chapmanbdsp

Manor Road, Richmond
Whole Life-Cycle Carbon Statement

Revision 01
May 2023
Ref: 61564

61564 – Manor Road
Whole Life-Cycle Carbon Statement

Revision	Issued for	Date	Author	Checked by
00	First Draft for comments	12/05/2023	Giorgio Beghi	Elli Mitrou
01	Issue for planning	19/05/2023	Giorgio Beghi	Elli Mitrou

Confidentiality and Third-Party Responsibility

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1 Executive Summary

This Revised Whole Life Carbon Statement has been prepared by chapmanbdsp on behalf of Avanton Richmond Developments Ltd ('the Applicant') as an update report to supersede the previously submitted Whole Life Carbon Statement work in support of the development of 84 Manor Road, North Sheen, London Borough of Richmond upon Thames ('the Site').

The aim of this Revised Whole Life Carbon Statement is to identify the applicable planning policies and the measures that have been applied to the design of the development in response to these requirements.

1.1 Proposed development details

In summary, full planning permission is sought for the following (herein referred to as 'the Proposed Development') is as follows:

"Demolition of existing buildings and structures and comprehensive phased residential-led redevelopment to provide 453 residential units (of which 173 units will be affordable), flexible retail, community and office uses, provision of car and cycle parking, landscaping, public and private open spaces and all other necessary enabling works."

The area schedule for the proposed uses is as below:

- Residential: 453 units / 37,248 square metres
- Commercial: 495 square meters

Full details and scope of the planning application is described in the submitted Planning Statement, prepared by Avison Young.

1.2 Whole life-cycle carbon

Whole life-cycle carbon (WLC) emissions are the total carbon emissions resulting from the construction and the use of a building over its entire life, including its demolition and disposal. They capture a building's operational carbon emissions from both regulated and unregulated energy use, as well as its embodied carbon emissions - that is, emissions associated with raw material extraction, the manufacture and transport of building materials, and construction; and the emissions associated with maintenance, repair and replacement, as well as dismantling, demolition and eventual material disposal. A WLC assessment also includes an assessment of the potential savings from the reuse or recycling of components after the end of a building's useful life. It provides a true picture of a building's carbon impact on the environment.

Table 1.1 – Estimated WLC emissions by life-cycle module

	A1-A5 (excl. BioC)	B-C (excl. B6 & B7)	A-C (excl. B6 & B7; incl. BioC)	B1-B5	B6-B7	C1-C4	D
kg CO_2e	18,410,443	11,769,109	29,373,125	10,426,467	8,307,858	1,342,641	-5,594,881
kg CO_2e/m^2 GIA	470	300	749	266	212	34	-143
Most relevant benchmark typology	Residential						
WLC Benchmark	*<850*	*<350*	*<1200*				
Aspirational WLC Benchmark	*<500*	*<300*	*<800*				

The total embodied carbon over the life cycle of the Proposed Development at this stage of the assessment is 749 $kgCO_2e/m^2$, as illustrated in

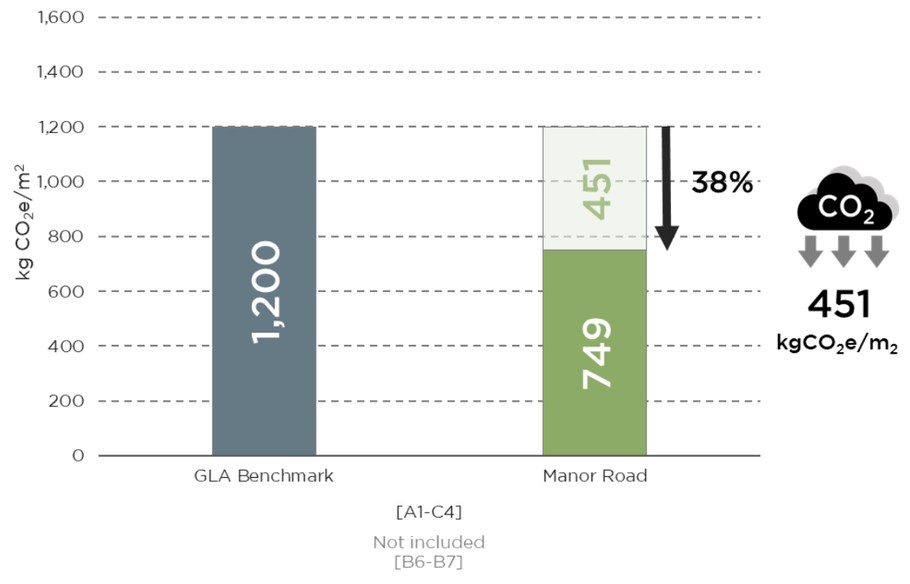


Figure 1.2.

Table 2.2 – Estimated WLC emissions by building element (RICS categories)

Building Element	Whole Life carbon emissions (kg CO_2e)
1 Substructure	1,451,991
2.1-2.4 Superstructure	5,085,910
2.5-2.6 Superstructure	4,570,234
2.7-2.8 Superstructure	1,252,832
3 Finishes	4,405,482
4 Fittings, furnishing & equipment	1,766,920
5 Services (MEP)	10,277,108
6 Prefabricated buildings and building units	-
7 Work to existing building	-
8 External works	562,649
Total (kg CO_2e)	29,373,125

This WLC assessment has been carried out in line with The London Plan (2021) Policy SI 2 using the Whole Life-Cycle Carbon Assessments LPG (2022). Figure *1*.1 shows the scope of the whole life-cycle carbon assessment.

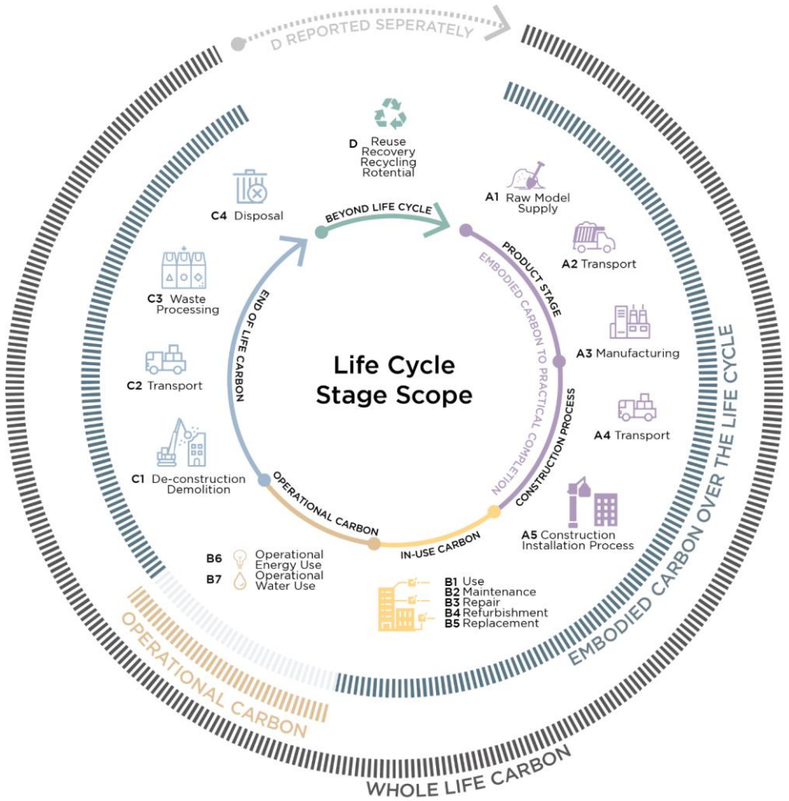


Figure 1.1 – Diagram of life-cycle modules and scope

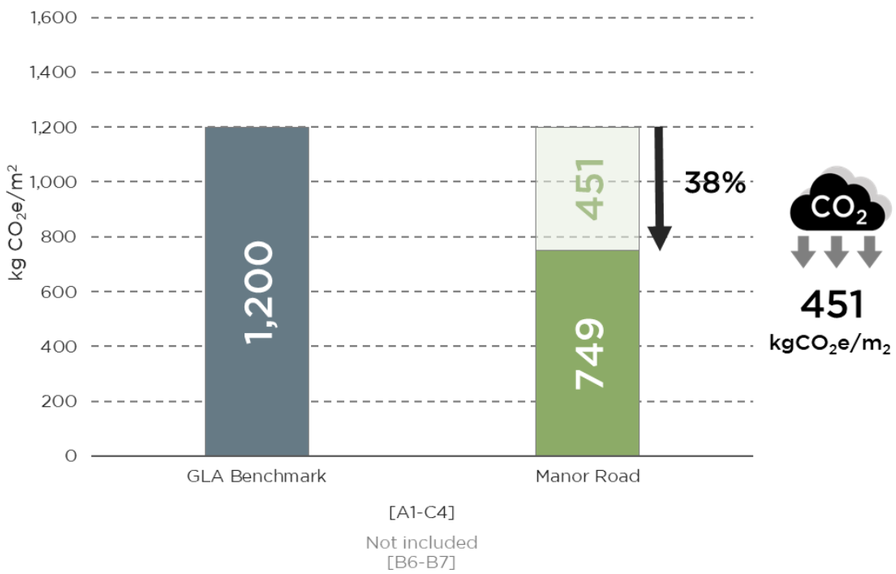


Figure 1.2 - Total embodied carbon over the life-cycle against GLA WLC benchmark

2 Introduction

This Revised Whole Life Carbon Statement has been prepared by chapmanbdsp on behalf of Avanton Richmond Developments Ltd ('the Applicant') as an update report to supersede the previously submitted Whole Life Carbon Statement work in support of the development of 84 Manor Road, North Sheen, London Borough of Richmond upon Thames ('the Site').

The previously submitted Whole Life Carbon Statement was prepared in 2020. Since this time there have been minor amendments to the proposed scheme, alongside a number of policy, guidance and regulatory updates (as detailed in Section 3 of this statement).

The aim of this Revised Whole Life Carbon Statement is to demonstrate compliance with the latest national, regional and local policies and regulatory requirements. It identifies the applicable planning policies and measures that have been applied to the design of the development in response to these requirements.

2.1 Site description

The site is located in the administrative area of the London Borough of Richmond upon Thames approximately 1.1km south of Kew Gardens and approximately 1.6km north of Richmond Park. The Thames is approximately 1.5km to the west.

The site is bound to the north by Manor Road Circus (a roundabout where the A316 and B353 meet), to the east by Manor Road (with residential development and Sainsbury's beyond), to the south and west by the railway (with residential development beyond in both cases). The railway to the south is the South Western Railway main line and the railway to the west is part of the London Overground / Underground network.

The surrounding uses in the area are predominantly residential with some light industrial and retail uses. The closest Conservation Areas to the site are Sheendale Road (to the west) and Sheen Road (southwest of the site). There are a number of Buildings of Townscape Merit in the vicinity of the site (for example along Manor Grove to the east).

The site has a rating of PTAL 4 (very good). North Sheen station is approximately 50m to the south-east. Pedestrian, cyclist and vehicular access to the site is from Manor Road.

2.2 Proposed development details

The site (about 1.5 ha.) is located to the south of A316 arterial Lower Mortlake Road and is shaped by railway lines and by Manor Road on each of its 3 sides. Only one side of the site has street frontage, along Manor Road. It is currently occupied by a Homebase store and associated surface level parking. There is a functioning bus depot on the northern section of the site which will remain as part of the design proposal.

In summary, full planning permission is sought for the following (herein referred to as 'the Proposed Development') is as follows:

"Demolition of existing buildings and structures and comprehensive phased residential-led redevelopment to provide 453 residential units (of which 173 units will be affordable), flexible retail, community and office uses, provision of car and cycle parking, landscaping, public and private open spaces and all other necessary enabling works."

The area schedule for the proposed uses is as below:

- Residential: 453 units / 37,248 square metres
- Commercial: 495 square meters

Full details and scope of the planning application is described in the submitted Planning Statement, prepared by Avison Young.

Figure 2.1 – Ground floor plan of the Proposed Development (Site area as per red line boundary).

3 Planning policy context

The following adopted and emerging sustainability policies have been considered within the context of the Proposed Development, to identify and target compliance with relevant requirements and to inform the embodied carbon reduction opportunities:

- National Planning Policy Framework (2021)
- GLA The London Plan (March 2021)
- GLA Whole Life-cycle Carbon Assessments LPG (March 2022)
- London Borough Richmond upon Thames Local Plan (July 2018)
- LBRuT Climate Emergency Strategy (2020-2024)

3.1 National Planning Policy Framework (2021)

The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England, and how these are expected to be applied. Taken together, these policies articulate the Government's vision of sustainable development, which should be interpreted and applied locally to meet local aspirations. The NPPF highlights that 'the purpose of the planning system is to contribute to the achievement of sustainable development' and that 'plans and decisions should apply a presumption in favour of sustainable development.' This scheme has been developed in line with the NPPF.

