IUCN National Committee United Kingdom

Peatland Programme

PEATLAND CODE

Field Protocol

Assessing eligibility,
determining baseline condition
category and monitoring change.

Version 2.1

XXXX 2024

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

Contents

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 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 either 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. Available at http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&ProjectID=19063&FromSearch=Y&Publisher=1&SearchText=peatland&SortString=ProjectCode&SortOrder=Asc&Paging=10#Description

Assessing Eligibility and Determining Baseline Condition Category

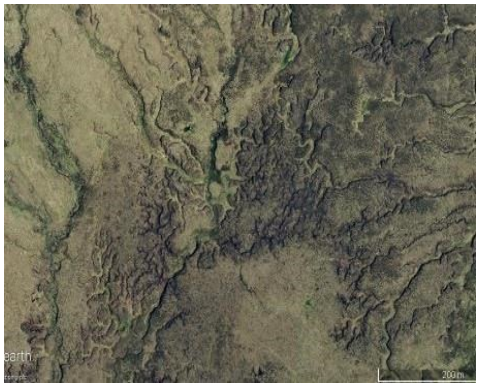
Pre-Restoration (Baseline) Condition Categories for raised bogs and blanket bogs

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 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 30m of an active artificial drain (grip)	3.32
Drained: Hagg/Gully	• Within 30m of an actively eroding hagg/gully drainage system OR • Within 30m 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. • Little to no key indicator species • Small discrete patches of bare peat frequent (micro-erosion) It would be expected that most features selected on the condition change matrix (below) will be to the right in the lighter green columns with some features selected in the dark green left column (see below)	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 Features selected are predominately in the left dark green columns on the condition change matrix (see below)	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		
Drained: Hagg/Gully		

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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 to take, in sequential order, to produce a map of assessment units on which to base the field survey.

General notes on mapping:
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; 0.01ha (10mx10m resolution).
2.	**Define project Area(s)**	Map as a polygon(s) and calculate gross project area in ha.
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-meter 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 and will likely have a drainage effect on the surrounding peat. 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 peatbank. Map the visible bare peat and 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 m. Bare peat classifiers or other remote sensing technologies can 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 10% 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, new projects do not have to ground truth unless the technology used changed.

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 drained area as 30m from 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 30m each side of the drain, creating a 60m strip.

7. Map 'Drained: Hagg/Gully' Peatland

After tracing the lines of any visible hagg/gully or peatbank in step 4, now map the drained area as 30m from outer line of the gully (or where applicable stop at a fence, track, boundary of 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 30m each side of the gully, creating a 60m strip.

8. Map eligible 'Modified bog' Peatland

Map the area of 'modified bog' on which active restoration activities are planned. For example, plug planting of sphagnum and bunding. Once mapped identify different texture-patterns within the modified

[2] Birnie, R, Smyth, M-A and Taylor, E. *INTERIM REPORT Chapter 1: UK Metric for Peatland Restoration*. 2014. Available at: https://www.iucn-uk-peatlandprogramme.org/peatland-code/introduction-peatland-code/peatland-code-governance

bog area. This can be done by eye or using an image segmentation program (like Photoshop's Filter Gallery or Artistic Cutout). For detailed explanation visit the Peatland Code website <To follow>

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

Field Survey

A project site will always have to 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. To ensure the information submitted to the Peatland Code is valid. Baseline field surveys can be up to 3 years old when submitting all documentation to the validation body for Project Plan Validation

This section describes the steps to 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 100mx100m grid overlay upon assessment unit map. Each intersection of the grid represents a survey point. Peat Depth and Condition category Assessment to be made at each survey point. Each survey point 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. It is advisable to also create a 50 x 50 m grid and overlay this on the map, in case additional peat depths must be measured (see below). For eligible Modified Bog only: Using GPS identify central points within at least five examples of each texture-pattern type on the mapped area - obtain grid reference for these

points. Prepare the condition matrix for each of these waypoints. Each condition matrix shall have the site/survey data and texture-pattern number. For more detailed guidance see <To follow>,

2. Peat Depth Assessment

At each survey point measure the peat depth to the nearest centimetre up to 1 m deep using a rod and record. Start your measurements using a 100mx 100m grid, when a measurement is less than 50 cm deep, increase measurement frequency to a 50 x 50 m grid around this shallow point until all the measurements around the shallow point(s) have a peat depth of over 50 cm.

