;
- Reuse, Recycle, Recover (module D): Encompasses any carbon costs or benefits achieved through any reuse, recycling or recovery potential. Carbon reduction measures will be including in the separate Circular Economy Statement.

To comply with Policy SI 2, the WLCA must cover the entirety of modules A to D, presenting the modules separately, with a reference study period of 60 years. All life-cycle stages detailed within the EN 15978 cradle-to-grave system boundary approach have been included within this assessment.

3.3.3 Benchmarking

A set of WLC 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. These benchmarks, integral to the GLA's evaluation process, are derived from assessments conducted for previous projects that adhered to the RICS PS in terms of scope, material baseline assumptions, and specifications. All life-cycle modules apart from B6, B7 (operational energy and operational water) and module D are included. Additionally, an "aspirational" set of benchmarks has been formulated for applicants seeking to surpass standard expectations, reflecting a 40% reduction in WLC emissions compared to the initial benchmarks. Both sets of benchmarks are included in this assessment and are being reported on.

To reflect the Proposed Development's land use, the benchmarks for office use are shown in **Table 1**.

Table 1 GLA Benchmark values for residential use[11]

Module	Benchmark (kg CO2e/m2 GIA)	Aspirational Benchmark (kg CO2e/m2 GIA)
A1-A5 (excluding sequestration)	<850 kg CO2e/m^2 GIA	<500 kg CO2e/m^2 GIA
B – C (excluding B6 & B7)	<350 kg CO2e/m^2 GIA	<300 kg CO2e/m^2 GIA
A-C (excluding B6 & B7, including sequestration)	<1200 kg CO2e/m^2 GIA	<800 kg CO2e/m^2 GIA

Comparison against the benchmark provides an initial indication of the performance of Proposed Development against current industry average. An overview of the modules is described below:

3.3.4 Data Sources, Assumptions and Omissions

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

The following data sources were used in the LCA model:

- Material types and quantities from the Project Team, broken down by RICS PS categories;
- Database OneClick LCA material/component databases;
- Relevant plans, sections, elevations and specifications from the Project Team.

Approach for WLC Assessment was discussed with members of the Project Team. Separate discussions were undertaken with the specialists producing the Energy Strategy, which has informed this document.

At this stage a Contractor has not been appointed and so there is a limitation with regards to the precise specifications of some of the materials and construction strategies to be used. The results of the One-Click calculation are based on the current and latest available list of Site plans, demolition activities, building materials and construction activities, along with information made available through the Site Waste Management Plan, Operational Waste Management Plan and Energy Statement. Where

[11] Whole Life-Cycle Carbon Assessments guidance | GLA (london.gov.uk)

required, assumptions have been made based upon professional judgement and reference to other similar schemes for which data is available. It is anticipated that all uncertainties will be resolved at the third stage of the WLCA, following construction and based upon as built data. This data can feed back into the growing body of evidence and be used to provide more accurate basis of assumptions in future assessments.

3.3.5 Product stage

OneClick's extensive LCA database of building materials was used to calculate the emissions of the product used. The project Cost Plan has been used to provide an itemised list of materials and quantities, and in accordance with RICS PS 'generic' environmental profiles have been allocated to materials where product details are not specified at this stage.

As per the RICS PS the reference study period (RSP) is 60 years, which aligns with the operational design life of 60 years. The functional unit for the assessment is kgCO2e/m^2 GIA. Different materials have different functional life spans, although this is discussed under the use stage modules B1-B5 below.

3.3.6 Demolition

RICS guidance acknowledges that "Demolition works are often decoupled from new construction projects, hence the responsibility for any emissions arising from demolition is not necessarily solely attributable to the new build project". As stated within the guidance "New build projects assessed are considered to commence their development on a cleared, flat site for consistency purposes." [8]

Accordingly, this is the approach taken for this assessment.

3.3.7 Construction stage

Construction activities have been assumed based on geographic location of the project and building area to calculate electricity, fuel, waste and transportation impacts of the development's construction. This is calculated using an algorithm within the OneClick software.

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 CO2e per £100,000 of project value, this is further referenced and approved by the BRE. The project value has not been provided by the Applicant, therefore professional judgement has been used to allow the construction transport GHG emissions to be included.

