

LCA Assessment

Site: One North Parade

Stage 2 (Concept Design) Assessment

Date: 11/02/2025

Contact: Jordan Bury



1.0 - Introduction

1.1 - Scope of works

Complete Sustainability Solutions has been appointed to undertake a Stage 2 Life Cycle Assessment (LCA) review for the proposed ground +13 storey office development at One North Parade, Manchester. This assessment is a critical component of our BREEAM (Building Research Establishment Environmental Assessment Method) certification process, aimed at evaluating the environmental and financial implications of the project throughout its entire lifecycle.

The Stage 2 LCA focuses on quantifying the environmental impacts associated with the construction, operation, and eventual decommissioning of the laboratory. By analysing factors such as energy consumption, material usage, and waste generation, this review provides a comprehensive understanding of the facility's ecological footprint and identifies opportunities for reducing its environmental impact.

1.2 - Statement of Compliance

The persons undertaking this assessment can confirm that they are a 'competent person' as defined in the BREEAM manual. They have undertaken training in IMPACT-compliant LCA software (both One Click and eTool) and have carried out a minimum of 20 life cycle assessment and life cycle costing studies over a range of varied projects. They can confirm that they are not professionally connected to a single manufacturer.

1.3 - Summary of Results

This report presents the results for LCA over a study period of 60 years, in accordance with the BREEAM methodology for Mat 01 and Man 02.

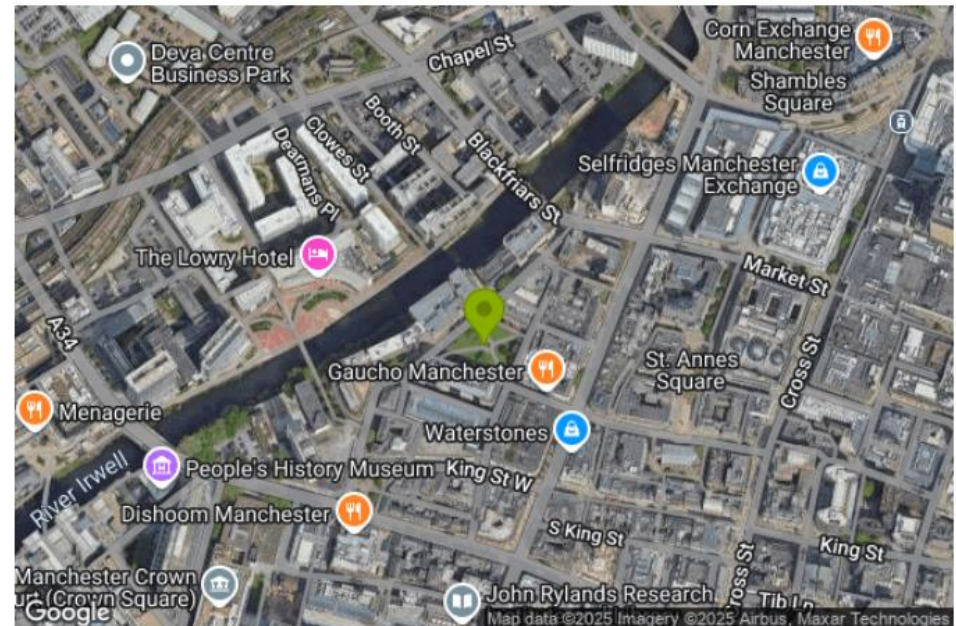
This report demonstrates that three credits + Exemplary Credit may be awarded for Mat 01, as a result of undertaking the LCA during the concept design.

1.4 - Site Location

Proposed Development:

The proposed development is the construction of a new office development at One North Parade, Manchester. The proposed ground +13 storey building will comprise of open plan office spaces, welfare areas and circulation core. The proposed GIA of the development is circa 11200m².

The project location is shown in figures 2 and 3.



