

Land fronting Boyton Road, Campsbourne Estate, Haringey
Life Cycle Carbon Assessment

20th Oct 2022

V2.0

Prepared by: Matthew Higgs

Reviewed by: Jess James

Contents

1 Introduction.....3

2 Methodology.....3

3 Proposed development4

 3.1 Building Fabric.....4

 3.1.1 Building Services5

4 Results.....5

 4.1 Building Embodied Emissions.....5

 4.2 Combined Life Cycle Emissions5

 4.3 Comparison with GLA WLC Benchmark.....5

5 Conclusion.....6

6 Appendix7

1 Introduction

This report summarises the life cycle carbon assessment for the redevelopment of Land fronting Boyton Road, adjacent to Wat Tyler House, Campsbourne Estate, Haringey. This report estimates the massing of proposed building materials and shows the embodied carbon, carbon resultant from on site activities and the use of the building over a 60 year time frame.

The proposal comprises the redevelopment of car park to provide 15 new residential homes for council rent (Class C3) in a part four, five and seven-storey building with associated cycle and refuse/recycling stores and amenity space. Public realm and landscaping improvements around the site including new tree planting and enhanced children’s play spaces to rear of Wat Tyler House and Gillett House. Provision of one on-street wheelchair accessible parking space. The site location is shown in Figure 1.1 below.

