Technical Appendix 9.6: Peat Carbon Emission Calculator

Glendye Wind Farm Overhead Line Grid Connection

Scottish & Southern Electricity Networks (SSEN) Transmission

Prepared by:

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Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1.0	3 October 2025	C. Marshall	A. Huntridge	G.Robb
2.0	9 October 2025	C. Marshall	A. Huntridge	G.Robb

Basis of Report

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1.0 Introduction

1.1 General

SLR Consulting Ltd (SLR) was commissioned Scottish & Southern Electricity Networks (SSEN) Transmission (the Applicant) to prepare a Peatland Carbon Emission Calculator for the proposed Glendye Windfarm Overhead Line Grid Connection (the "Proposed Development").

This Peatland Carbon Emission Calculator considers the Proposed Development which is located linearly between NO 78729 85831 and NO 60899 80043, approximately 5 km northwest from the village of Fettercairn and approximately 12 km southwest from the village of Strachan, Aberdeenshire. The Proposed Development is located across areas of open moorland, commercial forestry and improved arable grassland.

The work has been undertaken by a team of Peatland Specialists and Geologists, with over 18 years' experience in undertaking peat assessments and was undertaken by Dr. Chris Marshall, Principal at SLR. Chris holds a BSc (hons) Environmental Geology, an MSc in Geochemistry and a PhD in Earth Sciences, with 10 years of experience in peatland condition, restoration monitoring and assessment, including peer reviewed scientific papers, policy documents, governmental reports and membership of scientific and technical advisory groups.

1.2 Proposed Development

The Proposed Development is driven by the need to connect the consented Glendye Wind Farm[1] to the electricity transmission network at Fetteresso substation. The Proposed Development would comprise of approximately 19 km of new single circuit 132 kV overhead line (OHL), supported by steel trident poles. New permanent and temporary access tracks would also be required to facilitate the construction and operation of the Proposed Development.

Full details of the Proposed Development are provided in **Chapter 3: The Proposed Development** of the EIA Report**.**

1.3 Legislation and Guidance

The Peatland Carbon Emission Calculator is based on the SSE assessment methodology[2] and is aimed at ensuring proposed transmission developments are assessed to determine their net carbon impacts associated with disturbance to peat soil and peaty soils as required by the National Planning Framework (NPF4[3]) as detailed below.

Requirements of National Planning Policy 4

The intent of Policy 5 (Soils) of National Planning Policy 4 (NPF4[3]) is "*to protect carbon-rich soils, restore peatlands and minimise disturbance to soils from development*".

5(c) confirms that *"development proposals on peatland, carbon rich soils, and priority peatland will only be supported for:*

[1] S36 Consented Development - ECU Section 36 Ref: ECU00000676

[2] WSP. Assessment methodology: Emissions from peatland disturbance. SSEN Transmission ASTI EIA Framework. 30/10/2024

[3] Scottish Government (2023). https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2022/11/national-planning-framework-4-revised-draft/documents/national-planning-framework-4-revised-draft/national-planning-framework-4-revised-draft/govscot%3Adocument/national-planning-framework-4-revised-draft.pdf

- *essential infrastructure and there is a specific locational need and no other suitable site;*
- *the generation of energy from renewable sources that optimises the contribution of the area to greenhouse gas emissions reductions targets;*
- *small-scale development directly linked to a rural business, farm or croft;*
- *supporting a fragile community in a rural or island area; or*
- *restoration of peatland habitats."*

And 5(d) confirms that "*where development on peatland, carbon-rich soils or priority peatland habitat is proposed, a detailed site specific assessment will be required to identify:*

- *the baseline depth, habitat condition, quality and stability of carbon rich soils;*
- *the likely effects of the development on peatland, including on soil disturbance; and*
- ***the likely net effects of the development on climate emissions and loss of carbon."***

Policy 5 also confirms that the site specific assessment mentioned above at 5(d) "*should inform careful project design and ensure, in accordance with relevant guidance and the mitigation hierarchy, that adverse impacts are first avoided and then minimised through best practice.*

A peat management plan will be required to demonstrate that this approach has been followed, alongside other appropriate plans required for restoring and/ or enhancing the site into a functioning peatland system capable of achieving carbon sequestration".

1.4 Objectives

This report aims to provide an outline calculation and assessment of the net peat carbon emissions from the Proposed Development utilising site specific information as detailed in Section 2.0 and within the SSE methodology[2], which is summarised within the calculation sheet provided in Annex A.