3.3.8 Use stage

Service life of building materials was kept as default for the majority of material choices. This means that if its service life is 10 years (for example), then it will need to be replaced 5 times during the standard 60-year lifespan. Maintenance emissions have been calculated at 10 kgCO2/m2, as per GLA guidance, and repair and refurbishment emission were based on GLA guidance which assumes that these emissions make up 25 % of the total maintenance emissions for the site.

Operational energy demands (B6) have been based on the Energy Statement which was produced in support of this planning application to demonstrate compliance with London Plan 2021 Policy SI2.

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 was obtained by multiplying intended full occupancy of the development with annual water consumption.

Vegetation carbon withdrawal has been included in the WLC assessment and estimated based on the number of trees reported in the tree plan. However, when reporting the results for Modules A1 – A5, the sequestered carbon has been excluded.

3.3.9 End-of-life stage and beyond the life cycle

Emissions from deconstruction are calculated within the OneClick software based on the known parameters of the building and its location.

Benefits and loads beyond these modules (the system boundary) are considered in the Circular Economy Statement accompanying this WLCA and supporting the planning application.

The following table outlines the assumptions made within this WLCA assessment:

Table 2: WLCA Assumptions

Data	Data Source
Material types and volumes (A1-A3)	Material types were provided by the design team in a form of a cost plan. At least 99% of the cost allocated to each building element category has been accounted for in the assessment. The materials included are based on the latest currently available material data (include type of material, use case and volume/weight) in the cost plan.
Transport data (A4)	Default values provided by One Click.
Construction site operations (A5)	Waste estimates were provided by Velocity.
Refrigerant Use (B1)	Refrigerant: R454C Charge: 90kg Annual Leakage Rate: 2% Global Warming Potential: 148 End of Life Recovery Rate: 99%
Maintenance (B2)	B2 emissions have been calculated at 10 kgCO2/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 Tool does not have ways to consider B5 emissions. However, based on the information provided for B3 and B4 it is likely that these emissions have been accounted for.
Operational energy (B6)	Energy calculations based on SAP10 and CIBSE TM54 calculations from the Energy Strategy by Ridge and Partners LLP (March, 2024).
Operational water (B7)	Water consumption was assumed based on professional judgement and multiplied by the intended full occupancy.
End of life (C1-C4)	Default values provided by One Click based on the information within the EPD database.
Building areas	One Battersea Bridge –21,806 m^2 (GIA)
Assessment period	60 years

4.0 Whole Life-cycle Carbon Assessment

3.1 Design Stage Assessment Results

As noted above, this is an initial assessment based on the best available information which will need to be updated as the project progresses in line with GLA requirements.

The results when compared to the GLA benchmark values, as noted in the GLA guidance note "Whole Life-Cycle Carbon Assessments guidance – March 2022" are shown in **Table 3** below, in kgCO_2e per square meter of the GIA:

Table 3 Whole Life-cycle Carbon emissions model breakdown

Module	One Battersea Bridge	WLC Benchmark	Aspirational Benchmark
A1-A5 (excluding sequestration)	**616kg CO_2e/m^2 GIA**	<850 kg CO_2e/m^2 GIA	<500 kg CO_2e/m^2 GIA
B – C (excluding B6 & B7)	**291CO_2e/m^2 GIA**	<350 kg CO_2e/m^2 GIA	<300 kg CO_2e/m^2 GIA
A-C (excluding B6 & B7, including sequestration)	**861kg CO_2e/m^2 GIA**	<1200 kg CO_2e/m^2 GIA	<800 kg CO_2e/m^2 GIA

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

The WLC emissions, arising from the Proposed Development total to **861 kgCO2e/m^2 GIA.** This is broken down as:

- **616 kgCO_2/m^2** for modules A1-A5 (excluding sequestered carbon).
- **291kgCO_2/m^2** for modules B-C.

