Technical Appendix 8.1

Habitat Management Plan (HMP)

SCOTTISHPOWER RENEWABLES

Earraghail
Renewable Energy Development

Habitat Management Plan

February 2022

Final

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1 Introduction

ScottishPower Renewables (UK) ltd (SPR) is leading the UK in the operation and development of renewable technologies and proposes to develop Earraghail Renewable Energy Development (hereafter referred to as the "proposed Development") which lies south of the village of Tarbert in the northern part of the Kintyre Peninsula in Argyll & Bute.

As part of the Environmental Impact Assessment ("EIA") for the proposed Development an assessment has been made of the potential ecological impacts. As such, this Habitat Management Plan ("HMP") has been developed to not only mitigate for the loss of priority habitat but also to enhance the local area for biodiversity through large scale habitat restoration and native woodland creation.

SPR manages all HMP's internally and is currently delivering HMP's at 30 windfarm sites across the UK, encompassing a total land management area of approximately 10,000 ha.

2 Purpose of the HMP

The overall purpose of the HMP is to implement positive land management for the benefit of nature conservation which will mitigate any adverse impacts that the proposed Development may have had. In addition to purely mitigating against any adverse impacts, SPR is committed to enhancing the habitat value of the proposed Development and has taken the opportunity to provide not only mitigation, but large scale enhancement of local habitat features to provide wider benefits. This HMP defines the Aims and Objectives of the land management that will be implemented on the proposed Development to achieve this overall purpose.

The Earraghail Renewable Energy Development EIA describes the direct and indirect impacts the proposed Development will have on the habitats present on site. It is predicted that the proposed Development will result in the total loss (both direct and indirect impacts) of 0.17ha of wet dwarf shrub habitat, 2.27ha of blanket bog communities (M19a and M23) and 3.93ha of mosaic habitat containing blanket bog. Although these impacts were assessed as being not significant in the context of the EIA regulations, it is the purpose of this HMP to not only mitigate for these losses but provide substantial net gain for habitats and species in the local area through the restoration of 222.6ha of afforested blanket bog, 43ha of afforested heathland and the creation of 25ha of native woodland. It is anticipated that the habitat management outlined within the HMP will have a multitude of benefits for species that have been found to use the site such as black grouse, golden eagle and red-throated diver and will complement the habitats found in the adjoining Tarbert to Skipness Coast Site of Special Scientific Interest (SSSI) and Tarbert Woods Special Area of Conservation (SAC).

The HMP has been written in a manner that provides a clear link between management and monitoring and focuses on *habitat* criteria which are aspects that can be managed directly, and *species* criteria which are used to partially indicate habitat quality.

3 Management Structure and Reporting

The HMP will run from the first commissioning of the proposed Development to its decommissioning and will be managed wholly by SPR. The HMP is viewed as an iterative document which will be updated throughout the implementation process in line with results of monitoring and any updates to guidance and best practice. A review of the HMP will be undertaken every 5 years including any necessary

reclassification of areas within the HMP Units to ensure all areas are subject to the most appropriate management and therefore are encompassed under the correct Aims and Objectives for the habitat type.

4 Site Location and HMP Area

The proposed Development is located approximately 1.2km south west of the village of Tarbert and 2.1km north of the village of Skipness within the northern part of the Kintyre Peninsula in Argyll & Bute and comprises 13 wind turbines, battery storage and ground mounted solar arrays with associate infrastructure.

The HMP areas lie to the north of the turbine envelope (Figure 1) and currently comprises of commercial forestry.

5 Habitat Overview and Status

For the purposes of management, this HMP comprises three management Units (Figure 2):

Unit 1- Peatland restoration on modified blanket mire and wet heath occurring on peat generally >30cm depth
Unit 2 – Heathland/native woodland restoration on shallow peat soils <30cm peat
Unit 3 - New native woodland creation on mineral soils

Peatland habitats comprising a blanket mire grading out to wet/dry heath occupy Unit 1 of HMP area and represent "natural" habitats (albeit in a modified state) which would be expected to occur in a system unaltered by anthropogenic influences. As described in Section 4 the peatland habitat has been modified to accommodate commercial forestry. Peatland habitats in good condition provide a multitude of environmental benefits, particularly for biodiversity, hydrology and as part of the carbon cycle. Afforestation of peatlands has many negative impacts on the underlying peat including altering the hydrology, ultimately drying out the peat and leading to oxidation and loss of the peat mass. Removal of the trees and restoration of the underlying hydrology is key to restoring the overall habitat to a functional peatland for biodiversity, carbon storage and many other ecosystem services. The location of the peatland restoration area and removal of the forestry will also open up Loch na Machrach Moire to many species found on site such as red-throated diver that do not currently use the loch as it is enclosed by forestry.