3.2 The London Plan (2021)

The London Plan, a spatial development strategy for Greater London includes objectives to reduce the capital's impact on, and exposure to, the effect of climate change. The most relevant policies for this Adaptive Design Strategy are:

Policy SI 2: Minimising greenhouse gas emissions

Operational carbon emissions will make up a declining proportion of a development's whole life-cycle carbon emissions as operational carbon targets become more stringent. To fully capture a development's carbon impact, a whole life-cycle approach is needed to capture its unregulated emissions (i.e. those associated with cooking and small appliances), its embodied emissions (i.e. those associated with raw material extraction, manufacture and transport of building materials and construction) and emissions associated with maintenance, repair and replacement as well as dismantling, demolition and eventual material disposal).

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

Policy SI 8 Waste capacity and net-waste self sufficiency

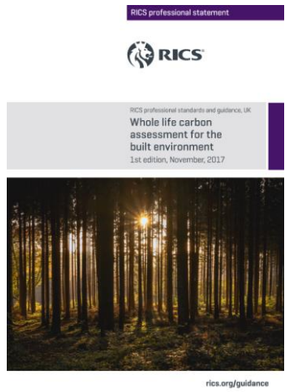
This policy sets out the need to manage London's waste sustainability, with the target to achieve net self-sufficiency by 2026.

3.3 GLA Whole Life-cycle Carbon Assessments LPG (2022)

This guidance explains how to prepare a Whole Life-Cycle Carbon (WLC) assessment in line with Policy SI 2 F of the London Plan 2021 using the WLC assessment template.

This guidance explains how to calculate WLC emissions and the information that needs to be submitted to comply with the policy. It also includes information on design principles and WLC benchmarks to aid planning applicants in designing buildings that have low operational carbon and low embodied carbon.

RICS Whole Life Carbon



The RICS Whole Life Carbon Assessment for the Build Environment, released in 2017, seeks to standardise WLC assessment and enhance consistency un outputs by providing guidance on implementing the broad appraisal methodology set out in EN 15978: Sustainability of Construction Works. The Greater London Authority have adopted the RICS WLC methodology in their guidance methodology for Whole Life Carbon assessment of referable planning applications.

3.4 London Borough Richmond upon Thames Local Plan (July 2018)

LBRuT's Local Plan was adopted in July 2018. The Local Plan replaces (2018) replaces the previous Local Plan as well as the Local Development Management policies. Key policies relating to Whole Life Carbon are summarised below.

Policy LP 20 Climate change adaption

The Council will promote and encourage development to be fully resilient to the future impacts of climate change in order to minimise vulnerability of people and property.

New development, in their layout, design, construction, materials, landscaping and operation, should minimise the effects of overheating as well as minimise energy consumption.

Opportunities to adapt existing buildings, places and spaces to the likely effects of climate change should be maximised and will be supported.

Policy LP 22 Sustainable design and construction

Developments will be required to achieve the highest standards of sustainable design and construction to mitigate the likely effects of climate change.

Developers are required to incorporate measures to improve energy conservation and efficiency as well as contributions to renewable and low carbon energy generation.

The Council requires developments to contribute towards the Mayor of London target of 25% of heat and power to be generated through localised decentralised energy (DE) systems by 2025.

Policy LP 24 Waste management

The Council will ensure that waste is managed in accordance with the waste hierarchy, which is to reduce, reuse or recycle waste as close as possible to where it is produced.

- Development proposals, where appropriate, should make use of the rail and the waterway network for the transportation of construction, demolition and other waste. Development proposals in close proximity to the river should utilise the river for the transport of construction materials and waste where practicable.

3.5 LBRuT Climate Emergency Strategy (2020-2024)

Richmond Council proclaimed a climate emergency in July 2019 and committed to strive towards become carbon-neutral by 2030. In order for the council and Richmond as a whole to play its part in resolving the climate emergency, the Richmond Climate Emergency Strategy (RCES) and Action Plan developed and identified six key areas that must be addressed to meet legislative requirements as wells as contributing to reducing carbon emission:

a) Our council: Becoming Carbon Neutral as an Organisation by 2030
b) Our legacy: Climate Change Mitigation and Energy Efficiency

c) Our waste: Waste and Plastics and the Circular Economy
d) Our air: Improving Air Quality
e) Our nature: Green Infrastructure and Biodiversity
f) Our resilience: Climate Resilience and Flooding

4 Whole Life-cycle Carbon Assessment

Whole life-cycle carbon (WLC) emissions are the total carbon emissions resulting from the construction and the use of a building over its entire life, including its demolition and disposal. They capture a building's operational carbon emissions from both regulated and unregulated energy use, as well as its embodied carbon emissions - that is, emissions associated with raw material extraction, the manufacture and transport of building materials, and construction; and the emissions associated with maintenance, repair and replacement, as well as dismantling, demolition and eventual material disposal. A WLC assessment also includes an assessment of the potential savings from the reuse or recycling of components after the end of a building's useful life. It provides a true picture of a building's carbon impact on the environment.

This WLC assessment has been carried out in line with The London Plan (2021) Policy SI 2 using the Whole Life-Cycle Carbon Assessments LPG (2022).

4.1 Methodology

BS EN 15978: 2011 (Sustainability of construction works – Assessment of environmental performance of buildings – Calculation method) has been followed in developing the WLC assessment. The RICS Professional Statement: Whole Life Carbon assessment for the built environment (RICS PS) has been used as the methodology for the assessment, except where noted in the Whole Life-Cycle Carbon Assessments LPG.

Material quantities and specifications were taken from the latest cost model produced by the quantity surveyors, Quantem, as of 20/March/2023. The assessment accounts for a minimum of 95% of the capital cost allocated to each building element category.

The UK's electricity grid is decarbonising and this will have an impact on the WLC emissions of a development. However, at present, the data is not reliable to do so accurately for embodied carbon emissions. Therefore, SAP 10.2 carbon emissions factors have been used to align with the energy strategy.

4.2 Life-cycle modules

The assessment includes all four life-cycle modules, in accordance with BS EN 15978 (see Tables 4.1 & 4.2 for detailed description):

- Module A1-A5 (product sourcing and construction stage)
- Module B1-B7 (use stage)
- Module C1-C4 (end-of-life stage)
- Module D (benefits and loads beyond the system boundary)

No specific future alterations or improvements are known or planned for the Proposed Development, therefore module B5 (refurbishment) would be zero and is omitted from the assessment.

In line with the GLA guidance, the assessment includes the following elements:

- Demolition
- Facilitating works
- Substructure
- Superstructure (frame, upper floors, roof, stairs and ramps, external walls, windows and external doors, internal walls and partitions, internal doors)
- Finishes
- Fittings, furnishing, and equipment
- Building services
- Prefabricated buildings and building units
- Work to existing building
- External works (hard and soft landscaping, fencing, fixtures, drainage, services)

Table 4.1 - Whole Life-Cycle Embodied Carbon Assessment stages

Product Stage			Construction Process Stage		Use Stage							End-of-Life Stage				Benefits and loads beyond the system boundary		
Raw material extraction & supply	Transport to manufacturing plant	Manufacturing & fabrication	Transport to project site	Construction & installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/demolition	Transport to disposal facility	Waste processing	Disposal	Reuse	Recovery	Recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
x			x	x	x	x	x	x		x	x	x				x		

The reference study period for the purposes of the assessment is 60 years. Description of the life cycle stages, and analysis scope are provided in the table below:

Table 4.2 - Description of the life cycle stages

Life cycle module	Analysis scope
A1-A3 Construction Materials	Raw material supply (A1) includes emissions generated when raw materials are taken from nature, transported to industrial units for processing and processed. Loss of raw material and energy are also taken into account. Transport impacts (A2) include exhaust emissions resulting from the transport of all raw materials from suppliers to the manufacturer's production plant as well as impacts of production of fuels. Production impacts (A3) cover the manufacturing of the production materials and fuels used by machines, as well as handling of waste formed in the production processes at the manufacturer's production plants until end-of-waste state.
A4 Transportation to site	A4 includes exhaust emissions resulting from the transport of building products from manufacturer's production plant to building site as well as the environmental impacts of production of the used fuel.
A5 Construction/ installation process	A5 covers the exhaust emissions resulting from using energy during the Site operations, the environmental impacts of production processes of fuel and energy and water as well as handling of waste until the end-of-waste state.
B4 Material replacement	The environmental impacts of material replacements (B4) includes environmental impacts from replacing building products after they reach the end of their service life. The emissions cover impacts from raw material supply, transportation and production of the replacing new material as well as the impacts from manufacturing the replacing material as well as handling of waste until the end-of-waste state.
B6 Energy use	The considered use phase energy consumption (B6) impacts include exhaust emissions from any building level energy production as well as the environmental impacts of production processes of fuel and externally produced energy. Energy transmission losses are also taken into account.
C1-C4 Deconstruction	The impacts of deconstruction include impacts for processing recyclable construction waste flows for recycling (C3) until the end-of-waste stage or the

Life cycle module	Analysis scope
	impacts of pre-processing and landfilling for waste streams that cannot be recycled (C4) based on type of material. Additionally, deconstruction impacts include emissions caused by waste energy recovery.
D External impacts/end-of-life benefits	The external benefits include emission benefits from recycling recyclable building waste. Benefits for re-used or recycled material types include positive impact of replacing virgin-based material with recycled material and benefits for materials that can be recovered for energy cover positive impact for replacing other energy streams based on average impacts of energy production.

In line with the GLA guidance, the operational carbon emissions are calculated based on the Part L assessments undertaken for the proposed development as part of the Energy Strategy for planning. This encompasses carbon emissions related to both regulated and unregulated energy uses (in line with Part L definitions).

4.3 Software tool

One Click LCA software is used to create the WLC model. Please refer to Table *3*.3 for an overview of the software tool.

Table 3.3 – One Click LCA software tool overview

Tool	Country of origin	Applicable to UK?	Project type	Online/offline	Scope	Data source
One Click LCA	Finland	Yes	Buildings and infrastructure	Online software	Modules A-C (+D)	Built-in with access to some of the most widely spread local EPD databases, including Ecoinvent which contains generic LCA data.

4.4 WLC Inputs

This section sets out the inputs used in the Whole Life Carbon assessment:

Table 4.4 – Input data used in the embodied carbon assessment.

Building element group	Building element	Basis of information
Demolition	0.1. Toxic/hazardous/contaminated material treatment	The feasibility cost estimate provided by the project quantity surveyors did not include an allowance for contaminated land removal and treatment.
	0.2 Major demolition works	An allowance for site excavation and demolition works was included in the assessment and used the average intensity of 1.39 kg CO_2e/m^3 cleared debris, as developed by OneClick LCA software.
0 Facilitating works	0.3 & 0.5 Temporary/enabling works	An allowance for site preparatory works was included in the assessment in line with the feasibility cost estimate and used the average intensity of 1.39 kg CO_2e / m^3 extracted soils.
	0.4 Specialist groundworks	No specialist ground works were included separately, with individual ground works accounted for in the relevant sub structure / external landscaping sections
1 Substructure	1.1 Substructure	The specific foundations quantity was determined by the structural engineer embodied carbon quantities (concrete & rebar)
2 Superstructure	2.1 Frame	Material quanitity and composition was calculated from the cost plan using OneClick LCA EPDs. The composition was informed by the structural engineer embodied carbon quantities and report.
	2.2 Upper floors incl. balconies	Material quanitity and composition was calculated from the cost plan using OneClick LCA EPDs. The composition was informed by the structural engineer embodied carbon quantities and report.
	2.3 Roof	Material quanitity and composition was calculated from the cost plan using OneClick LCA EPDs. The composition was informed by the structural engineer embodied carbon quantities and report.
	2.4 Stairs and ramps	Material quanitity and composition was calculated from the cost plan using OneClick LCA EPDs. The composition was informed by the structural engineer embodied carbon quantities and report.
	2.5 External walls	Material quanitity and composition was calculated from the cost plan using OneClick LCA EPDs. The composition was informed by the structural engineer embodied carbon quantities and report.
	2.6 Windows & external doors	Cost plan quantities have been used together with in-built EPDs within OneClick LCA.
	2.7 Internal walls and partitions	Cost plan quantities have been used together with in-built EPDs within OneClick LCA.
	2.8 Internal doors	Cost plan quantities have been used together with in-built EPDs within OneClick LCA.
3 Finishes	3.1 Wall finishes	The wall, floor and ceiling finishes were calculated using OneClick LCA's EPDs in line with the cost plan quantities.
	3.2 Floor finishes	
	3.3 Ceiling finishes	
4 Fittings	4.1 Fittings, furnishing & equipment	Cost plan allowance for wardrobes, sanitaryware and kitchen fittings have been used. Provisional EPDs have been used to match the fittings proposed to be installed.
5 Building services/MEP	5.1-5.14 Services	Building services data uses data provided from the cost plan. The lengths of ducts, electrical distribution, water distribution are based on the m^2 quantities provided in the cost plan. In-built OneClick LCA EPD's have been used.
6 Prefabricated buildings and building units	6.1 Prefabricated buildings and building units	No prefabricated elements are applicable.