2.0 - BREEAM Criteria

BREEAM New Construction 2018 Mat 01 – Building Life Cycle Assessment

1. During the Concept Design, demonstrate the environmental performance of the building as follows:
 - a) Carry out a building LCA on of the superstructure design using either the BREEAM Simplified Building LCA tool or an IMPACT Compliant LCA tool according to the methodology.
 - b) Submit the Mat 01/02 Results Submission Tool to BRE at the end of Concept Design, and before planning permission is applied for (that includes external material or product specifications).
2. During Technical Design, demonstrate the environmental performance of the building as follows (office, industrial and retail buildings only):
 - a) As criterion 1.a.
 - b) Submit the Mat 01/02 Results Submission Tool to BRE at the end of Technical Design.
- 3 & 4. During Concept Design, identify opportunities for reducing environmental impacts as follows:
 - c) Carry out building LCA options appraisal of 2 to 4 significantly different superstructure design options (applicable to the Concept Design stage).
 - d) Use a building LCA tool that is recognised by BREEAM (as suitable for assessing superstructure during Concept Design) according to the methodology.
 - e) For each design option, fulfil the same functional requirements specified by the client and all statutory requirements (to ensure functional equivalency).
 - f) Integrate the LCA options appraisal activity within the wider design decision-making process. Record this in an options appraisal summary document.
 - g) Record the following in the Mat 01/02 Results Submission Tool: The differences between the design options; the design option selected by the client to be progressed beyond Concept Design; the reasons for selecting it and the reasons for not selecting the other design options.
 - h) Submit the Mat 01/02 Results Submission Tool to BRE at the end of Concept Design, and before planning permission is applied for (that includes external material or product specifications).
- 6 & 7. During Concept Design identify opportunities for reducing environmental impacts as follows:
 - a) Carry out building LCA options appraisal of a combined total of at least six significantly different substructure or hard landscaping design options (at least two shall be substructure and at least two shall be hard landscaping).
 - b) Using a building LCA tool that is recognised by BREEAM (as suitable for assessing substructure and hard landscaping during Concept Design) according to the methodology.
 - c) As criteria 4.c to 4f.

BREEAM New Construction 2018 Mat 01 (Exemplary Credit criteria) – Building Life Cycle Assessment

8 & 9. During Concept Design identify opportunities for reducing environmental impacts as follows:

- a) Carry out building LCA options appraisal of at least 3 significantly different core building services design options.
- b) Use a building LCA tool that is recognised by BREEAM (as suitable for assessing core building services during Concept Design) according to the methodology.
- c) As criteria 4.c to 4f.

10 & 11. Achieve Elemental LCC plan and Component Level LCC options appraisal credits (Man 02 Life cycle cost and service life planning).

12. Include design options appraised for criteria 3 to 4 (and 6 to 7 and 8 to 9, if pursued) during Concept Design in the elemental LCC plan

13. Include the design options appraised for criterion 5 during Technical Design in the 'Component level LCC option appraisal' (in Man 02 Life cycle cost and service life planning).

14. Integrate the aligned LCA and LCC options appraisal activity within the wider design decision- making process. Record this in an options appraisal summary document including the relevant cost information from the 'elemental LCC plan' and 'Component level LCC option appraisal'.

15 & 16. A suitably qualified third party either carries out the building LCA work or verifies the building LCA work (if by others), and produces a report describing how they have checked the building LCA work accurately represent the designs under consideration during Concept Design and Technical Design with reference to the requirements of criteria 1 to 7 (and 8 to 14 if pursued).

17. For each LCA option, itemise in the report the checks made by the suitably qualified third party including, as a minimum, the quality requirements.

18. Include details of the suitably qualified third party's relevant skills and experience and a declaration of their third party independence from the project client and design team in the report.

3.0 - Methodology

3.1 - Life Cycle Assessment

The LCA has been undertaken using the following tools and data:

- 'eTool LCD' software
- Building Regulations compliant energy modelling software and REEB energy consumption benchmarks
- Construction data from Complete Sustainability database and the project's Construction Method Statement.

Life Cycle Assessment (LCA) is a technique for assessing the potential environmental impacts of a product or service. LCAs involve cradle-to-grave analysis of production systems and provide comprehensive evaluations of all upstream and downstream energy inputs and a number of environmental emissions. A graphical illustration of each of the LCA stages is shown in Figure 1:

Existing buildings are responsible for a major share of energy use, greenhouse gas emissions and the environmental impacts of the construction sector. Renovating buildings improves operational energy performance, but it also increases the environmental impacts due to the materials and building services that are added to improve energy performance.