It is therefore the proposal of the HMP to fell Unit 1 and restore the underlying modified blanket bog habitat. The Unit will be felled using a phased approach in agreement with FLS post consent. SPR is already delivering 8,500ha of peatland restoration through its renewable energy developments and is at the forefront of research and innovation into peatland restoration techniques being appointed lead author of the International Union for Conservation of Nature (IUCN) report on deforested peatland restoration for the Commission of Inquiry on Peatlands[1]. More detail on the experience SPR has in forest to bog restoration such as that outlined in this HMP can be found there.

Units 2 and 3 strive to restore and create a mosaic of habitats considered to be of conservation value to a range of species, including black grouse. The EIA for the proposed Development identified several black grouse leks on the open moorland to the north of the turbine envelope. An emphasis on improving the quality of existing heathland habitat and creating new areas of low density native woodland will aim to create habitats suitable for use by black grouse throughout their lifecycle. It is anticipated that the measures proposed within the HMP will also increase heather frequency and cover throughout the Units, providing an increased food resource for black grouse and enhanced cover for nesting.

[1] Robson et al., (2019) *Commission of Inquiry on Peatlands Update: Peatlands and Forestry*. https://www.iucn-uk-peatlandprogramme.org/resources/commission-inquiry/commission-inquiry-peatlands-update-2017-20

6 Aims and Objectives

Overview

The primary intention of this HMP is to deliver large scale restoration of deforested blanket bog habitat, heathland restoration and native woodland creation.

Delivery Process

The delivery of an HMP is based on achieving the various Aims, which are assessed by measuring the extent to which clearly defined Objectives and their associated condition indicators have been met. The definition of each Objective is therefore a key requirement for an HMP to allow progress to be assessed in a quantified, objective way which has clear implications for whether the overall Aims are likely to be met and whether any management measures need to be put in place or amended.

A summary of the stages applied to each Objective within this HMP is shown in Figure 3. For Objectives where the required management is not obvious, or the processes not well enough understood to allow them to be defined in detail, a programme of trials is advocated to allow the methods, costs, rates and effects of management measures to be assessed before being implemented more widely.

