Whole Life-Cycle Carbon Assessment

14 Blackburn Road

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IN2 Project. No.: L22014

Rev.01

Revision History

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24.03.2023	01	Updated Following NRF comments

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1.0 Executive Summary

The following report details the Whole Life-Cycle Carbon Assessment ('**WLCA**') undertaken for the redevelopment of 14 Blackburn Road. A range of measures, discussed in this report, have been implemented to reduce overall carbon emissions of the site both from an operational perspective and embodied carbon.

2.0 Introduction

This Whole Life Carbon Assessment, prepared by IN2 Engineering, is submitted on behalf of Hampstead Asset Management Ltd ('HAML') and Builder Depot Limited ('BDL') (together 'the Applicant') to accompany an application for full planning permission for the development at 14 Blackburn Road, London, SW6 1RZ ('the Site').

The Site is occupied by various warehouses (between one and two storeys). The Site is bound along its northern edge by Blackburn Road and railway land to the south (serving the Metropolitan and Jubilee lines between West Hampstead Underground Station and Finchley Road). The West Hampstead Underground Station, together with retail facing on to West End Lane, lies to the west of the Site.

Opposite the site are a number of developments, including the part 6 part 8 storey iQ Student Accommodation (at Haywood House, Blackburn Road), the three storey Clockwork Factory, as well as five x three storey residential properties closer to the West End Lane end of Blackburn Road. The Clockwork Factory is subject to a new planning application, which seeks consent for three residential buildings of up to nine storeys in height.

To the northeast, the Site is bound by a pocket of industrial land and two commercial units owned and operated by Audi. Further to the east of the Site comprises the O2 Shopping Centre, which contains a mix of uses including retail units, community uses and restaurants, two large commercial superstores and associated car parking.

The Site contains no listed buildings and is not within a Conservation Area however it neighbours the South Hampstead Conservation Area, located to the south of the Site. Although not currently an allocated site, the Site sits within the West Hampstead Interchange Area and a Call for Sites application has been submitted.

The Site has the benefit of an implemented scheme, consented in 2004 under planning permission with reference PWX0202103 dated 6 January 2004 (the '2004 Permission'), which will provide 14 residential units within a western block, as well as a four storey eastern block, comprising two storeys of warehouse floorspace and two storeys of office floorspace (the 'Implemented Development').

To add three additional floors of commercial floorspace to the eastern block forming part of the Implemented Development, the Applicant seeks full planning permission for the following description of development (herein 'the Proposed Development'):

"The erection of three floors of commercial floorspace (Use Class Eg), together with cycle parking, and associated works."

In tandem, the Applicant has submitted a section 73 application to alter conditions attached to the 2004 Permission to substitute certain drawings authorised by the 2004 Permission in order to provide for the additional three storeys to be constructed on the eastern block as part of the Proposed Development. The section 73 application also seeks consent for certain internal changes within the eastern block to suit the Applicant's operational needs, as well as improvements to external fenestration. . The description of development for the section 73 application is as follows:

"Variation of Condition 2 (approved plans) pursuant to planning permission [PWX0202103] dated 06.01.2004 for Redevelopment of whole site by the erection of a 4 storey eastern block comprising two Class B8 and eight Class B1 units with associated service yard, together with a 4 storey plus basement western block comprising 8 dwellinghouses and 6 self-contained flats with associated underground car parking. Changes include: revisions to ground floor elevation and roof plan" (referred to as the 'S73 Development').
This WLCA will be presented in conjunction with the Whole Life-Cycle Carbon ('WLC') assessment templates produced by the Greater London Authority ('GLA') to ensure that the Proposed Development meets all planning requirements.

While this Whole Life Carbon Assessment has been submitted in support of the application for full planning permission only, it considers the construction and operational phases of the eastern block forming part of the S73 Development and the Proposed Development. It does not fully consider the western (residential) block, as this is to remain as consented by the 2004 Permission, save for minor changes. Please see the submitted Design and Access Statement for further details.
In addition, this assessment has been provided with the section 73 application, but for information only and not approval.

Figure 1 The Site

Scope

The scope of work is defined by the RICS professional statement Whole life carbon assessment for the built environment guidance 2017 ('the RICS PS') in conjunction with the GLA Whole Life-Cycle Carbon Assessment Guidance (March 2022) ('the GLA Guidance'). A summary of building elements included can be seen in Figure 3. Life-cycle stages A1-A5, B1-B7, C1-C4 and module D have been included for all building elements where appropriate. The purpose of undertaking this assessment is to minimise WLC impacts of the development. This WLCA accounts for a minimum of 95 per cent of the capital cost allocated to each building element category.