To address these trade-offs and establish which specification and design decisions will have the least environmental impact, it is essential to take a life cycle approach. Conducting an LCA will provide more insight into the development's environmental profile and avoid the common occurrence of simply transferring impacts between the operational and construction stages.

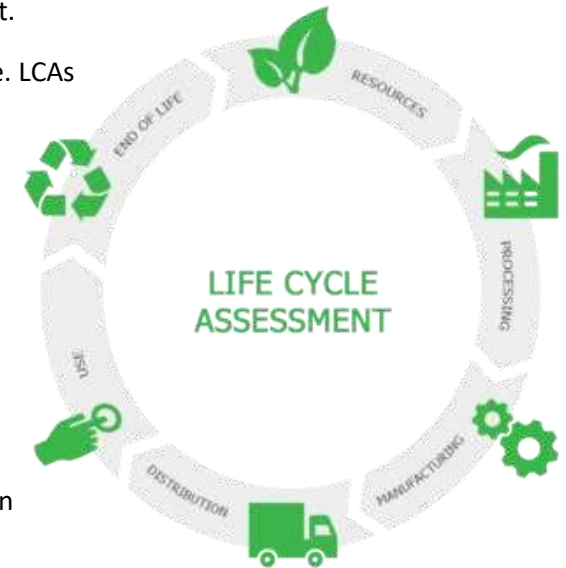


Figure 4: Stages included within an LCA (courtesy of OneclickLCA)

ASSESSMENT INCLUSIONS

EMBODIED IMPACTS / LIFE CYCLE EMBODIED IMPACTS

UPFRONT IMPACTS		IN USE IMPACTS		END OF LIFE IMPACTS	POST LIFE CYCLE IMPACTS
PRODUCT	CONSTRUCTION	USE		END OF LIFE	BENEFITS AND LOADS BEYOND SYSTEM BOUNDARY
A1 Raw Material Supply	A4 Equipment Transport	B1 General Use	B4 Replacement	C1 Deconstruction and Demolition	D1 Operational Energy Exports
A2 Raw Material Transport	A5 Construction and Installation	B2 Maintenance	B5 Refurbishment	C2 Waste Transport	D2 Closed Loop Recycling
A3 Product Manufacturing		B3 Repair		C3 Waste Processing	D3 Open Loop Recycling
				C4 Disposal	D4 Materials Energy Recovery
					D5 Direct Use
		OPERATIONAL IMPACTS			
		B6 Operational Integrated Energy	B7 Operational Integrated Water		
		B6+ Non-Integrated Energy	B7+ Non-Integrated Water		
		B8 User Activities not covered under B1-B7			

3.3 - Study Boundary

To undertake an LCA for a building, different building elements need to be considered at different life stages. What is and is not included is referred to as the 'boundary'. This report has been based on a BREEAM compliant boundary, which excludes certain building elements and stages.

The following life stages are considered in both the LCA analyses:

- A1-A3: Product stage - raw materials supply, transport and manufacturing
- A4: Transport of the products to the construction site
- A5: Construction of the main building elements
- B1: Use
- B2-B3: Maintenance and repair
- B4-B5: Material replacement and refurbishment
- C1-C4: Deconstruction/demolition
- D: Reuse, recovery and recycling potential

The following building elements have been included in both the LCA analyses:

- Structural frame (all columns and beams and miscellaneous connections)
- Construction envelope - all walls, roof and floor elements, as well as finishes
- Windows and frames
- External works (landscape, pavements, roads)
- Transport of all the construction materials to the site
- Maintenance and replacement of building elements during the material lifespan

3.4 - Study Period

The study period for this project is 60 years, in accordance with BREEAM and ISO methodologies.

3.5 - Assumptions and Standards

The following data set has been used for this analysis:

- Average transport values for the UK, according to eTool database
- Grid electricity carbon intensity profile following the 'slow progression decarbonisation scenario' from the National Grid Future Energy Scenarios 2015.

The software used to undertake the analysis is eTool LCD, which complies with:

- ISO 14040 2006: Environmental management – Life cycle assessment – Principles and framework
- ISO 14044 2006: Environmental management – Life cycle assessment – Requirements and guidelines
- EN 15978 2011: Sustainability of construction works. Assessment of environmental performance of buildings. Calculation method
- ISO 15686-5:2008 (Buildings and constructed assets– Service life planning – Part 5: Life cycle costing)
- PD-156865 Standardized Method of Life Cycle Costing for Construction Procurement

3.6 - Site Description

The proposed development is the construction of a new office development at One North Parade. The proposed ground +13 storey building will comprise of open plan office spaces, welfare areas and circulation core.

