# ACKRON WIND FARM

# TECHNICAL APPENDIX A7.1:

# HABITATS & BOTANY

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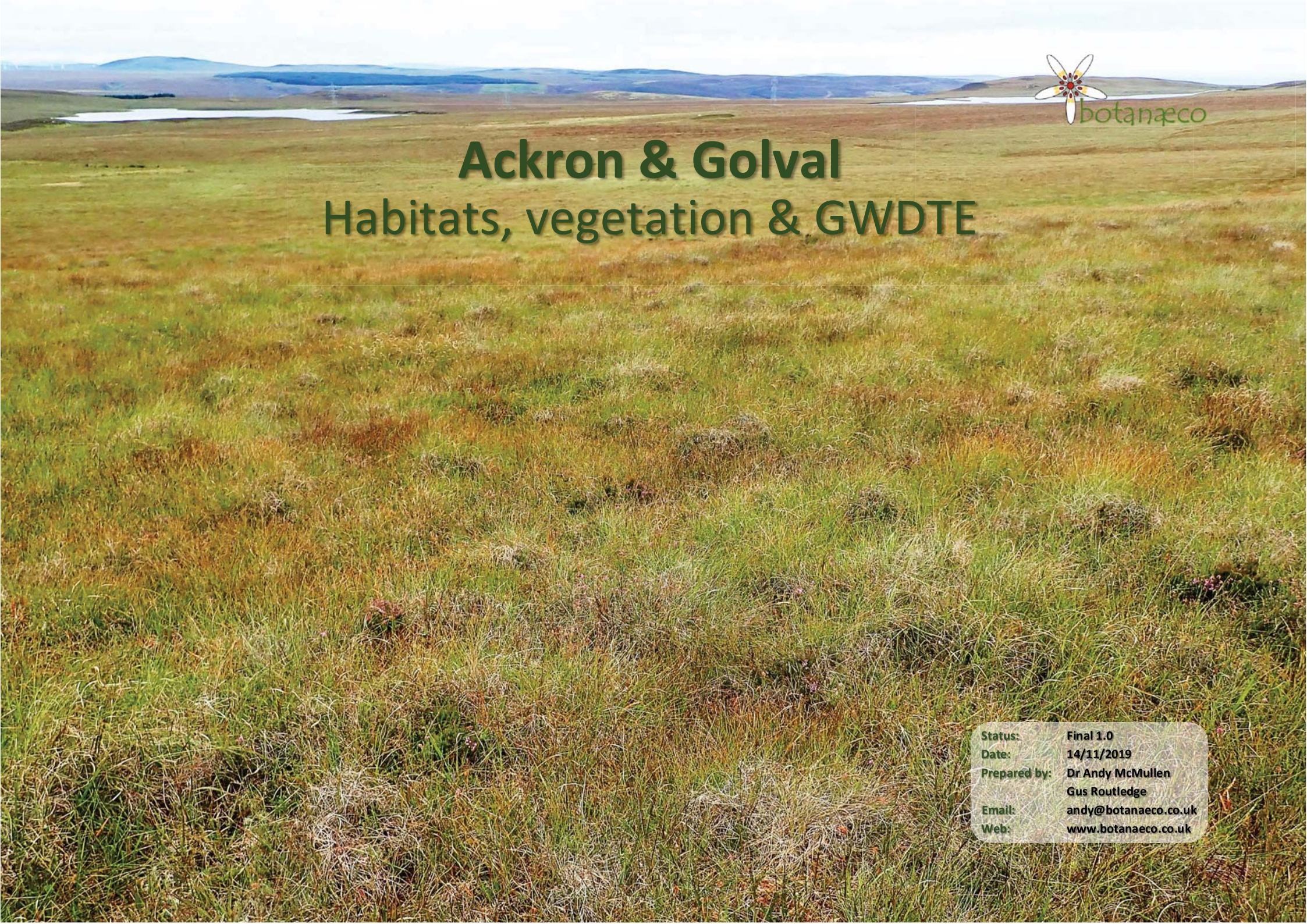

# Ackron & Golval

## Habitats, vegetation & GWDTE


| | |
|---|---|
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**Cover picture:** Looking northwest from the south-eastern lobe, across extensive, designated blanket bog and the two lochs.

# Summary


**This report** describes the results of habitat survey & assessment of Ackron & Golval, near Melvich in Sutherland, in Highland.

The **aim** of the report is to provide a habitat baseline against which sensitivities can be identified.

**Ackron & Golval** encompasses 944 ha on the oceanic, north coast of Scotland. It includes extensive peatland habitats (blanket bog & wet heath) with smaller patches of bracken & dry heath; and there is pastoral grassland on the low ground. There are also two large lochs (≈2 ha).

Golval is included within several **designations**:

- the East Halladale Site of Special Scientific Interest (SSSI)
- Caithness & Sutherland Peatlands Ramsar, Special Area of Conservation (SAC) & Special Protection Area (SPA).

The **Carbon & Peatland Map** predicts extensive peatland across Ackron & Golval and that it is absent from only the steepest slopes.

The are no **Ancient Woodland Inventory** Sites within Ackron & Golval.