The full results, which include emission from B6 and B7 lifecycle stages are as follows:

Table 4 Full WLCA results

Module	Category	Total kg CO2e over 60 years	Total kgCO2e/m2 GIA over 60 years (GIA=21,806 m2)
A1-A3	Construction materials	10,925,947	501
A4	Transport	258,579	12
A5	Site Operations	2,255,969	103

Module	Category	Total kg CO2e over 60 years	Total kgCO2e/m2 GIA over 60 years (GIA=21,806 m2)
B1	In Use	174,890	8
B2	Maintenance	218,700	10
B3	Repair	54,675	3
B4-B5	Replacement/Refurbishment	4,519,124	207
B6	Operational Energy Use	12,433,609	570
B7	Operational Water Use	2,764,919	127
C1-C4	End of Life (ex. biogenic carbon)	374,621	17
Total		33,981,034	1,558
Carbon sequestration		-1,060,771	-49
Total		**32,920,263**	**1509**
Total A-C (excluding B6 & B7)		**18,782,506**	**861**

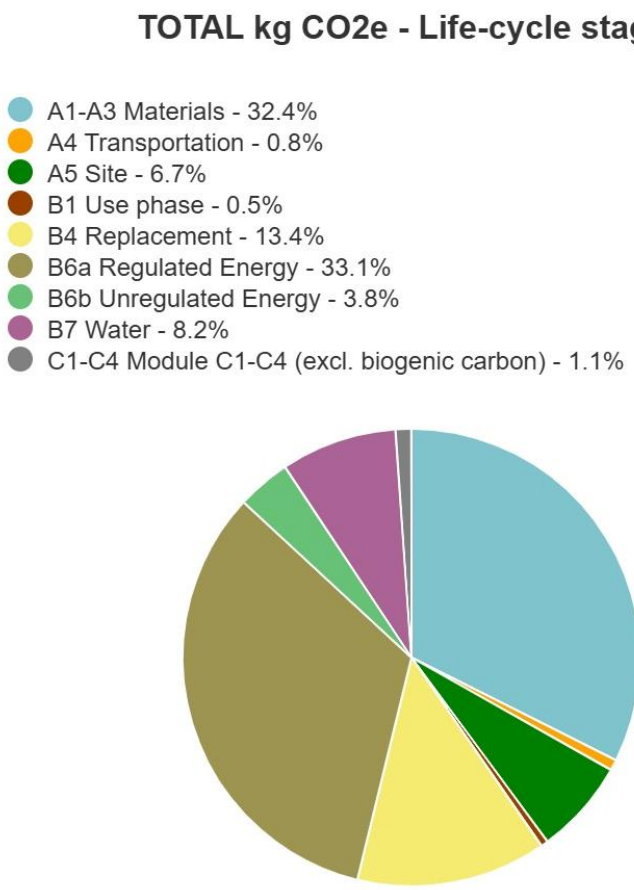
The above results demonstrate that 18,782 tonnes of CO_2e are expected to be emitted over a 60-year period, or **861 $kgCO_2e/m^2$** when B6 and B67 emission are not considered.

When operational energy and water emissions are included in the calculation above the total emissions are expected to be 32,920 TCO_2 over 60 years.

The expected WLC results are lower than the GLA WLC Benchmark for all modules. This demonstrates that Proposed Development at One Battersea Bridge has taken account of relevant policy and reduced emissions as far as reasonably possible based on current information available

As shown in **Figure 3,** the highest proportion of emissions arise from modules A1-A3 (32.4% of the total), as well as from regulated energy (B6, 33.1 % of the total), By practical completion, (A1-A5), 39.9% of the emissions will be released, with 59% being emitted during use (B), and 1.1 % at the end of the building life (C). In **Table 5**, module D is shown as negative values. This is because materials can be recycled or reused, releasing less emissions than if virgin materials were to be used.

