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WHOLE LIFE CARBON REPORT

Thames Young Mariners – Outdoor Learning Centre

Surrey County Council

R001TNR - 01

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Document History

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Surrey Outdoor
Learning & Development

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1. Introduction

This report encompasses the Whole Life Carbon Assessment results required for the purposes of the Greater London Authority Planning Requirements. The outdoor learning centre, Thames Young Mariners (TYM), requires redeveloping to bring the site up to current health and safety standards with modern, fit for purpose facilities which will allow SOLD to increase its service capacity and strengthen its commercial operation for Surrey County Council.

Surrey Outdoor Learning & Development (SOLD) is a unique service provided by Surrey County Council, which runs outdoor learning programmes from three sites: Henley Fort near Guildford, High Ashurst in the Surrey Hills, and Thames Young Mariners, a water activity venue on the Thames between Richmond and Kingston.

It is important to note that this should be read in conjunction with the following documents: Circular Economy Statement & Template, Whole Life Carbon Assessment Template, and Pre-demolition Waste Audit.

1.1 Whole Life Carbon Emissions

As defined by the London Plan Guidance document, Whole Life Carbon (WLC) Emissions are the total carbon emissions resulting from the construction and use, over the specific building's life span – this includes demolition and disposal.

1.2 Scope of a WLC Assessment

The WLC of a building refers to the carbon associated with the building's 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.

1.2.1 Life Cycle Modules

The WLC assessment is broken down into 4 overarching modules, A, B, C & D. As per the guidance in BS EN 15978 and RICS PS – those 4 overarching modules are further split as shown in Table 1.

This WLC Assessment complies with the planning requirements laid out Policy SI 2, in that it covers all the associated life cycle modules.

Additionally – the modules are assessed under the 60-year life expectancy of the building.

Module	Stage	Sub-Category
A1	Product	Raw Material Supply
A2		Transport
A3		Manufacturing
A4	Construction Process	Transport
A5		Construction/Installation
B1	Use	Use
B2		Maintenance
B3		Repair
B4		Replacement
B5		Refurbishment
B6		Operational Energy Use
B7		Operational Water Use
C1	End-of-Life	Deconstruction/Demolition
C2		Transport
C2		Waste Processing
C4		Disposal
D	Beyond the Building Lifecycle	Reuse, Recovery and Recycling Potential

Table 1: Life Cycle Modules

1.2.2 Scope of Material

This assessment is for planning therefore the materials and their quantities are provided by the project team for the building's Concept Design (RIBA 2) quantities. Due to the nature of the framework that Surrey County Council follow, specification of brand names or unique identifies is not permitted at this stage. Therefore instead, using the information provided by the design team, the best material fit was used to perform the WLC.

A full breakdown of what materials were requested from the Design Team can be Found in Table 2.

Building Element Group	Building element (NRM level 2)
Demolition	0.1 Toxic/hazardous/contaminated material treatment
	0.2 Major demolition works
0 Facilitating works	0.3 & 0.5 Temporary/enabling works
	0.4 Specialist groundworks
1 Substructure	1.1 Substructure
2 Superstructure	2.1 Frame
	2.2 Upper floors incl. balconies
	2.3 Roof
	2.4 Stairs and ramps
2 Superstructure	2.5 External walls
	2.6 Windows and external doors
2 Superstructure	2.7 Internal walls and partitions
	2.8 Internal doors
3 Finishes	3.1 Wall finishes
	3.2 Floor finishes
	3.3 Ceiling finishes
4 Fittings, furnishings and equipment (FF&E)	4.1 Fittings, furnishings & equipment incl. building-related and non-building-related.
5 Building services/MEP	5.1–5.14 Services incl. building-related and non-building-related
6 Prefabricated Buildings and Building Units	6.1 Prefabricated buildings and building units
7 Work to Existing Building	7.1 Minor demolition and alteration works
8 External works	8.1 Site preparation works
	8.2 Roads, paths, pavings and surfacings
	8.3 Soft landscaping, planting, and irrigation systems
	8.4 Fencing, railings, and walls
	8.5 External fixtures
	8.6 External drainage
	8.7 External services
	8.8 Minor building works and ancillary building

Table 2: Material List Breakdown

1.2.3 Scope Clarifications

SOLD have a specialist procurement process for interior furniture's and fixings which is focused on a centralised database held by the council. Council buildings can pick the items they would like to have in their building from this list. Because of this, Building Group 4 has been omitted at this stage. Additionally, Building Element Groups 6 (Prefabricated Buildings and Building Units) and 7 (Work to Existing Building) have been omitted as they do not appear in this development.