2.0 Peat Carbon Balance Assessment

2.1 Impacts to Peatland

2.1.1 Baseline Data

The Proposed Development is located on areas of peat and carbon rich soils, which have been confirmed through multiple phases of peat depth and condition surveys, augering and geomorphological mapping, as detailed within **Technical Appendix 9.1: Peat Landslide Hazard Risk Assessment (PLHRA)**, **Technical Appendix 9.2 Peat Management Plan PMP,** and **Technical Appendix 9.3 Peatland Condition Assessment** with NVC mapping recording peatland habitats as discussed in detail within **Chapter 7: Ecology**.

Based on the review of the information detailed above, the Proposed Development will have both direct and indirect impacts to peatland through excavation of peat and carbon rich soils to facilitate construction and operation of the Proposed Development.

The site specific baseline data from the sources above has been used to complete all inputs and outputs which are provided in **Annex A**, with further details on these inputs and any assumptions used within the assessment detailed below.

2.1.2 Direct and Indirect Impacts and Inputs

In accordance with current guidance[4] on assessing impacts to peatland, the following criteria and assumptions have been used to determine direct and indirect impacts on peatland and used within the calculations provided in **Annex A**;

- Direct Impacts to Peatland – for areas of excavation and average depth of peaty soils and peat soils within the Proposed Development Area footprint as listed below:
  - Transmission Poles
  - New access tracks
  - Upgraded access tracks
- Indirect Impacts – 30 m buffer area from the Direct Impact areas detailed above and average depth of peaty soils and peat soils, assuming indirect impacts to peatland by the loss of function.
- The Proposed Development Peatland Condition Class used for the directly and indirectly impacted peatland is ‘Drained: Artificial’, based on the current land use comprising hill drains and haggs and gulleys
- Restored Peatland Condition Class included in this peat carbon assessment constitutes redressing and restoration of peat around permanent and temporary infrastructure locations as detailed in **Technical Appendix 9.2 Peat Management Plan**.
- Additional peatland restoration or compensation is excluded from the peat carbon assessment as the proposals for this are not currently finalised and are not included in this EIA.

[4] NatureScot (2023) Advising on peatland, carbon-rich soils and priority peatland habitats in development management. Available at: NatureScot website (Accessed: 9 October 2025)

2.2 Results

2.2.1 No Impact Scenario

The No Impact Scenario calculates the pre-construction baseline condition and future peatland emissions for the Proposed Development over the lifetime of the project. This assumes, there was no development and carbon emissions from the peatland continued at the rate of the current Peatland Condition Classes present such as Modified, Drained Artificial, Drained Hagg Gulley and Actively eroding gulleys.

The results of the No Impact Scenario indicated that there would be a reduction in the carbon storage within the peatland by-12804.0 t CO_2 equivalent over the 50 year longer term.

2.2.2 Project Impact Scenario

The Project Impact Scenario calculates the peatland emissions for the Proposed Development assuming the construction of the Proposed Development and considering temporary construction impacts as well as the impacts on carbon emissions from the Proposed Development following reinstatement to peatland of Modified condition, considering both short term (2-5 years) and long term (50 years) timescales.

Based on the construction of the Proposed Development and associated enhancement detailed in Technical Appendix 9.2 Peat Management Plan, there would be a reduction in the Carbon Flux rate from the pre-construction baseline of 52.2 tCo2e/5 years and a reduction in carbon storage within the peatland of -2761.2 t CO_2e over the 50 year longer term.

