IUCN National Committee United Kingdom

Peatland Programme

PEATLAND CODE

Field Protocol

Assessing eligibility, determining baseline condition category and monitoring change

Version 2.1

October 2024

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Enquiries relating to the Peatland Code should be sent to: peatlandcode@iucn.org.uk.

Contents

Definitions

The document employs the following definitions:
Shall: represents a mandatory requirement
Should: represents recommendations or best practices that project developers should aim to implement on their projects
May: represents a course of action permissible by the Peatland Code

Raised and blanket bogs[1]

There are three broad peatland types in the UK: blanket bog, raised bog and fen. The first section of the Field Protocol should be followed when restoring raised and blanket bogs, and the second section should be followed when restoring fens.

Bogs

Bogs develop in cool, wet, oceanic climates and are predominantly fed by rainwater (ombrotrophic) and are therefore nutrient-poor and acidic. **Raised bogs** are found in relatively small, isolated areas in the lowlands where peat has accumulated up to 10m over 10,000 years. **Blanket bogs** are extensive areas where peat has formed a mantle across lowland, or more commonly, upland landscapes. **Fens** are found throughout the UK but are often common within a blanket bog and raised bog landscape. Where bog is the predominant peatland type, the methods described for bog within the field protocol should be applied to the whole project area.

Blanket bogs

Blanket bogs are globally rare, but in the UK they form the largest extent of any widespread semi-natural habitat. Typically, they occur in the uplands as mantles of peat over extensive areas but can also be found in the lowlands in the north-western parts of the UK. Healthy blanket bog is mainly composed of bog vegetation fed only by precipitation and is consequently nutrient-poor and acidic.

Raised bogs

Raised bogs are localised domes of peat rising above the surrounding land and are mainly found in the lowlands. They are also fed only by rainwater and are nutrient-poor and acidic. Consequently, the plant species found in raised bogs are similar to those in blanket bogs.

1. Crichton Carbon Centre. *Annex 1 Field Protocol and Guidance, Developing Peatland Carbon Metrics and Financial Modelling to Inform the Pilot Phase UK Peatland Code*. Report to Defra for Project NR0165. 2015.

Assessing Eligibility and Determining Baseline Condition Category

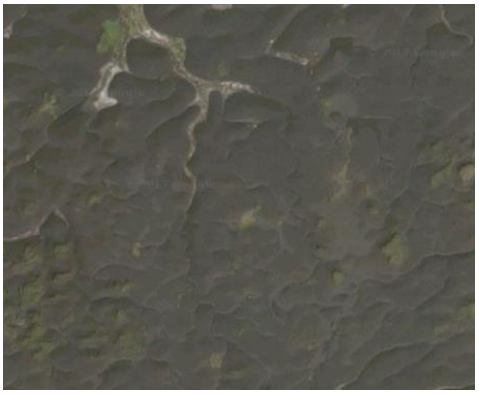
Pre-Restoration (Baseline) Condition Categories for raised and blanket bogs

Note emission factors are valid on peat over 50 cm deep, as well as peat between 30 and 50 cm if it used to be deep peat.

Pre-Restoration Condition Category	Description	Emission Factor ($tCO_2e/ha/yr$)
Actively Eroding: Hagg/Gully	• A linear feature of bare peat that is actively eroding within a hagg/gully system (e.g., steep bare peat cliffs and/or bare gully bottoms) that needs reprofiling OR • Artificial drains which have opened up to the point that they are bare and actively eroding, and require reprofiling	17.72
Actively Eroding: Flat Bare	• Bare peat (e.g., bare peat pan or former peat extraction site) that is actively eroding and requires intervention to revegetate (e.g., re-seeding, geotextiles, etc.)	17.72
Drained: Artificial	• Within 30 m of an active artificial drain (grip)	3.32
Drained: Hagg/Gully	• Within 30 m of an actively eroding hagg/gully drainage system OR • Within 30 m of a vegetated hagg/gully drainage system	2.51

Modified	Evidence present that it is still a degraded system, with exhibiting features that show sub-optimal condition, such as: • No/little *Sphagnum* • *Calluna vulgaris* or other non-bog vegetation (e.g., purple moor grass (*Molinia*)) extensive • Small discrete patches of bare peat frequent (micro-erosion)	2.51
Near Natural*	• *Sphagnum*-dominated • *Calluna vulgaris* not forming dominant canopy but instead rather scattered when viewed from above • Little or no bare peat	0.32

**Ineligible for Peatland Code Restoration - these condition categories may be present within the project site and can be included within the restoration plan, but any claims of emissions reduction as a result of their restoration cannot be validated/verified under the Peatland Code.*

Actively Eroding: Hagg/Gully		
Actively Eroding: Flat Bare		
Drained: Artificial	Within 30m of this type of feature: 	Within 30m of this type of feature: 

	Within 30m of this type of feature:	Within 30m of this type of feature:
Drained: Hagg/Gully		
Modified		
Near Natural		

Assessment Unit Mapping for raised and blanket bogs

The purpose of desk-based mapping using aerial photography and other data sources is to start to identify the peatland condition categories present at a potential project site. This section describes the steps project developers shall take, in sequential order, to produce a map of assessment units on which to base the field survey.

Requirement

Projects shall add the project name, scale, a North arrow, the grid reference of the central point and the access point onto site (if this is relevant) to your map. Projects shall have very distinct colours for the different assessment units and include the method that has been used to create the map (e.g., satellite imagery, drone imagery, etc.).

1.	**Using Google Earth or other digital aerial imagery, produce a base map**	Assume minimum mapping unit for the restoration site, which is 0.01 ha (10x10 m resolution). The use of UAV imagery at this stage can be helpful to improve project design and provide more accurate costing estimates. However, this is not a requirement.
2.	**Define Project Area(s)**	Map as a polygon(s) and calculate gross project area in hectares.
3.	**Map Non-peatland Features**	Map features that are clearly non-peatland, such as rock, forest, water courses, tracks, etc. Around watercourses, establish a 30 m drainage exclusion zone from which rewetted carbon units cannot be claimed, but revegetated carbon units can (in this instance peat depths shall be taken from this area). Water courses are defined as any linear and permanently flowing water features that incise through peat (i.e., bare peat sides) and will not be blocked. Calculate the non-peatland area and the drainage exclusion zone (unless claiming revegetated carbon units), then subtract this from the Gross Area to determine the Net Project Area in hectares.
4.	**Map 'Actively Eroding: Hagg/Gully' Peatland**	Trace the crest of any visible hagg/gully or peat bank. Map the visible bare peat, measure the length and width and calculate the area. Only if the extent of bare peat cannot be determined from aerials, e.g., if bare peat is restricted to the steep