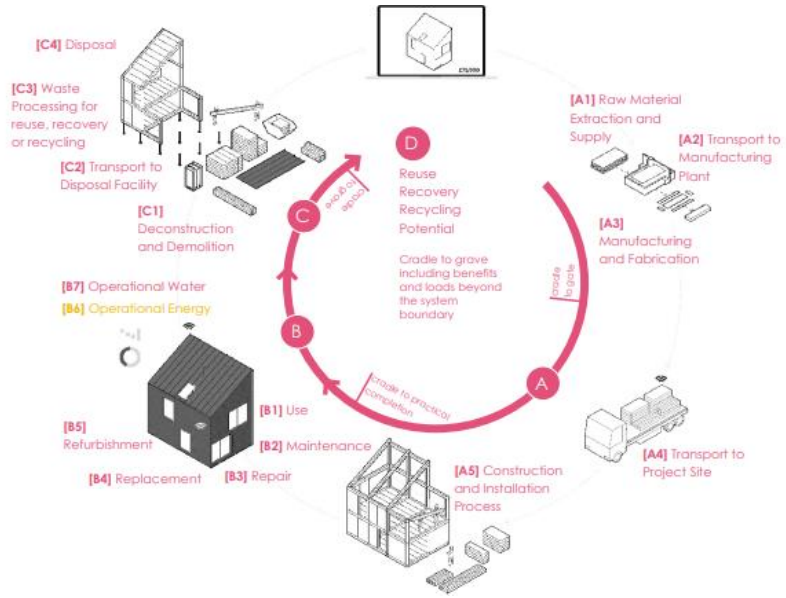

Figure 2 WLC scope

Building Elements

The below building element categories have been included in WLC calculations in line with the GLA Guidance.

Building Part/Element Group	Included in WLC Calculations
0 Demolition	Yes
1 Substructure	Yes
2 Superstructure	Yes
3 Finishes	Yes
4 Fittings, furnishings, and equipment ('FF&E')	Yes
5 Building Services	Yes
6 Prefabricated Buildings and Building Units	Yes
7 Work to Existing Building	Yes
8 External works	Yes

Figure 3 Building elements included

4.0 Regulations and Technical Guidance

London Plan

The London Plan (2021) has introduced a range of topics including areas relating to WLC assessments. Policy SI 2 (Minimising greenhouse gas emissions) included in the London Plan 2021 requires a WLC assessment to be carried out.

Policy SI 2 Minimising greenhouse gas emissions

A Major development should be net zero-carbon.[151] 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
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[152] 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.

151 Where zero-carbon is used in the Plan it refers to net zero-carbon – see Glossary for definition.

152 Building Regulations 2013. If these are updated, the policy threshold will be reviewed. https://www.gov.uk/government/publications/conservation-of-fuel-and-power-approved-document-l

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.

Figure 4 London Plan Policy SI 2

GLA Whole Life-Cycle Carbon Assessments Guidance (March 2022)

The GLA Guidance on compiling WLC assessments in line with Policy SI 2 F of the London Plan 2021 explains how to calculate WLC emissions and the information that needs to be submitted to comply with the policy.

RICS Professional Statement

The GLA Guidance mandates the use of the RICS PS to inform the method for WLC assessments for use in GLA planning applications. The objective of the RICS PS as set out within the introduction of the document is to:

"Standardise whole life carbon assessment and enhance consistency in outputs by providing specific practical guidance for the interpretation and implementation of the methodology in EN 15978 in carbon calculations – see section 2 for more detail. This is to achieve coherent and comparable results that can be used to benchmark the whole life carbon performance of built assets."

5.0 Methodology

The WLC emissions of the Proposed Development are calculated from combining the operational carbon emissions with the embodied carbon emissions. Full details of operational energy modelling can be found in the accompanying Energy Strategy. Section 5 of this WLCA will outline the methodology used in completing embodied carbon modelling.

One Click LCA has been selected to carry out the WLC assessment using its GLA Guidance-compliant tool which is aligned with the RICS PS.