Peatland **habitats** including blanket bog (350 ha, 37 %), wet modified bog (11 ha, 1 %) and their mosaics (32 ha, 2 %); and wet heath (242 ha, 26 %) and its mosaics (120 ha, 13 %) collectively extended across a total of 755 ha or 79 % of Ackron & Golval.

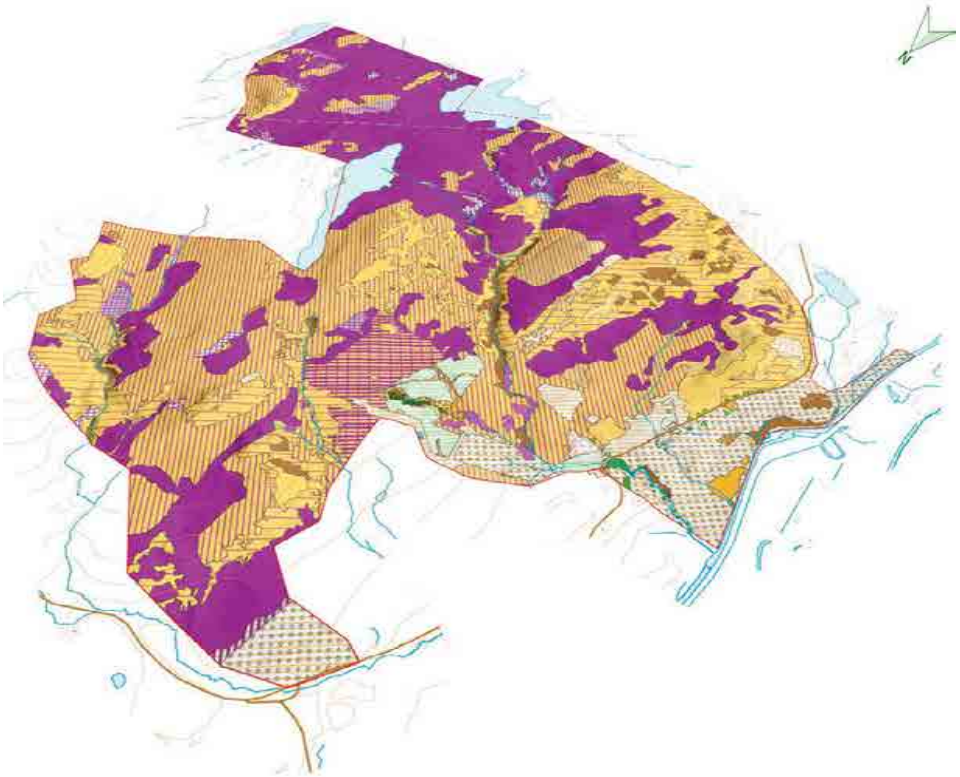
**Peatland Condition Assessment** identifies 'near natural' blanket bog in shallow valleys and more extensive blanket bog vegetation that has been modified by a combination of grazing, drainage & peat-cutting.

The **conservation importance** of designated habitats in the southeast is 'International'. Non-designated peatland & related mire habitats are of Local importance. The remaining habitats are of Site importance.

Highly to moderately groundwater dependent **GWDTE** are localised and include: M10a basic springs; M15a wet heath; & an M32b-type spring.

The key **constraints** to development identified by the survey & assessment are the following:

- Internationally important habitat & designations
- Local importance blanket bog & its related deep peat
- High groundwater dependency M10a & M32b-type flushes

*3D representation of the Phase 1 habitats at Ackron & Golval.*

# 1 Introduction

## Remit

1.1 This report describes the results of habitat survey & assessment of Ackron & Golval, near Melvich in Sutherland, in Highland.

## Aim & objectives

1.2 The aim of the report is to provide a habitat baseline against which sensitivities can be identified by meeting the following objectives:

- Phase 1 habitat & National Vegetation Classification survey.
- Assessment of habitat importance & sensitivity, including Groundwater Dependent Terrestrial Ecosystems (GWDTE).

## The site

1.3 Ackron & Golval encompasses 944 ha on the oceanic, north coast of Scotland. It includes extensive peatland habitats (blanket bog & wet heath) with smaller patches of bracken & dry heath; and there is pastoral grassland on the low ground. There are also two large lochs (≈2 ha).

[1] SNH's SiteLink data, including mapping and site documentation, is available through https://gateway.snh.gov.uk/. Accessed 28/08/2019.

[2] Further details and downloads of the Carbon & Peatland Map 2016 are available at soils.environment.gov.scot/maps/carbon-and-peatland-2016-map/. Accessed 28/08/2019.

[3] *A guide to understanding the Scottish Ancient Woodland Inventory* is available for download at https://www.nature.scot/sites/default/files/2017-06/C283974.pdf. The data is available at https://gateway.snh.gov.uk/natural-spaces/dataset.jsp?dsid=AWI. Accessed 28/08/2019.

# 2 Approach

2.1 In preparation of a baseline to inform assessment, a desk-based study of environmental information was undertaken, to identify known sensitivities, before a field-based survey to map & describe habitats and their constituent vegetation communities. The resulting data is then assessed to identify sensitivities in relation to guidance & legislation. Details on the methods & sources are provided in the following sections.