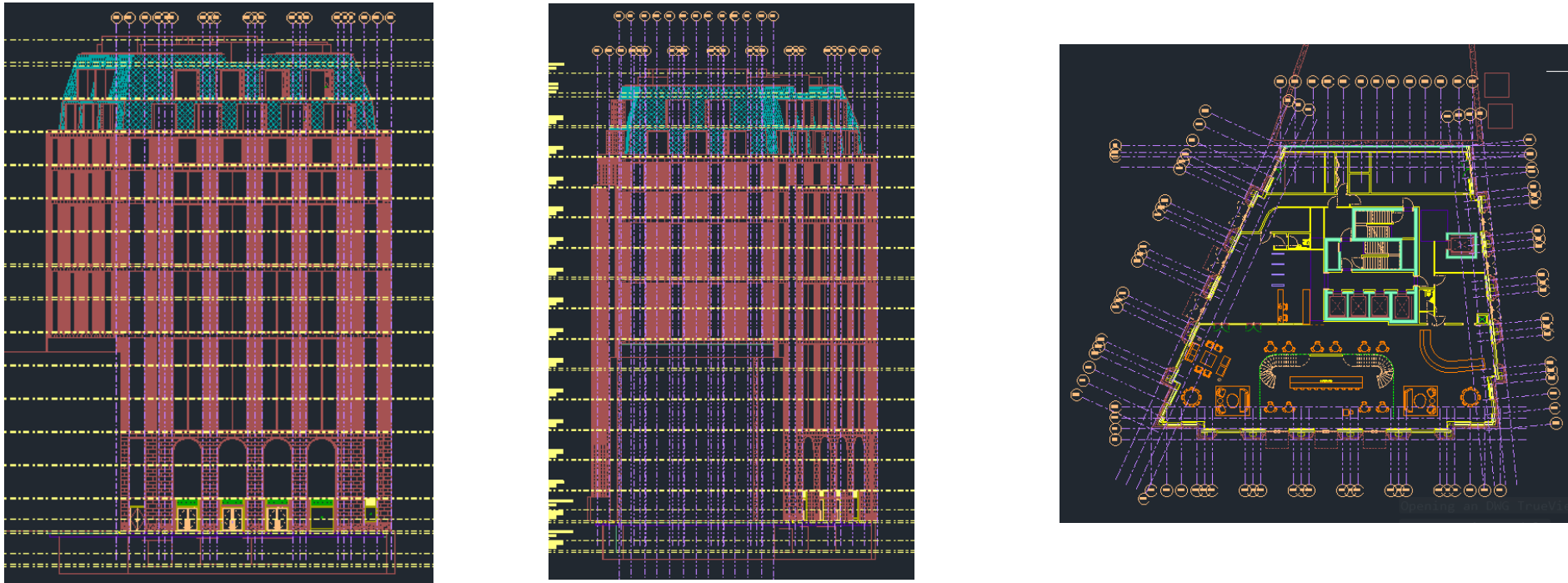


Figure 6 – Proposed Plans

4.0 - LCA Results

4.1 - Overview

The following pages present the results from the LCA of the proposed scheme. The embodied CO₂ figure should include manufacturing, transport, construction and deconstruction of the materials, therefore, the total embodied carbon for the building is the sum of A1-A3, A4, A5 and C1-C4 life stages – **544.21 kgCO₂e/m²**. The table below provides a summary of the GWP for each stage.