Pre-Construction Demolition

The GLA Guidance mandates that applications include carbon figures associated with pre-construction demolition section 3.1.4 states:

"To calculate the carbon emissions associated with pre-construction demolition, actual figures should be used where possible. If actual figures are not available, applicants can apply a standard assumption of 50kgCO2e/m2 to the GIA of the existing areas being demolished that fall within the boundary line."

At this stage of the design, actual carbon figures for pre-construction demolition are not available therefore the GLA Guidance has been used and a figure of 50kgCO2e/m2 will be used to account for pre-construction demolition.

Material Selection and Accuracy

At this early design stage of the Proposed Development, an outline bill of quantities and various RFIs (requests for information) to the design team have been used to maintain accuracy in the embodied carbon assessment. 3D thermal models have also been used to inform the quantities of materials.

It should also be noted that at this stage of the development, material quantities for the superstructure and substructure of the development are unknown. Therefore, a concrete frame has been assumed and material quantities have been assumed from previous project experience. This will need to be updated as the Proposed Development progresses.

The GLA Guidance states that when it is too early in the design process for specific manufacturers to be known for materials:

"Then sector level data (e.g. EPDs that use data covering several manufacturers) should be used."

In line with this approach, generic material environmental product declarations ('**EPDs**') have been selected for assumed material types, a full list of EPD databases used can be found in Appendix C. At this stage of the design, some decisions are still to be made on material types and these will be updated in the WLC for post construction stage. For example, a final figure for ground granulated blast-furnace slag ('**GGBS**') content in concrete has yet to be agreed however for this WLCA it is expected that at least a 25% target subject to viability / buildability will be achieved.

To ensure accuracy in the post construction stage of the WLCA, specific materials and quantities should be provided and approved by the quantity surveyor.

Maintenance and Repair Emissions (B2 and B3)

The GLA Guidance recognises the difficulty of calculating maintenance and repair emissions at the early design stage. Section 2.5.12 of the GLA Guidance states:

"During the design stage, modules B2 and B3 will be more challenging to estimate. Applicants can estimate how much electricity may be used multiplied by the expected number of days of planned maintenance each year. Alternatively, for module B2 emissions, a total figure of 10 kgCO2e/m2 gross internal area (GIA) may be used to cover all building element categories, or 1 per cent of modules A1-A5, whichever is greater. For module B3 emissions, these may be estimated as 25 per cent of module B2, as per the RICS PS (item 3.5.3.3)."

At this stage of the development, estimates on electricity usage for maintenance and repair are not available, therefore the GLA Guidance figures of 10 kgCO2e/m2 for module B2 and 2.5 kgCO2e/m2 for module B3 have been used. When reporting the figures, the standard emission rates have been split between the RICS categories in line with the breakdown of a typical development in the GLA Guidance, the breakdown is as follows:

- Substructure: 17 per cent
- Superstructure: 25 per cent
- Façade: 23 per cent
- Internal finishes: 12 per cent
- FF&E: 1 per cent
- Services / mechanical, electrical and plumbing ('**MEP**'): 20 per cent
- External works: 2 per cent.

Operational Energy Analysis

Operational energy analysis for the Proposed Development has been carried out using EDSL TAS modelling software which is approved for UK building regulations Part L modelling ('**BRUKL**') amongst other outputs. TM54 modelling is not yet available at this stage of development to calculate unregulated energy loads. The BRUKL produced from the TAS model however allows for unregulated loads to be calculated and input into the One Click LCA software. One Click LCA can then calculate the operational energy consumption over the 60 year life cycle selected for the WLC assessment. TM54 modelling will be considered as design develops. Operational energy has been considered for the Western Block only in line with Energy Strategy.

Regulated energy has been calculated to result in 1580t CO2e with unregulated sources resulting in 2429t CO2e. This results in total module B6 emissions of 4009 tonnes.

Full details of the operational energy analysis can be found in the supporting Energy Strategy.

MEP Systems

At the early stage of design of the Proposed Development, specific manufacturers have not yet been selected for MEP systems, in order to carry out TM65 analysis manufacturers need to be contacted in order to give a material breakdown of their products. As this is not possible generic MEP systems have been selected in order to estimate embodied carbon of the MEP systems. Full details of the generic materials selected and the EPD database they are selected from can be seen in Appendix C.

Refrigerants

The GLA Guidance places emphasis on the need to report emissions due to refrigerants. As the Proposed Development will utilise air source heat pumps ('**ASHP**') for heating and cooling, there will be refrigerant usage on Site, therefore this has been included in WLC calculations. At this stage of design it is assumed that R-410A will be used in the heat pumps, full details of refrigerant use can be seen Figure 5.