Figure 3 Emissions released across Life-cycle modules



3.2 Embodied Carbon Breakdown

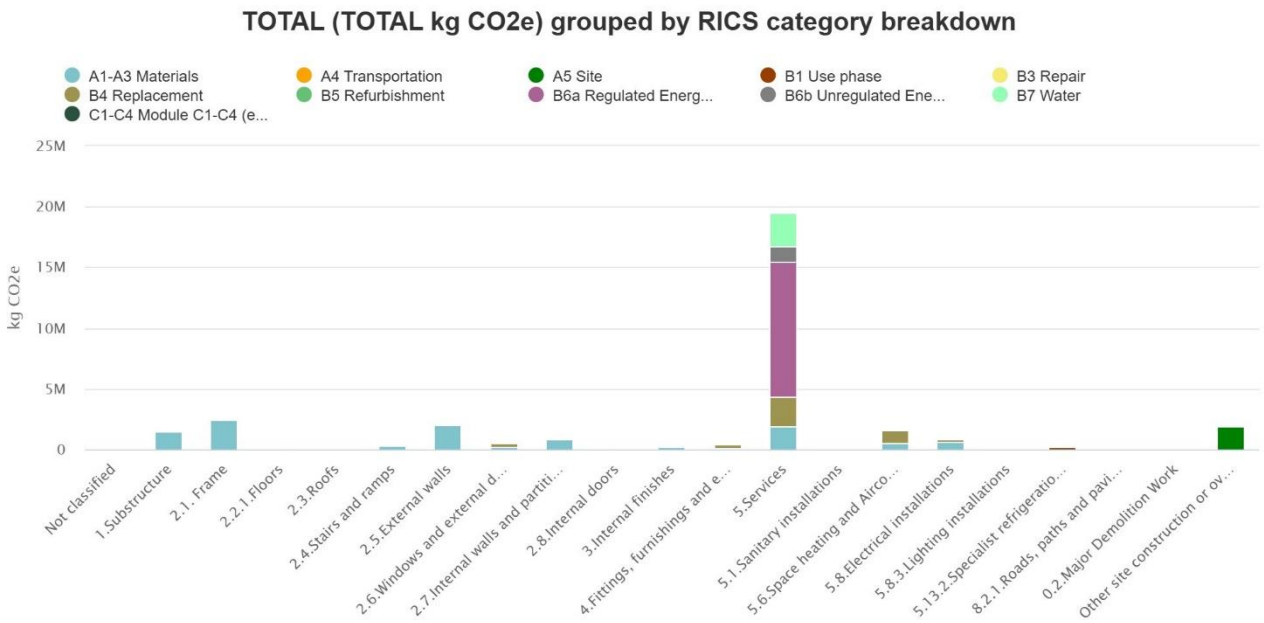
Table 5 and **Figure 4** display emissions at the different RICS building element categories. Again, it can be seen that the majority of the emissions originate from the embodied carbon of materials.

The substructure, and superstructure (frame and upper floor) and service installations contain a large proportion of steel, while the floor finishes incorporate screed composed of cement. The production process for both cement and steel are carbon- intensive, contributing significantly to the overall embodied carbon value.

Table 5 Emission breakdown by life-cycle module and building element

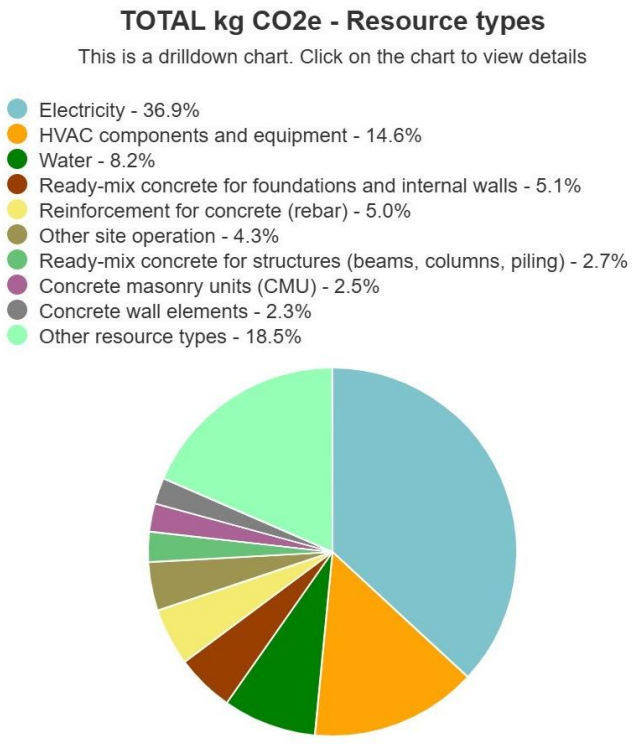
	Carbon at completion (module A1-A5) (Tonnes)	Carbon over lifecycle (B2-B5) (Tonnes)	Carbon over lifecycle (C1-C4) (Tonnes) (ex.biogenic carbon)	Whole Life Carbon (Tonnes)	Carbon over lifecycle (D) (Tonnes)
Substructure	1,630	0	69	1,699	-1,018
Superstructure	6,429	384	484	6,990	-575
Finishes	244	66	586	312	-0.92
Fittings, furnishings and equipment	83	3,223	121	406	0
Services (MEP)	3,112	4,185	45	22,541	-5626
External works	9	9.5	0.3	19	-0.8
Other site construction	1,931	0	0	1,931	0
Unclassified		273			
Biogenic Carbon			-1061		
Total tonnes CO2	13,440	4967	374	18,781	-7222
Total kg CO_2/m^2 GIA	616	227	17	861	-331
				Total tonnes CO2 (inc module D)	**11,559**
				Total kg CO_2/m^2 GIA (inc module D)	**530**