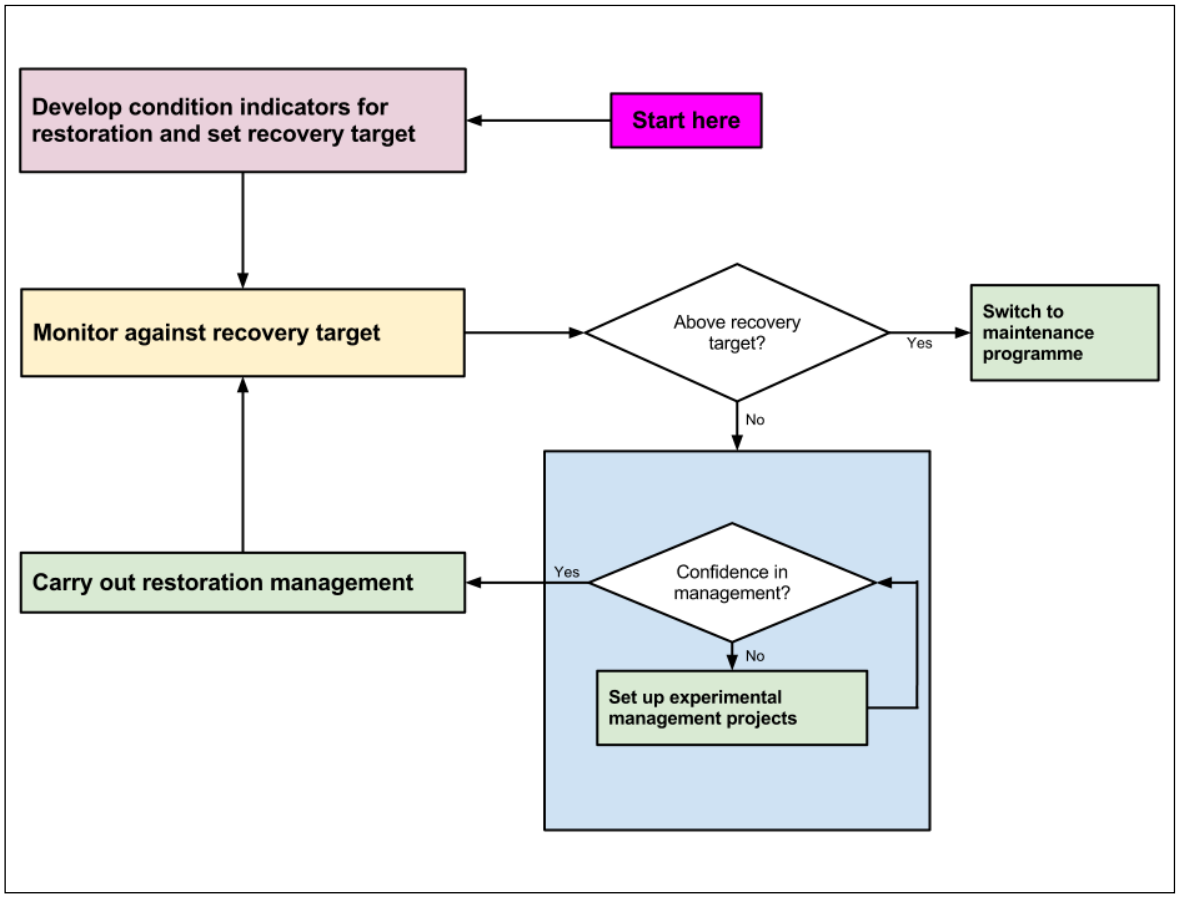


Figure 3: Process for monitoring and management to achieve habitat restoration, redrawn from Hurford and Schneider (2007).

Overall Weighted Score

In order to assess the success and outcome of the Aims, a scoring system will be used to express the outcome of monitoring results. Some Objectives are considered to be more fundamental than others to achieve in order for habitats to be restored and therefore are higher weighted accordingly (see individual Objectives within each Aim for the weighting). This allows an overall weighted average score for the entire monitored area to be produced out of 100 (total = percentage of plots meeting each objective x weighting) and compared against the table below, with 100 demonstrating each Objective is met at every sample location. This method allows an overall assessment of restoration progress to be made.

Table 1: Showing the total weighted average against the condition class of the monitored area

Condition Class	Weighted average range
Very poor	< 60.0
Poor	60.01-70.0
Acceptable	70.01-80.0
Good	80.01-90.0
Excellent	90.01-100

Aims and Objectives are described for the each of the three HMP Units below. Management measures that will be undertaken across the HMP Units are described in Section 7, and a description of the monitoring that will be implemented to assess the progress of the Aims using each Objective is included in Section 8.

Aim 1: Restore conditions for deforested blanket bog habitat

Definition and Distribution

The definition of deforested blanket bog habitat covered by Aims 1 and 2 is defined as all deforested areas within the Unit 1 boundary where peat depth is >30cm. The distribution of this habitat is shown in Figure 2 and covers a total area of approximately 222.6ha.

Background

SPR have undertaken comprehensive research and monitoring on deforested peatland sites to understand the underlying hydrology and have such developed techniques which demonstrably restore blanket bog conditions. The key issue arising from extensive afforestation of blanket bog is a disruption to the water table. With extensively elevated ground along ridges as a result of ploughing creating habitat that is out with the water table level and therefore too dry for bog vegetation to recolonise out with the furrows (Photo 1). In addition, the presence of conifer regeneration from seed can cause additional drying pressure through evapo-transpiration as well as shading as the trees increase in size.

Photo 1: Post felling bog habitat showing elevated ridge with stumps visible and associated regeneration of conifers.

Condition Requirements

The conditions required for the restoration of blanket bog within these areas are defined as follows:

- Water table depth must be close to ground level throughout the year, including the main drought period April - August.
- Regenerating trees must be absent.

Objectives

Based on these requirements a set of Objectives have been defined which will allow progress to be monitored. An Objective is considered to be met when monitoring (Section 8) indicates that at least 70% of sample plots meet the criteria with the exception of tree regeneration (Objective 1.4) which requires 90% of sample plots to be met.