Life Stage	GWP (kgco2e)
A1-A3 Construction materials	4,500,996.22
A4 Transport to site	292,214.64
A5 Construction/ installation process	555,756.76
B2-B3 Maintenance and repair	15,888.29
B4-B5 Material replacement and refurbishment	411,103.98
B6 Energy Use	-178,735.22
C1-C4 Deconstruction	746,292.96
Totals	6,338,232.44

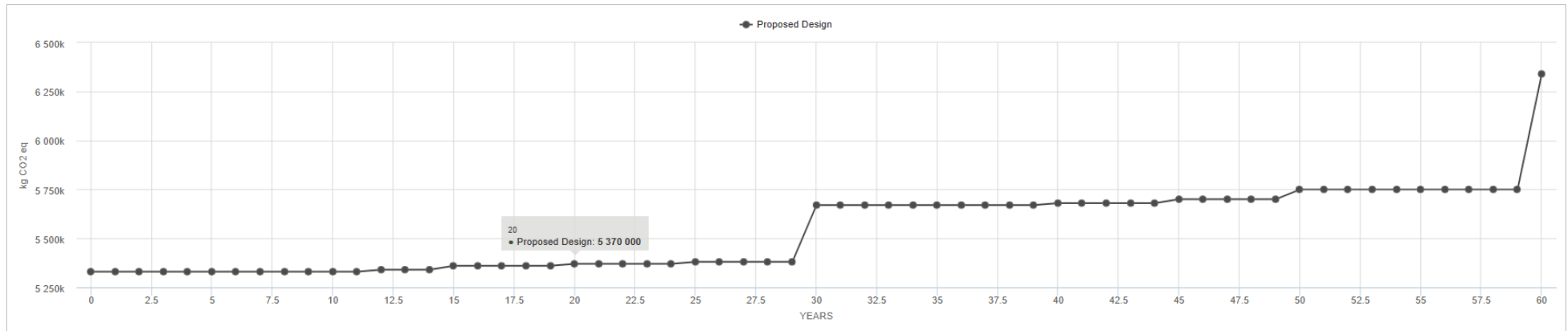
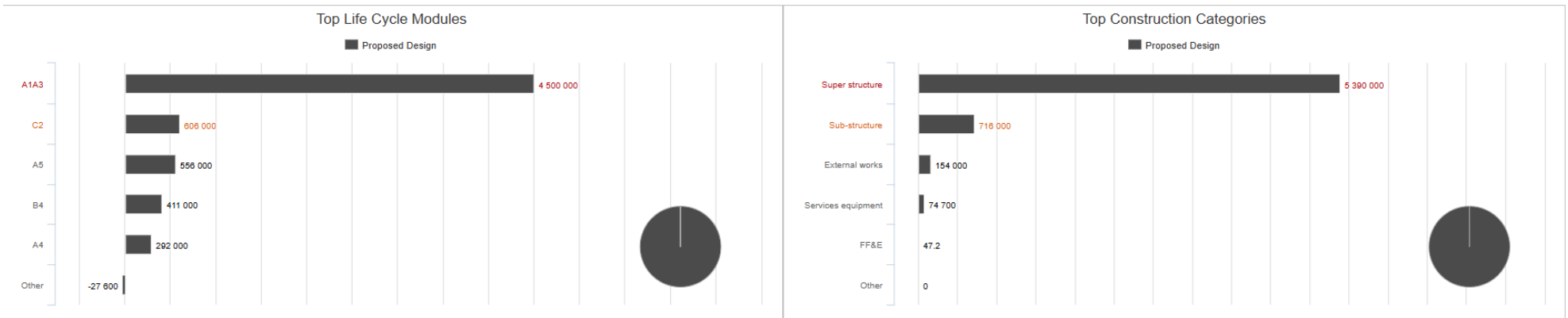


Figure 5: Top Five Global Warming Potential Total, GWP chart



6.0 - Options Appraisal

6.1 - Overview

Following the quantification of the environmental impacts of the proposed the scheme, the next step is to undertake an options appraisal. These options are opportunities to reduce the global warming potential and/or the cost of the scheme over a 60-year life cycle.