Figure 4 Elemental emission breakdown



As represented in Figure 5 HVAC components and electricity account for 51.5 % of the total whole life emission calculated within this assessment. Generic data has been used, as at the timing of this writing this report, as the exact material types are not known.

Figure 5 CO_2 emissions from resource type



5.0 Carbon mitigation measures

The proposed development prioritises sustainability and the reduction of whole-life carbon by incorporating thoughtful measures throughout the design stage. Lean design principles will be applied to minimise the quantities of concrete used, and the concrete composition will optimise Ground Granulated Blast-furnace Slag (GGBS) content for its lower embodied carbon, resulting in reduced A1-A3 emissions.

Moreover, operational carbon emissions (B6 and B7) will be significantly decreased by up to 35% compared to the Part L 2013 baseline. This reduction will be achieved through National Grid decarbonisation plan and through implementation of passive design measures, energy efficiency initiatives, and integration of air source heat pumps (ASHP), aligning with the GLA policy outlined in the Energy Planning Guidance.

5.1 Reduce material use

Further measures concern future demolition and deconstruction of the development which could be considered at the design stage. Consideration to be given to ways to facilitate dismantling, where possible.

Management of construction and municipal waste arisings from the development have been explored within the Circular Economy Statement. Please refer to the report for full details.

5.2 Recycled materials

The use of recycled content and secondary aggregates will be encouraged and given priority, reducing the demand for virgin material and optimising material efficiency in construction. The design has taken in to account the reuse of reprocessed material from the site, e.g., recycled aggregates, timber, or masonry. More details can be found in the Circular Economy Statement.

5.3 Reuse of material

The Circular Economy statement details the strategy for recovery and reuse of materials. Please refer to the report for further detail.

5.4 Sustainable Procurement

The transportation of materials from the manufacturing facility to the building site adds to the carbon of the development. Preference will be given to the use of local sources and suppliers whenever possible and commercially viable to reduce ‘transport miles” and help reduce the emissions produced during transportation. This review would impact life cycle A4 - emissions from transportation to site.

6.0 Conclusions

The WLC assessment of One Battersea Bridge has highlighted that the embodied material carbon, life-cycle stages A1-A3, are the main emission sources. Managing the supply chain and opting for local products will reduce the transportation related emissions. Consideration has also been given to the use of recycled materials and materials with low environmental impact. Furthermore, sustainable waste management practices which will be promoted during both excavation, construction and demolition phases of the Proposed Development, will help reduce emissions even further. Considering WLC at the design stage gives guidance to the project team upon which materials selection or products will offer the most efficiency depending on their lifetimes, as well as support material circularity, decreasing end of life emissions too.

The kg CO2e/m^2 GIA values are displayed in **Table 3**. This assessment has calculated that the Proposed Development is below the **850 kg CO2e/m^2 GIA** benchmark given by the GLA for modules A1-A5, below **350 CO2e/m^2 GIA** benchmark for modules B and C, and achieves a total A-C emissions value below the GLA benchmark at **861 kg CO2e/m^2 GIA**. Consequently, the development is fully compliant with GLA policy. This demonstrates that for the Proposed Development situated at One Battersea Bridge the relevant policy has been taken into account and emissions have been reduced as far as reasonably possible based on current information available.

A series of high-level opportunities to further reduce carbon emissions post planning have also been proposed. These measures will be looked at in detail in the next stage of the design development process and included, where possible.

Following RIBA stage 6, at the post construction stage, the WLC assessment will be updated and submitted to the GLA using real monitored data from the finished Proposed Development.

Appendix 1: Completed GLA spreadsheet

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