	Objective	Description
Bog water table	1.1	The bog water table should be no deeper than 20cm from the surface of the main peat mass on each sampled plot when assessed in summer 'drought conditions' (defined as the time at which water table levels on site are considered to in the lowest 10% of their measured range, and rainfall has been negligible for at least 3 weeks; surveys undertaken any time between 1st April and 31st August). Weighting: 20%
	1.2	The bog water table should be no deeper than 10cm below the surface of the main peat mass on each sampled plot when assessed in summer 'drought conditions'. Weighting: 15%
	1.3	The bog water table should be at or above the surface of the main peat mass on each sampled plot when assessed in summer 'drought conditions'. Weighting: 5%
Tree regeneration	1.4	Conifer trees, broadleaf trees and exotic shrubs (e.g. Rhododendron) should be absent from each sampled plot. Weighting: 5%
	1.5	Conifer trees, broadleaf trees and exotic shrubs (e.g. Rhododendron) should be < 1m in height if present. Weighting: 5%

Aim 2: Improve quality of deforested blanket bog habitat

Definition and Distribution

The definition of deforested blanket bog habitat covered by Aims 1 and 2 is defined as all deforested areas within the Unit 1 boundary where peat depth is >30cm. The distribution of this habitat is shown in Figure 2 and covers a total area of approximately 222.6ha.

Background

The long-term aspiration (>5 years) is to restore the blanket bog habitat to a high quality (Photo 2). However, the precise vegetation assemblage which would be expected is difficult to define and variation is expected between the various mesotope types.

Photo 2: *Drosera rotundifolia*, *S. papillosum*, *Narthecium ossifragum* and *Vaccinium oxycoccus* are species typically found on relatively unmodified blanket bog

Objectives

A number of indicators have been used to formulate Objectives which reflect different aspects of blanket bog quality over time. These will be compared against suitable reference areas where possible to allow the quality of the restored blanket bog to be assessed in context. An Objective is considered to be met when at least 70% of sample plots meet the criteria.

	Objective	Description
Sphagnum and peat	2.1	At least one species of Sphagnum should be present (predicted community M17, 18 or 19) on each sampled plot. Weighting: 10%
	2.2	*Sphagnum papillosum* or *S. magellanicum* should be present (predicted community is M17 & 18) on each sampled plot. Weighting: 5%
	2.3	Sphagnum spp. should account for at least 30% of basal cover on each sampled plot. Weighting: 10%
	2.4	Visible trampling or uprooting impacts of large grazing mammals on Sphagnum hummocks (or lawns) should be absent on each sampled plot. Weighting: 2.5%
	2.5	Bare peat should comprise <1% of 'basal' cover on each sampled plot, in situations where it is arising due to trampling effects or disturbance by machinery (where sites are naturally eroding this target can be modified to suit). Weighting: 5%
Higher plants	2.6	*Eriophorum* spp. should be present on each sampled plot. Weighting: 5%
	2.7	*Calluna vulgaris* should be present on each sampled plot. Weighting: 5%
	2.8	*Calluna vulgaris* of at least 20cm average canopy height and with < 20% leading shoots browsed by deer/sheep on average, should be present on each sampled plot. Weighting: 2.5%
	2.9	'True grasses' foliar cover should be less than 5% on each sampled plot. Weighting: 2.5%
	2.10	The combined cover of *Calluna vulgaris*, *Eriophorum* spp. and *Tricophorum cespitosum* should account for no more than 75% of foliar cover on each sampled plot. Weighting: 2.5%

Aim 3: Restore conditions for heathland/ regenerating woodland habitat

Definition and Distribution

The definition of heath / regenerating native woodland habitat covered by Aim 3 is defined as areas within Unit 2 which have been felled where peat depth is <30cm. The exact distribution of habitats will vary depending on conditions, but it is expected to comprise an area of 43.3ha.

Background

The key issue arising for these habitats is the extent of conifer regeneration from seed, which if left unchecked will begin to shade out the target habitat vegetation. There is also a threat of invasive non-native species becoming established, particularly on richer soils, which may require management in the future.

It is anticipated that a low density of native broadleaf trees will naturally become established throughout the Unit with a local seed source from the adjoining Tarbert to Skipness Coast Site of Special Scientific Interest (SSSI) and Tarbert Woods Special Area of Conservation (SAC).

Condition Requirements

The conditions required for heathland / regenerating native woodland are defined as follows:

- Regenerating conifers must be absent.
- Invasive non-native species must be absent.

Based on these requirements a set of Objectives have been defined which will allow progress to be monitored.

Objectives

Objective	Description
3.1	Mean tree height should not decrease annually at 95% of plots*. Weighting: 20%
3.2	Non-native tree species and invasive plants should be absent from 95% of plots. Weighting: 20%
3.3	Dwarf shrub should not exhibit chronic overgrazing growth forms at 100% of plots. Weighting: 30%
3.4	Frequency of dwarf shrub should not decline. Weighting: 30%

*where trees are present

Aim 4: Establish and maintain native woodland habitat

Definition and Distribution

The definition of native woodland habitat covered by Aim 4 is defined as all habitats within the 25ha of Unit 3 with suitable mineral soils where woodland would be expected to naturally establish.