Refrigerant	Charge of refrigerant (kg)	Global Warming Potential ('GWP') of refrigerant ($kgCO_2e/kg$)	Annual Leakage rate (%)	End of life Leakage Rate (%)
R-410A	20	2087.5	5	10

Figure 5 Refrigerant use

Ensuring Data Quality

To ensure data quality, the GLA Guidance mandates the use of third-party quality assurance mechanisms to ensure accuracy in WLC studies, section 2.3.3 states:

"Applicants and developers should adopt third-party quality assurance mechanisms to ensure accuracy in their submissions."

In order to ensure data quality throughout this WLCA, IN2 have sent RFIs to various members of the design team to ensure accuracy in material selections. One Click LCA includes a completeness and plausibility check feature which was used throughout the WLC study to ensure all features required for the WLC assessment were captured and accurate. IN2 also employed a thorough internal quality assurance process ensuring all work was reviewed and any necessary changes made before issue.

6.0 Results

Below are results of the WLC study carried out for the Proposed Development.

Full results of the WLC assessment can be seen in Appendix A of this WLCA along with the accompanying GLA WLC spreadsheet.

	Module A1-A5 (excluding sequestered carbon)	Modules B-C (excl B6 & B7)	Modules A-C (excluding B6-B7; including sequestered carbon)
TOTAL kg CO_2e	5,109,055 kgCO_2e	3,035,027kgCO_2e	8,122,304 kgCO_2e
TOTAL kg CO_2e/m^2 GIA	559.835 kgCO_2e	332.569 kgCO_2e	890 kgCO_2e

Figure 6 Total kg CO_2e per WLC stages (table)

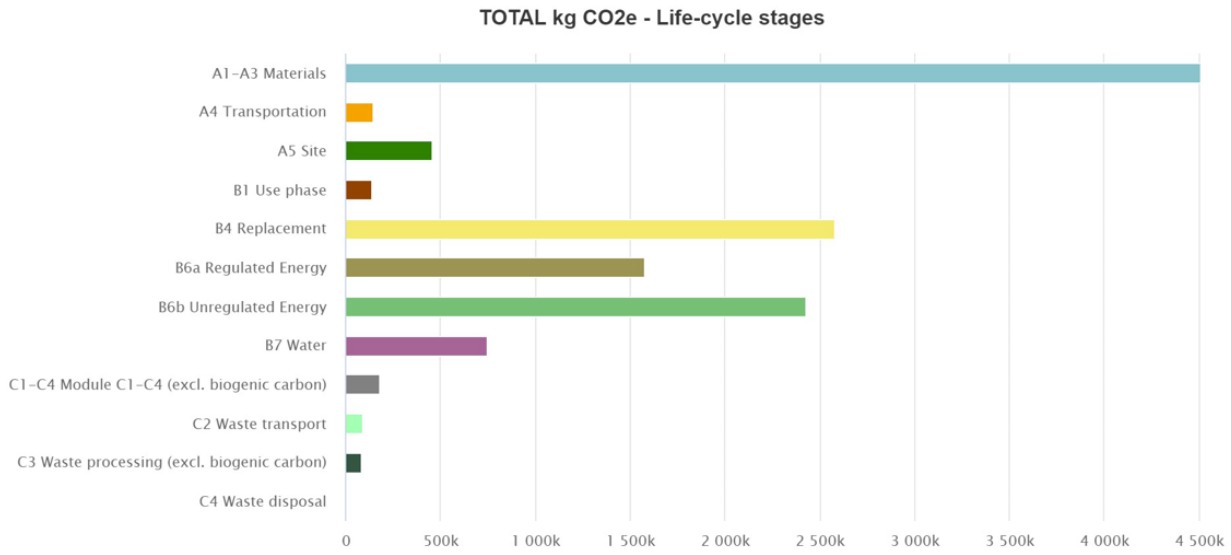

Figure 7 Total kg CO_2e per WLC stages (bar chart)