At that point revert back to the 100 x 100 m grid, see Figure 1 below. Additional depth measurements may be requested by the validator to accurately establish depth of bare peat cliffs for use in 'Actively Eroding: Hagg/Gully' area calculation or to determine the boundary of the project site. 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 website.

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 30cm 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 doing this the new Assessment Unit boundary should be halfway between two peat depth points.
For projects over 30 years, projects need to show that at least 75% of 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).

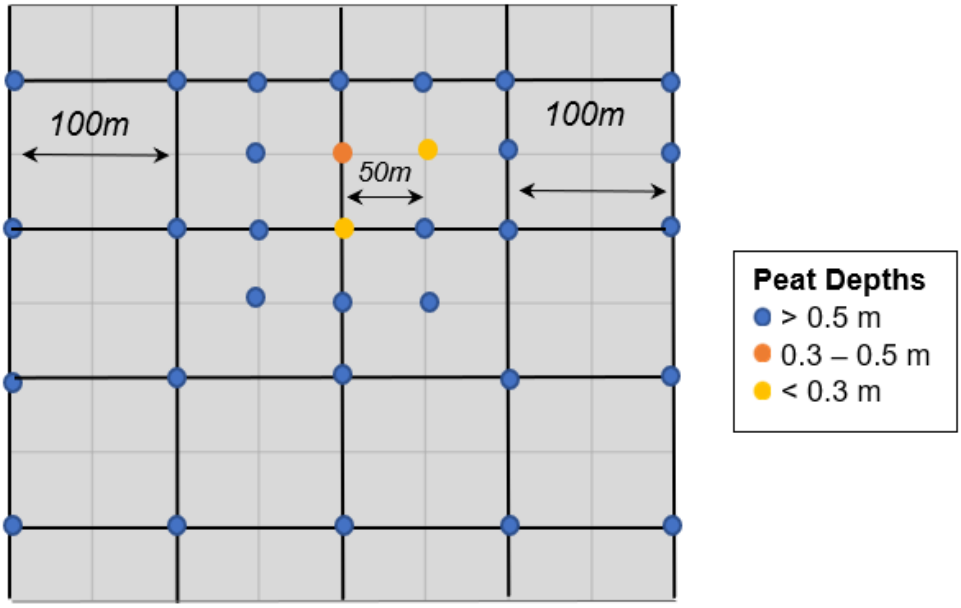


Figure 1: An example of the survey measurement frequency depending on peat depth

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. Condition Matrix monitoring

For eligible Modified bog condition category only: Navigate to the first GPS waypoint, using the condition matrix circle **all**

the features you can see in this location and on the way to your location. See image below for an example:

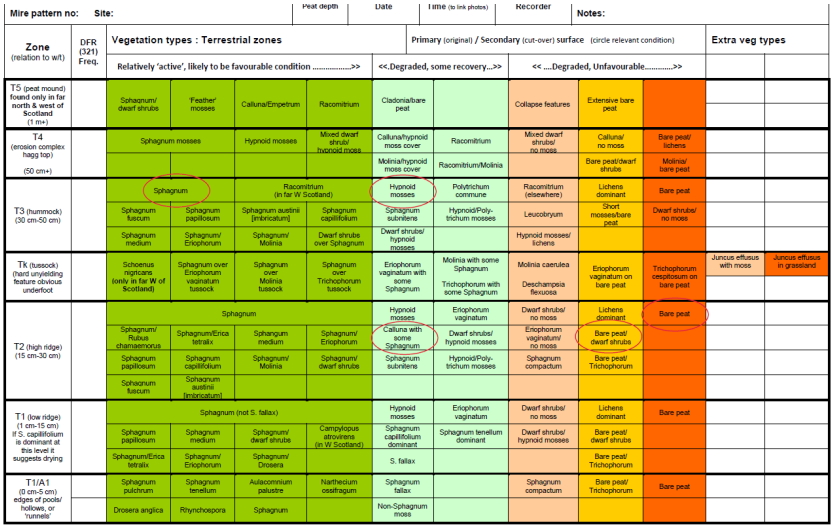


Figure 2: Example of how to complete the matrix.

To determine what vertical zones (nanotopes) are present, use a simple 30 cm plant-pot moisture meter, note depth of high-moisture zone when the needle flicks up to the start of the blue zone on the meter (it may fall away again within 10-20 secs due to function of capacitance response – ignore this).