## Survey boundary & buffers

2.2 The survey boundary & buffers are defined in Map 1 *et seq*. In these maps, the site boundary is the area in which all habitats & vegetation communities are recorded & mapped. It is surrounded by a 250 m GWDTE buffer to allow for the extension of potential, hydrological effects. Within this buffer, only groundwater dependent GWDTE are mapped. Within the boundary & buffer, distinctive or demonstrative features recorded as 'Target Notes'.

## Habitat designations

2.3 A desk study was undertaken to identify habitat designations, including:

- SNH's Sitelink[1] to identify nature conservation designations
- SNH's Carbon & Peatland Map 2016[2] to identify high value 'Class 1' or 'Class 2' peatland
- Ancient Woodland Inventory[3] to identify native woodlands.

## Survey

2.4 There are two elements to the survey: a 'Phase 1' habitat survey and more detailed 'National Vegetation Classification' (NVC) of vegetation within the habitats. The data from these is mapped & described and supplemented by field assessment of habitat/vegetation condition & groundwater dependency. The survey methods are described in the following sections.

### Phase 1 habitat survey

2.5 Phase 1 habitat survey was undertaken within the survey boundary according to the standard method[4] and guidance[5]. As a 'broad-brush' approach, Phase 1 habitat survey is now somewhat

[4] JNCC 2010. *Handbook for phase 1 habitat survey - a technique for environmental audit* and other relevant information available from http://jncc.defra.gov.uk/page-2468. Accessed 28/08/2019.

[5] Chartered Institute of Ecology and Environmental Management 2013. *Guidelines for Preliminary Ecological Appraisal*. Available from https://www.cieem.net/guidance-on-preliminary-ecological-appraisal-gpea-. Accessed 28/08/2019.

outdated by current legislation and initiatives but it still provides a well-established & useful overview. Furthermore, it includes habitats not covered by the more detailed National Vegetation Classification described below. In the **Baseline** (Section 3, below), the vegetation communities are grouped and described under the heading of the relevant Phase 1 habitat.

### National Vegetation Classification

2.6 The National Vegetation Classification (NVC) is more detailed & precise than the Phase 1 habitat method; and is necessary for identifying habitats/plant communities of relevance to modern legislation (such as Annex I of the Habitats Directive, or GWDTE of the Water Framework Directive). It is therefore the primary system to which vegetation (& habitat) is related within this report, for the purposes of identification, description & mapping.

2.7 Vegetation is identified, mapped & described according to the five volumes of *British Plant Communities*[6] in accordance with the standard NVC method (as outlined in the *NVC Users Handbook*[7]). This involves walking the site on a route determined by topography/viewpoints and the need to sample distinctive areas. Homogenous areas are mapped onto rectified aerial photographs overlain with contours & other physical features to ensure accuracy. A single vegetation community or mosaic of more may be mapped, depending upon the scale and patterning of the vegetation. Where mosaics are mapped, the percentage cover of each NVC community is stated in the mapping.

2.8 Characteristics of the vegetation (structure, condition & species composition) are recorded as 'Target Notes' (see Appendix 1) of specific or representative features. These and the habitat & vegetation descriptions include lists of characteristic species that are semi-quantified using the DAFOR scale[8].

### Notable species

2.9 Notable species are those that are subject to nature conservation designation. The 2016 JNCC spreadsheet of taxa designations[9] defines these species and is used as the main point of reference in addition to the *Highland Biodiversity Action Plan*[10].

### Nomenclature

2.10 Standardised vernacular names are used for the vascular plants (ferns, herbs and trees). Scientific names (italicised within the text) are used for the moss, liverwort and lichen species because although vernacular names are now in existence, they are not in general usage. The standard checklists for vernacular and scientific names are employed[11].

## Assessment

2.11 Assessment of the baseline is undertaken against local, national & international legislation & initiatives to identify priorities for nature conservation and sensitive habitats. The methods described in the following sections have been applied in assessment of the baseline.

### Peatland Condition Assessment

2.12 Peatland Condition Assessment[12] was employed in the field to determine the condition of the peatland habitat. This classifies the peatland into four classes:

1) Near-Natural
2) Modified
3) Drained
4) Actively Eroding.

2.13 Field-based assessment of a series of key indicators identifies the appropriate class for each area of peatland. These indicators include features such as the *Sphagnum* cover & vegetation condition; evidence of fire frequency & intensity; bare peat; and scrub/tree invasion[13].

### Conservation priorities

2.14 The baseline established by the desk study and survey is assessed against the following to identify priorities for protection & conservation at the European and national (Scottish) scale:

- Peatland & carbon map 2016[2]
- Ancient Woodland Inventory[3]
- Highland Biodiversity Action Plan[10]
- Annex I of the EU Habitats Directive[13]
- Scottish Biodiversity List[14]

[6] Rodwell, J.S. 1991-2000. *British plant communities*. 5 Volumes. Cambridge University Press.

[7] Rodwell, J.S. 2006. *NVC Users' Handbook*. Download available at http://jncc.defra.gov.uk/page-3724. Accessed 28/08/2019.

[8] DAFOR scale: **D**ominant > **A**bundant > **F**requent > **O**ccasional > **R**are.

[9] The JNCC spreadsheet of taxa designations and further information are available at: http://jncc.defra.gov.uk/page-3408. Accessed 28/08/2019.