bare cliffs, use a default[2] width of two metres. Bare peat classifiers or other remote sensing technologies may be used for this, with a minimal mapping resolution of 25 cm. However, evidence of the ground truthing shall be submitted to the validator, by taking photographs of features identified by the remote sensing technology throughout the site. As a minimum, 20% of the survey points within each AU shall be photographed to use for ground truthing. Ground truthing shall take into account both the presence of Actively Eroding peat, and whether it is flat/bare or hagg/gully. When a project developer has proven that their technology works in other Peatland Code projects, new projects of similar nature, both geospatial as baseline condition category/categories, do not have to ground truth unless the technology used has changed. Alternatively, a methodology can be approved through the Technical Advisory Board and Executive Board. For more information on this please contact thePeatland Code team on peatlandcode@iucn.org.uk.

5.	**Map 'Actively Eroding: Flat Bare' Peatland**	Map visible peat pans as polygons if they are big enough; otherwise map as per 'Actively Eroding: Hagg/Gully'. Bare peat classifiers or other remote sensing technologies can be used for this. See the ground truthing and evidence requirements under step 4 above.
6.	**Map 'Drained: Artificial' Peatland**	Trace the lines of any visible drain. Map the drained area as 30 m from the outer line of the drain (or where applicable, stop at a fence, track, boundary of restoration site, break of slope or a drainage exclusion zone of a water course; or for raised bogs, the ring-ditch if it's before this). For wandering drains across otherwise undrained land, map 30 m each side of the drain, creating a 60 m strip.
7.	**Map 'Drained: Hagg/Gully' Peatland**	After tracing the lines of any visible hagg/gully or peat bank in step 4, now map the drained area as 30 m from the outer line of the gully (or where applicable, stop at a fence, track, boundary of

2. Birnie R, Smyth MA, Taylor E. *INTERIM REPORT Chapter 1: UK Metric for Peatland Restoration*. Report to Defra. 2014. Available at: https://www.iucn-uk-peatlandprogramme.org/peatland-code/introduction-peatland-code/peatland-code-governance.

restoration site, break of slope or a natural water course; or for raised bogs, the ring-ditch if it's before this). For wandering hagg/gullys across otherwise undrained land, map 30 m each side of the gully, creating a 60 m strip.

8.	**Map eligible 'Modified bog' Peatland**	Map the area of 'modified bog' on which active restoration activities are planned.
9.	**Map non-eligible 'Modified bog' Peatland**	Map all remaining modified peatland within the project site as non-eligible modified bog.
10.	**Identify Assessment Units**	Map the boundary of each assessment unit. Each Assessment Unit shall reflect one condition category only. The number of Assessment Units should be the minimum achievable (join Assessment Units of the same condition categories where possible and spatially appropriate). Calculate the area of each Assessment Unit in hectares (the sum of each assessment area unit should be equal to the Net Project Area).

Field Survey

A project site shall be surveyed in the field to ensure the peatland present is of eligible depth and to confirm the pre-restoration (baseline) peatland condition categories present. The Assessment Unit map, described in the previous section, provides the structure for the field survey.

This section describes the steps project developers shall take, in sequential order, to produce a map of Assessment Units on which to base the field survey.

1. Establish location of survey points

Place a 100 x 100m grid overlay upon the Assessment Unit map. Each intersection of the grid represents a survey point. Peat depth and condition category assessment shall be made at each survey point. Each survey point shall be waymarked using GPS/grid reference to allow return for monitoring purposes. When the exact survey point cannot be reached due to ground conditions, record the actual GPS/grid reference of the point. It is advisable to also create a 50 x 50m grid and overlay this on the map in case additional peat depths must be measured (see below).

2. Peat Depth Assessment

At each survey point measure and record the peat depth to the nearest centimetre up to 1 metre deep using a rod. Start your measurements using a 100 x 100m grid; when a measurement is less than 50 cm deep, increase the measurement frequency to a 50 x 50m grid around this shallow point until all the measurements around the shallow point(s) on the 50 x 50m grid have a peat depth of over 50 cm. At that point, revert to the 100 x 100m grid - see Figures 1 and 2 below. Additional depth measurements may be requested by the validator to accurately establish the depth of bare peat cliffs for use in ‘Actively Eroding: Hagg/Gully’ area calculation or to determine the boundary of the project site.

Isolated shallow pockets falling in the ‘Drained’ and ‘Modified’ baseline condition categories within the 30 cm to 50 cm range are accepted for restoration projects if less than three peat depth points, connected in any direction on a 50 x 50m grid are surrounded by deeper peat (>50 cm). Any peat depth points between 30 cm and 50 cm in the ’Actively Eroding’ baseline condition category are eligible, no matter the size of area.

Add these peat depths, overlaid on the map with Assessment Units, and supply a cross-referenced spreadsheet which clearly details all peat depth measurements for every Assessment Unit using the template available on the

Peatland Code pages of the IUCN UK Peatland Programme website.

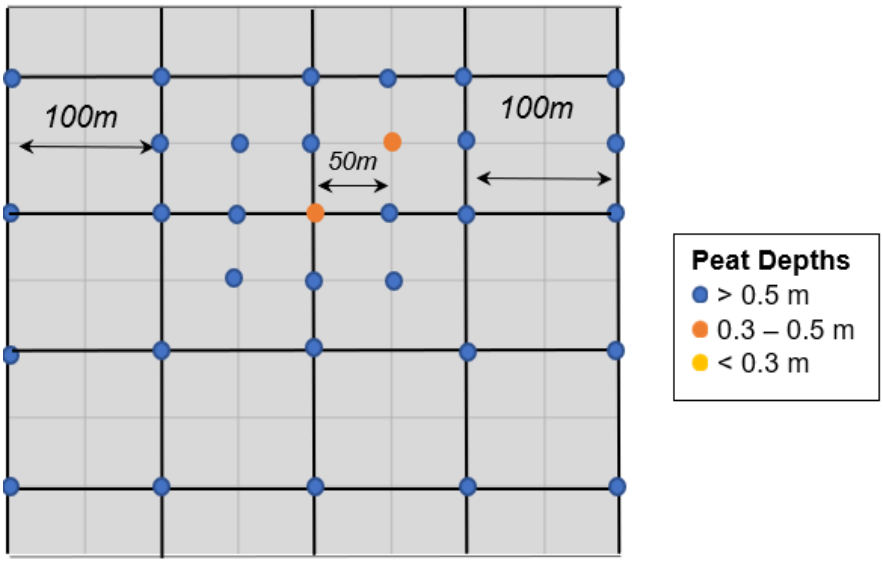


Figure 1: An example of the survey measurement frequency depending on peat depth. The figure illustrates an **eligible** area of