Background

A detailed planting plan will be drawn up for agreement post-consent including species mix, planting method and protection. An ESC survey will be undertaken to inform the planting plan with a focus on direct planting native broadleaves and allowing the rest of the area to naturally regenerate from the local seed source to a total cover area of around 25%. It is likely that planting will be undertaken in clumps and along watercourses to reflect the adjoining woodland. Final species composition will be agreed with FLS but will likely comprise downy birch,sessile oak, rowan, hazel, alder and species of willow. The planting plan will be created to compliment and extend the species present in the nearby Tarbert to Skipness Coast Site of Special Scientific Interest (SSSI) and Tarbert Woods Special Area of Conservation (SAC) and reflect what would naturally be expected to be found given the soil types and conditions. Planting will take place within the first year after final commissioning of the proposed Development and a maintenance programme will continue until trees are considered established, achieving the criteria set out in the below Objectives.

Objectives

Objective	Description
4.1	Achieve target density of 2,500 stems per hectare within planted areas after 5 years. Weighting: 50%
4.2	Achieve mean height of >1m after 10 years within planted areas. Weighting: 20%
4.3	Achieve mean height of >1.8m for canopy species after 15 years within planted areas. Weighting: 10%
4.4	Mean tree height should not decrease annually at 95% of plots in unplanted natural regeneration areas. Weighting: 15%
4.5	Invasive species should be absent from all plots. Weighting: 5%

7 Habitat Management Measures

7.1 Physical Interventions on blanket bog

Physical interventions are defined as measures which comprise mechanical treatment to an area of land. These treatments will be carried out in line with current best practice, at an appropriate time post felling once modelling of catchments for water quality purposes has been undertaken. The felling of Unit 1 will be undertaken in phases which will be agreed with FLS post-consent. Subject to the agreed phased felling plan, SPR will commit to undertaking 25% of the total restoration work in Unit 1 (approximately 56ha) within the first 3 years post felling. This programme may be accelerated depending on the review of catchment sizes in relation to the felled areas which may negate the need for water quality testing and modelling. Subsequent phases of restoration will be undertaken following the pattern of agreed felling.

7.1.1 Description

SPR have undertaken several trial projects to investigate types of intervention and their associated costs, environmental risks and practical considerations relevant to forest-bog restoration as detailed in the previously referenced IUCN report. A summary of techniques is presented in the table below.

Technique	Description	Drain/furrow disruption	Conifer regeneration removal
Cross-tracking	Uses a tracked excavator to flatten plough ridges and disrupt drainage pathways and kill conifer regeneration	Yes	Yes
Ground-smoothing	Uses an excavator bucket to upturn stumps, infill furrows and drains, and bury conifer regeneration Untreated buffers of 5m are left at 50m intervals and adjacent to watercourses, although these may be increased to 10m depending on sensitivity (e.g. water vole mitigation and adjacent on watercourses connected to a downstream SAC at NatureSot's request)	Yes	Yes
Hand clearance	Hand felling of conifer regeneration using clearing saws or chainsaws	No	Yes (densities <2500/ha)
Wave damming	Creating dams approx. 4m apart within existing drains and double ploughed furrows to stop water flow.	Yes	No
Raking	Uses an excavator to rake conifer regenerating into brash lanes which are used to facilitate machine access across stumps	No	Yes

The precise areas where each technique will be implemented will be determined when undertaking the detailed planning of restoration work post felling. It is envisaged that a combination of measures will typically be required within each defined area depending on ground conditions, topography and the extent of factors affecting restoration (i.e. conifer regeneration, stump sizes, drain status etc.).

All methods require forestry residues (lop and top referred to collectively as brash) to be left on site after harvesting of the stem wood materials (>7cm diameter) in order to facilitate access by tracked excavators during the operational phase. Forestry residues are also important in protecting the exposed peatland soils which are generated by several of the methods, both in terms of pluvial, fluvial and Aeolian erosive forces, frost heave and by providing sheltered micro-climates for vegetation to establish.

For any areas where machinery access to extract timber is impossible due to ground conditions, or where the quantity of standing timber required to form the brash lanes would result in no timber being extracted (i.e. all timber available is used to construct the brash lane) alternative methods of clearing trees such as in-situ mulching may be proposed by the contractor in consultation with SPR's ecology team, FLS and SEPA. Alternative methods will only be deemed acceptable if the quantity and distribution of material left on site is beneficial to the restoration process by providing a thin layer of protective mulch as per SEPA Guidance Note LUPS-GU27.