[10] Highland Biodiversity Action Plan 2015-2020. Available for download at http://www.highlandbiodiversity.com. Accessed 28/08/2019.

[11] BSBI List of British & Irish Vascular Plants and Stoneworts, for higher plants. Available at http://www.nhm.ac.uk/our-science/data/uk-species/checklists/NHMSYS0000436459/index.html. For mosses and liverworts: Blockeel, T.L. & Long, D.G. 1998. *A check-list and census catalogue of British and Irish Bryophytes.* British Bryological Society. Accessed 28/08/2019.

[12] SNH 2017. *Peatland Condition Assessment*. Available for download from http://www.snh.gov.uk/docs/A1916874.pdf. Accessed 28/08/2019.

[13] Full list of Habitats Directive Annex I habitats and detailed descriptions available at http://jncc.defra.gov.uk/Publications/JNCC312/UK_habitat_list.asp. Accessed 28/08/2019.

[14] Further details and download of the Scottish Biodiversity List available at https://www.nature.scot/scotlands-biodiversity/scottish-biodiversity-strategy/scottish-biodiversity-list. Accessed 28/08/2019.

2.15 The assessment is undertaken according to the Ecological Impact Assessment guidance[15], which recommends that a level of ecological importance is assigned to ecological features using a geographical context. Table 1 summarises the geographical contexts as they relate to the Site.

**Table 1:** Ecological importance categories.

| Importance | Context | Characteristics |
|---|---|---|
| **International** | Europe | • Viable area of habitat included in Annex I of the Habitats Directive. |
| **National** | UK\ Scotland | • A viable area of priority habitat listed in the UKBAP.<br>• Habitat area >1% of the national resource.<br>• An area of habitat fulfilling the criteria for designation as an ASSI/SSSI. |
| **Regional** | Highland | • Importance more than County but not sufficient for SSSI designation. |
| **County** | Sutherland | • County-designated (e.g. Biodiversity Action Plan) habitats.<br>• Habitat area >1% of the county resource.<br>• Semi-natural, ancient woodland >0.25ha in extent. |
| **Local** | Site & 2 km buffer | • Habitats that are unique or otherwise significant in the local area.<br>• Areas of habitat that contribute to the local ecological resource. |
| **Site** | Site only | • Common, often anthropogenic habitats. |

## Groundwater dependent terrestrial ecosystems

2.16 Potential Groundwater Dependent Terrestrial Ecosystems (GWDTE) were identified during the NVC survey according to current SEPA guidance (Guidance Note 31)[16]. Their location-specific groundwater dependency is assessed because GWDTE are not always groundwater dependent, so their inappropriate consideration can cause unnecessary constraint. Assessment is based on the physical environment (geology, hydrology & topography) of the potential GWDTE as well as their floristics.

[15] CIEEM 2018. Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.. Download at https://cieem.net/resource/guidelines-for-ecological-impact-assessment-ecia/. Accessed 28/08/2019.

[16] Land Use Planning System SEPA Guidance Note 31. Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Download available at http://www.sepa.org.uk/media/144266/lups-gu31-guidance-on-assessing-the-impacts-of-development-proposals-on-groundwater-abstractions-and-groundwater-dependent-terrestrial-ecosystems.pdf. Accessed 28/08/2019.

# 3 Baseline

3.1 The baseline describes the habitats of the site in relation to its general characteristics, designations, habitats & vegetation communities.

## General description

3.2 In this section, the physical characteristics of Ackron & Golval are described. They are illustrated in Map 1.

3.3 Ackron & Golval extends across 940 ha. The topography is relatively subdued and descends westward in a series of steps from a high point of 200 m in the southeast, to around 15 m a.s.l. in the valley of the Halladale River in the west. Poorly-defined summits rising up to 30 m are associated with the lower/western edges of the level areas above steep, short slopes up to 50 m high that lead down to the next broadly level area. Five such steps, orientated north-south, cross the site and become increasingly well-defined westward. Watercourses follow the westward slope.

3.4 Typical upland habitats are extensive across most of Ackron & Golval (i.e. heaths & mires) and there are two lochs. On the lowest ground, in the extreme-east, there are additional, pastoral habitats and there is an area of plantation in the centre-west. There are also single, small areas of scattered scrub & broadleaved trees.

3.5 Current management is associated with grazing of livestock and the small area of forestry. An electricity transmission line crosses the southeast.

## Designations

3.6 In this section, statutory & non-statutory designations associated with Ackron & Golval are identified. The distribution of designated habitats & sites is illustrated in Maps 2 & 3. They are listed in Table 2 with their orientation to & distance from Ackron & Golval; and their notified features.

### Statutory designations

3.7 Statutory designations provide a legal basis to the protection of certain sites and their specified natural heritage features.

#### Designated sites

3.8 Ackron & Golval are included within and surrounded by several statutory designations, as illustrated in Map 2 and listed in Table 2 with their orientation, distance & notified features.