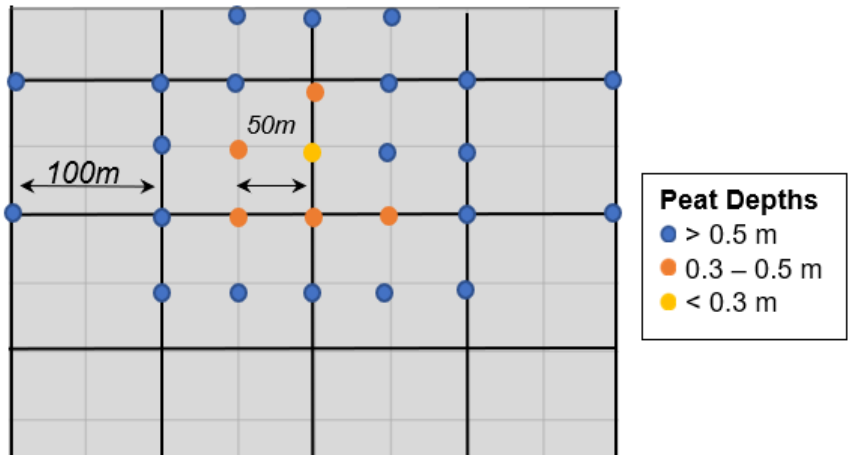


Figure 2: The figure illustrates an **ineligible** area of shallow peat.

A minimum of 75% of the peat depths recorded on the 100 x 100 m grid within all Assessment Units must be greater than or equal to 30 cm for the site to meet Peatland Code eligibility requirements. Assessment Unit boundaries may be redrawn to exclude areas of shallower peat and meet the required threshold. If this is done, the new Assessment Unit boundary should be halfway between two peat depth points.

Projects with a duration exceeding 30 years shall show that at least 75% of the peat depth points on the 100 x 100 m grid within all Assessment Units exceed the minimum peat depth needed for the project duration (see guidance in Peatland Code section 1.2).

3. Peatland Condition Assessment

At each survey point determine and record the condition category present using the pre-restoration (baseline) condition category definitions. If condition assessments recorded within each Assessment Unit do not match the expected condition, as mapped during the desk-based mapping, further field survey is required to establish the cause. Assessment Unit boundaries shall be redrawn to reflect the condition in the field.

4. Photographs

Take photographs that clearly show the status of all peatland features to restore. These should be spread over the whole project area and all Assessment Units, as well as covering type of restoration if multiple restoration techniques are planned. As an indication, pictures should be taken at one in every four survey points on the 100 x 100m grid. For 'Actively Eroding hagg/gully' Assessment Units, make sure your pictures show clearly that these are actively eroding; this is especially important for areas that have vegetation over the top but an actively eroding base underneath. All photographs should be repeatable fixed-point images of key restoration features, and their locations should be numbered and shown on a corresponding Assessment Unit map.

An alternative acceptable method is to use an orthorectified map (minimal resolution of 1 metre) from drone imagery which enables assessment of pre- and post-restoration conditions. Additional photographs of e.g., specific haggs/gullies are encouraged where conditions differ from the norm for that particular site. Project developers/landowners may be required to take additional photographs to accurately establish the baseline if insufficient evidence is provided to the VVB.

5. Confirm Assessment Units

Re-map the boundary(s) of each Assessment Unit, if necessary, and calculate the area of each in hectares (for use within the Peatland Code Emissions Calculator). Overlay the peat depth points over the mapped Assessment Units.