3.0 Conclusions

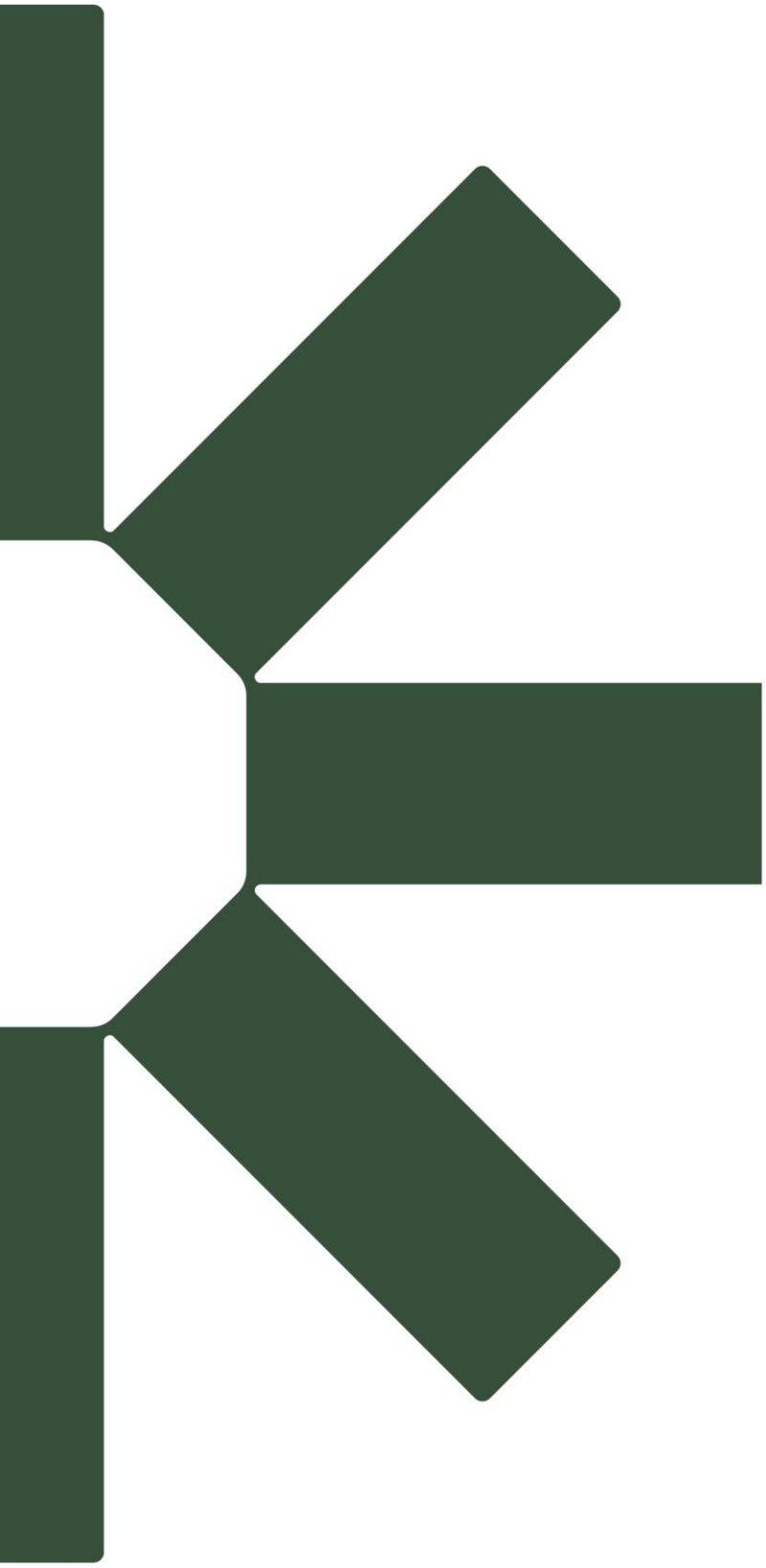
The calculation of peat carbon emissions from the peatland within the area of the Proposed Development using site specific survey data and the assessment methodology[2] for the Proposed Development, has indicated that the carbon emissions would remain stable with development and enhancement. There would be a slight net decrease of carbon emissions when compared to the carbon emissions for the current peatland condition class, assuming no development.

Annex A Peat Carbon Emission Calculator

Glendye Wind Farm Overhead Line Grid Connection

Scottish & Southern Electricity Networks (SSEN) Transmission

SLR Project No.: 428.013097.00001



Making Sustainability Happen

1. Instructions

This MS Excel document is designed to support the assessment of carbon emissions from peatland disturbance as part of the SSEN Transmission ASTI EIA Framework. Further detail on the associated Scottish Government policies are provided in the WSP Emissions from Peatland Disturbance Assessment Methodology MS PowerPoint (November, 2024).

This calculator has been developed in line with NatureScot guidance "*Advising on peatland, carbon-rich soils and priority peatland habitats in development management" (2023), the "Calculating potential carbon losses and savings from wind farms on Scottish peatlands*" (2018) guidance and the Peatland Code Emissions Calculator. The calculator should be used in conjunction with the WSP Emissions from Peatland Disturbance Assessment Methodology MS PowerPoint (November, 2024).