**Table 2:** Designated sites within Ackron & Golval & 5 km buffer.

| Site | Designation | Distance & orientation | Notified features |
|---|---|---|---|
| **East Halladale** (included within Caithness & Sutherland Peatlands) | SSSI | Adjacent, southeast | • Blanket bog<br>• Breeding bird assemblage<br>• Dunlin, breeding<br>• Golden plover, breeding |
| **Caithness & Sutherland Peatlands** (includes East Halladale & West Halladale SSSIs) | Ramsar | Adjacent, south | • Blanket bog<br>• "Rare species of … plants and animals".<br>• Dunlin |
| | SAC | | • Acid peat-stained lakes and ponds<br>• Blanket bog<br>• Clear-water lakes or lochs with … poor to moderate nutrient levels<br>• Depressions on peat substrates<br>• Marsh saxifrage<br>• Otter<br>• Very wet mires often identified by an unstable `quaking` surface<br>• Wet heathland with cross-leaved heath |
| | SPA | | • Several bird species |
| **Strathy Coast** | SSSI | 0.8 km, northwest | • Geological features<br>• Machair<br>• Maritime cliff<br>• Sand dune<br>• Saltmarsh<br>• Vascular plant assemblage |
| **North Caithness Cliffs** (includes Red Point Coast SSSI) | SPA | 1.3 km, north | • Several marine and land-based birds. |
| **Red Point Coast** (included within North Caithness Cliffs SPA) | SSSI | 1.3 km, north | • Geological features<br>• Maritime cliff<br>• Scottish primrose<br>• Guillemot |
| **West Halladale** (included within Caithness & Sutherland Peatlands) | SSSI | 1.9 km, southwest | • Blanket bog<br>• Breeding bird assemblage<br>• Black-throated diver<br>• Common scoter |
| **Sandside Bay** | SSSI | 1.9 km, north | • Sand dunes |

3.10 Within Ackron & Golval, and extending to the southeast is East Halladale Site of Special Scientific Interest (SSSI) that is included within the more extensive designation of the Caithness & Sutherland Peatlands Ramsar, Special Area of Conservation (SAC) & Special Protection Area (SPA). Both these sites are designated for the presence of blanket bog and a varied range of related habitats & species. West Halladale SSSI, 1.9 km to the southwest, is designated for the same range of features and is also included the Caithness & Sutherland Peatlands Ramsar, SAC & SPA.

3.11 A short distance to the north (0.8 km to 1.9 km) is a series of coastal designations including Strathy Coast SSSI, Red Point Coast SSSI & Sandside Bay SSSI designated for their coastal habitats & species. Red Point Coast SSSI is additionally included in the North Caithness Cliffs SPA designated for marine & land-based birds.

## Non-statutory designations

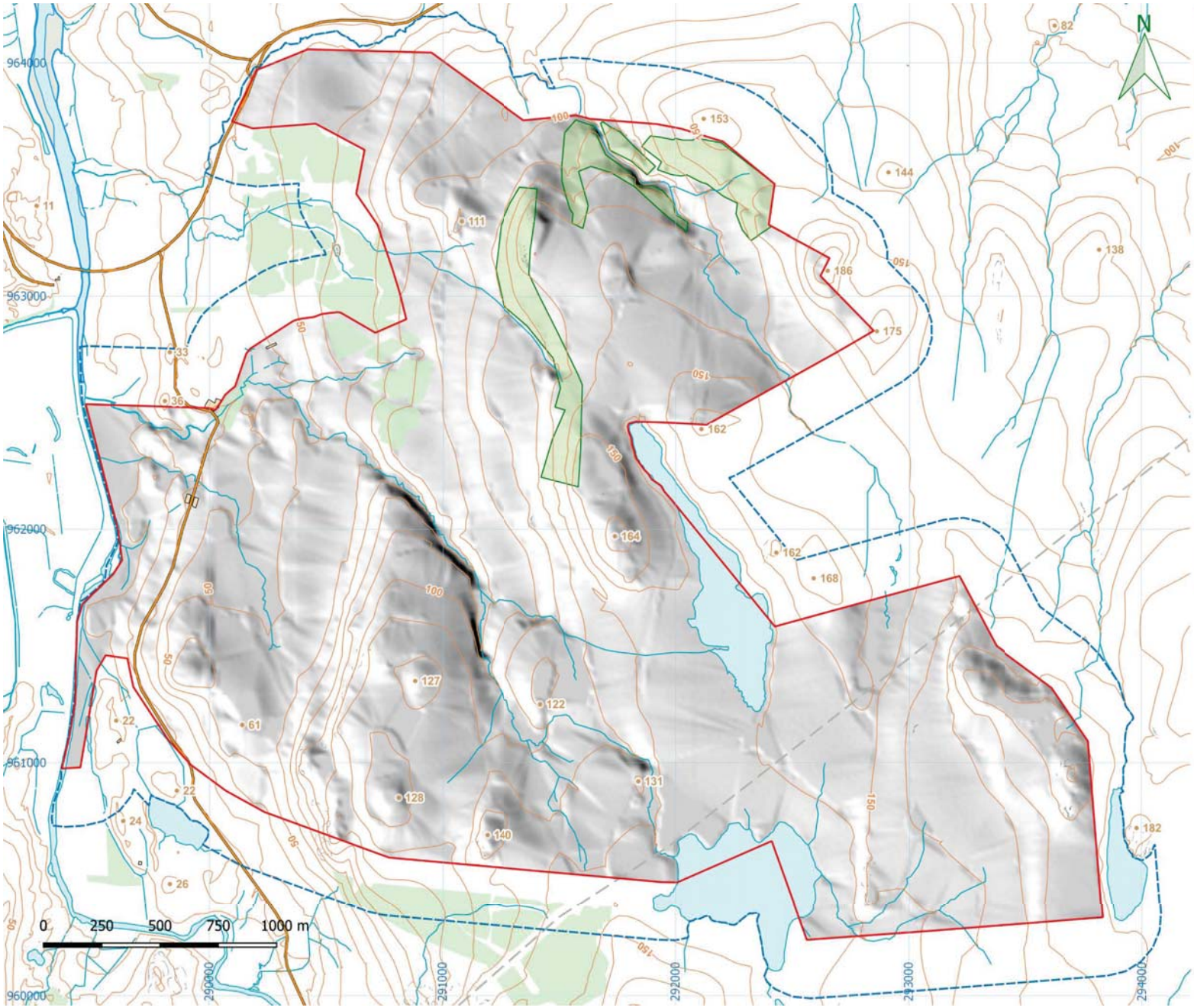
3.12 Non-statutory designations do not have the same legal basis as statutory designations. They identify areas of natural heritage importance and assist related planning & management decisions. The non-statutory designations relating to the site are illustrated in Map 3 and described below.