Assess the frequency of each vertical zone within the texture-pattern by eye using a simple 3-point scale of 'Dominant' : 'Frequent' : 'Rare' and put the relevant code (D,F,R) in the 'DFR' column. It is possible to use middle values (i.e. D/F, or F/R) if this seems appropriate but such use is not essential.

Repeat this process for all of GPS locations in the different textured zones. You will need to complete a condition matrix sheet for each of the GPS locations, please ensure that the GPS waypoint is marked on the matrix. See detailed video explanation (to follow).

5 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 type of restoration if multiple restoration techniques are planned. As an indication, pictures should be taken every four survey points on the 100 x 100 m grid. For actively eroding hagg/gully assessment units, make sure your pictures show clearly that these are actively eroding, this is especially important for those 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 way would be to use an orthorectified map (minimal resolution of 1 meter) 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. The validator could request additional photographs to establish the baseline accurately.

6. Confirm Assessment Units

Re-map the boundary(s) of each assessment unit, if necessary, and calculate the area of each in ha (for use within the Peatland Code Emissions Calculator). Overlay the peat depth points over the mapped assessment units.

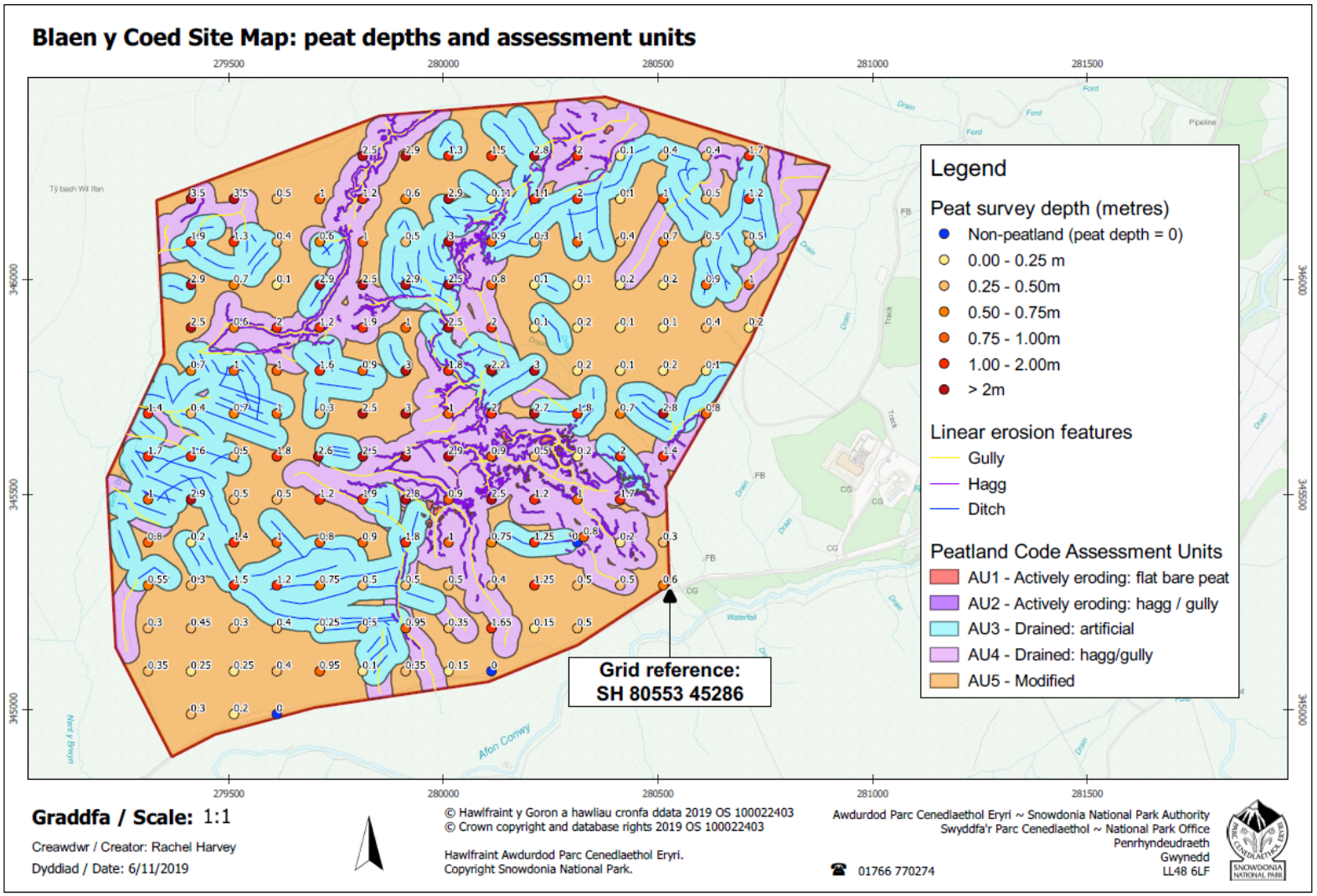


Figure 3. An example Project Site map with the project name and grid refence included, as well as 5 separate assessment units, peat depths at each survey point and survey points have been identified for use in the Field Survey as per the requirements under version 1.2. Please note this map is included for information but does not include the increased grid reference to 50 x 50 m and has full depth peat measurements. This map was created by Snowdonia National Park Authority and the Welsh Peatlands SMS project (see the Blaen y Coed project on the Land carbon registry (https://mer.markit.com/br-reg/public/project.jsp?project_id=104000000027002)).

Monitoring Condition Category Change

Post-Restoration Condition Categories.

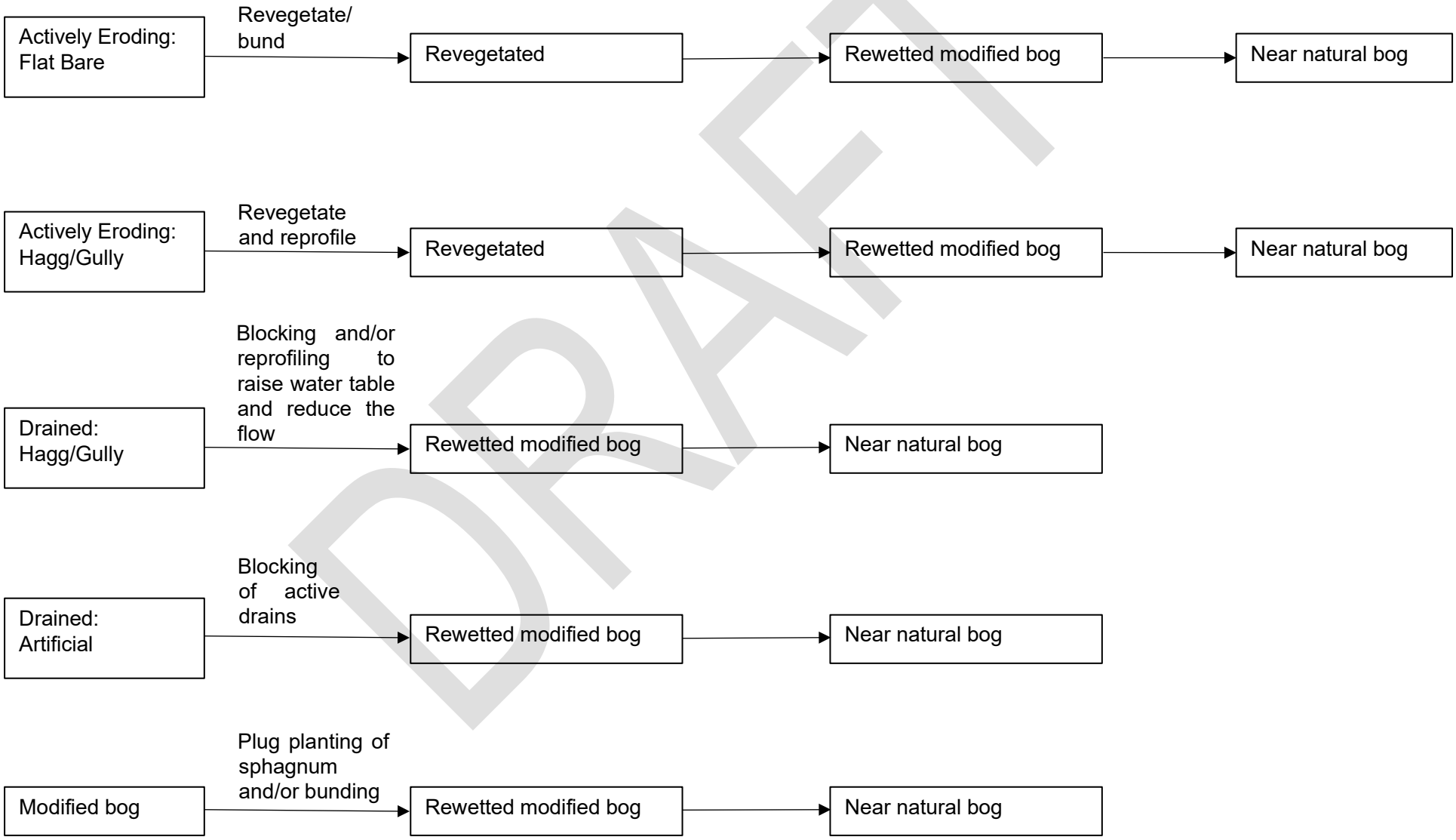
Note emission factors are valid on peat over 50 cm deep, as well as for small pockets of peat between 30 and 50 cm.