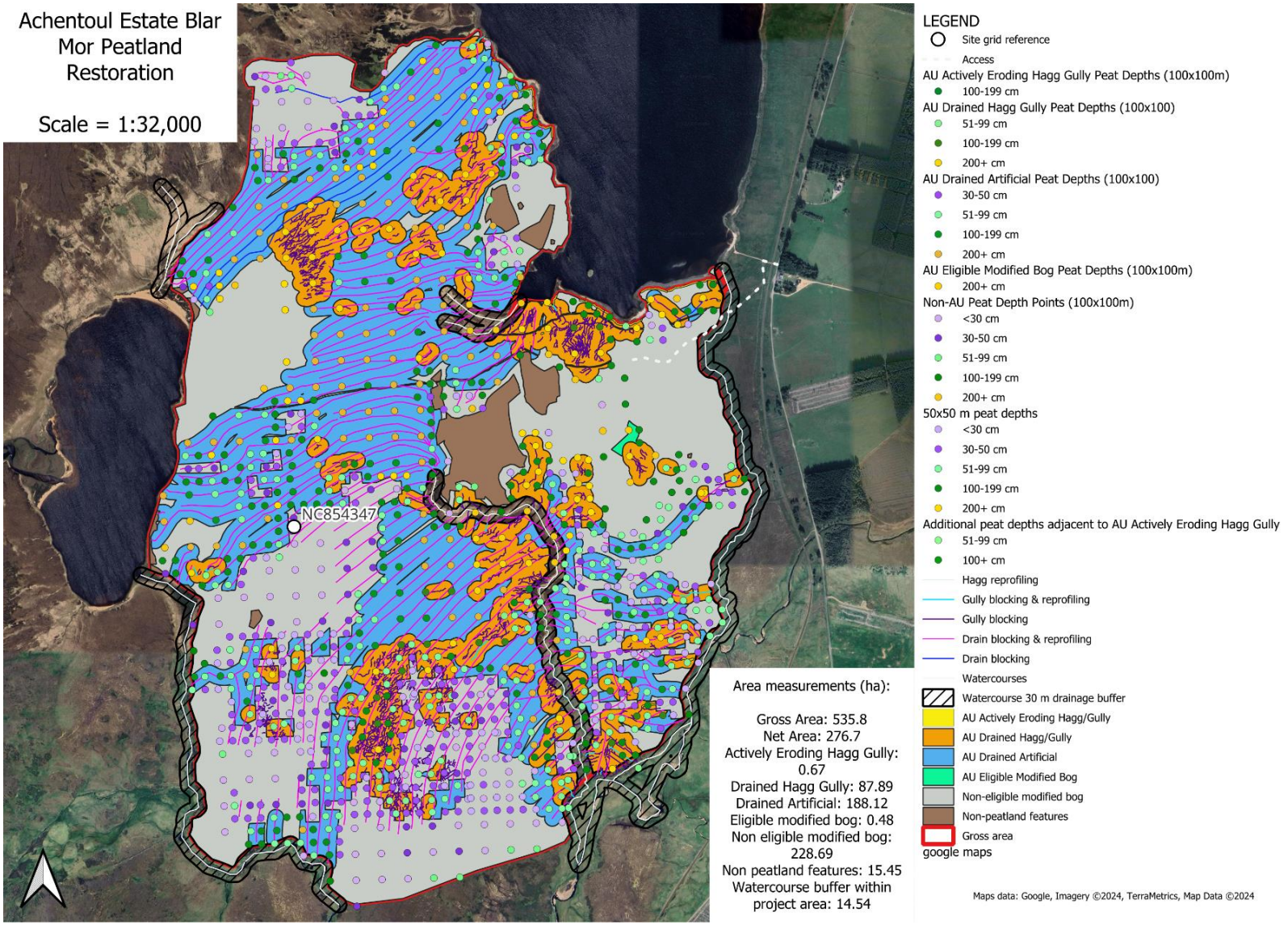


Figure 3. An example Project Site map with the project name and grid refence included, as well as 5 separate Assessment Units. pPat depths at each survey point and survey points have been identified for use in the Field Survey as per the requirements under Peatland Code version 2.1.

Monitoring Condition Category Change

Post-Restoration Condition Categories

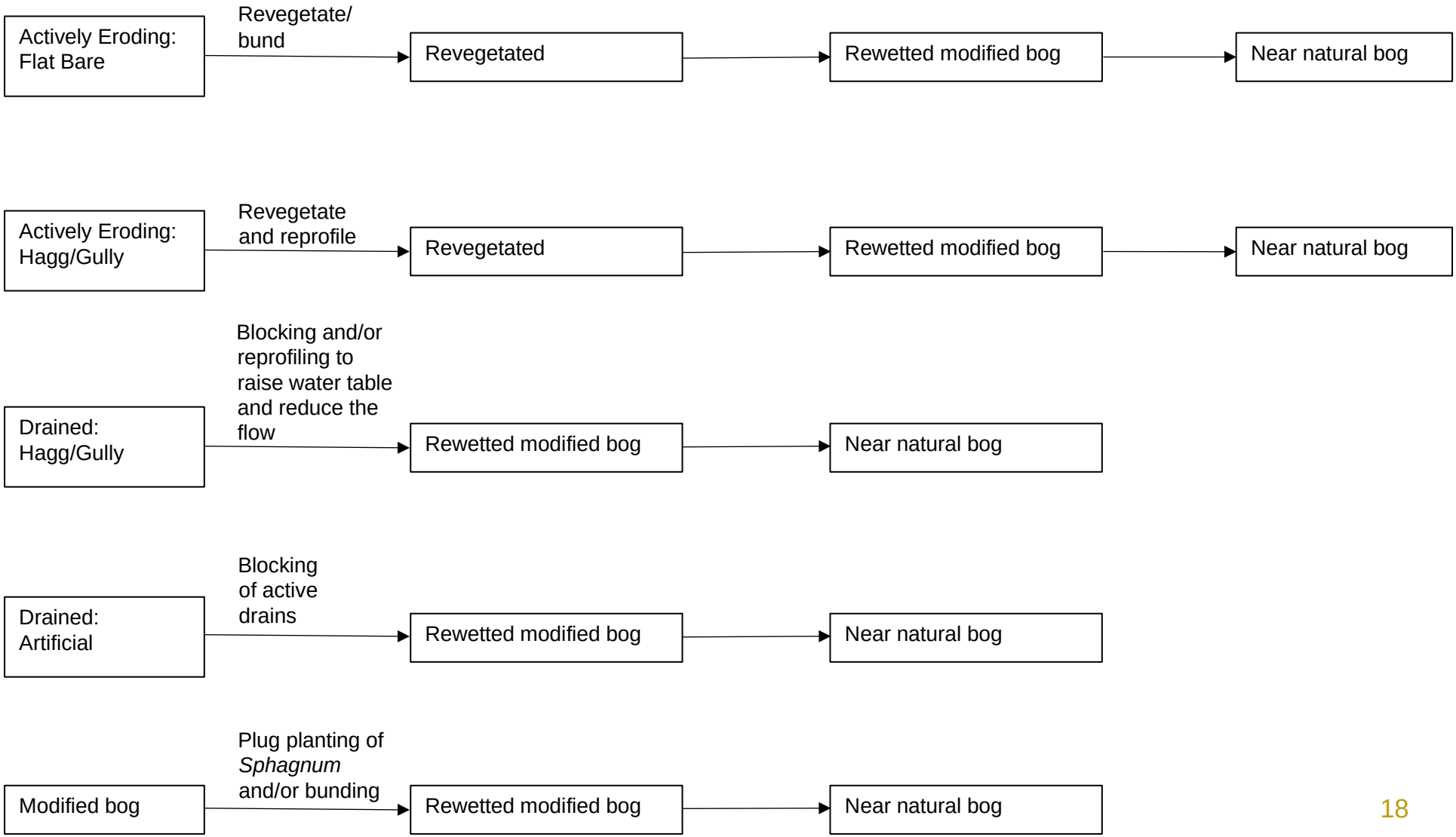
Note emission factors are valid on peat over 50 cm deep, as well as for small pockets of peat between 30 and 50 cm.

Post-Restoration Condition Category	Description	Emission Factor (tCO_2e/ha/yr)
Revegetated	• Any former bare peat is no longer extensive nor continuous	3.42
Modified bog	Evidence present that it is still a degraded system, with exhibiting features that show sub-optimal condition such as: • No/little *Sphagnum* • *Calluna vulgaris* or other non-bog vegetation (e.g., moor grass (*Molinia*)) extensive • Small discrete patches of bare peat frequent (micro-erosion)	2.51
Rewetted modified bog	• Within 30 m of a rewetted artificial drainage system (active flow interrupted by restoration activities) OR • Within 30 m of a rewetted hagg/gully drainage system (active flow interrupted by restoration activities) OR • *Sphagnum* in parts • Scattered patches of *Calluna vulgaris* • Extent of bare peat limited to small patches	0.32

Near Natural Bog	• *Sphagnum*-dominated • *Calluna vulgaris* not forming a dominant canopy but instead rather scattered when viewed from above. Little or no bare peat	0.32

Condition change steps for bogs

Condition change steps for bogs under the Peatland Code. Above the first transition arrows are examples of possible interventions. Please note, these examples might not be the most appropriate interventions for your project.