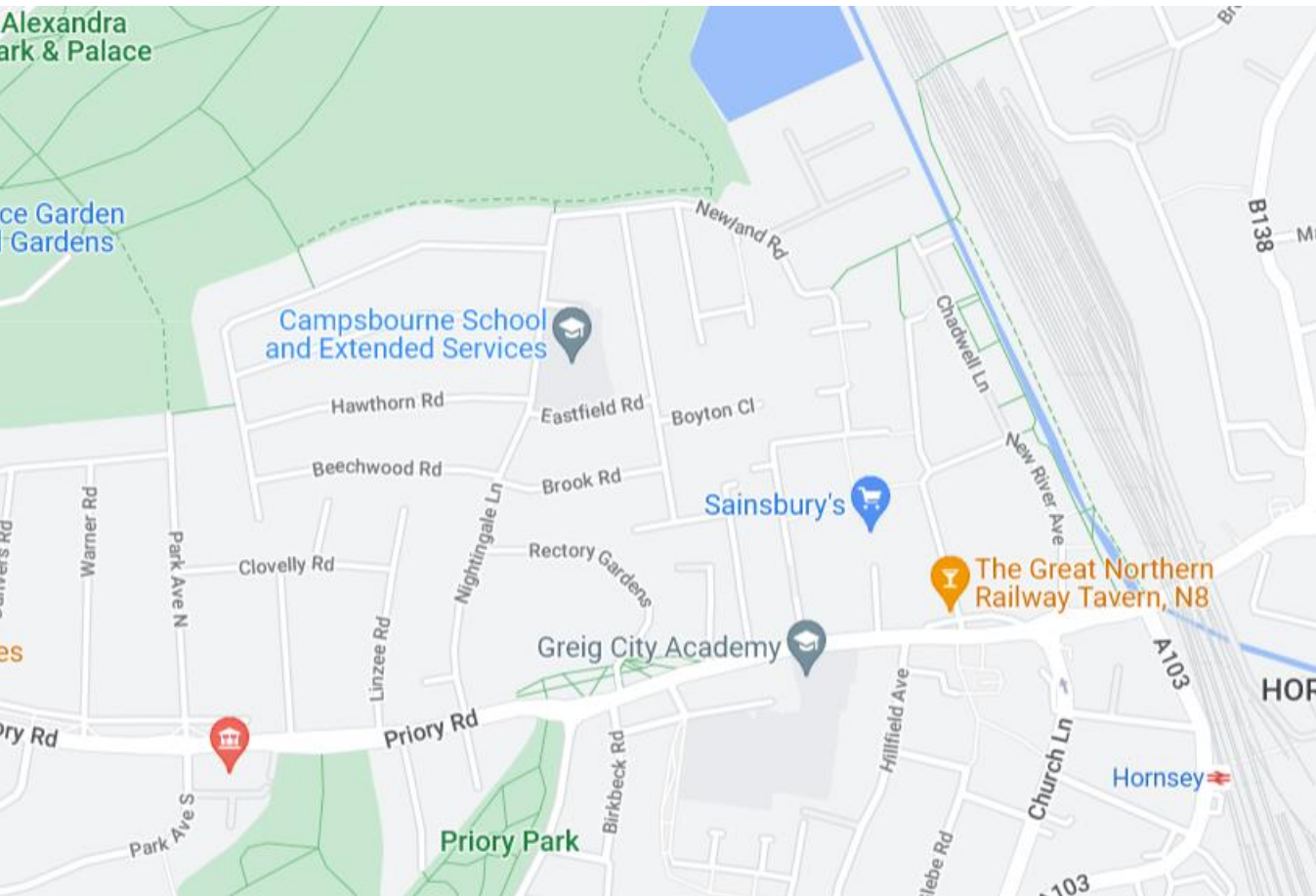


Figure 1.1 – Site Location.

2 Methodology

The aim of this life cycle carbon assessment is to estimate the carbon emissions resultant from the redevelopment of the land fronting Boyton Road, adjacent to Wat Tyler House, including those

emissions embodied within building materials and those resultant from the construction and operation of the proposed building.

All emissions associated with the proposed materials for the new development were calculated using One Click LCA’s ‘RICS: Whole life cycle assessment’ Tool. Whole life-cycle carbon emissions are the total greenhouse gas emissions arising from a development over its lifetime, from the emissions associated with raw material extraction, the manufacture and transport of building materials, to installation/construction, maintenance, and eventual material disposal. The scope of the assessments carried out can be seen below in table 2.1.

Product			Construction		Use							End of Life			
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
Raw Material	Transport	Manufacturing	Transport	Construction	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	Demolition	Transport	Waste Processing	Disposal
✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✗	✓	✓	✓	✓

Table 2.1 4 LCA scope.

All superstructure, substructure, non-loadbearing elements, fixtures and fittings have been included within this assessment.

This is a provisional life cycle assessment conducted prior to technical design, as such, it is based on as designed drawings and indicative building element build-ups provided by the design team, combined with assumptions on likely material use.

For the proposed new development. Operational emissions are quantified using the approved Standard Assessment Procedure for the Energy Rating of Dwellings (SAP). This report has been checked by Jess James who is an On Construction Domestic Energy Assessor (OCDEA).

3 Proposed development

3.1 Building Fabric

The proposed development comprises the demolition of the existing car park found on site , the removal of all materials and the excavation of all foundations. The proposed design would then be constructed in its place. The external envelope of the proposed design comprises a cavity external wall with a brick out leaf, non-combustible cavity insulation with a steel infill frame with further infill insulation. The ground floor , intermediate floors and roof of the proposed design are all in-situ reinforced concrete, insulated as necessary and finished with PUR vinyl flooring . the roof feature an extensive green roof. The proposed design is set over 7 floors from ground to 6th.

Windows utilised within the prosed design are triple glazed composite aluminium and wood framed windows as are exterior doors. Doors to utility areas are to be PPC steel units. New ground floors will be a 125mm RC raft supported by RC pile foundations, The buildings frame is of an RC concrete construction in which blade columns hidden within walls support the upper floors. Upper floors are of an RC concrete construction with a slab thickness of 125mm.

New roofs will be formed of a 200mm concrete slab and will feature an extensive type green roofing arrangement with 200mm non-combustible insulation

Internal walls will be steel framed partitions finished with painted plasterboard. Party walls and wall to corridor will be of a steel framed construction also . However , these will be double thickness and insulated for both acoustic and thermal isolation.

Construction will be carried out to a high quality , resulting in a low air permeability rating , this will allow for the use of an ASHP for the provision of space and water heating, thus reducing lifetime emission associated building operation. The ASHP used for the purposes of modelling the operation energy use has a COP estimate of 2.8 and will cover 100% of space heating demand and 80% of the hot water demand over the buildings operational lifetime. The additional 20% of hot water demand will be handled by a top up immersion heater system. The lifetime of the system is estimated at 25 years.