Building element group	Building element	Basis of information
7 Work to existing building	7.1 Minor demolition and alteration works	No minor works are applicable.
8 External works	8.1 Site preparation works	Site preparation works icorporate data from the cost plan.
	8.2 Roads, paths, paving & surfacing	Data from the cost plan have been used.
	8.3 Soft landscaping, planting and irrigation systems	Data from the cost plan have been used.
	8.4 Fencing, railings and walls	Excluded from the assessment due to lack of available data.
	8.5 External fixtues	Excluded from the assessment due to lack of available data.
	8.6 External drainage	Data from the cost plan have been used.
	8.7 External services	Excluded from the assessment due to lack of available data.
	8.8 Minor building works and ancillary buildings	No allowance was considered for minor building works and ancillary buildings

A full list of all product declarations is given in Appendix 6.2.

Operational carbon emissions are estimated as part of the Energy Strategy, submitted by chapmanbdsp in support of the planning application. The assessment of operational carbon emissions has been based on the methodology set out in Part L of the building regulations, and a total of regulated and unregulated carbon emissions is reported.

- Residential areas: Operational carbon emissions are based on SAP calculations in line with Part L1A methodology.
- Non-residential areas: Operational carbon emissions are based on BRUKL calculations of regulated and unregulated energy.

4.5 WLC Results

Since at this stage, individual manufacturers EPDs are not available as yet, the current WLC analysis is based on typical materials database available on One Click LCA to give an indication of the expected performance. The concrete grades, steel grades, recycled content, etc. have been all discussed and agreed with the structural engineer and are currently based on high-level assumptions. Please refer to Appendix 0 for the list of EPDs used.

Quantities provided from the cost consultant are based on Stage 2 (Concept design) information. This information is very high level; therefore, the quantities are the same. The quantities provided do not allow for the following:

1. Contingency for the natural design evolution that will take place through the proceeding stages.
2. Items not currently drawn and therefore not quantifiable, e.g. temporary works, construction methodology driven works, secondary steel, upstands, plinths etc.
3. Items not fully coordinated and any discrepancies between documentation.
4. Wastage and ancillary items.

The results are based on SAP 10.2 carbon factors over a 60-year lifetime. Embodied carbon figures broken down as per life-cycle module are presented below. The WLC study shows that the embodied carbon over the life cycle is 971 $kgCO_2/m^2$. The detailed results can be found in Appendix 6.1.

Table 4.4 – Estimated WLC emissions

	A1-A5 (excl. BioC)	B-C (excl. B6 & B7)	A-C (excl. B6 & B7; incl. BioC)	B1-B5	B6-B7	C1-C4	D
kg CO_2e	18,410,443	11,769,109	29,373,125	10,426,467	8,307,858	1,342,641	-5,594,881
kg CO_2e/m^2 GIA	470	300	749	266	212	34	-143
Most relevant benchmark typology	Residential						
WLC Benchmark	*<850*	*<350*	*<1200*				
Aspirational WLC Benchmark	*<500*	*<300*	*<800*				

Figure 4.1 shows the estimated whole life carbon of the proposed development by building elements (RICS categories).

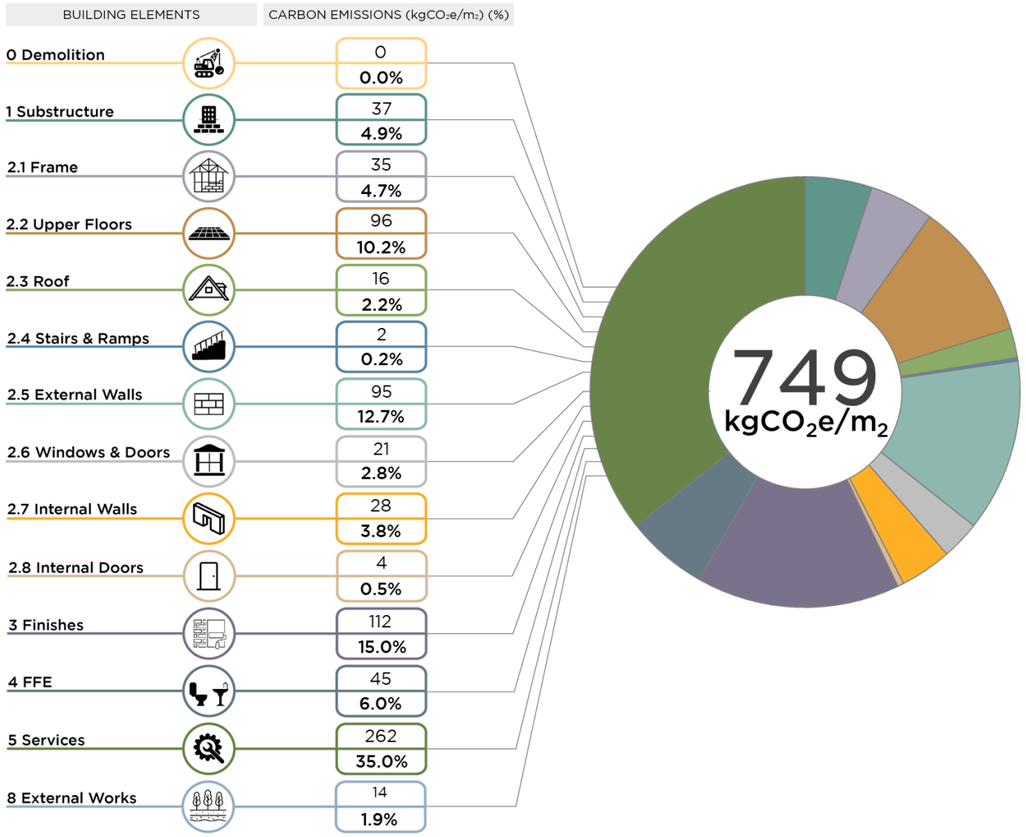


Figure 4.1 – Whole life carbon assessment results by RICS category.

4.6 Comparison with WLC benchmarks

The GLA has developed WLC benchmarks for the most typical typologies: offices; residential; schools and universities; and retail. All developments, regardless of their scope, are expected to compare their WLC baseline against the most relevant benchmark.

The WLC benchmarks are based on previous project assessments and have been cross-referenced with data from across the industry. These assessments were Shell and Core, and Cat A finishes; and followed the RICS PS in terms of the scope of assessment, and material baseline assumptions and specifications.

A further set of aspirational WLC benchmarks have been developed which are based on a 40% reduction on the first benchmark, in line with the WGBC 2030 WLC emissions reduction target.

The building has been compared to the most relevant, Residential, benchmark. Figure 4.2 shows the Proposed Development against the Residential WLC benchmark for different life-cycle modules.

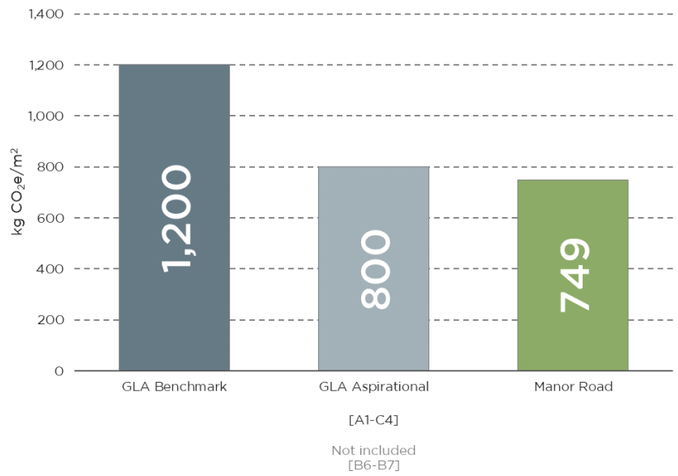


Figure 4.2 – WLC baseline of the proposed development against GLA WLC residential benchmark.

4.7 Key actions

At the outset of the project, the GLA's 16 WLC principles (Appendix 6.5) were discussed and used to inform the design of the development. Following those principles, the key actions that have been taken to achieve the WLC emissions reported include:

- Minimise operational energy use - The operational energy has been minimised following the London Plan's Energy Hierarchy such that a 62% improvement in the total regulated carbon emissions can be achieved over Part L 2021. For further details please refer to the Energy Statement produced by chapmanbdsp.
- Building life expectancy – Although a building life of 60 years has been used for the assessment, in line with the GLA guidance, the design team is targeting a building life expectancy of 100+ years. This has resulted in the selection of durable materials throughout the substructure and superstructure.

4.8 Opportunities to further reduce embodied carbon

To investigate further opportunities for reducing the embodied carbon of the scheme, an investigation of elemental mass vs. embodied carbon was carried out. Please refer to the Sankey diagram shown below for the outcome of this analysis. The elements contributing the most are concrete, steel, and timber. Therefore, potential material interventions would be further investigated for these specific elements at the detailed design stage. These options are as below:

- Potential for recycled aluminium. Currently, it is understood that there is shortage of recycled aluminium in the supply chain
- Increasing the GGBS content of the concrete to replace cement. However, this can significantly increase the curing time and therefore the construction programme. Therefore, this option needs to be further investigated along with offsite construction.
- Structural load reduction may be considered. It is understood that a reduction of as small as 0.5 kPa can lead to significant cost and carbon savings.
- The MEP systems will be reviewed, and opportunities to reduce operational carbon will be investigated as the scheme progresses. This will be done in parallel with operational energy calculations to ensure that reducing the embodied carbon of MEP equipment does not result in a worsening of operational energy across the building lifecycle.

Further potential opportunities	Improvement
Locally and nationally sourced materials	A4 module – Transport to site
MEP systems to be reviewed	A1-A3 - Product Stage
Indoor partitions, doors and insulation	A1-A3 – Product Stage
Higher concrete GGBS replacement	A1-A3 – Product Stage

- The project pre-demolition audit has identified materials which can be re-used or recovered to be used within the proposed development. The Circular Economy statement details the strategy for recovery of materials in line with the circular economy model. The benefits of recovered materials have not been accounted for in the Whole Life Carbon Assessment at this stage due uncertainty in the quantity of replacement materials. It is understood that this would be accounted for at a more detailed stage of design when more accurate data is available.

5 Conclusion

This report has detailed the whole life-cycle carbon strategy for the proposed development and demonstrates how it relates to the relevant planning policy documents including the London Plan and the LBRuT's Local Plan.

The WLC study shows that the embodied carbon over the life cycle is 749 $kgCO_2/m^2$.

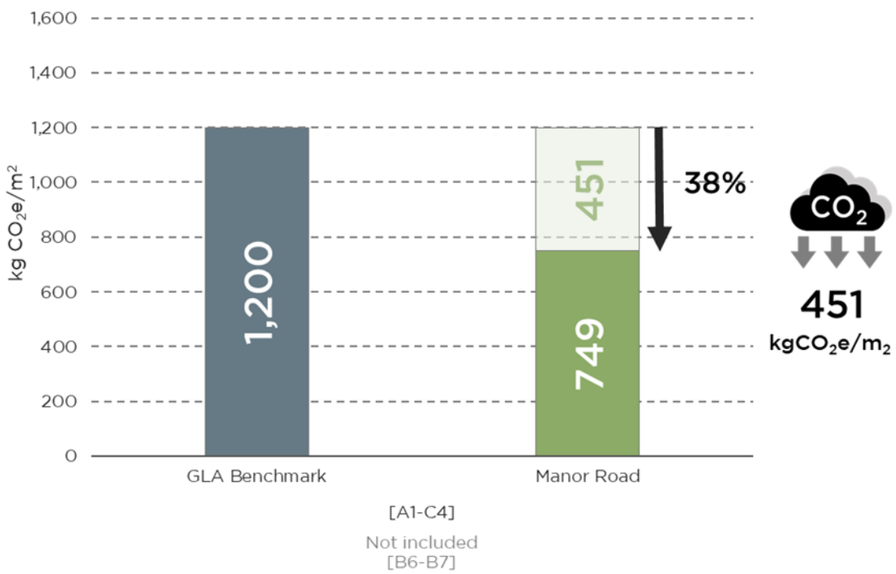


Figure 5.1 – WLC baseline against WLC residential benchmark

6 Appendices

6.1 The GLA WLC Spreadsheet

The GLA WLC Spreadsheet is submitted separately as a standalone spreadsheet.