Pre-verification field survey

This section describes the steps project developers shall take, in sequential order, to produce a condition change monitoring report, required for the purposes of ongoing verification (year 5 after finishing restoration and at least every 10 years thereafter for the project duration).

1.	**Locate survey points**	Using GPS/grid references recorded at each survey point when establishing eligibility and determining baseline condition category, locate the same survey points.
2.	**Peatland Condition Assessment**	Create a circle with a 5-metre radius around each survey point. Where a restoration feature falls within the 5 m radius, identify and document the existing condition category, or categories, based on post-restoration condition category definitions. If no restoration features are present within the 5 m radius, walk in a straight line to the nearest northerly restoration feature from your peat depth point and create a circle with a 5 m radius there instead. Record the proportion of each condition category within the circle. The average percentage recorded of improved condition category is used to convert PIUs to PCUs for each Assessment Unit, i.e., if 90% within one Assessment Unit has changed to the next condition category, 90% of PIUs are converted to PCUs within that category. Best practice guidance: use drone footage to accurately assess bare peat on your site.
3.	**Photographs**	Fixed-point photos shall be repeated at the same location as the pre-validation field survey.
4,	**Condition Category Change**	Compare condition category present to condition category predicted at validation. If predicted condition category has not been achieved, further field survey shall be required to establish the cause and identify remedial action required.

Fens

Fens are areas of peatland fed by rainwater, as well as surface- and groundwater that contains nutrients from the underlying geology with which it has been in contact with (minerotrophic). There are several different types of fens. Base-poor fens are associated with acidic groundwater (pH 5 or less) which has been in contact with sandstone or granite. These base-poor fens often have typical bog vegetation (e.g., cotton grass, heather and *Sphagnum* mosses). In contrast, base-rich fens are fed by waters with a higher pH (pH 5 or more) which has been in contact with a base-rich rock such as limestone. The vegetation on these types of mineral-rich fens often consists of sedges, reeds and brown mosses.

Assessing Eligibility and Determining Baseline Condition Category

Pre-Restoration (Baseline) Condition Categories for fens

Please note the Emission Factors here are indicative and the actual baseline emissions will be calculated using the Emissions Calculator using the measured baseline water table on site.

Pre-Restoration Condition Category	Description	Emission Factor ($tCO_2e/ha/yr$)
Cropland (peat < 40 cm) – Drained	• Vegetated with a conventional crop • Peat depth less than 40 cm • Peripheral surface (can be physical drainage channel or drainage effect due to ground levels) or sub-surface field drains present	26.10
Cropland (peat > 40 cm) – Drained	• Vegetated with a conventional crop • Peat depth min 40 cm • Peripheral surface (can be physical drainage channel or drainage effect due to ground levels) or sub-surface field drains present	37.17

Grassland – intensive Drained	• Grassland vegetation covering (year-round)
	• Intensively managed:
	  ○ Sown-in grass species
	  ○ Intensive grazed or mown (>3 cuts per year)
	  ○ Evidence of regular fertiliser addition
	• Peripheral surface (can be physical drainage channel or drainage effect due to ground levels) or sub-surface field drains present
		22.00

Grassland – extensive Drained	As above but extensively managed: • Characterised by a mix of acid grassland species • No peatland/heathland moss layer • No or very limited mowing • No recent addition of fertiliser	15.88

Modified Fen	• Over-grazed or other kinds of surface disturbance. • Impacted water level (i.e., any water level below the target) • Eutrophicated	/[3]See footnote [3]
Rewetted Fen*	• Fen peats that have been deliberately rewetted, usually through ditch blocking or bunding and associated water control structures • This is a transitional stage that may last for decades before near-natural fen is re-established • Rewetted fens may have vegetation that is not typical of near-natural fens during the transition from drained peatland to near-natural fen vegetation communities • The water table should not exceed 5 cm above the surface during the spring, summer and autumn; in winter this is allowed	3.31
Near Natural Fen*	• Fen peatlands with a high water table for most of the year and characterised by typical fen vegetation for the geography and geology of the area • The water table should not exceed 5 cm above the surface during the spring, summer and autumn; in winter this is allowed	-0.36

**Ineligible for Peatland Code Restoration – these condition categories may be present within the project site and can be included within the restoration plan but any claims of emissions reduction as a result of their restoration cannot be validated/verified under the Peatland Code.*

3. Note that Modified Fen does not have a Tier 2 emission factor due to lack of sufficient data to derive a category-specific emission factor. The emissions reduction will be calculated using the water table and the fen Emissions Calculator.

Assessment Unit Mapping for fens

The purpose of desk-based mapping using aerial photography and other data sources is to start to identify the peatland condition categories present at a potential project site. This section describes the steps project developers shall take, in sequential order, to produce a map of Assessment Units on which to base the field survey.

Requirement

Add the project name, scale, a North arrow, the grid reference of the central point and the access point onto site (if this is relevant) to your map. Use very distinct colours for the different Assessment Units. Also state which method has been used to create the map (e.g., satellite imagery, drone imagery, etc.).

1.	**Using Google Earth or other digital aerial imagery, produce a base map**	Assume minimum mapping unit for the restoration site; 0.01 ha (10x10 m resolution).
2.	**Define Project Area(s)**	Map as a polygon(s) and calculate gross project area in hectares.
3.	**Map Non-peatland Features**	Map features that are clearly non-peatland such as rock, forest, water courses, tracks, etc. Around watercourses, establish a 30-metre drainage exclusion zone from which rewetted carbon units cannot be claimed, but revegetated carbon units can (in this instance peat depths shall be taken from this area). Water courses are defined as any linear and permanently flowing water features that incise through peat (i.e., bare peat sides) and will not be blocked. Calculate the non-peatland area and the drainage exclusion zone (unless claiming revegetated carbon units), then subtract this from the Gross Area to determine the Net Project Area in hectares.
4.	**Map vegetation types**	Map your vegetation types: • None/crop (arable cropland, ploughed annually) • Intensive grassland • Extensive grassland • Fen vegetation: identify different functional vegetation units (e.g., scrub, reedbed, herb rich fen, sedges, rushes, emergent vegetation (water's edge), *Sphagnum*-rich).
5.	**Map drains/irrigation channels**	Trace the lines of any visible drain/irrigation channel and add these to the map. Also map any known field drains (sub-surface).