Post-Restoration Condition Category	Description	Emission Fac ($tCO_2e/ha/yr$)
Revegetated	• Any formally bare peat 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) • It would be expected that most features selected on the condition change matrix (below) will be to the right in the lighter green columns with some features selected in the dark green left column	2.51

Rewetted modified bog	• Within 30m of a rewetted artificial drainage system (active flow interrupted by restoration activities) OR • Within 30m 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 • Features circled on the condition matrix should show a change toward to the left darker green column.	0.32
Near Natural Bog	• *Sphagnum* dominated • 'Calluna vulgaris not forming dominant canopy but instead rather scattered when viewed from above. Little or no bare peat • Features circled are predominately in the left dark green columns on the condition change matrix.	0.32

Condition change steps for bogs

Condition change steps for bogs under the Peatland Code, with above the first transition arrows examples of interventions.



Pre-verification field survey

This section describes the steps to 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 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-meter radius around each survey point and exclude any area that is not within the Assessment Unit. In the circular area around each survey point, identify and document the existing condition category, or categories, based post restoration condition category definitions. Record the proportion of each category within the circle. To achieve the specified condition category, the average percentage recorded for that category must be at least 75% within each Assessment Unit. Assessment Units can be redrawn to capture areas of higher or lower expected performance.
3.	**Condition Matrix monitoring**	For eligible Modified bog pre restoration condition category only: Navigate back to your GPS waypoints, using a new condition matrix circle **all** the features you can see in this location and on the way to your location. Repeat this process for all the GPS waypoints. The circled features should predominantly be in the left light green columns. This shows condition improvement. If features circled are predominately in the right darker columns this indicates declining condition.
4.	**Photographs**	Fixed point photos shall be repeated at the same location as the pre-validation field survey.
5.	**Condition Category Change**	Compare condition category present 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.

www.iucn-uk-peatlandprogramme.org/peatland-code/introduction-peatland-code/projects.

Fens

Fens are areas where peat has formed which is fed by surface and groundwater – containing nutrients from the underlying geology in which it has been in contact with – as well as rainwater (minerotrophic). There is a wide range of types of fens. Base-poor fens are associated with acidic groundwaters (pH 5 or less) which has been in contact with sandstone or granite for example. These base-poor fens often have bog-type vegetation (e.g. cotton grass, heather and sphagnum mosses). In contrast, base-rich fens, fed by waters with a higher pH (pH 5 or more) which has been in contact with limestone for example. The vegetation on these types of fens are often sedges, reeds and brown mosses.

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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 emission calculator with the measured baseline water table on site.

Pre-Restoration Condition Category	Description	Emission Factor ($tCO_2e/ha/yr$)
Cropland (peat > 45 cm) – Drained	• Vegetated with a conventional crop. • Peat depth min 45cm. • 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]
Rewetted Fen*	• Fen peats that have been deliberately re-wetted, 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 as it transitions 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 emission reduction from will be calculated using the water table and the fen emission 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 to take, in sequential order, to produce a map of assessment units on which to base the field survey.

General notes on mapping:
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; 0.01ha (10mx10m resolution).

2. **Define project Area(s)**

   Map as a polygon(s) and calculate gross project area in ha.

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-meter 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 and will likely have a drainage effect on the surrounding peat.

   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 same condition categories where possible and spatially appropriate). Calculate the area of each Assessment Unit in ha (the sum of each assessment area unit should be equal to the Net Project Area).

Field Survey

A project site will always have to 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 to 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 100mx100m grid overlay upon assessment unit map. Each intersection of the grid represents a survey point. Each survey point 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 with a tape measure the depth of the peat from the core and take a picture from each core including the tape measure.