The Tool consists of the following tabs:

1. Results Summary Table: A table providing the outputs of the assessment in a format designed to be incorporated into a technical note appended to the soils and hydrology chapter of the EIA. Values are auto populated from the values entered into Sheets 2. Baseline Calculation and 3. Post Construction Calculation.
Please note a negative value for emissions indicates a net loss of carbon and overall emissions to the environment.

2. Baseline Calculation: Enter the required information under the three categories of impacted peatland (Direct Impacts, Indirect impacts and no impacted) in the green cells. Definitions of these categories are provided in the NatureScot guidance referenced above. The carbon stored within the peatland is calculated in accordance to the methodology provided in the Calculating potential carbon losses and savings from wind farms on Scottish peatlands guidance document (see Reference Values sheet). Peatland condition in alignment with the Peatland Carbon code should also be entered into the table where known. Expected ranges and default values are provided.
Enter a value of 0 for all cells where no data is available or relevant.
A complete loss of carbon is assumed for any Peatland included within the directly impacted category.

3. **Post Construction Calculation:** Enter the required information under the three categories of impacted peatland (Restored, Indirect impacts and no impacted) in the green cells. Note *Directly impacted Peatland* is excluded from this sheet as it is presumed to be lost during construction. Both a short term and long term data entry option is provided to allow for slower anticipated restoration of peatland condition post construction. If no change is expected post construction, replicate the short term inputs in the long term data input section as well.

4. **Reference Values:** This sheet provides the source values used within the tool and the source for calculation equations.

Version Control

Version	Name	Author	Checker	Date
V1.0	Version 1	Ben O'Hickey	Gareth Oakley	11-11-2024
V2	Version 2	Ben O'Hickey	Gareth Oakley	28-01-2025
V3	Version 3	Ben O'Hickey	Clara Mitchell	18-02-2025

2. Baseline Data Input

Scenario	Carbon Values reported	Pre-Construction	Future Baseline (5 years)	Future Baseline (50 years)	N/A		Overall Change (50 Years)
No Impact scenario	Carbon Storage (tCO_2e)	28983.2	27702.8	16179.2			-12804.0
	Carbon Flux rate (tCO_2e per 5 years)	-256.08	-256.08	-256.08			0.0

Scenario	Carbon Values reported	Pre-Construction Baseline	During Construction	Post Construction (short term, 2-5 years)	Post Construction (Long term, 50 years)		Overall Change (50 Years)
Project Impact scenario	Carbon Storage (tCO_2e)	28983.2	26222.0	28983.2	26222.0		-2761.2
	Carbon Flux rate (tCO_2e per 5 years)	-256.08	-231.68	-203.89	-203.89		52.2

3. Baseline Data Input

Require values to be added

Auto calculates based off input values.

Carbon Storage / removed Calculation (tCO_2e)

Directly Impacted	Expected Range	Suggested Default value		Indirectly Impacted		Not Impacted		Baseline Total	
Total Area of Peat impacted (m^2)			17107	Total Area of Peat impacted (m^2)	162460	Total Area of Peat (m^2)		Total Area of Peat impacted (m^2)	179,567
Average depth of Peat surveyed (m)	0 -10	5m	0.6	Average depth of Peat surveyed (m)	0.6	Average depth of Peat surveyed (m)		Average depth of Peat surveyed (m)	0.6
Volume of Peat Removed (m^3)			10264.2	Volume of Peat Impacted (m^3)	97476	Volume of Peat Impacted (m^3)	0	Volume of Peat Impacted (m^3)	107740.2
Carbon Content of Dry Peat (%)	19% - 65%	42%	42%	Carbon Content of Peat (%)	42%	Carbon Content of Peat (%)	42%	Carbon Content of Peat (%)	42%
Bulk Density of Peat (kg/m^3)	50 - 300	175	175	Bulk Density of Peat (kg/m^3)	175	Bulk Density of Peat (kg/m^3)	175	Bulk Density of Peat (kg/m^3)	175
Carbon Loss (kg)			754418.7	Carbon Loss (kg)	7164486	Carbon Loss (kg)	0	Carbon Loss (kg)	7918904.7
Total CO_2e Value			2761.172442	Total CO_2e Value	26222.01876	Total CO_2e Value	0	Total CO_2e Value	28983.1912

Carbon Emissions Calculation (tCO_2)

Enter the total area of peatland that meets each of the Peatland Carbon Code condition criteria (m^2)