The detailed planning work will include a due diligence exercise to identify sensitive receptors, catchment scale water quality assessment (predominantly DOC), mitigation measures (including natural silt screens using untreated vegetated strips) and a monitoring plan for suspended solids during and after the works are implemented, and actions to take in response to monitoring results.

7.1.2 Programme

In line with current best practice, interventions which require landscape-scale physical interventions will be phased over multiple years to mitigate against any negative environmental impacts which could otherwise arise as a result of the treatment works. This will be updated as required to reflect current best practice and available guidance. A range of criteria will be applied to determine how areas should be prioritised over this period which is briefly described below.

1. Elevation/hillslope position (deforested areas of blanket bog): deforestation monitoring undertaken by SPR on other sites has shown that areas of watershed/spur mesotope blanket bog tends to be drier and hence in poorer condition than mesotopes lower down hillslopes. It is also considered that drain/furrow disruption measures should start at the top of the drainage network as starting further down would cause any dams/infilling measures to have greater risk of erosion/failure due to upstream catchments still using the drains as preferential pathways. Therefore, blanket bog management units in the highest elevations were given higher priority for physical intervention.
2. Impact magnitude: the degree of existing impact due to drains, based on density, size and visual occlusion in unplanted bog and the veracity of conifer regeneration in deforested areas. A higher priority has been given to areas with larger and more active drains and those deforested areas with a greater density of regenerating conifers.

Detailed monitoring will be undertaken on the first cohort of treated land using the protocol described in Section 8 to assess the results against the Objectives detailed in this HMP. If monitoring shows Objectives are unlikely to be met, further detailed monitoring may be implemented on additional cohorts of treated land and further treatment measures implemented. For example, SPR has implemented measures at Whitelee and Black Law Windfarms post treatment to remove regenerating non-native conifers that survived mechanical intervention by hand clearance.

8 Monitoring

The following monitoring Will be implemented in order to assess the success of each of the Aims presented within this HMP against their Objectives and direct any future treatment requirements.

8.1 Bog monitoring

SPR has developed a protocol to monitor vegetation in relation to the Objectives set out within this HMP based on extensive experience monitoring similar habitats across Scotland.

Monitoring will be undertaken on a set of permanent 1m radial samples set on a grid throughout the first treatment cohort in Unit 1.

At each 1m radial sample the following information is collected for species relevant to the Objectives (target species):

1. Presence/absence of target species
2. By eye cover targets of key metrics (see 2a below)
3. Height and offtake of *Calluna*
4. Depth to water table (using fixed dipwell)
5. 3 pin hits of foliar and basal vegetation cover equally spaced along a 20m transect (long format only)

There are two monitoring methods used: a long monitoring protocol and short monitoring protocol. The short monitoring protocol only records items 1, 2, 3 and 4.

Frequency Assessment
At each monitoring sample plot a rope demarcated at 0.25m, 0.50m and 1m will be used to form a radial quadrat. Starting with the smallest distance and working up to 1m, the presence of each target species is to be recorded, noting the smallest distance found. This nested unit size allows different sizes of sampling units to be applied to species of differing abundances for trend monitoring i.e. common species are assessed in smaller units, rarer species are assessed in larger units.

General Cover Assessment
Record each by eye cover assessment within each frequency point (1m circle):
is sphagnum cover > 30% (if unsure record lower)
is bare peat cover < 1% (if unsure record higher)
is true grass cover (excluding Molinia) < 5% (if unsure record higher)
is the combined cover of *Calluna*, *Eriophorum* and *Tricophorum* < 75% (if unsure record higher)

***Calluna* height and offtake**
Record the height of a representative *Calluna* plant within each 1m radial plot. Record *Calluna* height from top of the basal layer the depth of the basal layer to peat surface separately. Record the percentage of *Calluna* long shoots browsed.

Dipwells

Permanent dipwells will be installed at each monitoring sample plot. During a drought period where there has been limited rainfall in the preceding 14 days (typically between April and June, although can occur at other times), the dipwells will be measured by measuring from the top of the dipwell to the water table (termed "water depth"), and from the top of the dipwell to the main peat mass surface (termed "peat offset"). By subtracting the peat offset from the water depth it is possible to calculate the true value of the water table within the bog.