For condition category "modified fen" peat depth at a representative field unit should 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. Three transects across every to measure field unit shall be measured taking into account the maximum variability in ground conditions and vegetation cover and type, with a minimum number of 15 measurements evenly spaced per transect. For example, a transect from the water's edge to higher ground/middle of basin to edge. If in doubt of the location of the transect advise from IUCN UK PP can be sought. Submission of any other existing peat depth data is welcomed.

For condition categories cropland and grassland (both intensive and extensive) peat depth should be measured at each survey point of the 100x 100m grid.

A minimum of 75% of the peat depths recorded within all Assessment Units must be greater than or equal to 45cm 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. For projects over 30 years, projects 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 Peatland Code section 1.2).

3. Water table assessment

Type of monitoring methods

Use a mix of rust rods, dipwells and continuous loggers. At least one continuous water level logger per field unit (same field units as determined for peat depth measurements) is required, with a minimum of 5 different dipwells read monthly and a minimum of 15 rust rods read quarterly.

Alternatively, if preferred by the project, dipwells can replace some or all of the rust rods. In the case of using dipwells instead of rust rods, ensure a total of 20 dipwells are read monthly. All dipwells and rust rods will move up and down together in response to rain/dry weather. Therefore, use the continuous record to gap-fill the manual records and calculate the monthly and annual mean water table depth across the site.

The Eyes On The Bog manual (found here: https://www.iucn-uk-peatlandprogramme.org/get-involved/eyes-bog) outlines the protocol for installation of rust rods.

A minimum baseline of 12 months is required. If not, the full required water table monitoring set up was established for a minimum of 12 months, but a subset was, this could be accepted IF the project can evidence that after installation of the full required set all loggers, rust rods and dipwells respond to changes in a homogenous way.

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

Monitoring design

A representative field unit should be monitored, 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. The water table measurements should be done in a stratified approach: map the habitat into the main areas present (e.g. dry heather, wet Juncus flush, or field middle and field edge, etc.) and sample each of those. The maximum

variability in ground conditions and vegetation cover and type should be measured. For example measurement points from the water's edge to higher ground/middle of basin to edge, see p 214 of the Fen management handbook.

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 on site. This will inform the restoration plan.

5. Peatland Condition Assessments

Check that the mapped vegetation types where 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 water table depth should be within the ranges of the relevant condition category as shown in table 1 below.

6. 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 type of restoration if multiple restoration techniques are planned. As an indication pictures should be taken every four survey points on the 100 x 100 m grid. Where vegetation cover is variable more fixed points have to 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 way would be to use an orthorectified map (minimal resolution of 1 meter) from drone imagery which enables assessment of pre and post restoration conditions. Additional photographs of e.g. 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 ha (for use within the Peatland Code Fen Emissions Calculator). Overlay the peat depth points over your assessment units.

Water table ranges

The water table ranges in the table 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. Emission reductions can still be achieved even without a move in category. Effective water table depth is defined as whichever is the smallest out of the mean annual measured water table depth and measured peat depth.

Table 1. Defined ranges of minimum and maximum plausible 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	WTDe Min (cm)	WTDe 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

[4] Evans, C., Artz, R., Burden, A., Clilverd, H., Freeman, B., Heinemeyer, A., Lindsay, R., Morrison, R., Potts, J., Reed, M., & Williamson, J. Aligning the peatland code with the UK peatland inventory. *Report to Defra and the IUCN 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

			intensive 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. 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 re-wetted bog and fen). Upper limit set to 30 cm as deeper WTD values would not be considered paludiculture (assign site to cropland).

[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 emission calculator with the measured baseline water table on site.

Post-Restoration Condition Category	Description	Emission Factor ($tCO_2e/ha/yr$)
Cropland– drained	• Vegetated with a conventional crop. • 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]