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						
0.2	Major Demolition Works						
0.3	Temporary Support to Adjacent Structures						
0.4	Specialist Ground Works						
1		Concrete	509,670 kg	60 year service life	Cement/mortar use in a backfill	0 kg	509,670 kg
1		Concrete	1,626,210 kg	60 year service life	Concrete crushed to aggregate (for sub-base layers), Portland Cement 200 kg / m3	0 kg	1,626,210 kg
1		Concrete	6,429,528 kg	60 year service life	Concrete crushed to aggregate (for sub-base layers), Portland Cement 300 kg / m3	0 kg	6,429,528 kg
1		Insulation	31,713 kg	60 year service life	Landfilling (for inert materials)	0 kg	0 kg
1		Services	1,044 kg	60 year service life	Metal-containing product recycling (90 % metal)	0 kg	1,044 kg
1		Steel	377,683 kg	60 year service life	Steel recycling	0 kg	377,683 kg
2.1		Concrete	8,372,064 kg	60 year service life	Concrete crushed to aggregate (for sub-base layers), Portland Cement 300 kg / m3	0 kg	8,372,064 kg
2.1		Steel	592,550 kg	60 year service life	Steel recycling	0 kg	592,550 kg
2.2		Concrete	19,825,800 kg	60 year service life	Concrete crushed to aggregate (for sub-base layers), Portland Cement 300 kg / m3	0 kg	19,825,800 kg
2.2		Soil	882,304 kg	60 year service life	Do nothing	882,304 kg	0 kg
2.2		Steel	1,046,188 kg	60 year service life	Steel recycling	0 kg	1,046,188 kg
2.3		Aggregates	0 kg	60 year service life	Do nothing	0 kg	0 kg
2.3		Bitumen	15,678 kg	20 year service life	Landfilling (for inert materials)	0 kg	0 kg
2.3		Concrete	3,212,952 kg	60 year service life	Concrete crushed to aggregate (for sub-base layers), Portland Cement 300 kg / m3	0 kg	3,212,952 kg
2.3		Concrete	66,403 kg	60 year service life	Rebar separated (2 %), concrete to aggregate	0 kg	66,403 kg
2.3		Insulation	6,614 kg	60 year service life	Landfilling (for inert materials)	0 kg	0 kg
2.3		Insulation	1,412 kg	60 year service life	Plastic-based material incineration	0 kg	0 kg
2.3		Paint	865 kg	10 year service life	Plastic-based material incineration	0 kg	0 kg
2.3		Steel	495 kg	60 year service life	Stainless steel recycling	0 kg	495 kg
2.3		Steel	190,054 kg	60 year service life	Steel recycling	0 kg	190,054 kg
2.3		VCL	1,938 kg	30 year service life	Plastic-based material incineration	0 kg	0 kg
2.4		Concrete	379,536 kg	60 year service life	Concrete crushed to aggregate (for sub-base layers), Portland Cement 300 kg / m3	0 kg	379,536 kg
2.4		Steel	1,352 kg	60 year service life	Stainless steel recycling	0 kg	1,352 kg
2.4		Steel	19,769 kg	60 year service life	Steel recycling	0 kg	19,769 kg
2.5		Clay	5,311,488 kg	60 year service life	Brick/stone crushed to aggregate (for sub-base layers)	0 kg	5,311,488 kg
2.5		Insulation	118,560 kg	60 year service life	Landfilling (for inert materials)	0 kg	0 kg
2.5		Mortar	1,920,672 kg	60 year service life	Cement/mortar use in a backfill	0 kg	1,920,672 kg
2.5		Paint	3,177 kg	15 year service life	Landfilling (for inert materials)	0 kg	0 kg
2.5		Stone	2,650,175 kg	60 year service life	Brick/stone crushed to aggregate (for sub-base layers)	0 kg	2,650,175 kg
2.6		Steel	7,112 kg	30 year service life	Metal-containing product recycling (90 % metal)	0 kg	7,112 kg

2.6		Windows & doors	302,764 kg	60 year service life	Glass-containing product recycling	0 kg	302,764 kg
2.6		Wood	21,291 kg	40 year service life	Wood-containing product incineration (80% wood)	0 kg	0 kg
2.7		Gypsum	623,274 kg	30 year service life	Gypsum recycling	0 kg	623,274 kg
2.7		Paint	169 kg	10 year service life	Landfilling (for inert materials)	0 kg	0 kg
2.7		Wood	63,323 kg	30 year service life	Wood incineration	0 kg	0 kg
2.8		Wood	146,010 kg	40 year service life	Wood-containing product incineration (80% wood)	0 kg	0 kg
3		Carpet	67,227 kg	15 year service life	Plastic-based material incineration	0 kg	0 kg
3		Concrete	4,563,376 kg	60 year service life	Cement/mortar use in a backfill	0 kg	4,563,376 kg
3		Gypsum	28,620 kg	40 year service life	Gypsum recycling	0 kg	28,620 kg
3		Gypsum	1,722,011 kg	60 year service life	Gypsum recycling	0 kg	1,722,011 kg
3		Paint	5,552 kg	10 year service life	Landfilling (for inert materials)	0 kg	0 kg
3		Paint	34,979 kg	15 year service life	Landfilling (for inert materials)	0 kg	0 kg
3		Tile	362,033 kg	30 year service life	Brick/stone crushed to aggregate (for sub-base layers)	0 kg	362,033 kg
3		Wood	520,148 kg	60 year service life	Wood incineration	0 kg	0 kg
4		Services	2 kg	17 year service life	Landfilling (for inert materials)	0 kg	0 kg
4		Steel	3,097 kg	60 year service life	Stainless steel recycling	0 kg	3,097 kg
4		Wood	163,782 kg	12 year service life	Wood-containing product incineration (80% wood)	0 kg	0 kg
5		Aluminium	159 kg	30 year service life	Aluminium recycling	0 kg	159 kg
5		Concrete	407 kg	30 year service life	Rebar separated (2 %), concrete to aggregate	0 kg	407 kg
5		Plastic	1,495 kg	20 year service life	Plastic-based material incineration	0 kg	0 kg
5		Sanitaryware	33,248 kg	60 year service life	Landfilling (for inert materials)	0 kg	0 kg
5		Services	1,282 kg	10 year service life	Landfilling (for inert materials)	0 kg	0 kg
5		Services	3,863 kg	17 year service life	Landfilling (for inert materials)	0 kg	0 kg
5		Services	3,406 kg	20 year service life	Landfilling (for inert materials)	0 kg	0 kg
5		Services	8,369 kg	35 year service life	Landfilling (for inert materials)	0 kg	0 kg
5		Services	2,485 kg	10 year service life	Metal-containing product recycling (90 % metal)	0 kg	2,485 kg
5		Services	49,658 kg	15 year service life	Metal-containing product recycling (90 % metal)	0 kg	49,658 kg
5		Services	11,278 kg	20 year service life	Metal-containing product recycling (90 % metal)	0 kg	11,278 kg
5		Services	21,926 kg	22 year service life	Metal-containing product recycling (90 % metal)	0 kg	21,926 kg
5		Services	382,162 kg	25 year service life	Metal-containing product recycling (90 % metal)	0 kg	382,162 kg
5		Services	677 kg	30 year service life	Metal-containing product recycling (90 % metal)	0 kg	677 kg
5		Services	16,254 kg	40 year service life	Metal-containing product recycling (90 % metal)	0 kg	16,254 kg
5		Services	7,112 kg	45 year service life	Metal-containing product recycling (90 % metal)	0 kg	7,112 kg
5		Services	27,633 kg	60 year service life	Metal-containing product recycling (90 % metal)	0 kg	27,633 kg
5		Services	65 kg	60 year service life	#N/A	0 kg	65 kg
5		Steel	297 kg	30 year service life	Stainless steel recycling	0 kg	297 kg
5		Steel	6,177 kg	30 year service life	Steel recycling	0 kg	6,177 kg
8		Glass	17,528 kg	35 year service life	Glass recycling	0 kg	17,528 kg
8		Plastic	1,111 kg	30 year service life	Plastic-based material incineration	0 kg	0 kg
8		Services	4 kg	25 year service life	Metal-containing product recycling (90 % metal)	0 kg	4 kg
8		Soil	1,950,696 kg	60 year service life	Do nothing	1,950,696 kg	0 kg
8		Steel	149,253 kg	60 year service life	Steel recycling	0 kg	149,253 kg
8		Stone	369,090 kg	60 year service life	Brick/stone crushed to aggregate (for sub-base layers)	0 kg	369,090 kg

Refrigerants		Refrigerant name	Initial Charge(kg)	Annual leakage rate %	Refrigerant GWP ($kgCO_2e/kg$)	End of Life recovery rate %		
a	Refrigerants Type 1 (if applicable) - please see CIBSE TM65 for methodology	Refrigerant R32 (difluoromethane), EN15804+A1 and EN15804+A2 impacts	560	5	700.01	10		
b	Refrigerants Type 2 (if applicable) - please see CIBSE TM65 for methodology							
c	Refrigerants Type 3 (if applicable) - please see CIBSE TM65 for methodology							
		TOTAL	65,296,857 kg				2,833,000 kg	61,208,085 kg
		Material intensity (kg/m2 GIA)	1,665 kg/m2 GIA				72 kg/m2 GIA	1,561 kg/m2 GIA