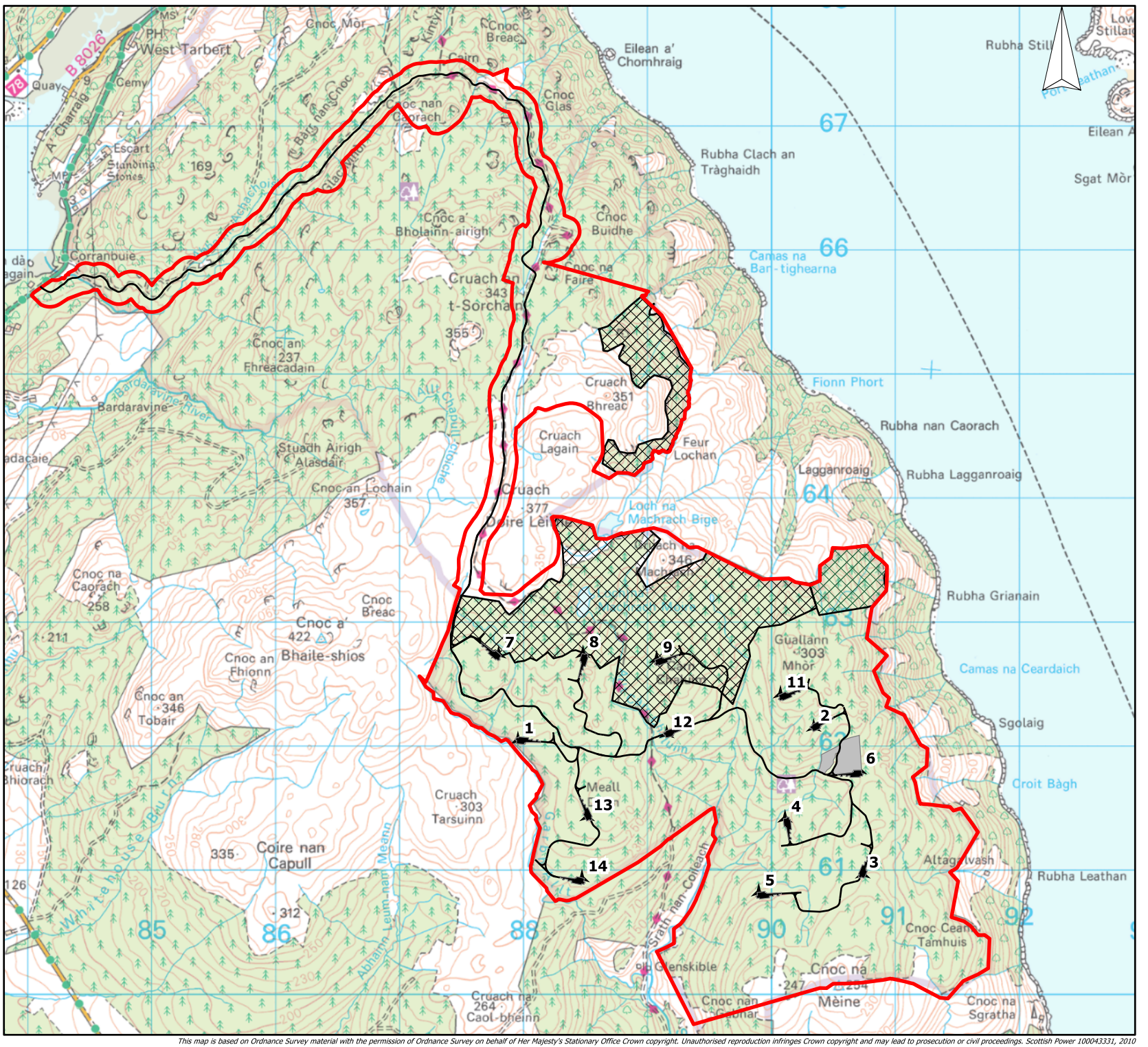
Pin hits

At each monitoring sample plot a rope demarcated at 1m, 11m and 19m is set out to the west. At each marker point a laser pointer is stood on the north side of the rope and used to record any living plant species, litter or bare peat that it hits directly below. Both basal layer and higher vegetation are to be recorded.