Directly Impacted	Area (m^2)	Emissions (tCO_2e / 5 years)	Indirectly Impacted	Area	Emissions (tCO_2e / 5 years)	Not Impacted	Area	Emissions (tCO_2e / 5 years)	Baseline Total	Area	Emissions (tCO_2e / 5 years)
Actively Eroding: hagg gully	273.712	-2.42508832	Actively Eroding: hagg gully	2599.36	-23.0303296	Actively Eroding: hagg gully	0	0	Actively Eroding: hagg gully	2873.072	-25.45541792
Actively Eroding: Flat Bare		0	Actively Eroding: Flat Bare		0	Actively Eroding: Flat Bare	0	0	Actively Eroding: Flat Bare	0	0
Drained: Artificial	2617.371	-4.34483586	Drained: Artificial	24856.38	-41.2615908	Drained: Artificial		0	Drained: Artificial	27473.75	-45.60642666
Drained: Hagg/Gully	5149.207	-6.462254785	Drained: Hagg/Gully	48900.46	-61.3700773	Drained: Hagg/Gully	0	0	Drained: Hagg/Gully	54049.67	-67.83233209
Modified	8895.64	-11.1640282	Modified	84479.2	-106.021396	Modified	0	0	Modified	93374.84	-117.1854242
Near Natural		0	Near Natural	0	0	Near Natural	0	0	Near Natural	0	0
		-24.39620717			-231.6833937			0	Total		-256.0796009

3. Postconstruction Data Input

Short Term Calculation

Require values to be added

Auto calculates based off input values.

Carbon Storage / removed Calculation (tCO_2)

Restored Peatland	Expected Range	Default values		Indirectly Impacted		Not Impacted		Post Construction Total	
Total Area of Peat impacted (m^2)			162460	Total Area of Peat impacted (m^2)		Total Area of Peat (m^2)	0	Total Area of Peat impacted (m^2)	162460
Average depth of Peat surveyed (m)	0 -10	5m	0.6	Average depth of Peat surveyed (m)		Average depth of Peat surveyed (m)	0.6	Average depth of Peat surveyed (m)	0.6
Volume of Peat Removed (m^3)			97476	Volume of Peat Impacted (m^3)	0	Volume of Peat Impacted (m^3)		Volume of Peat Impacted (m^3)	97476
Carbon Content of Dry Peat (%)	19% - 65%	42%	42%	Carbon Content of Peat (%)	42%	Carbon Content of Peat (%)	0%	Carbon Content of Peat (%)	0.28
Bulk Density of Peat (kg/cm^3)	50 - 300	175	175	Bulk Density of Peat (kg/m^3)	175	Bulk Density of Peat (kg/m^3)	0	Bulk Density of Peat (kg/m^3)	116.6666667
Carbon Loss (kg)			7164486	Carbon Loss (kg)	0	Carbon Loss (kg)	0	Carbon Loss (kg)	7164486
Total CO_2e Value			26222.01876	Total CO_2e Value	0	Total CO_2e Value	0	Total CO_2e Value	26222.01876

Carbon Emissions Calculation (tCO_2)

Enter the total area of each peatland that meets each of the Peatland Carbon Code Condition (M^2)

Restored Peatland	Area	Emissions (tCO_2e/ 5 years)	Indirectly Impacted	Area	Emissions (tCO_2e / 5 years)	Not Impacted	Area	Emissions (tCO_2e / 5 years)	Post Construction Total	Area	Emissions (tCO_2e / 5 years)
Actively Eroding: hagg gully	0	0	Actively Eroding: hagg gully	0	0	Actively Eroding: hagg gully	0	0	Actively Eroding: hagg gully	0	0
Actively Eroding: Flat Bare	0	0	Actively Eroding: Flat Bare	0	0	Actively Eroding: Flat Bare	0	0	Actively Eroding: Flat Bare	0	0
Drained: Artificial	0	0	Drained: Artificial	0	0	Drained: Artificial	0	0	Drained: Artificial	0	0
Drained: Hagg/Gully	0	0	Drained: Hagg/Gully	0	0	Drained: Hagg/Gully	0	0	Drained: Hagg/Gully	0	0
Modified	162460	-203.8873	Modified	0	0	Modified	0	0	Modified	2E+05	-203.8873
Near Natural	0	0	Near Natural	0	0	Near Natural	0	0	Near Natural	0	0
		-203.8873			0			0			-203.8873

Long Term Calculation

Carbon Storage / removed Calculation (tCO_2)