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 ($kgCO_2e$)		Use stage ($kgCO_2e$)							End of Life (EoL) stage ($kgCO_2e$)				TOTAL Modules A-C $kgCO_2e$	Benefits and loads beyond the system boundary ($kgCO_2e$)
			Module A			Module B							Module C					
Building element category			[A1] to [A3]	[A4]	[A5]	[B1]	[B2]	[B3]	[B4]	[B5]	[B6]	[B7]	[C1]	[C2]	[C3]	[C4]		Module D
0.1	Demolition: Toxic/Hazardous/Contaminated Material Treatment												0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
0.2	Major Demolition Works												0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
0.3	Temporary Support to Adjacent Structures	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e			0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
0.4	Specialist Ground Works	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e			0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
0.5	Temporary Diversion Works	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e			0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
1	Substructure	0 kg CO2e	1,261,522 kg CO2e	65,680 kg CO2e	81,258 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e			0 kg CO2e	39,659 kg CO2e	3,788 kg CO2e	83 kg CO2e	1,451,991 kg CO2e	-211,104 kg CO2e
2.1	Superstructure: Frame	0 kg CO2e	1,199,360 kg CO2e	67,798 kg CO2e	65,927 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e			0 kg CO2e	47,188 kg CO2e	4,185 kg CO2e	0 kg CO2e	1,384,458 kg CO2e	-192,615 kg CO2e
2.2	Superstructure: Upper Floors	0 kg CO2e	2,578,034 kg CO2e	162,921 kg CO2e	142,115 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e			0 kg CO2e	98,075 kg CO2e	9,134 kg CO2e	0 kg CO2e	2,990,279 kg CO2e	-463,479 kg CO2e
2.3	Superstructure: Roof	0 kg CO2e	497,512 kg CO2e	26,092 kg CO2e	28,216 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	61,025 kg CO2e	0 kg CO2e			0 kg CO2e	16,974 kg CO2e	10,253 kg CO2e	58 kg CO2e	640,131 kg CO2e	-90,161 kg CO2e
2.4	Superstructure: Stairs and Ramps	0 kg CO2e	62,854 kg CO2e	3,049 kg CO2e	3,042 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e			0 kg CO2e	1,919 kg CO2e	177 kg CO2e	0 kg CO2e	71,042 kg CO2e	-20,280 kg CO2e
2.5	Superstructure: External Walls	0 kg CO2e	3,401,856 kg CO2e	23,016 kg CO2e	263,601 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	15,624 kg CO2e	0 kg CO2e			0 kg CO2e	29,274 kg CO2e	3,418 kg CO2e	317 kg CO2e	3,737,105 kg CO2e	-66,569 kg CO2e
2.6	Superstructure: Windows and External Doors	-39,034 kg CO2e	708,309 kg CO2e	2,113 kg CO2e	62,020 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	48,262 kg CO2e	0 kg CO2e			0 kg CO2e	11,947 kg CO2e	39,340 kg CO2e	170 kg CO2e	833,129 kg CO2e	-31,019 kg CO2e
2.7	Superstructure: Internal Walls and Partitions	-97,095 kg CO2e	504,793 kg CO2e	1,749 kg CO2e	69,739 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	523,416 kg CO2e	0 kg CO2e			0 kg CO2e	13,922 kg CO2e	98,350 kg CO2e	0 kg CO2e	1,114,875 kg CO2e	-87,706 kg CO2e
2.8	Superstructure: Internal Doors	-113,907 kg CO2e	63,945 kg CO2e	727 kg CO2e	4,340 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	66,808 kg CO2e	0 kg CO2e			0 kg CO2e	559 kg CO2e	115,409 kg CO2e	76 kg CO2e	137,957 kg CO2e	0 kg CO2e
3	Finishes	-386,939 kg CO2e	2,411,987 kg CO2e	18,927 kg CO2e	353,720 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	1,417,063 kg CO2e	0 kg CO2e			0 kg CO2e	55,200 kg CO2e	535,419 kg CO2e	105 kg CO2e	4,405,482 kg CO2e	-628,503 kg CO2e
4	Fittings, furnishings & equipment	-169,452 kg CO2e	363,346 kg CO2e	1,532 kg CO2e	14,379 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	1,385,141 kg CO2e	0 kg CO2e			0 kg CO2e	746 kg CO2e	171,143 kg CO2e	85 kg CO2e	1,766,920 kg CO2e	-15,964 kg CO2e
5	Services (MEP)	0 kg CO2e	3,337,470 kg CO2e	5,772 kg CO2e	29,192 kg CO2e	10,796 kg CO2e	285,673 kg CO2e	0 kg CO2e	6,582,760 kg CO2e	0 kg CO2e	3,913,290 kg CO2e	4,214,537 kg CO2e	180,031 kg CO2e	0 kg CO2e	20,291 kg CO2e	4,888 kg CO2e	265 kg CO2e	18,584,966 kg CO2e	-3,467,839 kg CO2e
6	Prefabricated Buildings and Building Units	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e			0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
7	Work to Existing Building	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e			0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e
8	External works	0 kg CO2e	446,971 kg CO2e	10,082 kg CO2e	65,473 kg CO2e	0 kg CO2e	0 kg CO2e	0 kg CO2e	29,900 kg CO2e	0 kg CO2e			0 kg CO2e	7,471 kg CO2e	2,752 kg CO2e	0 kg CO2e	562,649 kg CO2e	-319,644 kg CO2e
Other site construction impacts or overall construction stage [A5] carbon emissions not specific to an individual building element category					0 kg CO2e												0 kg CO2e	
TOTAL $kgCO_2e$		**-806,426 kg CO2e**	**16,837,960 kg CO2e**	**389,460 kg CO2e**	**1,183,023 kg CO2e**	**10,796 kg CO2e**	**285,673 kg CO2e**	**0 kg CO2e**	**10,129,998 kg CO2e**	**0 kg CO2e**	**8,127,827 kg CO2e**		**180,031 kg CO2e**	**0 kg CO2e**	**343,226 kg CO2e**	**998,256 kg CO2e**	**1,160 kg CO2e**	**37,680,983 kg CO2e**	**-5,594,881 kg CO2e**
TOTAL - kg CO_2e/m^2 GIA		**-21 kg CO2e/m2 GIA**	**429 kg CO2e/m2 GIA**	**10 kg CO2e/m2 GIA**	**30 kg CO2e/m2 GIA**	**0 kg CO2e/m2 GIA**	**7 kg CO2e/m2 GIA**	**0 kg CO2e/m2 GIA**	**258 kg CO2e/m2 GIA**	**0 kg CO2e/m2 GIA**	**207 kg CO2e/m2 GIA**		**5 kg CO2e/m2 GIA**	**0 kg CO2e/m2 GIA**	**9 kg CO2e/m2 GIA**	**25 kg CO2e/m2 GIA**	**0 kg CO2e/m2 GIA**	**961 kg CO2e/m2 GIA**	**-143 kg CO2e/m2 GIA**

6.2 OneClick LCA information export & EPDs

Please, see below the OneClick tool inputs and EPD assumptions.

Resource name	Technical specification	Product	Manufacturer	EPD program	EPD number	Environment Data Source	Standard	Verification	Year	Country	Upstream database
Acoustic panels from MDF, with painted finish	16 mm, 9.9 kg/m2, 619 kg/m3, fire resistance class = B-s2, d0	TOPAKUSTIK® Painted Finish	NH Akustik + Design AG	SCS Global	SCS-EPD-05539	EPD TOPAKUSTIK® Acoustical Panels	ISO 14040	Third-party verified (as per ISO 14025)	2019	switzerland, germany	ecoinvent
Acrylic washbasin, faucets not included	16.4 kg/unit	DONNEE PAR DEFAUT	DED	INIES	INIES_DLAV20161116_164646, 28753	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
Air/air heat pump, external, per unit	70.05 kg/unit	Multi Split: MU5R30 U40 (Z5UW30GFA0)	LG Electronics Inc.	INIES	LLGE-00002-V01.01-FR, 29546	PEP	EN15804+A1	Third-party verified (as per ISO 14025)	2022	southKorea	ecoinvent
Aluminium die-cast parts	2700 kg/m3			OKOBAUDAT	-	ÖKOBAUDAT 2021-II (25.06.2021)	EN15804+A1	Third-party verified (as per ISO 14025)	2020	germany	GaBi
Aluminium framed double glazed doors, per m2	79.5% glass, 15.7% aluminium, 2.2% steel, 44 kg/m2, width:1.23m, height:2.18m, 6mm toughened and 8.8mm laminated glass	Edge Symmetry	Optima	International EPD System	S-P-05433	EPD Aluminium Framed Double Glazed Doors	EN15804+A1, EN15804+A2	Third-party verified (as per ISO 14025)	2022	unitedKingdom	ecoinvent
Aluminium wire rod for electrical applications		Aluminium Wire rod - series 6000	TRIMET France	International EPD System	S-P-03583	EPD Aluminium Wire rod - series 6000 from TRIMET France	EN15804+A1	Third-party verified (as per ISO 14025)	2021	france	ecoinvent
Bar stool from steel and plastic	7.6 kg/unit	AXA barstool 1055/06	Casala	INSIDE/INSIDE	EPD-NIBE-20181022-2871	EPD 21019-003 - AXA barstool 1055/06	EN15804+A1	Third-party verified (as per ISO 14025)	2019	netherlands	ecoinvent
Bituminous waterproofing system - Single layer	5.44 kg/m2	AXTER, DERBIGUM, MEPLE, SIPLAST-ICOPAL, SOPREMA	Chambre Syndicale Française de l'Etanchéité	INIES	INIES_CTOI20180219_105730, 8349	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2017	france	ecoinvent
Brick sandwich wall assembly, incl. mineral wool insulation				One Click LCA		One Click LCA generic construction definitions				europe	Other
Bricks	226x104x60, 226x85x60 mm	NF with holes & solid, RF	Wienerberger	IBU	EPDWIE20130206-IAB1EN	Bricks Wienerberger AS	EN15804+A1	Third-party verified (as per ISO 14025)	2014	germany	GaBi
Cable barrier (cord barrier) for roads per m (per ft), steel (2 materials)				One Click LCA		Adjusted data based on the specifications of the Swedish Transport Administration (Trafikverket).				LOCAL	Other
Cable tray system	4.62 kg/m	BS H72 x L316 Ref 401037	NIEDAX FRANCE	INIES	NDAX-00025-V01.01-FR, 12948	PEP	EN15804+A1	Third-party verified (as per ISO 14025)	2018	france	ecoinvent
Carbon steel reinforcing bar (secondary production route – scrap)	97.07% recycled steel, 7850 kg/m3		UK Cares	BRE	BREG EN EPD 000125	EPD Carbon steel reinforcement bar (secondary production route -scrap), Sector average, UK cares	EN15804+A1	Third-party verified (as per ISO 14025)	2016	unitedKingdom, poland, turkey, spain, france, portugal	GaBi
Carpet tiles, nylon (Polyamide), pile weight 700 g/m2	Total weight 4,623 g/m2			ICE	-	ICE database January 2011, V2.0	ISO 14064	Self declared	2011	unitedKingdom	-
Ceiling air fan	diamètre = 150 cm, 25 kg/unit	DONNEE PAR DEFAUT	DED	INIES	INIES_DBRA20200422_131958, 31637	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent

Resource name	Technical specification	Product	Manufacturer	EPD program	EPD number	Environment Data Source	Standard	Verification	Year	Country	Upstream database
Ceramic floor tile	10 mm, average density 2000 kg/m3		Mosa	MRPI	11.1.0001.004	EPD Vloertegelcollectie Koninklijke Mosa	EN15804+A1	Third-party verified (as per ISO 14025)	2013	unitedKingdom	ecoinvent
Ceramic toilet	19.6 kg/unit	- DURAVIT : Starck 3 (420009; 452709; 220209). ME by Starck (452909; 453009). DuraStyle (455209; 457109). // - KOHLER : Struktura (EDE101-00 ; EDF101-00). Patio (EDV101-00 ; E1534-00). Brive (E4345-00) // - ROCA : DEBBA (A346998000 ; A34699L000). VICTORIA (A34630300S).	Association Française des Industries de la Salle de Bains	INIES	INIES_CCUV20200303_175319, 14206	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2020	france	ecoinvent
Ceramic wall tile	6 mm, average density 2000 kg/m3		Mosa	MRPI	11.1.0002.004	EPD Wandtegelcollectie Koninklijke Mosa	EN15804+A1	Third-party verified (as per ISO 14025)	2013	unitedKingdom	ecoinvent
Circular duct fan R-100, galvanized steel			RUUKKI	-	-	Kuumasinkityt rakennustuotteet, Ruukki 2014	EN15804+A1	Third-party verified (as per ISO 14025)	2014	europe	GaBi
Clay soil, loose wet density	1760 kg/m3			One Click LCA	-	LCA inventory for clay pit operation, Ecoinvent 2014	ISO14040	Internally verified	2014	LOCAL	ecoinvent
Combined refrigerator-freezer, 277 L net volume model	Outer dimensions: 186 x 60 x 64 cm (73 x 24 x 25 in), 69.65 kg/unit (153.55 lb/unit)			One Click LCA	-	One Click LCA	EN15804+A1, EN15804+A2	Internally verified	2022	LOCAL	ecoinvent
Concrete roof tiles	Avg. thickness per m2: 22.4 mm, 334x420 mm, 2100 kg/m3		Eternit	IBU	EPD-ETE-20130224-IAA1-DE	EPD Eternit Dachstein Heidelberg Eternit Dachstein Verona Eternit Dachstein Göteborg Eternit Dachstein Kapstadt Eternit AG	EN15804+A1	Third-party verified (as per ISO 14025)	2014	germany	GaBi
Cooktop with four induction hobs	5 x 60 x 52 cm (2 x 24 x 21 in), 11.55 kg/unit (25.46 lb/unit)			One Click LCA	-	One Click LCA	EN15804+A1, EN15804+A2	Internally verified	2022	LOCAL	ecoinvent
Corrugated galvanized steel sheets	10.02 kg/m2, ép. 0,5mm et 0,88mm		L'ENVELOPPE METALLIQUE DU BATIMENT	INIES	INIES_CPRO20171215_162543, 27406	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2017	france	ecoinvent
Corrugated plastic pipes	0.138 kg/m	FFKuS-EM-F-105 co2ntrol	Fränkische Rohrwerke Gebr. Kirchner GmbH & Co.	IBU	EPD-FRW-20190167-IBA1-DE	EPD FFKuS-EM-F-105 co2ntrol® FRÄNKISCHE Rohrwerke Gebr. Kirchner GmbH & Co. KG	EN15804+A1	Third-party verified (as per ISO 14025)	2020	germany	GaBi
Double button switch mechanism	67 g/unit	WE045X, WE0150X, WE001X, WE001TX, WE002X, WE002TX, WE010X, WE010TX WE022X, WE022TX, WE022GX, WE023X, WE023TX, WE025X, WE025TX, WE040X, WE040TX, WE044X, WE044TX, WE044GX, WE045X WE045TX,	Hager SE	INIES	HAGE-00469-V01.01-FR, 23956	PEP	EN15804+A1	Third-party verified (as per ISO 14025)	2020	germany	ecoinvent