1.3 Description of WLC Assessment Tool

The calculations were performed with One Click LCA calculation tool. The software has been verified to be IMPACT equivalent by BRE. One Click LCA has also been third party verified by ITB for compliancy with the following LCA standards: EN 15978, ISO 21931–1 and ISO 21929, and data requirements of ISO 14040 and EN 15804. ITB is a certification organization and a Notified Body (EC registration nr. 1488) to the European Commission designated for construction product certification. Polish Accreditation Board assures the independence and impartiality of ITB services (Accreditation Certificates are: AB 023, AC 020, AC 072, AP 113). ITB activities are conducted in accordance with the requirements of the following assurance standards: ISO 9001, ISO/IEC 27001, ISO/IEC 17025, EN 45011, and ISO/IEC 17021.

2. Whole Life Carbon Assessment – Brief

The following assessment is for the 5 buildings on the SOLD TYM Site, Main Building + Staff Accommodation (B1), 3No. Guest Residential Accommodation (B2), Champing Changing Block (B4). An individualised Breakdown can be found in Table 3, for the purposes of this Assessment the buildings are considered 1 whole building with the combined GIA.

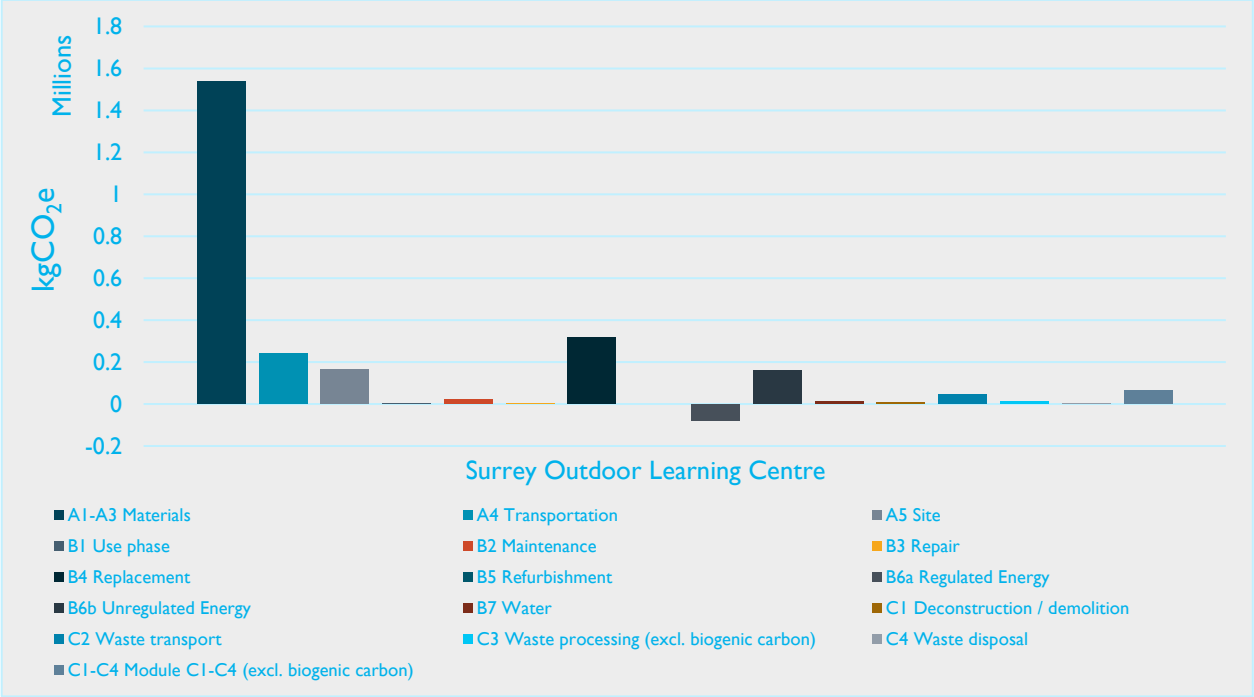
Building Code	Building Provision	Approx GIA / m^2	Quantity	Total Area / m^2
B1	Main Building + Staff Accommodation	1009	1	1009
B2	Guest Residential Accommodation	255	3	765
B4	Camping Changing Block	200	1	200
BALL	Site Wide	N/A	5	1974

Table 3: Building Breakdown

The materials chosen in this assessment account for the entire capital cost of this development in its current (RIBA 2) form. We do expect this to change as the design progresses further into the detailed design.