10. Identify Assessment Units

Map the boundary of each Assessment Unit. Each Assessment Unit should reflect one condition category only. The number of Assessment Units should be the minimum achievable (join Assessment Units of the same condition categories where possible and spatially appropriate). Calculate the area of each Assessment Unit in hectares (the sum of each assessment area unit should be equal to the Net Project Area).

Field Survey

A project site shall be surveyed in the field to ensure the peatland present is of eligible depth and to confirm the pre-restoration (baseline) peatland condition categories present. The Assessment Unit map, described in the previous section, provides the structure for the field survey.

This section describes the steps project developers shall take, in sequential order, to produce a map of Assessment Units on which to base the field survey.

1. Establish location of survey points

Place a 100x100 m grid overlay upon the Assessment Unit map. Each intersection of the grid represents a survey point. Each survey point is to be waymarked using GPS/grid reference to allow return for monitoring purposes. When the exact survey point cannot be reached due to ground conditions, record the actual grid reference of the point.

2. Peat Depth Assessment

Peat depth shall be measured by taking a peat core up to the peat depth needed for the required project length (so a maximum of 1.5 m). Measure the depth of the peat from the core and take a picture from each core including the tape measure used.

For the condition category 'Modified Fen', peat depth at a representative field unit shall be measured. If there are any exceptions to the treatments (e.g., lower or higher laying soils, different vegetation types), extra measurements on those units are required. Project shall use three transects across every field unit, taking into account the maximum variability in ground conditions, vegetation cover and type. Project shall have a minimum of 15 measurements evenly spaced per transect. If in doubt about where to locate transects, seek advice from the IUCN UK Peatland Programme's Peatland Code team. Submission of any other existing peat depth data is welcomed.

For condition categories 'Cropland and Grassland' (both intensive and extensive) peat depth shall be measured at each survey point of the 100x100 m grid.

A minimum of 75% of the peat depths recorded within all Assessment Units shall be greater than or equal to 45 cm for the site to meet Peatland Code eligibility requirements, except for the 'Cropland – Drained' condition category and 'Grassland' that used to be cropland in the past 20 years. If less than 75% of peat

depths in these condition categories are greater than or equal to 45 cm, follow the soil sampling guidance in step 3 below to determine eligibility. Assessment Unit boundaries may be redrawn to exclude areas of shallower peat and meet the required threshold.

Projects with a duration exceeding 30 years need to show that at least 75% of peat depth points within all Assessment Units exceed the minimum peat depth needed for the project duration (see guidance in the Peatland Code version 2.1, section 1.2 'Project Duration').

3. Soil sampling

For the 'Cropland – Drained' condition category and 'Grassland' that used to be cropland in the past 20 years with less than 75% of peat depths greater than or equal to 45 cm:

Determine the Soil Organic Carbon stock (t ha^{-1}) at each survey point, by measuring both soil organic carbon content (SOC%) and soil fine dry bulk density (t m^{-3}). If the soil is homogenous (i.e., fully ploughed) then take one sample mid-sequence in the peat layer; if the peat consists of different layers (e.g., shallow ploughed or not ploughed), the thickness of each layer with its respective SOC and bulk density shall be measured.

Quantify SOC% by combustion elemental analysis on sieved soil (<2 mm) with removal of soil inorganic carbon content prior to combustion. This provides a direct measurement of SOC% by the producing CO_2 from the combustion of a soil sample at high temperatures.

Quantify soil fine dry bulk density (t m^{-3}) by calculating the mass of sieved soil (< 2 mm) in a known volume of soil, taking into account soil moisture content and the volume of stones (> 2 mm).

Soil Organic Carbon stock (t ha^{-1}) = ∑(volume per layer (m^3 ha^{-1})) x bulk density (t m^{-3}) x SOC% (decimal fraction).

Average every 4 SOC stock measurements to give a value of tonnes per hectare for every hectare in the project area. A minimum of 75% of the SOC stock

recorded within all Assessment Units shall be greater than 30 times the Emission Factor for CO_2-C emissions for the relevant baseline category (see table 'Pre-Restoration (Baseline) Condition Categories for fens'). Projects with a duration exceeding 30 years need to show that at least 75% of SOC stock recorded within all Assessment Units exceeds the minimum SOC stock needed for the project duration.

3. Water table assessment

The monitoring design for mean annual water table is project specific; where and how often the water table is measured depends on the local setting, stratigraphy, and inferred water-supply mechanisms of the site. Therefore, each project shall design the most appropriate monitoring approach for their project area and state this design in the PDD. Projects shall evidence in the PDD that someone with independent expertise (e.g., a hydrologist) that meets the Peatland Code competency requirements, set out below, has reviewed the monitoring design and considers it robust.

Competency requirements for water table monitoring design experts:

- 5 years' experience designing hydrological monitoring strategies for peatlands, which have fed into peer-reviewed papers.
- A degree in hydrology, environmental science, or a related field. Advanced degrees (MSc or PhD) are preferred.
- Chartered Member (C.WEM) of the Chartered Institution of Water and Environmental Management (CIWEN) is preferable.

Minimum accuracy requirement for continuous loggers is 5 cm in the field (not lab-based accuracy). Calibration of continuous loggers is required and shall be done at least every 6 months (if the logger is not telemetry-enabled then this can be done in post data processing).

A minimum of 12 months of baseline data is required. If the complete water table monitoring setup was not in place for the full 12 months, but a partial setup was, this **may** be acceptable. However, the project must demonstrate that once the full setup was

installed, all measurements consistently responded to changes in the same way.

The number of loggers and dipwells could be reduced after the first verification IF all methods show the same water table depth.

4. Drain assessment

Assess the hydrological function of surface and sub-surface drains on the site. Establish if they are removing water from the site or bringing water onto site. This will inform the restoration plan.

5. Peatland Condition Assessments

Check that the mapped vegetation types were correct at each survey point and determine and record the condition category present using the pre-restoration (baseline) condition category definitions. If condition assessments recorded within each Assessment Unit do not match the expected condition, as mapped during the desk-based mapping, further field survey is required to establish the cause. Assessment Unit boundaries shall be redrawn to reflect the condition in the field.

The mean annual water table depth should fall within the specified ranges of the relevant condition category, as shown in Table 1 below. This means that while actual water table levels can fluctuate outside these ranges, the average annual water table depth must remain within the specified range.