Resource name	Technical specification	Product	Manufacturer	EPD program	EPD number	Environment Data Source	Standard	Verification	Year	Country	Upstream database
		WE046X, WE046TX, WE049X, WE049TX, WE300X, WE300TX, WE301X, WE301TX									
Double particleboard wardrobe	1800 x 1000 x 600 mm, 1.08 m3 storage/unit, 72.9 kg/unit	DOUBLE WARDROBE	Bisley	International EPD System	S-P-05029	EPD Wardrobe Units | LIVING BY BISLEY	EN15804+A1, EN15804+A2	Internally verified	2022	unitedKingdom	ecoinvent
Drainage and infiltration system, drain pipe, geotextile, EPS particles and polyethylene net	2.48 kg/m	Drenotube® 300 mm, Drenotube® 370 mm	FUMOSO INDUSTRIAL, SA	INIES	INIES_ISYS20190802_093938, 11104	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2019	spain	ecoinvent
Drainage floor underlay from EPS	ép.25 mm	DONNEE PAR DEFAUT	DED	INIES	INIES_DCOU20191220_144652, 31818	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
Drainage system, PVC, per m2 GFA	0.20 kg/m2			One Click LCA	-	Ruuska et al. 2013. Rakennusmateriaalien merkitys rakentamisen ympäristövaikutusten kentässä. VTT.	EN15804+A1	Internally verified	2016	LOCAL	GaBi
Drinking water supply piping network, per m2 GIFA (residential buildings)				One Click LCA	-	One Click LCA	EN15804+A1	Internally verified	2019	LOCAL	ecoinvent
Earthing system for apartment buildings per m2				One Click LCA							-
Electric built-in oven	60 x 60 x 56 cm (24 x 24 x 22 in), 28.42 kg/unit (62.66 lb/unit)			One Click LCA	-	One Click LCA	EN15804+A1, EN15804+A2	Internally verified	2022	LOCAL	ecoinvent
Electric elevator elements dependent of the number of floors	903 kg/unit, max load: 4000 kg	DONNEE PAR DEFAUT	DED	INIES	INIES_DJXN20220110_105409, 28660	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
Electrical equipment box/cabinet CE	1200 x 800 x 250mm,	QUADRO CE 1200X 800 X 250 C/ FLANGE (901131)	LEGRAND	INIES	LGRP-00904-V01.01-EN, 12483	PEP	EN15804+A1	Third-party verified (as per ISO 14025)	2019	france	ecoinvent
Electricity distribution system, cabling and central, for all building types	per m2 GFA			One Click LCA	-	One Click LCA	EN15804+A1	Internally verified	2019	LOCAL	ecoinvent
Emulsion paint for allround interior use	Pigment: Lightfast Pigments, binder: Acrylic Copolymer Dispersion , solvent: Water, 1.444 kg/l, 17 m2/l, 0.17 kg/m2	Vinyl Matt White	Dulux Trade	MRPI	1.1.00001.2017	EPD Dulux Trade Vinyl Matt	EN15804+A1	Third-party verified (as per ISO 14025)	2017	unitedKingdom	ecoinvent
Enamelled stoneware shower tray	35 kg/unit	KOHLER : Kyreo (EN104-00 ; EN103-00 ; EN134-00 ; EN133-00 ; EN163-00 ; EN164-00 ; EN111-00 ; ENB90-00 ; ENC90-00), Replay (N140K-00 ; N140K-220)	Association Française des Industries de la Salle de Bains	INIES	INIES_CREC20140416_154402, 14202	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2020	france	ecoinvent
Entrance metal door with metal frame	34.85 kg/m2	- ATHENA STANDARD ISOLANT (NEUF ET REHA) - ATHENA ACOUSTIQUE (NEUF ET REHA) - ATHENA	MALERBA	INIES	INIES_IHTS20220309_133438, 29411	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent

Resource name	Technical specification	Product	Manufacturer	EPD program	EPD number	Environment Data Source	Standard	Verification	Year	Country	Upstream database
		STANDARD ISOLANT 2V TIERCES (NEUF ET REHA)									
External wood door, 2,1 x 1 m				One Click LCA	-	OneClickLCA	EN15804+A1	Internally verified	2011	LOCAL	ecoinvent
Finishing wall mortars, French average	3 mm, 4.2 kg/m2	DONNEE PAR DEFAUT	DED	INIES	INIES_DMOR20170317_174244, 6396	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2017	france	ecoinvent
Fire alarm, B.A.A.S + D.L, French average		DONNEE PAR DEFAUT	DED	INIES	INIES_DB.A20161116_164323, 5576	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2016	france	ecoinvent
Fire sprinkler	0.072 kg/unit	DONNEE PAR DEFAUT	DED	INIES	INIES_DSPR20201130_194806, 31681	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
Fire-resistant glass	21.1 mm, 50.5 kg.m2, 2393 kg/m3	PROMAGLAS	Promat GmbH	ift Rosenheim	EPD-PPG-21.0	Oekobau.dat 2017-I, EPD Brandschutzglas PROMAGLAS und Promat-SYSTEMGLAS	EN15804+A1	Third-party verified (as per ISO 14025)	2015	europe	GaBi
Flooring screed	C20/25 - XC1 - S3 - 20 CEM I, 50mm, 116.8kg/m2, 2336 kg/m3		SNBPE	INIES	INIES_CCHA20181217_151718, 12450	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2018	france	ecoinvent
Flush metal enclosure with door	23.1 kg/unit	401449 + 401459 Ref door : 401441/401451, 401442/401452 , 401443/401453, 401447/401457, 401448 401458, 401449/401459	LEGRAND	INIES	LGRP-00898-V01.01-EN, 12316	PEP	EN15804+A1	Third-party verified (as per ISO 14025)	2019	france	ecoinvent
Galvanized steel railing for supporting partitions or plasterboard	0.415 kg/m	Fourrure F47, Fourrure F45, Fourrure MOB, Fourrure CD 60, Fourrure F60 OMEGA, Fourrure FL55, Entretoise F47.	KNAUF	INIES	INIES_IPLA20170216_083714, 32796	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
Gas pipe protection channel from stainless steel	largeur 90 mm, 1.4kg/m	DONNEE PAR DEFAUT	DED	INIES	INIES_DGOU20200323_173632, 31890	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
General Carpet				ICE	-	ICE database January 2011, V2.0	ISO 14064	Self declared	2011	unitedKingdom	-
Geotextile from polypropylene	300 g/m2		MDEGD	INIES	INIES_DGÉO20180223_161025, 7993	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2018	france	ecoinvent
Glass noise barrier per m2 (per ft2) with concrete base and poles (4 materials)	Reference product 2.3 m (7.5 ft) height			One Click LCA		Adjusted data based on the specifications of the Swedish Transport Administration (Trafikverket).				LOCAL	Other
Glass wool insulation	R=5.0 m2K/W, L=0.040 W/mK, ép. 200 mm, 2.295 kg/m2, Lambda=0.04 W/(m.K)	ISOLANT TOITURE 200	ISOVER	INIES	INIES_IISO20170504_091653, 12203	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2017	france	ecoinvent
Glass wool insulation panels, unfaced, generic	L = 0.031 W/mK, R = 3.23 m2K/W (18 ft2°Fh/BTU), 25 kg/m3 (1.56 lbs/ft3), (applicable for densities: 0-25 kg/m3 (0-1.56 lbs/ft3)), Lambda=0.031 W/(m.K)			One Click LCA	-	One Click LCA	EN15804+A1	Internally verified	2018	LOCAL	ecoinvent
Glass wool/mineral	0.031-0.033 W/mK		Knauf	BRE	BREG EN EPD000063	EPD Glass Mineral Wool	EN15804+A1	Third-party verified (as per ISO 14025)	2015	unitedKingdom	ecoinvent

Resource name	Technical specification	Product	Manufacturer	EPD program	EPD number	Environment Data Source	Standard	Verification	Year	Country	Upstream database
wool insulation with ECOSE Technology						Insulation with ECOSE Technology (0.031-0.033 W/mK), Knauf Insulation 2015					
Green roof assembly	R > 5m2.K/W			-		One Click LCA generic construction definitions				europe	Other
Gypsum plaster board, regular, generic	6.5-25 mm (0.25-0.98 in), 10.725 kg/m2 (2.20 lbs/ft2) (for 12.5 mm/0.49 in), 858 kg/m3 (53.6 lbs/ft3)			One Click LCA	-	One Click LCA	EN15804+A1	Internally verified	2018	LOCAL	ecoinvent
Gypsum plasterboard with square edges, moisture resistant	L= 0.19 W/mK, 12.5 mm, 8.49 kg/m2, 679 kg/m3, 10Q water vapour resistance	Gyproc Moisture Resistant	British Gypsum (2019)	International EPD System	S-P-00507 ver. 2	EPD 12.5mm Gyproc Moisture Resistant	EN15804+A1	Third-party verified (as per ISO 14025)	2019	unitedKingdom	ecoinvent
Gypsum plasterboard, tapered or square edges	12.5 mm, 8.44 kg/m2, 675 kg/m3, 10Q water vapour resistance	Gyproc WallBoard	British Gypsum (2019)	International EPD System	S-P-00506, ver.2	EPD for Gyproc WallBoard, ver. 2	EN15804+A1	Third-party verified (as per ISO 14025)	2019	unitedKingdom	ecoinvent
Heat distribution piping network, per m2 heated area, all building types				One Click LCA	-	One Click LCA	EN15804+A1	Internally verified	2019	LOCAL	ecoinvent
Home automation hub with GSM telephone transmitter	1.302 kg/unit	6414118-TYDOM 2.0 6414125-TYDOM 2.0 IT EN DE ES PLNL FR 6414118-TYDOM 2.0 6414125-TYDOM 2.0 IT EN DE ES PLNL FR	Delta Dore	INIES	DDOR-00004-V02.01-FR, 30995	PEP	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
Hot dip galvanized steel	0.73 mm, 5.72 kg/m2			OKOBAUDAT	-	ÖKOBAUDAT 2021-II (25.06.2021)	EN15804+A1	Third-party verified (as per ISO 14025)	2020	germany	GaBi
Intercom speaker, French average		DONNEE PAR DEFAUT	DED	INIES	INIES_DCAR20161116_164425, 31422	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
Intercom system for apartment buildings per m2				One Click LCA							-
Interior wooden door leaf, solid core, painted	926x2040x60 mm, 56.18 kg/unit, 3 hinges and lock included, 35dB sound reduction, PL		JELD-WEN Sverige AB	BRE	BREG EN EPD 000349	EDPSolid Core Door EI30/R'w 35dB PL	EN15804+A1	Third-party verified (as per ISO 14025)	2021	sweden	ecoinvent
Junction box	0.154 kg/unit	IP55 100x100 (B05534), B05534, B05546	Hager SE	INIES	HAGE-00609-V01.01-FR, 27361	PEP	EN15804+A1	Third-party verified (as per ISO 14025)	2021	germany	ecoinvent
Kitchen cabinet from plywood	H: 900 mm, D: 600 mm, W: 600 mm, 44 kg/unit		One Click LCA	One Click LCA	-	One Click LCA	EN15804+A1, EN15804+A2	Internally verified	2023	LOCAL	ecoinvent
Kitchen pantry cabinet	H: 2000 mm, D: 300 mm, W: 600 mm, 84 kg/unit		One Click LCA	One Click LCA	-	One Click LCA	EN15804+A1, EN15804+A2	Internally verified	2023	LOCAL	ecoinvent
LAN cable	0.16 kg/m, CAT6A F/UTP	32878	LEGRAND	INIES	LGRP-01411-V01.01-FR, 32226	PEP	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
LED overhead lighting system	8.527 kg/unit	Flight Vitality	Whitecroft Lighting Ltd, Lancashire plant	RTS	RTS_138_21	EPD FLIGHT VITALITY FVWQ9Y64KEP	EN15804+A1, EN15804+A2	Third-party verified (as per ISO 14025)	2021	unitedKingdom, OCLEPD	ecoinvent
Leveling screed	90 kg/m2	Fabricants CERMIX Mapei PRB Saint Gobain Weber France Sika TECHNIQUE	SYNDICAT NATIONAL DES MORTIERS INDUSTRIELS	INIES	INIES_CJWM20210914_210622, 27264	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2021	france	ecoinvent