Restored Peatland	Expected Range	Default values		Indirectly Impacted		Not Impacted		Post Construction Total	
Total Area of Peat impacted (M^2)			162460	Total Area of Peat impacted (m^2)		Total Area of Peat (m^2)	0	Total Area of Peat impacted (m^2)	162460
Average depth of Peat surveyed (M)	0 -10	5m	0.6	Average depth of Peat surveyed (m)	0.6	Average depth of Peat surveyed (m)	0.6	Average depth of Peat surveyed (m)	0.6
Volume of Peat Removed (m^3)			97476	Volume of Peat Impacted (m^3)	0	Volume of Peat Impacted (m^3)		Volume of Peat Impacted (m^3)	97476
Carbon Content of Dry Peat (%)	19% - 65%	42%	42%	Carbon Content of Peat (%)	42%	Carbon Content of Peat (%)	0%	Carbon Content of Peat (%)	0.28
Bulk Density of Peat (kg/m^3)	50 - 300	175	175	Bulk Density of Peat (kg/m^3)	175	Bulk Density of Peat (kg/m^3)	0	Bulk Density of Peat (kg/m^3)	116.6666667
Carbon Loss (kg)			7164486	Carbon Loss (kg)	0	Carbon Loss (kg)	0	Carbon Loss (kg)	7164486
Total CO_2e Value			26222.01876	Total CO_2e Value	0	Total CO_2e Value	0	Total CO_2e Value	26222.01876

Carbon Emissions Calculation (tCO_2)

Enter the total area of each peatland that meets each of the Peatland Carbon Code Condition (m^2)

Restored peatland	Area	Emissions (tCO_2e / 5 years)	Indirectly Impacted	Area	Emissions (tCO_2e / 5 years)	Not Impacted	Area	Emissions (tCO_2e / 5 years)	Post Construction Total	Area	Emissions (tCO_2e / 5 years)
Actively Eroding: hagg gully	0	0	Actively Eroding: hagg gully	0	0	Actively Eroding: hagg gully	0	0	Actively Eroding: hagg gully	0	0
Actively Eroding: Flat Bare	0	0	Actively Eroding: Flat Bare	0	0	Actively Eroding: Flat Bare	0	0	Actively Eroding: Flat Bare	0	0
Drained: Artificial	0	0	Drained: Artificial	0	0	Drained: Artificial	0	0	Drained: Artificial	0	0
Drained: Hagg/Gully	0	0	Drained: Hagg/Gully	0	0	Drained: Hagg/Gully	0	0	Drained: Hagg/Gully	0	0
Modified	162460	-203.8873	Modified	0	0	Modified	0	0	Modified	2E+05	-203.8873
Near Natural	0	0	Near Natural	0	0	Near Natural	0	0	Near Natural	0	0
		-203.8873			0			0			-203.8873

4. Reference Values

Carbon Storage Calculation

Methodology Source: [Calculating potential carbon losses and savings from wind farms on Scottish peatlands Technical Note – Version 2.10.0. 3]

Required Values

Component	Description
Volume of Peat Removed (m^3)	Total volume of peat excavated during construction
Bulk Density of Peat (kg/m^3)	Mass of peat per unit volume
Carbon Content of Peat (%)	Proportion of peat mass that is carbon
Oxidation Factor	Proportion of carbon in removed peat that will oxidize and be released as CO_2
Carbon Loss (kg)	Volume * Bulk Density * Carbon Content * Oxidation Factor

Calculation method

$$L_{\text{removed}} = \frac{3.667}{100} \times pC_{\text{dry peat}} \times BD_{\text{dry soil}} \times V_{\text{direct}}$$

Loss of carbon from the removed peat, R_{emoved} (t CO_2), is calculated from the carbon content of dry peat, pCdrypeat (%), the dry soil bulk density (dried to a constant weight at 105°C), BDdrysoil (g cm^{-3}), and the volume of peat removed, Vdirect (m^3).

Carbon Emissions Calculation

Methodology Source: [Peatland Code Emissions Calculator]

Pre-Restoration (Baseline) Condition Category	Pre-Restoration Emissions (tCO_2e/ha)	Pre-Restoration Emissions (tCO_2e/m^2)
Actively Eroding: hagg gully	-88.60	-0.0089
Actively Eroding: Flat Bare	-88.60	-0.0089
Drained: Artificial	-16.60	-0.0017
Drained: Hagg/Gully	-12.55	-0.0013
Modified	-12.55	-0.0013
Near Natural	-1.60	-0.0002