6. Photographs

Take photographs that clearly show the status of all peatland features to restore. These shall be spread over the whole project area and all Assessment Units, as well as covering type of restoration if multiple restoration techniques are planned. As an indication, pictures should be taken at one in every four survey points on the 100 x 100 m grid. Where vegetation cover is variable, more fixed points must be included to show this variation, e.g., shrub, open water, areas of different grazing pressure. These photographs should be repeatable (fixed point) images of key restoration features, and their locations should be numbered and shown on a corresponding Assessment Unit map. An alternative acceptable method is to use an orthorectified map (minimal resolution of 1 metre) from drone imagery which enables assessment of pre- and post-restoration

		conditions. Additional photographs of, for example, specific features are encouraged where conditions differ from the norm for that particular site. The validator could request additional photographs to establish the baseline accurately.
7.	**Confirm Assessment Units**	Re-map the boundary(s) of each Assessment Unit, if necessary, and calculate the area of each in hectares (for use within the Peatland Code Fen Emissions Calculator). Overlay the peat depth points over your Assessment Units.

Water table ranges

The mean annual water table ranges in Table 1 below are used to help define condition categories. The ranges overlap and therefore cannot be used in isolation to define a category but will be used in conjunction with the visual inspection as set out above. Emissions reductions can still be achieved even without a change in category. Effective water table depth is defined as whichever is the smallest of the mean annual measured water table depth and measured peat depth.

Table 1. Defined ranges of minimum and maximum plausible mean annual effective water table depths (WTDe) for each fen condition category. Note that deep-drained categories are included here in order to estimate the emissions from pre-restoration land-use.[4]

Category	**WTD*e* Min (cm)**	**WTD*e* Max (cm)**	**Justification**
Near-Natural Fen	-5	13	Additional peat formation not anticipated to occur at WTD*e* < -5 cm, no peat formation anticipated at WTD*e* > 13 cm
Rewetted Fen	-5	20	Additional peat formation not anticipated to occur at WTD*e* < -5 cm; peat with WTD*e* > 20 cm cannot be considered re-wetted
Modified Fen	5	50	Modified fen unlikely to be strongly peat forming (WTD*e* minimum value of 5 cm limits potential uptake to a maximum of 3.9 t CO_2 ha^{-1} yr^{-1}); fen vegetation likely to be lost with WTD*e* > 50 cm (assign site to grassland or woodland)
Grassland (extensive)	30 (14)	100	Lower limit of WTD set to 30 cm, as this is considered to be the shallowest level of drainage that could support extensive grassland. However, WTD*e* may be < WTD in wasted peat, with a minimum value of 14 cm to ensure that net CO_2 uptake cannot occur. No data on CO_2 emissions with WTDe > 100 cm, but emissions expected to level off under extreme drying
Grassland (intensive)	30 (14)	100	Lower limit of WTD*e* set to 30 cm, as this is considered to be the shallowest level of drainage that could support intensive grassland. However, WTD*e* may be < WTD in wasted peat, with a

[4]4. Evans C, Artz R, Burden A, et al. Aligning the Peatland Code with the UK Peatland Inventory. Report to Defra and the IUCN UK Peatland Programme. March 2022 (updated November 2022). Available at: https://sciencesearch.defra.gov.uk/ProjectDetails?ProjectID=21088&FromSearch=Y&Publisher=1&SearchText=peatland%20code&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description

			minimum value of 14 cm to ensure that net CO_2 uptake cannot occur. Upper limit of 100 cm set as above.
Cropland	30 (14)	100	Lower limit of WTD set to 30 cm, as this is considered to be the shallowest level of drainage that could support cropland. However, WTD*e* may be < WTD in wasted peat, with a minimum value of 14 cm to ensure that net CO_2 uptake cannot occur. Upper limit of 100 cm set as above.
Paludiculture[5]	-5	30	Lower limit set to -5 cm (consistent with near-natural and rewetted bog and fen). Upper limit set to 30 cm as deeper WTD values would not be considered paludiculture (assign site to cropland)

[5]5. Paludiculture is currently not eligible under the Peatland Code.

Monitoring Condition Category Change

Post-Restoration Condition Categories

Please note the Emission Factors here are indicative and the actual baseline emissions will be calculated using the Emissions Calculator using the measured baseline water table on site.

Post-Restoration Condition Category	Description	Emission Factor ($tCO_2e/ha/yr$)
Cropland (peat < 40 cm) – Drained	• Vegetated with a conventional crop • Peat depth less than 40 cm • Peripheral surface (can be physical drainage channel or drainage effect due to ground levels) or sub-surface field drains present	26.10
Cropland (peat > 40 cm) – Drained	• Vegetated with a conventional crop • Peat depth min. 40 cm • Peripheral surface (can be physical drainage channel or drainage effect due to ground levels) or sub-surface field drains present	37.17
Grassland – intensive Drained	• Grassland vegetation covering (year-round) • Intensively managed (UK Greenhouse Gas Inventory category) • Peripheral surface (can be physical drainage channel or drainage effect due to ground levels) or sub-surface field drains present	22.00
Grassland – extensive Drained	• As above but extensively managed (UK Greenhouse Gas Inventory category)	15.88