Resource name	Technical specification	Product	Manufacturer	EPD program	EPD number	Environment Data Source	Standard	Verification	Year	Country	Upstream database
		BETON Références CERMICEM PAG MAPECEM MAPECEM PRONTO TOPCEM PRONTO MORTIER CHAPE FIBRE PRB CHAPECEM HPR PRB CHAPECEM N PRB CHAPECEM TRADI PRB MANUCEM HPR weber chape express weber chape légère CEGESOL MCN EXPRESS CEGESOL MCR SikaScreed HardTop-70 FINICHAPE FINICHAPE AN									
Lightning protection system for apartment buildings per m2				One Click LCA							-
MDF board, for interior applications	9/12/15/18 mm	Ecologique	Medite	BRE	BREG EN EPD000088, Issue 03	BREG EN EPD000088	EN15804+A1	Third-party verified (as per ISO 14025)	2017	unitedKingdom	ecoinvent
Masonry mortar, light	1000 kg/m3		quick-mix	IBU	EPD-QMX-20150010-IBC1-DE	EPD Mineralische Werkmörtel: Mauermörtel Leichtmauermörtel quickmix Gruppe GmbH & Co. KG	EN15804+A1	Third-party verified (as per ISO 14025)	2015	germany	GaBi
Massive wooden flooring/parquet	22-450 x 44-7000 x 8-35 mm, 11.71 kg/m2		Verband der Deutschen Parkettindustrie	IBU	EPD-VDP-20150262-IBG1-DE	Oekobau.dat 2017-I, EPD Kreisförmige, quadratische und rechteckige Stahlbauhohlprofile Vallourec Deutschland GmbH	EN15804+A1	Third-party verified (as per ISO 14025)	2015	germany	GaBi
Meadow including growing medium	thickness 150-200 mm			One Click LCA						LOCAL	Other
Mechanical ventilation with heat recovery	54 kg/unit	LGH-100RVX-E	Mitsubishi Electric	-	-	EPD LGH-100RVX-E CIBSE TM65 Embodied Carbon Mid-level Calculation	ISO 14040	Self declared	2021	japan	-
Natural portland limestone	2300 kg/m3		Portland Stone Firms	BRE	BREG EN EPD000389	EPD 1m3 of Portland Stone	EN15804+A1	Third-party verified (as per ISO 14025)	2021	unitedKingdom	ecoinvent
Natural stone paving tiles	thickness 100 mm (4 in)			One Click LCA						LOCAL	Other
One storey timber staircase	2587x225x905 mm, 41.9 deg		Stair Craft	-	-	EPD One storey timber staircase STAIRCRAFT (Midlands) Ltd	EN15804+A1	Self declared	2014	unitedKingdom	-
Opener and closer wireless lock	1.487 kg/unit	Door Keeper Réf. 1241680	SOMFY	INIES	SOMF-00053-V01.01-FR, 25967	PEP	EN15804+A1	Third-party verified (as per ISO 14025)	2020	france	ecoinvent
PVC cable ducts and bends	50 mm, SN8, 0,083 kg/m2		Pipelife Norge	EPD Norge	NEPD-2341-1084-NO	EPD Kabelrør PVC 50 mm SN8 Pipelife Norge AS	EN15804+A1	Third-party verified (as per ISO 14025)	2020	norway	ecoinvent
Painted MDF-board	11 mm	Arbor malte MDF plater til vegg og tak	Arbor-Hattfjelldal	EPD Norge	NEPD-1326-428-NO	EPD Arbor malte MDF plater til vegg og tak	EN15804+A1	Third-party verified (as per ISO 14025)	2017	norway	ecoinvent

Resource name	Technical specification	Product	Manufacturer	EPD program	EPD number	Environment Data Source	Standard	Verification	Year	Country	Upstream database
						Arbor-Hattfjelldal AS					
Painted MDF-board tabletop	1600x800x19 mm, 15.9 kg/unit	Tellus	Svenheim Møbelindustri	EPD Norge	NEPD-2073-938-EN	EPD Tellus tabletop 1600x800x19 MDF Valchromat Grey SLG Svenheim Møbelindustri AS	EN15804+A1	Third-party verified (as per ISO 14025)	2020	lithuania	ecoinvent
Plasterboard hatch door, for attic access, with aluminium frame	13.14 kg/m2	DONNEE PAR DEFAUT	DED	INIES	INIES_DTRA20191016_093510, 31886	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
Plasterboard, filled, sanded and painted				One Click LCA		One Click LCA generic construction definitions				europe	Other
Plastic profile	980 kg/m3, SBR,/EPDM			OKOBAUDAT	-	ÖKOBAUDAT 2021-II (25.06.2021)	EN15804+A1	Third-party verified (as per ISO 14025)	2020	germany	GaBi
Polyethylene sealing film for slabs	ép. 150 micron	Donnee par default	MDEGD	INIES	INIES_DFIL20180427_114145, 8228	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2018	france	ecoinvent
Polypropylene (PP) plastic pipe	0% recycled content			One Click LCA	-	One Click LCA	EN15804+A1	Internally verified	2019	LOCAL	ecoinvent
Polypropylene vapour membrane, French average	0.18 kg/m2		MDEGD	INIES	INIES_DPAR20180223_160939, 7991	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2018	france	ecoinvent
Porcelain stoneware tiles	9.5 mm, 20.6 kg/m2, 2168.4 kg/m3	ALMA,AMBOISE,ARDESIE,ART,ASTURIA,BETON EVOLUTION,CANVAS, CANVAS 2.0,CELTIC,CIMENT,DEEP,DIVA,DUNKERQUE, FERRY,FRAME,GEM,GROUND,HOTSPOT,INSTINCT,LA ROCHE,LOFT,LOUISIANE,MASH UP EXPORT,MONACO,MONTMARTRE,NAMUR,PONDICHERY,ROOM,SHADES,SHADES 2.018,SHELL,SHIMMER, SOUL,STONE EDGE,STREET,SUBLIME,THEATRE,TRACK,VALLEY,VILLA BETON,YELLOWSTONE.	DESVRES SAS	INIES	INIES_ICAR20200617_074540, 18643	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2020	france	ecoinvent
Power cable connectors		DONNEE PAR DEFAUT	DED	INIES	INIES_DCON20190819_150913, 31654	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
Precast concrete paver	60 mm, 135.78 kg/m2		CENTRE D`ETUDES ET DE RECHERCHES DE L`INDUSTRIE DU BÉTON	INIES	INIES_CHRI20220228_111833, 29323	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
Programmable thermostat	0.1921 kg/unit	6053005_TYBOX 1117 Autres références visées: 6053006 - 6053064 - 6053072 - 6053073	Delta Dore	INIES	DDOR-00043-V01.01-FR, 27526	PEP	EN15804+A1	Third-party verified (as per ISO 14025)	2021	france	ecoinvent
Ready-mix concrete for ground slabs	C25/30 XC1/XC2 CEM II/A, 2387.04kg/m3		SNBPE	INIES	INIES_CBÉT20190724_131702, 22908	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2019	france	ecoinvent

Resource name	Technical specification	Product	Manufacturer	EPD program	EPD number	Environment Data Source	Standard	Verification	Year	Country	Upstream database
Ready-mix concrete, normal strength, generic	C32/40 (4600/5800 PSI) with CEM II/B-V, 30% GGBS content in cement (300 kg/m3; 18.7 lbs/ft3 total cement)		One Click LCA 2022	One Click LCA	-	One Click LCA	EN15804+A1, EN15804+A2	Internally verified	2022	LOCAL	ecoinvent
Ready-mix concrete, normal-strength, generic	C20/25 (2900/3600 PSI), 10% (typical) recycled binders in cement (240 kg/m3 / 14.98 lbs/ft3)			One Click LCA	-	One Click LCA	EN15804+A1, EN15804+A2	Internally verified	2018	LOCAL	ecoinvent
Reinforced marker sign		0 626 34	Legrand	INIES	LGRP-00932-V01.01-FR, 10819	PEP	EN15804+A1	Third-party verified (as per ISO 14025)	2019	france	ecoinvent
Reinforcement steel (rebar), generic	97% recycled content (typical), A615		One Click LCA 2022	One Click LCA	-	One Click LCA	EN15804+A1, EN15804+A2	Internally verified	2022	LOCAL	ecoinvent
Reinforcement steel (rebar), generic	90% recycled content, A615			One Click LCA	-	One Click LCA	EN15804+A1	Internally verified	2018	LOCAL	ecoinvent
Reinforcement steel (rebar), generic	97% recycled content (typical), A615			One Click LCA	-	One Click LCA	EN15804+A1	Internally verified	2018	LOCAL	ecoinvent
Reinforcement steel products - cut and bent meshes	7800 kg/m3, 10-40 mm dia, BS 4449:2005		ROM Group	International EPD System	-	EPD Fabricated steel reinforcement products (cut and bent mesh)	EN15804+A1	Internally verified	2021	unitedKingdom	ecoinvent
Router	0.18 kg/unit	Zigbee Router	Assa Abloy	UL Environment	4789027809.118.1	EPD Zigbee Router Network Product	EN15804+A1	Third-party verified (as per ISO 14025)	2020	china	GaBi
Sand, compacted wet density	2082 kg/m3			One Click LCA	-	LCA inventory for sand quarry operation, Ecoinvent 2016	EN15804+A1	Internally verified	2020	LOCAL	ecoinvent
Sewage water drainage piping network, per m2 GIFA (factories and logistics buildings)				One Click LCA	-	One Click LCA	EN15804+A1	Internally verified	2019	LOCAL	ecoinvent
Sewage water drainage piping network, per m2 GIFA (residential buildings)				One Click LCA	-	One Click LCA	EN15804+A1	Internally verified	2019	LOCAL	ecoinvent
Shower head	0.3 kg/unit	HALO181-3 HALO181-4	SMART AND BLUE	INIES	INIES_IKWJ20220720_152110, 33537	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
Single and three phase distribution boards	14.7 kg/unit	Acti9 Isobar P Distribution Board - SEA9BPN12	Schneider Electric	-	ENVPEP1809003_V	EPD Acti9 Isobar P Distribution Board	EN15804+A1	Internally verified	2018	unitedKingdom	-
Single particleboard wardrobe	1800 x 500 x 600 mm, 0.54 m3 storage/unit, 49.6 kg/unit	SINGLE WARDROBE	Bisley	International EPD System	S-P-05029	EPD Wardrobe Units | LIVING BY BISLEY	EN15804+A1, EN15804+A2	Internally verified	2022	unitedKingdom	ecoinvent
Sink faucets	2.14 kg/unit	10001000 AX Starck basin mixer 100 71013000 HG MyCube basin mixer 14090007 HG Ecos basin mixer 100 CN 10003000 AX Starck basin mixer 100 71074000 HG Logis basin mixer 70 31060007 HG Metris S basin mixer CN 10010000 AX Starck	HANSGROHE SE	INIES	INIES_IFGD20221020_115324, 33589	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	germany	GaBi