3. Whole Life Carbon Assessment – Results

OneClick's breakdown of the Proposed Planning Design for Thames Young Mariners is as follows. These numbers have been calculated with assumptions made from Atkin's TM 54 report as well as the Be Lean and Be Green BRUKLs. Additionally, as data is scarce on the Building Services Life Cycle Analysis – the CIBSE TM65 guidance has been used with examples from commonly chosen manufacturers for the information.



Category	$kgCO_2e$	Category	$kgCO_2e$
A1-A3 Materials	1,536,625.249	B6a Regulated Energy	-80,444.5848
A4 Transportation	239,227.5638	B6b Unregulated Energy	160,889.1696
A5 Site	163,524.7742	B7 Water	13,510.27891
B1 Use phase	4,460	C1 Deconstruction / demolition	6,711.6
B2 Maintenance	19,393.77587	C2 Waste transport	45,606.41649
B3 Repair	4,848.443968	C3 Waste processing (excl. biogenic carbon)	13,643.23216
B4 Replacement	318,841.1176	C4 Waste disposal	221.2189863
B5 Refurbishment	0	C1-C4 Module C1-C4 (excl. biogenic carbon)	66,182.46764

Table 4: LCA Module Breakdown

Similar to most designs the A1-A3 module (read left to right on the graph) is the largest contributor – whilst this is typical, the relative size when compared to the other modules leaves room for improvement. Planning requires the design's Life Cycle modules are compared against their Benchmarks. At this stage, the project has a greater $kgCO_2e$ than the WLC benchmarks. Note that this is only at the current stage of the project, meaning there is still opportunity to adjust the design in order to meet the benchmarks – please see 'Next Steps' section for further details.

3.1 Whole Life Carbon Benchmarks

	Module A1-A5 (excluding sequestered carbon)	Modules B-C (excl B6 & B7)	Modules A-C (excl B6 & B7; including sequestered carbon)	Module B1-B5	Module B6-B7	Module C1-C4	Module D
TOTAL kg CO_2e	1985118.23	1226108.127	2494480.687	347542.8874	93954.8628	878565.24	-1027837.76
TOTAL kg $CO_2e/m2$	1005.632335	621.1287373	1263.668028	176.0602267	47.59618176	445.0685106	-520.6878217
WLC Benchmark	<850	<350	<1200	N/A	N/A	N/A	N/A
Aspirational WLC Benchmark	<500	<300	<800	N/A	N/A	N/A	N/A

Table 5: Whole Life Carbon Benchmarks for the type of building

3.2 Significant Material Contributor

As the A1-A3 Module is the greatest contributor we must look at the materials of the design in order to identify changes.

Below is a table which highlights the materials with the largest impact on the design:

Material	RICS Category as per WLC assessment	tCO_2e Contributions	Building
Structural Concrete	1.1.1	388	All
Structural Timber	2.5.1	45	Building 1
Architectural Concrete	2.2.1	76	Building 1
Concrete Slabs	2.2.1	97	Building 1 & 2
Steel Curtain Walling	2.5.1	641	All

Table 6: Highest Material Contributors

As you can see, the contributions are not limited to any particular building. This shows a project-wide need to lower the embodied carbon of the buildings.

4. Next Steps

As this project's design has a greater Whole Life Carbon than the benchmarks set by the GLA, it is strongly advised that meetings between the design team and client occur in order to further develop the design to lower its embodied carbon footprint. It is important to note that as this building is aspiring to Net Zero, the renewable technologies chosen will have an impact but, as Table 6 highlights, the Embodied carbon of the Building Services and Technologies are not the largest contributors.

Additionally, this WLC will need to be repeated again at the post-construction stage and it is advised that all items being specified or designed are recorded with their quantities and any Environmental Product Declarations that can be used are used.

5. Conclusion

The design in its current form, with assumptions around building services thanks to TM65, has higher embodied carbon per m^2 than the Whole Life Carbon Benchmarks. While not significantly higher than these benchmarks, it is important for the design team to recognise that only through their design can the embodied carbon of the building decrease.

The aim of this report while to highlight where the design is, is to also provide insight into the largest contributors to the embodied carbon of the design. It is hoped that from these the necessary changes can be made in order to facilitate reaching the GLA WLC benchmarks.

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