6.2 - Options Appraisal

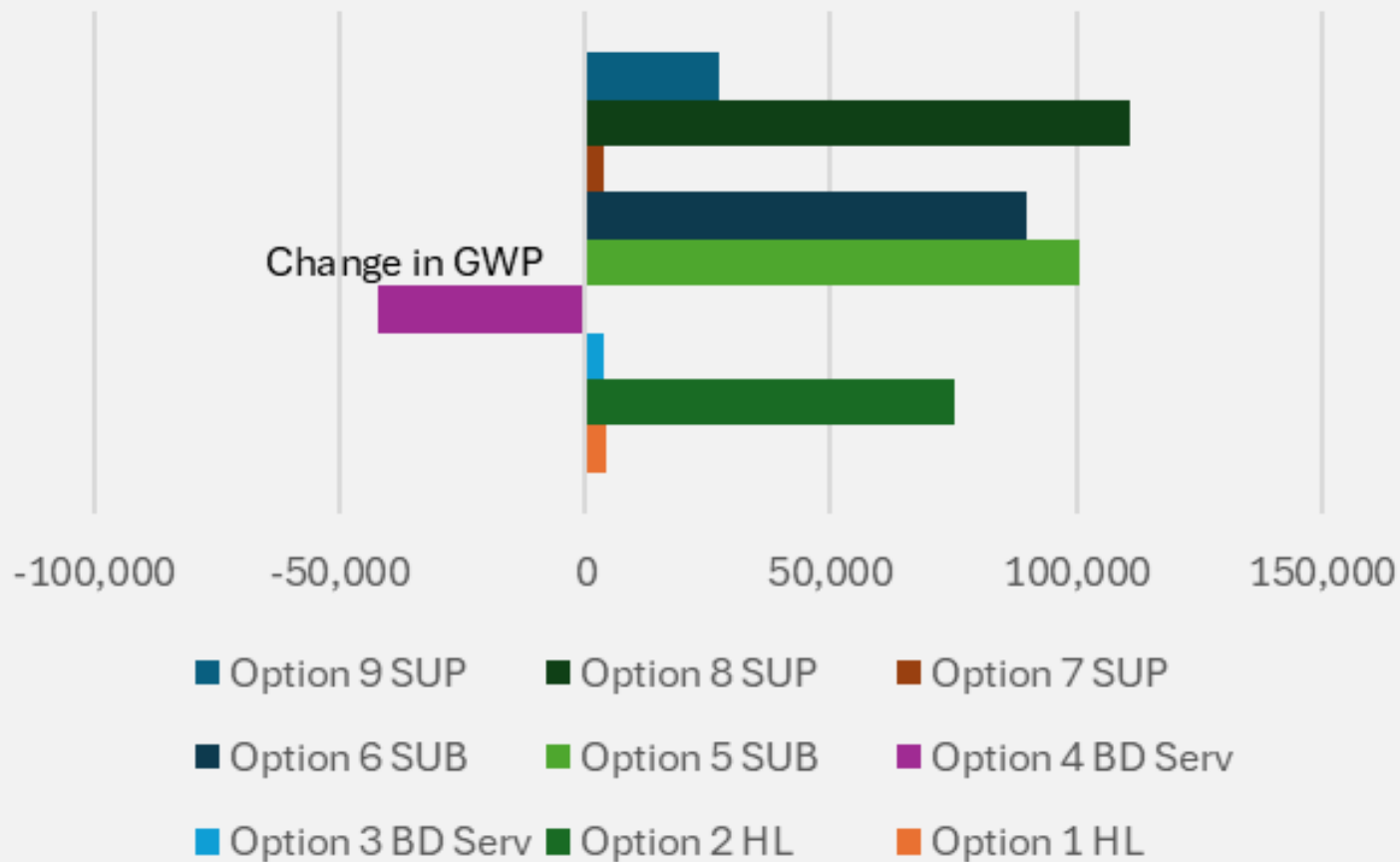
Several options have been analysed, with seven iterations demonstrating a decrease in the GWP of the development and demonstrating a decrease in the cost against the proposed scheme.

The proposed iterations investigate the GWP change when alterations are made to the superstructure, substructure, and external works.

Options to reduce the embodied carbon may not be adopted by the design team because of various other factors such as more frequent maintenance/replacement, aesthetic preference, and structural performance. All the options proposed in this report should be evaluated by the design team to determine which are feasible. Where they are deemed feasible, they should be actioned and added to the project's specifications.