Resource name	Technical specification	Product	Manufacturer	EPD program	EPD number	Environment Data Source	Standard	Verification	Year	Country	Upstream database
Smoke detector, French average		DONNEE PAR DEFAUT	DED	INIES	INIES_DDÉT20161116_164323, 5575	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2016	france	ecoinvent
Soil substrates for green roofs			MDEGD	INIES	INIES_DSUB20180223_161051, 7994	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2018	france	ecoinvent
Soil, compacted dry density	1650 kg/m3			One Click LCA	-	LCA for site construction products, OneClickLCA 2012	EN15804+A1	Internally verified	2020	LOCAL	ecoinvent
Solar panel photovoltaic system, 3 000 Wp			Gaia Solar	One Click LCA	-	One Click LCA	ISO14040	Internally verified	2014	LOCAL	ecoinvent
Stainless steel bicycle rack	1.3 kg/unit	DONNEE PAR DEFAUT	MINISTERE DE L'ENVIRONNEMENT, DE L'ENERGIE ET DE LA MER - MINISTERE DU LOGEMENT ET DE L´HABITAT DURABLE	INIES	INIES_DRAT20200616_135407, 32139	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
Stainless steel handrail	diam. 45mm	Donnee par default	MDEGD	INIES	INIES_DMAI20180529_140740, 8288	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2018	france	ecoinvent
Stainless steel mailboxes	4.54 kg/unit		ARGE	INIES	INIES_CBOÎ20170926_154228, 12818	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2016	france	ecoinvent
Stainless steel sink	5.57 kg/unit	DONNEE PAR DEFAUT	DED	INIES	INIES_DEVI20161116_164641, 28731	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2022	france	ecoinvent
Steel sheet hot dip galvanized	2-20 mm, 7840 kg/m3			OKOBAUDAT	-	ÖKOBAUDAT 2021-II (25.06.2021)	EN15804+A1	Third-party verified (as per ISO 14025)	2020	germany	GaBi
Straight steel staircase	Larg. 80 cm	DONNEE PAR DEFAUT	DED	INIES	INIES_DESC20191220_141237, 28182	MDEGD_FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2021	france	ecoinvent
Street slab, from stone, Finnish average	2700 kg/m3		KIVI ry	RTS	RTS_59_20	EPD Katulaatat	EN15804+A1	Third-party verified (as per ISO 14025)	2020	finland, OCLEPD	ecoinvent
TV socket	48g	WXF25x + WXD251Bx	Hager SE	INIES	HAGE-00373-V01.01-FR, 14212	PEP	EN15804+A1	Third-party verified (as per ISO 14025)	2020	europe	ecoinvent
Telephone system for apartment buildings per m2				One Click LCA							-
Thermostatic water mixer, shower		ENTRAXE 150	IDÉAL STANDARD	INIES	INIES_IMIT20140808_114744, 4936	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2014	france	ecoinvent
Ventilation system for residential building	per m2 GFA			One Click LCA	-	One Click LCA	EN15804+A1	Internally verified	2019	LOCAL, paraguay	ecoinvent
Wall insulation system (internal) with: steel studs, gypsum plaster board, and glass wool insulation	160mm+13mm, 16.923 g/m2, 88.8kg/m3, R=5 m2.K/W, Lambda=0.032 W/(m.K)	Systeme doublage Placostil® sur appuis et fourrures avec Placomarine® BA 13 et GR 32 roulé kraft 160 mm	PLACOPLATRE	INIES	INIES_ISYS20191122_091657, 33427	FDES	EN15804+A1	Third-party verified (as per ISO 14025)	2019	france	ecoinvent
Water-based epoxy floor paint	1.44 kg/l, 6 m2/l, 0.48 kg/m2	Dulux Trade High Performance Floor Paint	AkzoNobel	MRPI	1.1.00283.2022	EPD DULUX TRADE HIGH PERFORMANCE FLOOR PAINT	EN15804+A1	Third-party verified (as per ISO 14025)	2022	unitedKingdom	ecoinvent
Water-borne interior paints	1.36 kg/L, average coverage 8-10 m2/L	Biora, Ekora, Kolibri Sand, Paneelikattomaali, Ranch, Superlateksi, Tapettipohjamaali,	Teknos	RTS	RTS_14_18	EPD RTS EPD, Water-borne interior paints	EN15804+A1	Third-party verified (as per ISO 14025)	2018	finland, OCLEPD	ecoinvent

Resource name	Technical specification	Product	Manufacturer	EPD program	EPD number	Environment Data Source	Standard	Verification	Year	Country	Upstream database
		Teknospro, Tela, Timantti, Trend									
Water-borne wall paints for interior use	0.361 kg/m2, 1.528 kg/l	Zenit PU 03, Zenit Power, Classic Plafond, Classic Super Color Matt	AkzoNobel Herbol	MRPI	1.1.00211.2021	EPD Herbol Interior Wallpaints	EN15804+A1	Third-party verified (as per ISO 14025)	2021	belgium, france, italy, unitedKingdom	ecoinvent
Wooden bench	13.5 kg/unit	OVO Bench Collection	Benchmark	International EPD System	S-P-01955	EPD OVO Bench Collection	EN15804+A1	Third-party verified (as per ISO 14025)	2020	unitedKingdom	ecoinvent
Wooden interior door, per unit	809x2053 mm, 42x92 mm frame, 52 mm door leaf		Nordic Dørfabrikk	EPD Norge	NEPD-1535-525-EN	EPD Climate door / interior door Nordic Dørfabrikk AS	EN15804+A1	Third-party verified (as per ISO 14025)	2018	norway	ecoinvent

6.3 Building weight calculation

Building weight calculations have not been provided by the structural engineers.

RE: Manor Rd - WLC/Embodied Carbon calcs

EM

Elli Mitrou

To James Dale

Cc Carlos Bernal; chris@avanton.co.uk; Xinlong Wang; Patel, Smruti (Avison Young - UK)

Reply | Reply All | Forward

Tue 16/05/2023 11

Hi James,

Please, can you send across a building weight calculation for Manor Road?
This is required to be submitted alongside our circular economy statement.

Kind regards,
Elli

6.4 Operational energy and water use (B6 & B7)

The operational energy use (B6) has been estimated based on Part L 2021 for both regulated and unregulated energy use for the non-residential spaces and SAP10 for the residential spaces.

- Regulated energy for the development: 479,569.8 kWh
- Unregulated energy for the development: 516,487.4 kWh

The operational water use (B7) was estimated for the proposed development based on Table 22 of the BSRIA Rules of Thumb – guidelines for the building services (fifth edition):

a) Residential use type has been assumed

b) Maximum daily total water consumption = 115 l/person.

c) A diversity factor of 1.2 has been applied to account for guests and staff.

d) Therefore, the annual water usage for the development is 22.8 million litres.

6.5 Principles for reducing WLC Emissions

No.	Principle	Description Relevant life-cycle modules	Relevant life-cycle modules
1	Reuse and retrofit of existing built structures	Before embarking on the design of a new structure or building, the retrofit or reuse of any existing built structures, in part or as a whole, should be a priority consideration as this is typically the lowest carbon option. Significant retention and reuse of structures also reduces construction costs and can contribute to a smoother planning process.	A1-A5, B1-B6, C1-C4, D
2	Use recycled or repurposed materials	Use recycled or repurposed materials, as opposed to newly sourced raw materials, typically reduces the carbon emissions from constructing a new building and reduces waste. This process would start by reviewing the materials already on site for their potential for inclusion into the proposed scheme. Many of the currently available standard products already include a degree of recycled content. Applicants should obtain this information from the supply chain, preferably in the form of an EPD.	A1-A5, B1-B5, C1-C4, D
3	Material selection	This is the most important issue affecting the WLC 'cost' of a new building. Appropriate low carbon material choices are key to carbon reduction. Ensuring that there is synchronicity between materials selected and planned life expectancy of the building reduces waste and the need for replacement, thus reducing in-use costs. EPDs should be referenced. It is important to note that the overall life-time carbon footprint of a product can be as much down to its durability as to what it is made of. The selection of reused or recycled materials and products, plus products made from renewable sources, such as timber, will also help reduce the carbon footprint of a project.	A1-A5, B1-B5, C1-C4, D
4	Minimise operational energy use	A 'fabric first' approach should be prioritised to minimise the heating and cooling requirement of a building. Naturally ventilated buildings avoid the initial carbon and financial costs of a ventilation system installation, and the repeat carbon and financial costs of its regular replacement.	A1-A5, B1-B4, B6
5	Minimise operational water use	Carbon emissions from water use are largely due to the materials and systems used for its storage and distribution, the energy required to transfer it around the building, and the energy required to treat any wastewater. The choice of materials used and the durability of the systems, which help avoid leakage and resulting damage to building fabric, are therefore key aspects of reducing the carbon cost of water use. On-site water collection, recycling and treatment, and storage can have additional positive environmental impacts as well as reducing in-use costs.	A1-A5, B1-B5, B7, C1-C4, D
6	Disassembly and reuse	Designing for future disassembly ensures that products do not become future waste and that they maintain their environmental and economic value. A simple example is using lime rather than cement mortar; the former being removable at the end of a building's life, the latter not. This enables the building's components (e.g. bricks) to have a future economic value as they can be reused for their original purpose rather than becoming waste or recycled at a lower level (e.g. hardcore in foundations). Designing building systems (e.g. cladding or structure) for disassembly and dismantling has similar and even boarder benefits. Ease of disassembly facilitates easy access for maintenance and replacement leading to reduced maintenance carbon emissions and reduced material waste during the 'in-use' and 'end of life' phases. This leads to the potential for material and product reuse which also reduces waste and contributes to the circular economy principle.	A1-A5, B1-B5, C1-C4, D
7	Building shape and form	Compact efficient shapes help minimise both operational and embodied carbon emissions from repair and replacement for a given floor area. This leads to a more efficient building overall, resulting in lower construction and in-use costs. A complex building shape with a large external surface area in relation to the floor area requires a larger envelope than a more compact building. This measure of efficiency can be referred to as the 'wall to floor ratio', or the 'heat loss form factor'. This requires a greater use of materials to create the envelope, and a potentially greater heating and/or cooling load to manage the internal environment.	A1, B1, D
8	Regenerative design	Removing CO2 from the atmosphere through materials and systems absorbing it makes a direct contribution to carbon reduction. Examples include unfinished concrete, some carpet products and maximising the amount of vegetation.	A1, B1, D
9	Designing for durability & flexibility	Durability means that repair and replacement is reduced which in turn helps reduce life-time building costs. A building designed for flexibility can respond with minimum environmental impact to future changing requirements and a changing climate, thus avoiding obsolescence which also underwrites future building value. Building designed with this principle in mind will be less likely to be demolished at the 'end of life' as they lend themselves to future refurbishment. Examples include buildings being designed with 'soft spots' in	A1-A5, B1-B5, C1-C4, D
		floors to allow for future modification and design as well as non-structural internal partitions to allow layout change.	
10	Optimisation of the relationship between operational and embodied carbon	Optimising the relationship between operational and embodied emissions contributes directly to resource efficiency and overall cost reduction. For example, the use of insulation has a clear carbon benefit whereas its fabrication has a carbon cost. This means that it is important to look not only at the U-value of insulation, but also the carbon cost of the manufacture and installation of different product options. Avoiding fully glazed facades will reduce cooling demand and limits the need for high-carbon materials (glass units, metal frame, shading device etc) both at the construction stage, and the 'in use' stage through wholesale replacements.	A1-A5, B1-B6
11	Building life expectancy	Defining building life expectancy gives guidance to project teams as to the most efficient life expectancy choices for materials and products. This aids overall resource efficiency, including cost efficiency and helps future proof asset value.	A1-A5, B1-B5, C1-C4, D
12	Local sourcing	Sourcing local materials reduces transport distances and therefore supply chain lengths and has associated local social and economic benefits, e.g. employment opportunities. It also has benefits for occupiers as replacement materials are easier to source. Transport type is also highly relevant. A product transported by ship will have a significantly lower carbon cost per mile than one sent by HGV. A close understanding of the supply chain and its transport processes is therefore essential when selecting materials and products.	A1-A5, B3-B4
13	Minimise waste	Waste represents an unnecessary and avoidable carbon cost. Buildings should be designed to minimise fabrication and construction waste, which helps reduce initial and in-use costs. This can be achieved through the use of standard sizes of components and specification and by using modern methods of construction. Where waste is unavoidable, the designers should establish the suppliers' processes for disposal or preferably reuse of waste.	A1-A5, B1-B7, C1-C4, D
14	Efficient fabrication	Efficient construction methods (e.g., modular systems, precision manufacturing and modern methods of construction) can contribute to better build quality, reduce construction phase waste and reduce the need for repairs in the post completion and defects period (snagging). Such methods can also enable future disassembly and reuse with attendant future carbon benefits.	A1-A5, B1-B7, C1-C4, D
15	Lightweight	Lightweight construction uses less material which reduces the carbon footprint of the building as there is less material to source, fabricate and deliver to site. Foundations can then also be reduced with parallel savings. Lightweight construction can also be easier to design for future disassembly and reuse. The benefits of lighter construction should be seen in the context of other principles such as durability.	A1-A5, C1-C4, D
16	Circular economy	The circular economy principle focusses on a more efficient use of materials which in turn leads to financial efficiency. Optimising recycled content, reuse and retrofit of existing buildings, and designing new buildings for easy disassembly, reuse and retrofit, and recycling as equivalent components for future reuse is essential. The use of composite materials and products can make future recycling difficult. Where such products are proposed, the supplier should be asked for a method statement for future disposal and recycling.	C1-C4, D