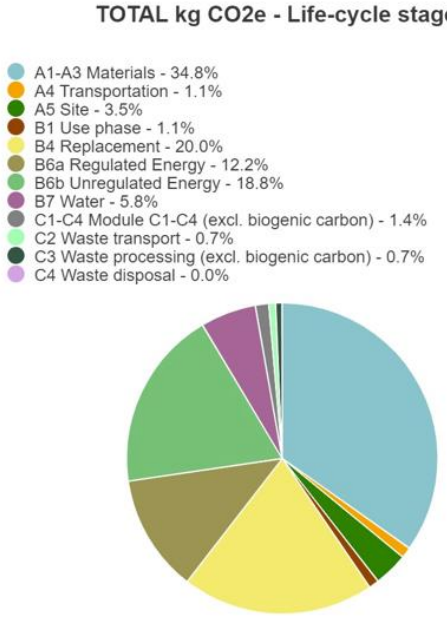

Figure 8 Total kg CO_2e per WLC stages (pie chart)

Comparison of Results with GLA Benchmarks

Figure 9 compares the WLC benchmarks extracted from the GLA Guidance spreadsheet with the results for the Proposed Development. The benchmarks for an office development have been selected as the majority of the development will be office space.

	Module A1-A5 (excluding sequestered carbon)	Modules B-C (excl B6 & B7)	Modules A-C (excluding B6-B7; including sequestered carbon)
TOTAL kg CO_2e	5,109,055	3,035,027	8,122,304
TOTAL kg CO_2e/m^2 GIA	599.8	332.569	890
Benchmark Type		Office	
WLC Benchmark	*<950*	*<450*	*<1400*
Aspirational WLC Benchmark	*<600*	*<370*	*<970*

Figure 9 WLCA comparison with GLA WLC benchmarks

As can be seen in Figure 9, the Proposed Development achieves GLA aspirational WLC benchmarks. This has been achieved through careful selection of products as can be seen in Section 7. The Proposed Development will also benefit from how the WLC benchmarks are defined. Office benchmarks have been selected as this is the most appropriate for the Proposed Development, however the ground floor of the Proposed Development is an open plan warehouse area, this will have an inherently lower embodied carbon than an office space resulting in the Proposed Development as a whole comparing favourably against the WLC benchmarks.

7.0 Embodied Carbon Reduction Measures

This section will discuss in more detail examples of features included in the design to reduce embodied carbon of the development. Figure 10 demonstrates the reduction in module A-C carbon emissions from the below measures.

Chipboard internal walls

It was identified that the internal walls of the Proposed Development were contributing more than expected for a development which is largely open plan. Therefore, internal walls utilising a chipboard siding, steel frame and rockwool insulation were selected over a masonry build-up internal wall. This choice saved 316863 kg CO_2e or 35 kg CO_2e/m^2 GIA.

Concrete roof assembly

Initially a concrete cast in situ roof assembly was assumed, but through the material optimisation process it was found that more efficient options were available. It has been assumed that a concrete roof assembly will be utilised which will bring about a saving of 105830 kg CO_2e or 12 35 kg CO_2e/m^2 GIA.

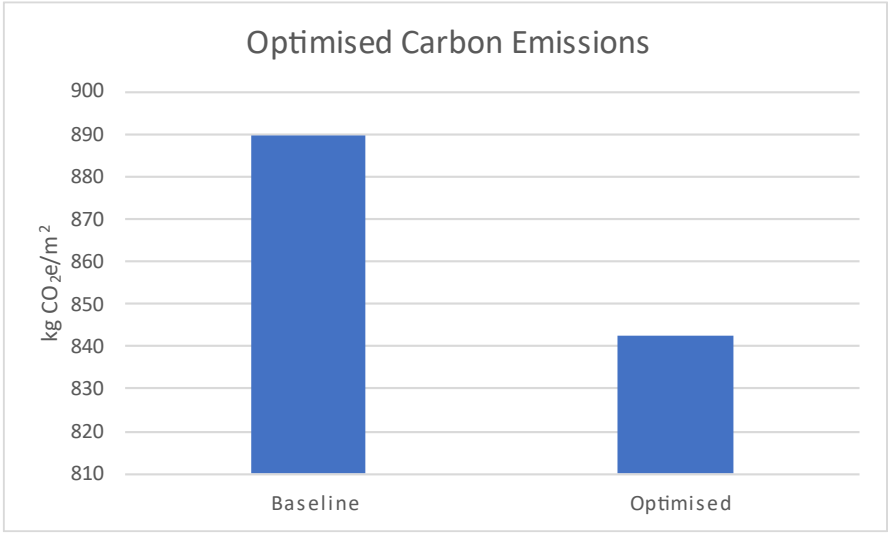

Figure 10 Optimised carbon emissions

8.0 Conclusion

In conclusion, the Proposed Development exceeds the aspirational WLC benchmarks set by the GLA for an office development through its careful selection of materials including the use of GGBS and use of a concrete frame.