Option	Description	Change in GWP (kg CO2 eq)	GWP (kgco2e/m2)
Option 1 HL	Replace 10% of hard landscaping areas with soft landscaping	4,144	566
Option 2 HL	Replace concrete paving with limestone paving	75,068	559
Option 3 BD Serv	Reduce the solar PV by 10%	3,881	566
Option 4 BD Serv	Replace electric HW cylinders with instantaneous electric	-42,343	570
Option 5 SUB	introduce 40% BFS into the concrete foundations	100,556	557
Option 6 SUB	Reduce the density of the concrete in the foundations by 5MPa	89,949	558
Option 7 SUP	Reduce the thickness of the insulation used in external wall by 25mm	3,816	566
Option 8 SUP	Replace double glazed windows with triple glazed windows	110,834	556
Option 9 SUP	Replace aliminium window frames spandrel frame windows	27,165	563

Life cycle analysis - Options



7.0 - Conclusion

The **life cycle assessment** (LCA) concludes that the largest global warming potential (GWP) impact over a 60-year period will come from the manufacturing and construction stages of the building.

It should be noted that when implementing more sustainable materials specification, careful consideration should be given to the lifespan of a given material or element. This is a highly sensitive variable in the analysis so changes in the lifespan or replacement rates can significantly change the projects GWP.

The options appraisal provides enhancements that can be made to reduce the embodied carbon. All the options proposed in this report should be evaluated by the design team to determine which are feasible. Where they are deemed feasible, they should be actioned and added to the project's specifications.

This report demonstrates that **three credits + Exemplary Credit** may be awarded for Mat 01, as a result of undertaking the LCA during the concept design.

Benchmarking

At Concept design (Stage 2) the LCA has been completed based on take off calculations. Currently the scheme does not show an improvement over the BRE Benchmarking standard for office developments.

It is recommended that at technical design (Stage 4) a full bill of materials is provided to enable the LCA calculations to be carried out and benchmarking to be revisited.

Superstructure - Comparison with the BREEAM benchmark

A completed 'Mat01_CD_SuperS_B' data file shall be saved in the same folder as this file.

Design option		Option data file link	m2 net internal area	BRE EN ecopoints/m2 net internal area (60 year study period)							
ID	Name			2.1 Frame	2.2 Upper floors	2.3 Roof	2.4 Stairs and ramps	2.5 External walls	2.6 Windows and external	2.7 Internal walls and	Total
B1	Mat01_CD_SuperS_B	Link	11200	0.46	0.76	0.05	0.02	1.08	0.50	Not in scope	2.88

Result from tool (BRE EN ecopoints / m2 NIA):	2.88
Benchmark value for this building type (BRE EN ecopoints / m2 NIA):	2.4
Percentage better than benchmark:	-19.8%
Credits awarded:	0.00

8.0 - UKNC2018 Mat0102 ResultsSubmissionTool

Building LCA during Concept Design (and pre detailed planning approval)

Assessment details

BREEAM assessment building use type:	Offices
Is the project part new-build, part refurbishment OR defined as a BREEAM 'Simple Building'?	No
Functional quantity 1 during Concept Design (m2 net internal area):	11200
Functional quantity 2 during Concept Design (n/a (no value required)):	
Has comparison with the BREEAM benchmark during Concept Design been done? Select tool used or leave blank.	Tools eToolLCD (IMPACT Compliant) – using BRE EN data v5.x only
Has superstructure option appraisal during Concept Design been done?	Yes
Has substructure and hard landscaping options appraisal during Concept Design been done?	Yes
Has core building services options appraisal during Concept Design been done?	Yes
Tool to use for options appraisal during Concept Design:	Tools eToolLCD (Default, UK)
Range of indicators provided by tool:	CO2e AND other environmental categories.
Tool recognised by BREEAM for superstructure option appraisal during Concept Design:	Yes
Tool recognised by BREEAM for substructure and hard landscaping options appraisal during Concept Design:	Yes
Tool Recognised by BREEAM for core building services options appraisal during Concept Design:	Yes
Environmental impact indicator used for comparisons:	Kg CO2e

Credits awarded (exemplar) 1.0

Concept Design results

Total credit score at Concept Design: 3 + Exemplar credit

Submission of the BREEAM MAT 01/02 Results Submission Tool to BREEAM by the end of Concept Design

Confirm the following (which comprise the BREEAM Mat 01/02 Results Submission Tool) are included and that the submission method is understood:-

This file.	Yes
The 'Mat01_CD_SuperS_B.xlsx' data file and all the associated option data files (including files that are not used).	Yes
The method for submission to BREEAM is to upload to BREEAM Projects. It may not be checked by BREEAM (unless and until the assessment undergoes QA).	Yes

Date the above sent to BREEAM during Concept Design: 11/02/2025