Table 4.1 details the materials included in each building element within the scope of the Proposed development life cycle assessment, these materials were utilised where possible in the LCA with the closest possible alternative being used where specific products are not present in the database.

Building Element	Proposed Construction
Foundations	Reinforced concrete pile foundations.
Ground Floor	300mm concrete raft, Kingspan K103 floorboard, 60mm screed
Upper floors	RC concrete slab 125mm, Kingspan K103 floorboard, 60mm screed
Roof	In-situ RC with tapered insulation (200mm) and an extensive green build up on a single ply flat roof membrane.
External Walls	Cavity construction with an external leaf of brickwork, non-combustible insulation (mineral wool 100mm) and an inner leaf of steel construction with further infill insulation (Mineral wool 70mm), cement sheathing board and finished in painted plasterboard
Internal walls and partitions	92mm metal stud framework, 21mm plywood, 15mm plasterboard, paint
Windows and external doors	triple glazed composite aluminium and timber frames along with external doors.
Internal doors	Timber doors

Table 4.1 Building element material breakdown.

U-values used for the proposed building operational energy calculations are shown below in table 4.2

Fabric Element	Estimated Performance
External Walls	0.16 W/m²K
Roof	0.10 W/m²K
Windows – front	1.10 W/m²K
Ground floor	0.10 W/m²K
External Doors	1.3 W/m²K
Air tightness	3 m³/m²h @ 50 Pa

Table 4.2 – Proposed development building fabric.

3.1.1 Building Services

The figures used for the building services of the proposed development are outlined in Table 4.3. An ASHP with a COP has been used in the determination of operation energy figures, a similar unit will be specified in the realised project. The specification of an ASHP requires underfloor heating, this is only possible with low air permeability. In addition, a 15.18kWp solar array is to be placed on the upper section of the flat green roof to supply renewable energy, further reducing energy demand from grid-supplied electricity.

Services Element	Estimated Performance
Heating	ASHP COP 2.8, underfloor heating, Time and temperature zone control
Ventilation	Natural ventilation + doc F compliant ventilation
Hot Water	As heating with additional electric boiler top up (100% eff)
Lighting	100% low energy fittings

Table 4.3 – Proposed development building services.

4 Results

4.1 Building Embodied Emissions

The embodied emissions associated with the material inputs into the new development are shown in Table 5.1, broken down by RICS category. When taking into account only the life cycle emissions of materials and construction activities the proposed development results in a lifetime emission of 712,106 kgCO₂e

RICS Category	LC Emissions – Refurb (kgCO ₂ e)
Substructure	158203
Frame	13851
Upper Floors	258136
Roof	12723
Stairs & Ramps	3348
Ext. Walls	90875
Int. Walls & Partitions	33464
Fixtures, Fittings, Furniture	36937
Services (MEP)	158993
Exterior Works	5217
Construction site activities	34752
Demolition	1961
Total (kgCO ₂ e)	826654

Table 5.1 Life cycle emissions discounting operational energy use.

4.2 Combined Life Cycle Emissions

When operational energy use is added to the life cycle emissions, it is shown that the proposed design produces a total of 1,472,853 kgCO₂e as seen in table 5.3 below. With CO₂ emissions of 646,198 kgCO₂e from operational energy use over the timeframe of the study. This is a result of the significantly reduced heat loss from the fabric and build quality expected which both improve heat retention and allow for the use of a highly efficient ASHP.

RICS Category	LC Emissions – Refurb (kgCO ₂ e)
Substructure	158203
Frame	13851
Upper Floors	258136
Roof	12723
Stairs & Ramps	3348
Ext. Walls	90875
Int. Walls & Partitions	33464
Fixtures, Fittings, Furniture	36937
Services (MEP)	158993
Exterior Works	5217
Construction site activities	34752
Demolition	1961
Operational energy use	646198
Total (kgCO ₂ e)	1472853

Table 5.3 Life cycle emissions including lifetime operational energy use.