As this WLCA has been compiled at the design stage of the Proposed Development, assumptions have had to be made on material usages as well as maintenance and repair. These calculations will need to be updated throughout the construction phase and a more accurate representation of the developments WLC emissions will be available in the post construction report required by the GLA.

Appendix A GWP for all WLC modules (Full details in GLA WLC spreadsheet)

Please see below a sample of the WLC results table, the full table is included in the separately submitted WLC spreadsheet.

GWP POTENTIAL FOR ALL LIFE-CYCLE MODULES ($kgCO_2e$) (See Note 1 below if you entered a reference study period in cell C12)		Sequestered (or biogenic) carbon (negative value) ($kgCO_2e$)	Product stage ($kgCO_2e$)	Construction process stage ($kgCO_2e$)		
			Module A			
Building element category			[A1] to [A3]	[A4]	[A5]	[B1]
0.1	Demolition: Toxic/Hazardous/Contaminated Material Treatment					
0.2	Major Demolition Works					
0.3	Temporary Support to Adjacent Structures					
0.4	Specialist Ground Works					
0.5	Temporary Diversion Works					
1	**Substructure**	0 kg CO2e	1,220,163 kg CO2e	85,390 kg CO2e	55,390 kg CO2e	
2.1	Superstructure: Frame	0 kg CO2e	202,783 kg CO2e	6,298 kg CO2e	7,586 kg CO2e	
2.2	Superstructure: Upper Floors	0 kg CO2e	328,586 kg CO2e	42,778 kg CO2e	58,553 kg CO2e	
2.3	Superstructure: Roof	0 kg CO2e	168,384 kg CO2e	2,108 kg CO2e	3,331 kg CO2e	
2.4	Superstructure: Stairs and Ramps	0 kg CO2e	2,000 kg CO2e	13 kg CO2e	104 kg CO2e	
2.5	Superstructure: External Walls	0 kg CO2e	661,796 kg CO2e	4,244 kg CO2e	56,131 kg CO2e	
2.6	Superstructure: Windows and External Doors	0 kg CO2e	78,155 kg CO2e	156 kg CO2e	0 kg CO2e	
2.7	Superstructure: Internal Walls and Partitions	0 kg CO2e	329,887 kg CO2e	656 kg CO2e	42,126 kg CO2e	
2.8	Superstructure: Internal Doors	-17,321 kg CO2e	39,252 kg CO2e	51 kg CO2e	0 kg CO2e	
3	**Finishes**	0 kg CO2e	47,974 kg CO2e	374 kg CO2e	4,852 kg CO2e	
4	**Fittings, furnishings & equipment**	-4,458 kg CO2e	40,362 kg CO2e	277 kg CO2e	1,667 kg CO2e	
5	**Services (MEP)**	0 kg CO2e	786,690 kg CO2e	2,893 kg CO2e	16,247 kg CO2e	137,775 kg CO2e

Appendix B- Bill of Quantities

MATERIAL QUANTITY AND END OF LIFE SCENARIOS		Product and Construction Stage (Module A)		Assumptions made with respect to maintenance, repair and replacement cycles (Module B)	Material 'end of life' scenarios (Module C)	Benefits and loads beyond the system boundary (Module D)	
Building element category		Material type	Material quantity (kg)			Estimated reusable materials (kg)	Estimated recyclable materials (kg)
Note/example		Breakdown of material type in each category [Insert more lines if needed] e.g. Concrete	65000 kg	For all primary building systems (structure, substructure, envelope, MEP services, internal finishes) including assumed material/product lifespans and annual maintenance/repair %	Declare 'end of life' scenario as per project's Circular Economy Statement, and used in the WLC assessment to produce Module C results	0 kg	25 kg
		e.g. Reinforcement	5000 kg			2 kg	8 kg
		e.g. Formwork	250 kg			0 kg	0 kg
0.1	Demolition: Toxic/Hazardous/ Contaminated Material Treatment	N/A	N/A		N/A	N/A	N/A
0.2	Major Demolition Works	N/A	N/A		N/A	N/A	N/A
0.3	Temporary Support to Adjacent Structures	N/A	N/A		N/A	N/A	N/A
0.4	Specialist Ground Works	N/A	N/A		N/A	N/A	N/A