### Carbon & Peatland Map

3.13 The Carbon & Peatland Map predicts extensive peatland across Ackron & Golval and that it is absent from only the steepest slopes. In the eastern parts of Ackron & Golval, the peatland is predicted to be 'Class 1' and in the west, 'Class 2' is prevalent. Class 1 & 2 peatland defines "nationally important carbon-rich soils, deep peat and priority peatland habitat". They are distinguished by Class 1's likelihood of "high conservation value" and Class 2's "potentially high conservation value and restoration potential"[2].

### Ancient woodland inventory

3.14 The are no Ancient Woodland Inventory Sites within Ackron & Golval. The closest such site is 2.6 km to the northeast.




## Ackron & Golval

### Physical features

**Map 1:**
**Physical features.**

**Legend**

Boundaries & buffers
- Site boundary
- GWDTE buffer (250 m)

Plantation
- Recently established plantation

Physical features
- Point height (m)
- Contour (m)
- Building
- Crags
- Electricity transmission line
- Foreshore
- High water mark
- Low water mark
- Road
- Tidal water
- Waterbodies
- Watercourses
- Woodland

Scale: 1:17 500 at A3

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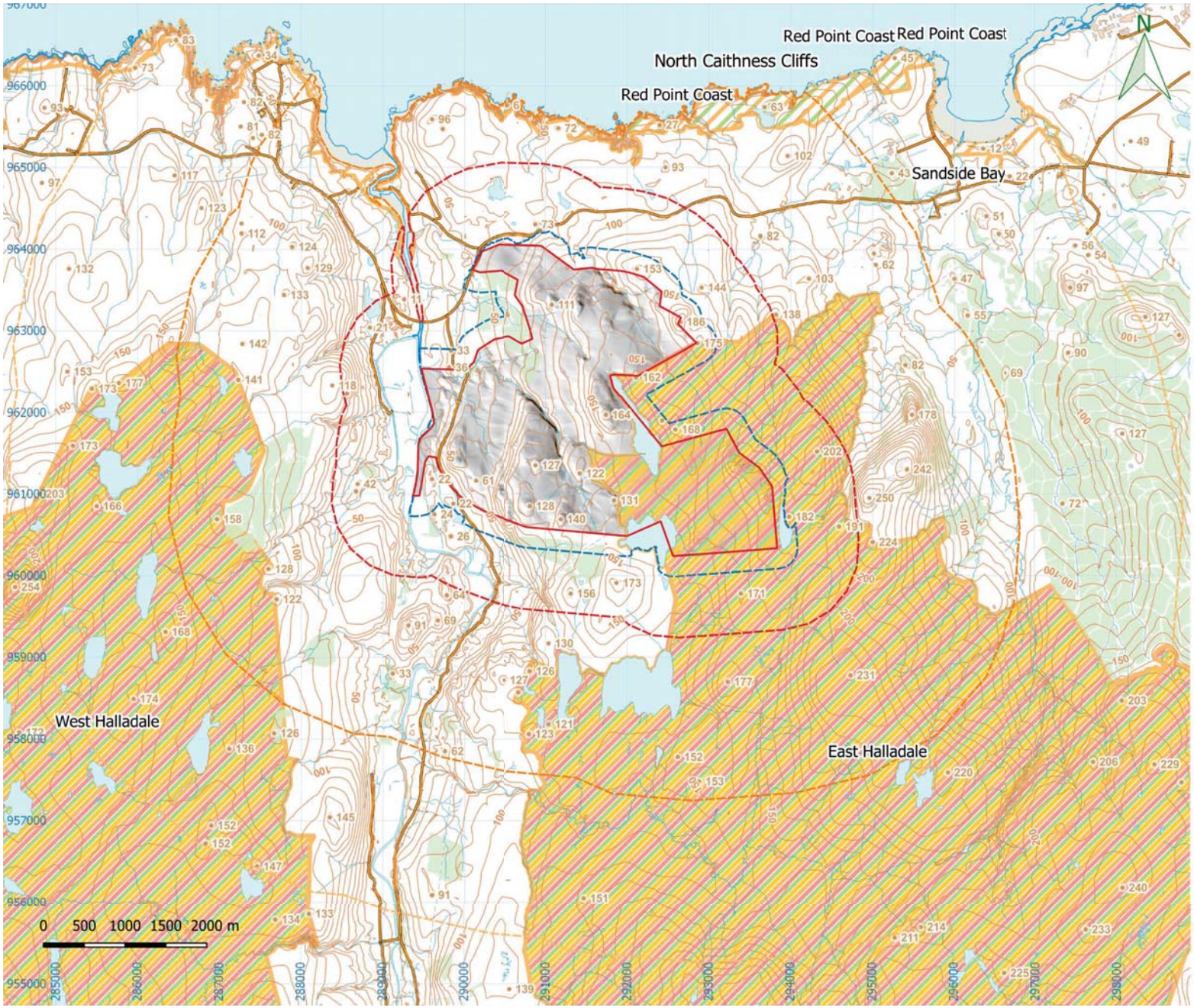