8.2 Tree planting

The tree planting area will be monitored against the Objectives set in this HMP using a standardised monitoring protocol using a systematic grid of sampling points throughout the planting areas allowing for maintenance and beat up to be tailored to the Units requirements. At each sample point within a circular plot of 100m^2 (allowed for scaling up of data to hectares) the following information will be gathered:

- Count of the number of trees in the plot
- For each tree within the plot record the following information
  - Species
  - Height
  - Condition
  - Damage categorised by type



SCOTTISHPOWER RENEWABLES

Legend

- Application boundary
- Proposed turbine location
- Proposed infrastructure
- Solar search area
- HMP Area

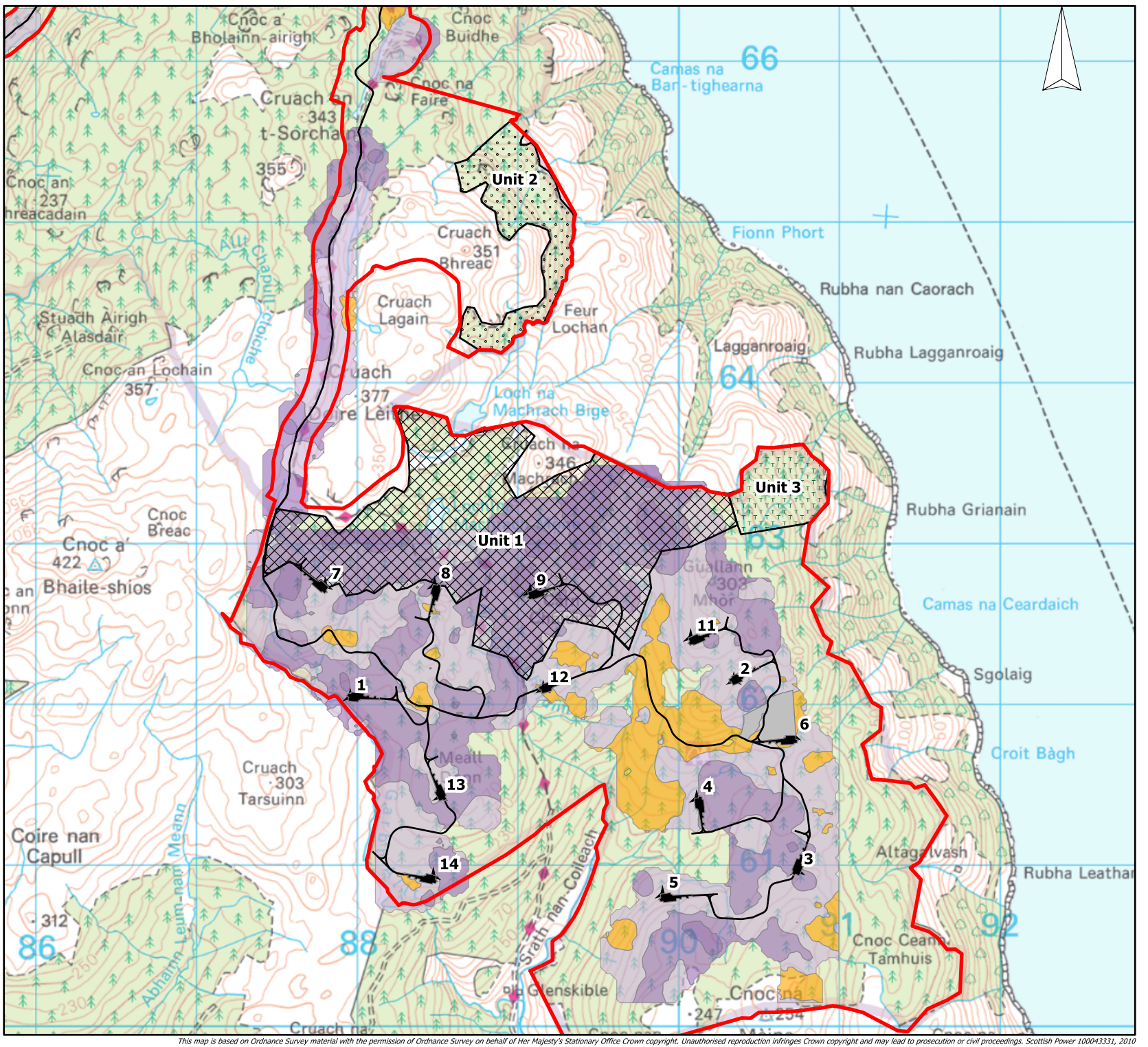
Scale: 1:42000 @ A4

Status	Date	Dr.	Ch.	Apj
FINAL	Dec 2021	CB	PR	PR

Site Location and HMP Area

Earraghail RED HMP Draft Version 4

Figure 1



ScottishPower Renewables
9th Floor
320 St Vincent Street
Glasgow
G2 5AD

T +44 (0)141 614 0451

EarraghailRenewableEnergyDevelopment@scottishpower.com

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