MATERIAL QUANTITY AND END OF LIFE SCENARIOS		Product and Construction Stage (Module A)		Assumptions made with respect to maintenance, repair and replacement cycles (Module B)	Material 'end of life' scenarios (Module C)	Benefits and loads beyond the system boundary (Module D)	
Building element category		Material type	Material quantity (kg)			Estimated reusable materials (kg)	Estimated recyclable materials (kg)
1	Substructure	Expanded Polystyrene ('**EPS**') Insulation	9850	As Building	Plastic Based Material Incineration	0 kg	0 kg
		Ready Mix Concrete	1773158	As Building	Concrete Crushed to aggregate	0 kg	1773158
		Plastic Vapour control layer	455	As Building	Plastic Based Material Incineration	0 kg	0 kg
		Reinforcement steel	66499	As Building	Steel Recycling	0 kg	66,499 kg
		Self levelling mortar	58956	As Building	Concrete Crushed to aggregate	0 kg	58,956 kg
		Reinforcement steel (Piles)	234717	As Building	Steel Recycling	0 kg	234,717 kg
		Ready Mix Concrete (Piles)	9353136	As Building	Concrete Crushed to aggregate	0 kg	9,353,136 kg
2.1	Superstructure: Frame	Ready mix concrete (column)	605829	As Building	Concrete Crushed to aggregate	0 kg	605829
		Reinforcement Steel(Column)	82709	As Building	Steel Recycling	0 kg	82709
		Concrete Beam	474001	As Building	Concrete Crushed to aggregate	0 kg	474001
		Reinforcement Steel (Beam)	82972	As Building	Steel Recycling	0 kg	82972

MATERIAL QUANTITY AND END OF LIFE SCENARIOS		Product and Construction Stage (Module A)		Assumptions made with respect to maintenance, repair and replacement cycles (Module B)	Material 'end of life' scenarios (Module C)	Benefits and loads beyond the system boundary (Module D)	
Building element category		Material type	Material quantity (kg)			Estimated reusable materials (kg)	Estimated recyclable materials (kg)
2.2	Superstructure: Upper Floors	Ready mix concrete	5466839	As Building	Concrete Crushed to aggregate	0 kg	5466839
		Reinforcement steel	275576	As Building	Steel Recycling	0 kg	275576
		Self Levelling mortar	288746	As Building	Concrete Crushed to aggregate	0 kg	288746
2.3	Superstructure: Roof	Hollow core concrete slabs	901159	As Building	Concrete Crushed to aggregate	0 kg	901159
		EPS insulation	12125	30	Plastic Based Material Incineration	0 kg	0 kg
		Plastic vapour control layer	494	As Building	Plastic Based Material Incineration	0 kg	0 kg
2.4	Superstructure: Stairs and Ramps	Steel reinforcement	3200	As Building	Steel Recycling	0 kg	3200
		Concrete	77376	As Building	Concrete Crushed to aggregate	0 kg	77376
2.5	Superstructure: External Walls	Lightweight concrete block	352868	As Building	Concrete Crushed to aggregate	0 kg	352,868 kg
		Lightweight concrete block	758667	As Building	Concrete Crushed to aggregate	0 kg	758,667 kg
		Plasterboard	64420	As Building	Gypsum recycling	0 kg	64,420 kg

MATERIAL QUANTITY AND END OF LIFE SCENARIOS		Product and Construction Stage (Module A)		Assumptions made with respect to maintenance, repair and replacement cycles (Module B)	Material 'end of life' scenarios (Module C)	Benefits and loads beyond the system boundary (Module D)	
Building element category		Material type	Material quantity (kg)			Estimated reusable materials (kg)	Estimated recyclable materials (kg)
		Rock wool insulation	196048	As Building	Landfill	0 kg	0 kg
		Gypsum Plaster	19909	30	Gypsum recycling	0 kg	19,909 kg
		Render mortar	187025	As Building	Mortar use in backfill	0 kg	187,025 kg
		Masonry mortar	48816	As Building	Mortar use in backfill	0 kg	48,816 kg
		Masonry mortar	104954	As Building	Mortar use in backfill	0 kg	104,954 kg
2.6	Superstructure: Windows and External Doors	PVC windows	32489	30	Glass containing product recycling	0 kg	32,489 kg
2.7	Superstructure: Internal Walls and Partitions	Internal wall system with rockwool core and chipboard siding	321166	30	Wood product recycling	0 kg	321,166 kg
2.8	Superstructure: Internal Doors	Wooden Door	10187	30	Wood product recycling		10,187 kg
3	Finishes	Carpet	18279	15	Landfill	0 kg	0 kg
		Paint	34095	10	Landfill	0 kg	0 kg
4	FF&E	Workstation with screens	28392	10	Wood product recycling	0 kg	28,392 kg