## Ackron & Golval

### Designations I

**Map 2:**
**Statutory designations.**

**Legend**

Boundaries & buffers
- Site boundary
- GWDTE buffer (250 m)
- 1 km buffer
- 3 km buffer
- 5 km buffer

Statutory designations
- Site of Special Scientific Interest (SSSI)
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Ramsar

Physical features
- Point height (m)
- Contour (m)
- Building
- Crags
- Electricity transmission line
- Foreshore
- High water mark
- Low water mark
- Road
- Tidal water
- Waterbodies
- Watercourses
- Woodland

Scale: 1:50 000 at A3

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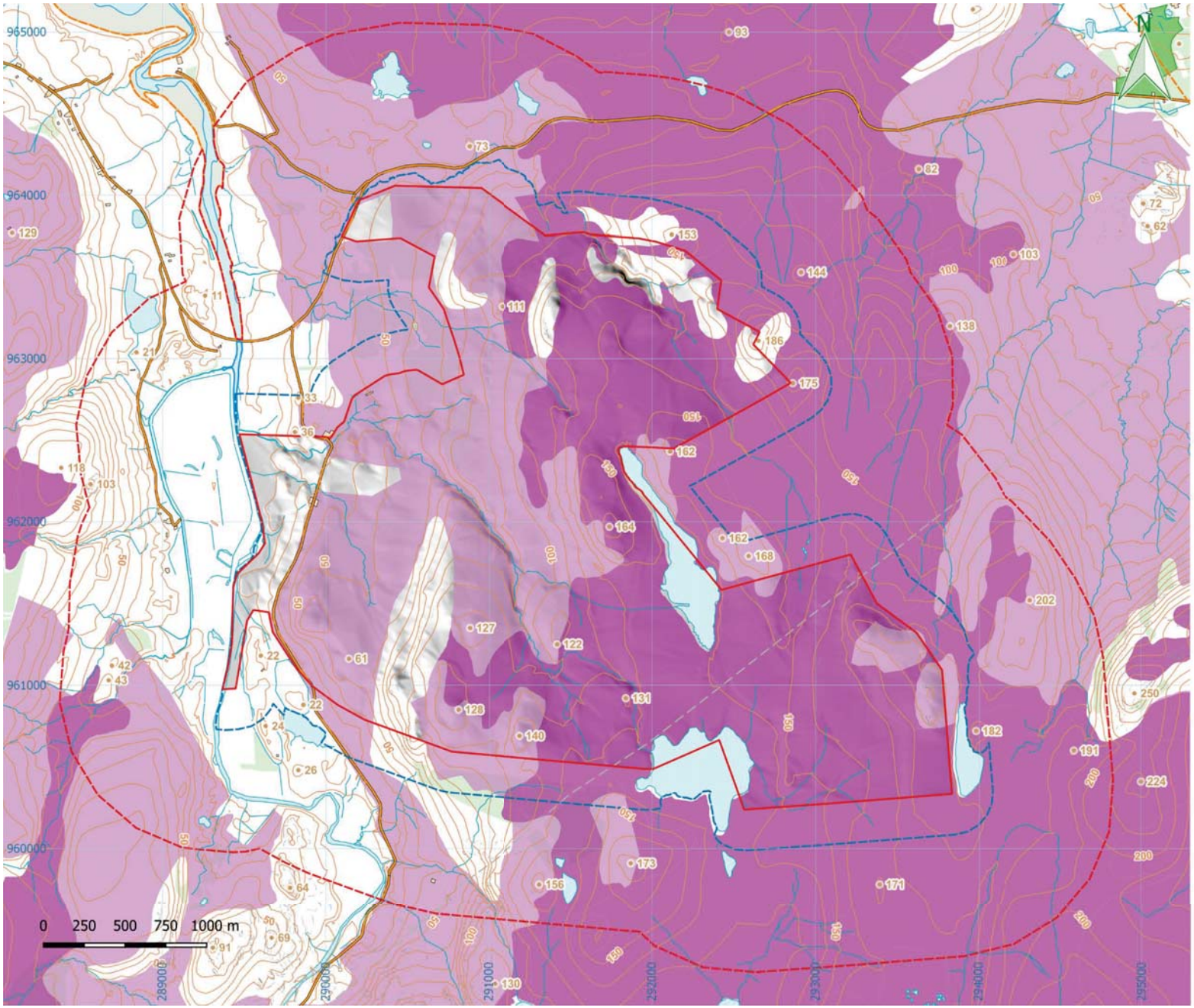