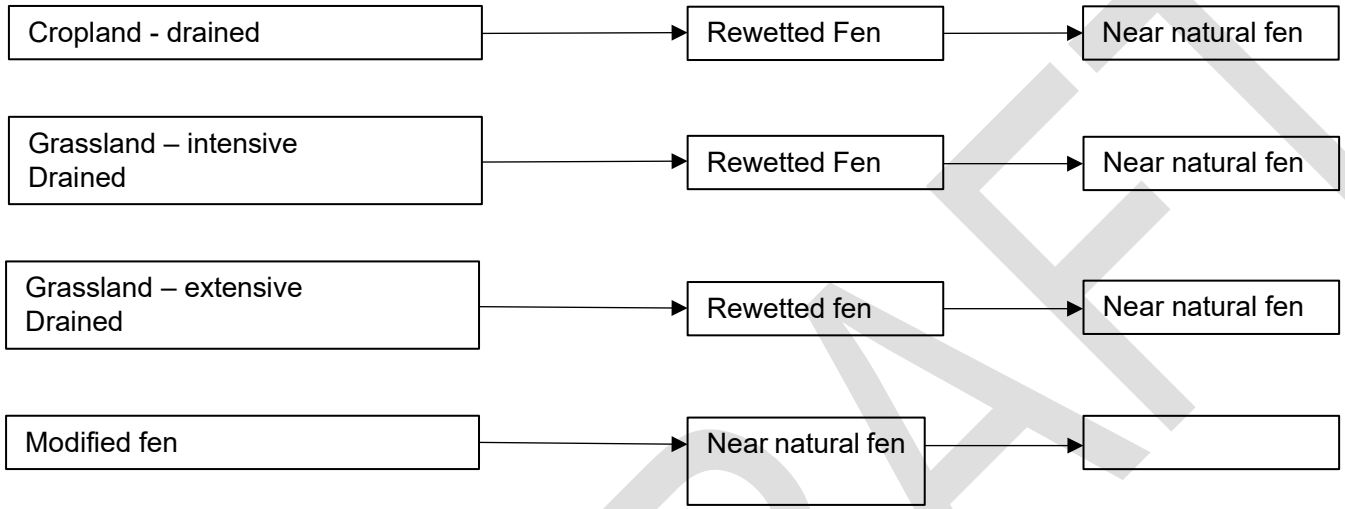
[6] Note that Modified Fen does not have a Tier 2 emission factor due to lack of sufficient data to derive a category-specific emission factor. The emission reduction from will be calculated using the water table and the fen emission calculator.

Rewetted Fen*	• Fen peats that have been deliberately re-wetted, 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 as it transitions 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

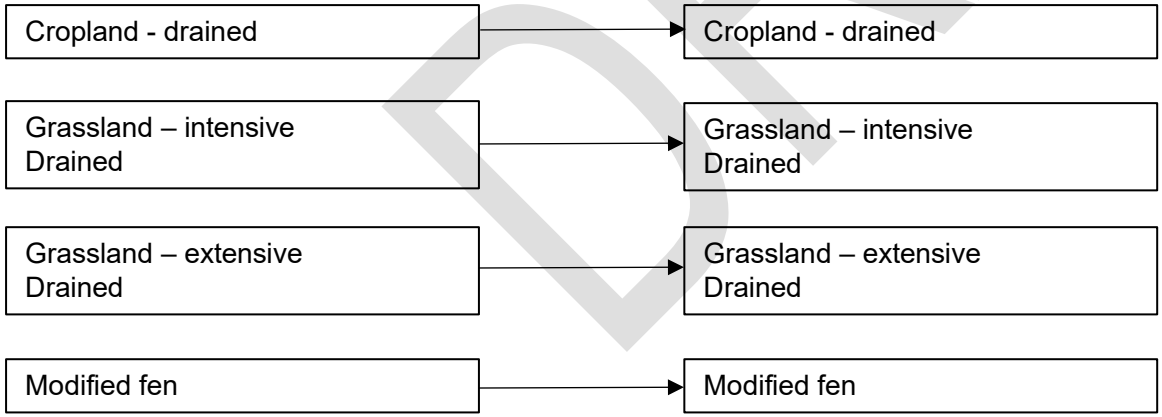
**Ineligible for Peatland Code Restoration – these condition categories may be present within the project site and can be included within the restoration plan but any claims of emissions reduction as a result of their restoration cannot be validated/verified under the Peatland Code.*

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 to 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 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-meter radius around each survey point and exclude any area that is not within the Assessment Unit. In the circular area around each survey point, identify and document the existing condition category, or categories, based post restoration condition category definitions. Record the proportion of each category within the circle. To achieve the specified condition category, the average percentage recorded for that category must be at least 75% within each Assessment Unit. Assessment Units can be redrawn to capture areas of higher or lower expected performance.
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 should be repeated at the same location as during the Field survey.
5.	**Condition Category Change**	Compare condition category present 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 > 45 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

www.iucn-uk-peatlandprogramme.org/peatland-code/introduction-peatland-code/projects.