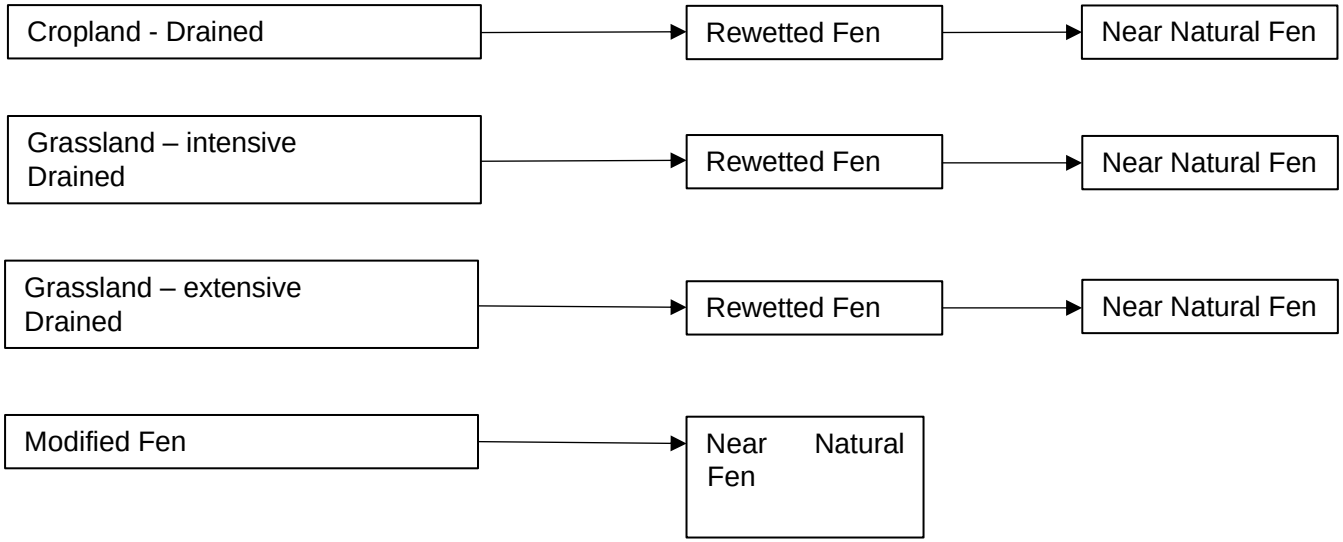
Modified Fen	• Over-grazed or other kinds of surface disturbance • Impacted water level (i.e., any water level below the target) • Eutrophicated	/[6]See footnote 6
Rewetted Fen*	• Fen peats that have been deliberately rewetted, usually through ditch blocking or bunding and associated water control structures • This is a transitional stage that may last for decades before near-natural fen is re-established • Rewetted fens may have vegetation that is not typical of near-natural fens during the transition from drained peatland to near-natural fen vegetation communities • The water table should not exceed 5 cm above the surface during the spring, summer and autumn; in winter this is allowed	3.31
Near Natural Fen*	• Fen peatlands with a high-water table for most of the year and characterised by typical fen vegetation for the geography and geology of the area • The water table should not exceed 5 cm above the surface during the spring, summer and autumn; in winter this is allowed	-0.36

**Ineligible for Peatland Code Restoration – these condition categories may be present within the project site and can be included within the restoration plan but any claims of emissions reduction as a result of their restoration cannot be validated/verified under the Peatland Code.*

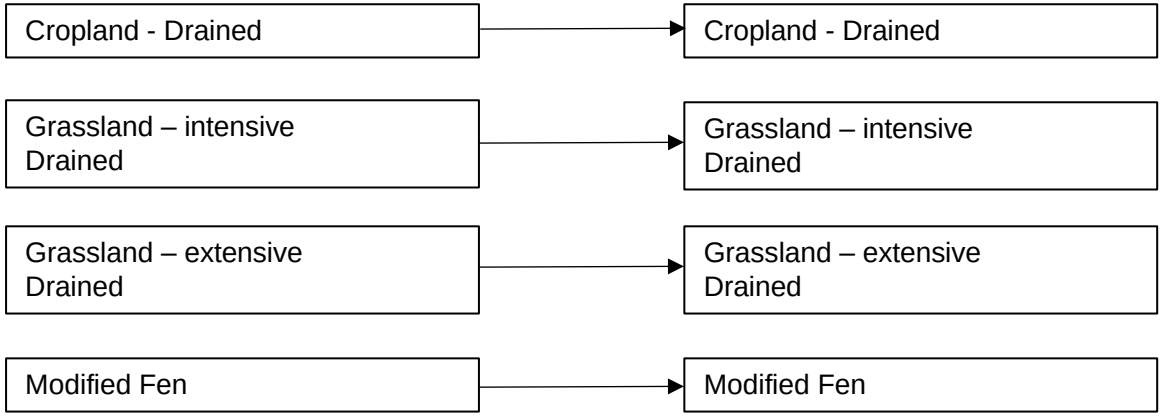
[6] Note that 'Modified Fen' does not have a Tier 2 emission factor due to lack of sufficient data to derive a category-specific emission factor. The emissions reduction will be calculated using the water table and the fen Emissions Calculator.

Condition change steps for fens

Condition change steps for fens under the Peatland Code:



Or same condition category with a higher water table:



Pre-verification field survey

This section describes the steps project developers shall take, in sequential order, to produce a condition change monitoring report, required for the purposes of ongoing verification (year 5 after finishing restoration and at least every 10 years thereafter for the project duration).

1.	**Locate survey points**	Using GPS/grid references recorded at each survey point when establishing eligibility and determining baseline condition category, locate the same survey points.
2.	**Peatland Condition Assessment**	Create a circle with a 5-metre radius around each survey point. Where a restoration feature falls within the 5 m radius, identify and document the existing condition category, or categories, based on post-restoration condition category definitions. If no restoration features are present within the 5 m radius, walk in a straight line to the nearest northerly restoration feature from your peat depth point and create a circle with a 5 m radius there instead. Record the proportion of each condition category within the circle. The average percentage recorded of improved condition category is used to convert PIUs to PCUs for each Assessment Unit, i.e., if 90% within one Assessment Unit has changed to the next condition category, 90% of PIUs are converted to PCUs within that category.
3.	**Water table assessment**	Water table data should be collected throughout the project according to the guidance under the paragraph ‘Field Survey’ above. This data should be presented at each verification and will be used to calculate the number of PIUs to be verified into PCUs.
4.	**Photographs**	Fixed point photos shall be repeated at the same location as during the Field survey.
5.	**Condition Category Change**	Compare present condition category to condition category predicted at validation. If predicted condition category has not been achieved, further field survey is required to establish the cause and identify remedial action required.

Annex

Peatland Code Condition Categories vs UK Greenhouse Gas Inventory

Peatland Code Condition Category	UK GHG inventory
Actively Eroding: Hagg/Gully	Modified Bog – Eroding: undrained
Actively Eroding: Flat Bare	Modified Bog – Eroding: undrained
Drained: Artificial	Modified Bog - grass/heather: drained
Drained: Hagg/Gully	Modified Bog - grass/heather: undrained
Re-vegetated	Rewetted bog
Modified Bog	Modified Bog - grass/heather: undrained
Rewetted Modified Bog	Rewetted Modified Bog
Near Natural Bog	Near Natural Bog
Cropland (peat < 40 cm) – Drained	Cropland (peat < 40 cm) – Drained
Cropland (peat > 40 cm) – Drained	Cropland (peat > 40 cm) – Drained
Grassland – intensive Drained	Grassland – intensive Drained
Grassland – extensive Drained	Grassland – extensive Drained
Modified Fen	Modified Fen
Rewetted Fen	Rewetted Fen
Near Natural Fen	Near Natural Fen