REPRODUCTION SHEET

Brock Commons Tallwood House

An 18-storey hybrid mass timber student residence, University of British Columbia

Location	Vancouver, British Columbia, Canada
Completed	August 2017
Use	Student residence (404 beds)
Gross floor area	15,120 m²
Storeys	18
Owner / developer	University of British Columbia
Architect	Acton Ostry Architects Inc.
Structural engineer	Fast + Epp
LCA practitioner	Athena Sustainable Materials Institute (Matt Bowick, author)
LCA standard applied	EN 15978:2011, 100-year reference study period
Certification	LEED Gold
Wood supplier	Structurlam Products
Wood origin / forest type	British Columbia interior softwood, long-rotation managed forest

§ 1 — PUBLIC SOURCES

Disclosure source documents

• **Athena EBD (Bowick 2018)**
https://www.naturallywood.com/wp-content/uploads/Tallwood_House_Environmental_Declaration_20180608.pdf

• **Canadian Wood Council case study**
https://cwc.ca/wp-content/uploads/2018/04/CS-BrockCommon.Study_.8.pdf

§ 2 — DISCLOSED FIGURES

What was published

Item	Value	Unit
Timber volume (CLT + glulam + NLT)	2,233	m³
Carbon stored in wood (biogenic)	1,753	tCO■e
Substitution credit (avoided emissions)	679	tCO■e
Total disclosed wood 'carbon benefit'	2,432	tCO■e
Whole-building 100-yr GWP	29,900	tCO■e

Whole-building per GFA	1,977 kg CO■e/m²

§ 3 — BOUNDARY STATEMENT

What is excluded, in the disclosure's own words

On excluded module B1.

> *"B1: there is currently insufficient consensus in terms of methodology and data to practically quantify these effects for all products used in the building."*
>
> — Athena EBD, p. 13

On end-of-waste allocation.

> *"This assessment assumes that once the material is either [1] separated for recycling, reuse, or energy recovery purposes or [2] disposed of (i.e. either via landfill or incineration), it has reached its end-of-waste state."*
>
> — Athena EBD, p. 14

§ 4 — DRL RECOMPUTATION INPUTS

Every input used in the corrected calculation

Input	Value	Source / band
Timber volume	2,233 m³	Building's own disclosure
A1–A3 manufacturing factor	0.18 tCO■e/m³	Athena/FPInnovations mid-range
Biogenic storage factor	0.917 tCO■e/m³	EN 15978 convention
SOC efflux factor	0.12 tCO■e/m³	Band: mid
EOL methane fraction	12% biogenic C as CH■	Band: ximenes
Foregone seq. factor	0.95 tCO■e/m³	Band: yr100

§ 5 — ARITHMETIC, LINE BY LINE

Every step of the recomputation, showing the calculation

Line	Calculation	Result
A1–A3	2,233 × 0.18	+402 tCO■e
Biogenic storage (industry credit)	2,233 × 0.917	−1,753 tCO■e
Disclosed net (A1–A3 − biogenic)	**Sum of lines above**	**−2,030 tCO■e**
+ SOC efflux	2,233 × 0.12	+268 tCO■e
+ EOL methane	1,753 × 0.12 × (16/44) × 27.9	+2,134 tCO■e
+ Foregone sequestration	2,233 × 0.95	+2,121 tCO■e

Full-boundary total	**A1–A3 + SOC + EOL + Foregone**	**+4,925 tCO■e**
Delta vs. disclosed	**Full-boundary − disclosed_net**	**+6,956 tCO■e**

§ 6 — EMISSION FACTOR LIBRARY

Every factor used here, with its source

The factors below are the same library used by the live mini-calculator on the building's web page. Default factor values are mid-range and sourced; low and high alternatives are also available. Anyone challenging this recomputation can do so by naming a specific factor and substituting an alternative value with a citation; the math will recompute.