MATERIAL QUANTITY AND END OF LIFE SCENARIOS		Product and Construction Stage (Module A)		Assumptions made with respect to maintenance, repair and replacement cycles (Module B)	Material 'end of life' scenarios (Module C)	Benefits and loads beyond the system boundary (Module D)	
Building element category		Material type	Material quantity (kg)			Estimated reusable materials (kg)	Estimated recyclable materials (kg)
		Office Chair	2652	10	Metal Product recycling	0 kg	2,652 kg
5	Services (MEP)	Ceramic Toilet	500	20	Landfill	0 kg	500 kg
		Brass valve (sprinkler)	89	30	Metal product recycling	0 kg	89 kg
		Monometers (sprinkler)	14	30	Metal product recycling	0 kg	14 kg
		Globe valves (sprinkler)	195	30	Metal product recycling	0 kg	195 kg
		Steel pipes (sprinkler)	36995	30	Metal product recycling	0 kg	36,995 kg
		Brass quarter turn valve (sprinkler)	9.22	30	Metal product recycling	0 kg	9 kg
		Flexible shower hose (sprinkler)	157	30	Metal product recycling	0 kg	157 kg
		Fire sprinkler (sprinkler)	163	30	Landfill	0 kg	0 kg
		Galvanised steel (sprinkler)	818	30	Metal product recycling	0 kg	818 kg
		Stainless steel (sprinkler)	1359	30	Metal product recycling	0 kg	1,359 kg

MATERIAL QUANTITY AND END OF LIFE SCENARIOS		Product and Construction Stage (Module A)		Assumptions made with respect to maintenance, repair and replacement cycles (Module B)	Material 'end of life' scenarios (Module C)	Benefits and loads beyond the system boundary (Module D)	
Building element category		Material type	Material quantity (kg)			Estimated reusable materials (kg)	Estimated recyclable materials (kg)
		Acrylic paint (sprinkler)	317	30	Landfill	0 kg	0 kg
		ASHP	4560	20	Metal product recycling	0 kg	4,560 kg
		Sockets	45	45	Landfill	0 kg	0 kg
		Brass Taps	16	20	Metal product recycling	0 kg	16 kg
		LED lights	2176	15	Landfill	0 kg	0 kg
		Urinal	540	20	Landfill	0 kg	0 kg
		Electrical cabling	36500	20	Metal product recycling	0 kg	36,500 kg
		Sewage pipework	1547	25	Metal product recycling	0 kg	1,547 kg
		Drinking water supply	740	25	Metal product recycling	0 kg	740 kg
		Ventilation system	25347	25	Metal product recycling	0 kg	25,347 kg
		Heating system	25096	20	Metal product recycling	0 kg	25,096 kg

MATERIAL QUANTITY AND END OF LIFE SCENARIOS		Product and Construction Stage (Module A)		Assumptions made with respect to maintenance, repair and replacement cycles (Module B)	Material 'end of life' scenarios (Module C)	Benefits and loads beyond the system boundary (Module D)	
Building element category		Material type	Material quantity (kg)			Estimated reusable materials (kg)	Estimated recyclable materials (kg)
		Sink	740	20	Landfill	0 kg	0 kg
		Solar panels	2925	20	Metal product recycling	0 kg	2,925 kg
		Elevator	3330	20	Metal product recycling	0 kg	3,330 kg
6	Prefabricated Buildings and Building Units	N/A	N/A	N/A	N/A	N/A	N/A
7	Work to Existing Building	N/A	N/A	N/A	N/A	N/A	N/A
8	External works	N/A	N/A	N/A	N/A	N/A	N/A

Appendix C- EPD Databases Used

Section 4 of this report goes into detail on how material EPDs have been selected. Below is a list of all EPD databases that have been used within this WLCA to select generic material types.

EPDs used in WLCA
INIES
One Click LCA
EPD NORGE
OKOBAUDAT
ICE
IBU
Inside
RTS
International EPD System

IN2 London
28 Waterside
44-48 Wharf Road
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