4.3 Comparison with GLA WLC Benchmark

The Greater London authority has set out a series of whole lifecycle carbon analysis, embodied carbon benchmarks. These benchmarks are used to compare the overall embodied carbon of a proposed design with a base line in order to determine performance. Benchmarks are delivered in kgCO₂e/m² Of building area. The Benchmark for the embodied carbon of a residential building including life cycle stages A - C (excluding B6 and B7) is 1200 kgCO₂e/m². The measure GIA of the proposed design is 1145.304m². The total embodied carbon for lifecycle stages A – C for the proposed design is 826654 kgCO₂e. As a result the total embodied carbon for the proposed design per m² is 721.8 kgCO₂e/m². Significantly below the benchmark set out by the GLA for residential buildings.

5 Conclusion

This report summarises the lifecycle carbon assessment for the development at Land fronting Boyton Road, adjacent to Wat Tyler House, Campsbourne Estate. In the London Borough of Haringey.

The aim of this assessment is the estimation of the massing of materials required to realise the proposed development and to estimate the global warming potential resultant from the construction and operation of the proposed design.

All emissions associated with the proposed materials for the new development were calculated using One Click LCA's 'RICS: Whole life cycle assessment' Tool. Operational energy emissions were then quantified for the existing building, after renovation, and for the proposed new development using the approved Standard Assessment Procedure for the Energy Rating of Dwellings (SAP).

The results indicate that the total embodied emissions from the construction of the new development will be 1,472,853 kgCO₂e. 646,198 kgCO₂e of this is resultant from operational energy use.

Figures in this report are based on provisional estimates of material and energy use.

6 Appendix 1 – WLCA Raw Data Table

Result category	Biogenic carbon (kg CO2e)	A1-A3 Product Stage	A4 Transportation to site	A5 Site operations	B4 Material replacement - materials	B5 Material refurbishment	B6 Operational Energy use - Regulated	C1 Deconstruction / demolition	C2 Waste transportation	C3 Waste processing	C4 Waste disposal	TOTAL kg CO2e	D External impacts (not included in totals)
0.1 Toxic Mat.													
0.2 Demolition									1961.73				1961.73
0.3 Supports													
0.4 Groundworks													
0.5 Diversion													
1 Substructure	0	137237.97	8790.53	6360.11	0					5314.62	498.97	1.12	158203.33
2.1 Frame	0	12347.96	456.49	569.73	0					442.38	34.93		13851.48
2.2 Upper Floors	0	153792.84	5048.37	18172.47	0	59770.14	0			4194.56	17153.92	4.61	258136.91
2.3 Roof	0	6264.3	5.85	528.35	0	5386.69	0			6.21	527.2	4.65	12723.24
2.4 Stairs & Ramps	0	2994.74	18.79	154.91	0					170.82	9.71		3348.97
2.5 Ext. Walls	0	83868.54	1302.97	4687.5	0	1933.68	0			1137.73	114.17	28.72	93073.32
2.6 Windows & Ext. Doors	-5195.67	30078.29	48.14	0	0	3030.32	0			272.61	5226.25	5.03	33464.96
2.7. Int. Walls & Partitions	0	13224	82.87	999.33	0	2974.4	0			680.23	29.07	0.53	17990.43
2.8 Int. Doors													
3 Finishes													
4 Fittings, furnishings & equipments	-10386.7	6959.3	143.35	293.15	0	29315.31	0			59.18	10545.66	8.04	36937.28
5 Services (MEP)	0	55646.2	150.91	299.92	0	100579.93	0	646198.56		283.58	24.9	7.49	803191.48
6 Prefabricated													
7 Existing bldg													
8 Ext. works	0	4429.48	510.24	213.69	0					57.22	6.76		5217.38
Unclassified / Other				34752.5									34752.5
TOTAL kg CO2e kg CO2e	- 15582.37	506843.61	16558.5	67031.66	0	202990.46	0	646198.56	1961.73	12619.12	34171.55	60.19	1472853.02