Factor	Value	Source
Biogenic storage	0.917 tCO2e per m3	EN 15978 convention: ~0.25 tC/m3 softwood timber x 44/12 to CO2e.
A1-A3 manufacturing	0.13 to 0.25 tCO2e per m3, default 0.18	Athena Sustainable Materials Institute EPDs; FPInnovations data.
SOC efflux — Low	0.06 tCO2e per m3	Achat et al. 2015, Forest Ecology and Management.
SOC efflux — Mid	0.12 tCO2e per m3	James & Harrison 2016, Forests (meta-analysis: 11% SOC loss).
SOC efflux — High	0.20 tCO2e per m3	Mayer et al. 2020, Forest Ecology and Management.
EOL methane — IPCC default	3% of biogenic C as CH4	EN 15978 default; very low landfill diversion.
EOL methane — Ximenes	12% of biogenic C as CH4	Ximenes et al. 2008, Carbon Balance and Management.
EOL methane — Wang	18% of biogenic C as CH4	Wang et al. 2013, Waste Management (long-term decay).
CH4 conversion to CO2e	x 16/44 (mass) x 27.9 (GWP100)	IPCC AR6 WG1 Ch.7 Table 7.15.
Foregone seq — 50 yr	0.45 tCO2e per m3	Stephenson 2014; reduced for beetle-kill salvage.
Foregone seq — 100 yr	0.95 tCO2e per m3	Stephenson 2014, Nature; Luyssaert 2008.
Foregone seq — 200 yr	2.00 tCO2e per m3	Long-rotation full-cycle estimate.

§ 7 — METHODOLOGICAL NOTES

Calibrations and assumptions specific to this building

• Biogenic-storage line uses the EN 15978 convention factor of 0.917 tCO2e per m3 of softwood timber, which corresponds to ~0.25 tC stored per m3 multiplied by 44/12 to convert C to CO2e.

• End-of-life methane line uses 12% of biogenic carbon released as CH4 in landfill (Ximenes 2008 measured value), multiplied by 16/44 to convert C mass to CH4 mass, then by IPCC AR6 GWP100 of 27.9.

• Foregone-sequestration window is set to 100 years to match the EN 15978 reference study period of the source EBD. This is a methodological choice that can be challenged; the calculator allows 50-yr and 200-yr alternatives.

• SOC efflux factor of 0.12 tCO2e per m3 harvested timber is mid-range from James & Harrison 2016 meta-analysis (11% average SOC loss in top 30 cm), normalised to typical BC interior plantation yield of ~250 m3/ha.

§ 8 — CITATIONS

Peer-reviewed and primary-source references

Bowick, M. (2018). Brock Commons Tallwood House — An Environmental Building Declaration According to EN 15978. Athena Sustainable Materials Institute.

EN 15978:2011. Sustainability of construction works — Assessment of environmental performance of buildings — Calculation method. European Committee for Standardization.

Stephenson, N. L., et al. (2014). Rate of tree carbon accumulation increases continuously with tree size. Nature, 507(7490), 90–93.

Luyssaert, S., et al. (2008). Old-growth forests as global carbon sinks. Nature, 455(7210), 213–215.

James, J. & Harrison, R. (2016). The effect of harvest on forest soil carbon: a meta-analysis. Forests, 7(12), 308.

Achat, D. L., et al. (2015). Forest Ecology and Management, 348, 124–141.

Mayer, M., et al. (2020). Tamm Review: Influence of forest management activities on soil organic carbon stocks. Forest Ecology and Management, 466, 118127.

Ximenes, F. A., et al. (2008). Greenhouse gas balance of native forests in NSW, Australia. Carbon Balance and Management, 3(1), 1–13.

Wang, X., et al. (2013). Methane emissions from landfills. Waste Management.

IPCC (2021). Sixth Assessment Report, WG1, Ch. 7, Table 7.15 — methane GWP■■■ = 27.9.

Searchinger, T. D., Peng, L., et al. (2023). Re-evaluating the climate effects of biofuels and bioenergy. Nature, 619, 64–73. doi:10.1038/s41586-023-06187-1

§ 9 — AUDITOR'S NOTE

This Reproduction Sheet is audit working papers. It is intended to be checked, disputed, and corrected.

If any input on this page is wrong — the timber volume, the boundary statement, the emission factor band — please write. The feedback channel logs every submission with timestamp. A correction will be published on the building's page and a revised version of this sheet will be issued. The purpose of this document is not to be unchallengeable. It is to be challengeable line by line.

Auditor: Murphy O'Neal **Version:** 1.0 **Reference framework:** Divergent Resource Logic (DRL), full-boundary accounting framework.
Status: Pre-publication draft. To be reviewed by counsel before public release.