## Ackron & Golval

### Designations II

**Map 3:**
**Non-statutory designations.**

**Legend**

Boundaries & buffers
- Site boundary
- GWDTE buffer (250 m)
- 1 km buffer
- 3 km buffer

Non-statutory designations
- Ancient Woodland Inventory

Carbon & Peatland Map
- Class 1
- Class 2

Physical features
- Point height (m)
- Contour (m)
- Building
- Crags
- Electricity transmission line
- Foreshore
- High water mark
- Low water mark
- Road
- Tidal water
- Waterbodies
- Watercourses
- Woodland

Scale: 1:25 000 at A3

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## Habitats & vegetation

3.15 The conditions & results of the field survey in relation to the ecology & floristics of the habitats & vegetation communities are described in this section. Statistics on the absolute (ha) & relative (%) habitat cover are provided in Table 4. Maps are provided in Map 4 & 5 and a large-scale map (Map 11) in Appendix 2. This latter map includes Target Notes and labels for the NVC communities within the habitats. Maps 4 & 5 provide habitat details only.

### Survey

3.16 Survey was undertaken across the northern half of the site (Ackron) on the 27th of June, 2019, by Dr Andy McMullen (AM) the Principal Botanist at Botanæco[17] and Gus Routledge[18], a final year student at the SRUC, under the former's supervision. The southern half (Golval) was surveyed on the 3rd to 4th of September, 2019 by AM alone. The weather during both phases of survey was comparable and ideal for survey: overcast with high cloud and occasional breaks revealing blue sky; there was no rain; and wind speeds were low.

### General habitat description

3.17 A general overview of the habitats within Ackron & Golval is provided in this section with more detailed, individual habitat & vegetation accounts in the following sections. Note that the area figures exclude small areas of M15a in the GWDTE buffer.

3.18 Peatland habitats, including blanket bog (350 ha, 37 %), wet modified bog (11 ha, 1 %) and their mosaics (32 ha, 2 %); and wet heath (242 ha, 26 %) and its mosaics (120 ha, 13 %) collectively extended across a total of 755 ha or 79 % of Ackron & Golval. Blanket bog is most extensive in the southeast quadrant and is generally confined to basins elsewhere. Wet heath is extensive in the north & west and more patchily distributed in the southeast on watersheds & moderate slopes unsuitable for the formation of deep peat.

3.19 Water draining across the peatland areas collects to acid/neutral flush that is frequent in numerous small patches. Only the larger (>5 m in any dimension) are mapped across 5 ha (0.5 %). There are also areas of acid/neutral & base-rich flush associated springs & more diffuse groundwater emergence (0.2 ha, <0.1 %). Marshy grassland conducts surface water across 5 ha (0.5 %).

3.20 The steepest slopes and mounds or ridges are associated with patches of dry heath across 13 ha (1 %); and on the lower ground: bracken (19 ha, 2 %) or acid grassland 63 ha (7 %). The acid grassland includes unimproved and semi-improved forms. The latter is most extensive on the enclosed, low ground west of the road. There are also very small areas of neutral grassland (2 ha, 0.3 %).

3.21 Wooded habitats include conifer plantation (10 ha, 1 %) and much smaller areas of scrub & broadleaved woodland (around 1 ha, 0.1 % cover each). An area of coniferous plantation has recently been established on wet heath habitat but the tyrees are immature and the habitat remains unchanged (but for the cuts used to plant the trees). Its extent is illustrated in Map 1. In addition, there is scattered scrub & trees amongst the other habitats.

3.22 Areas of hard surfacing are associated with tracks and a quarry, both in the western half of the site. Each of these land uses accounts for around 1 ha (0.1 %).

### Habitat & vegetation descriptions

3.23 Habitats & their constituent vegetation communities are described in this section in relation to their distribution, floristic composition, ecology, condition & management.

#### A1.1.1 Broadleaved woodland - semi-natural

3.24 Semi-natural woodland includes areas that do not obviously originate from planting. The canopy can include a variety of species, including non-natives.

3.25 There are only two small areas of continuous woodland cover on the lowest ground, amongst semi-improved acid grassland. The same habitat type extends beneath the canopy of birch & rowan in an indistinctive field layer rich in the grass, Yorkshire fog. This species-poor & uneven assemblage is identified in broad terms as the W11 *Quercus petraea-Betula pubescens-Oxalis acetosella* woodland.

3.26 In addition to these two small blocks of woodland, there are scattered alder & birch trees in the enclosed plantation area (see Target Note 25, in Appendix 1). These are mature and more recent colonists are likely to have succumbed to deer that can now access through breaks in the enclosing fence. The deer have also created an obvious browse line in the mature trees.

#### A1.2.2 Coniferous woodland – plantation

3.27 Coniferous plantation has more than 30% planted trees of which more than 90% are conifers.

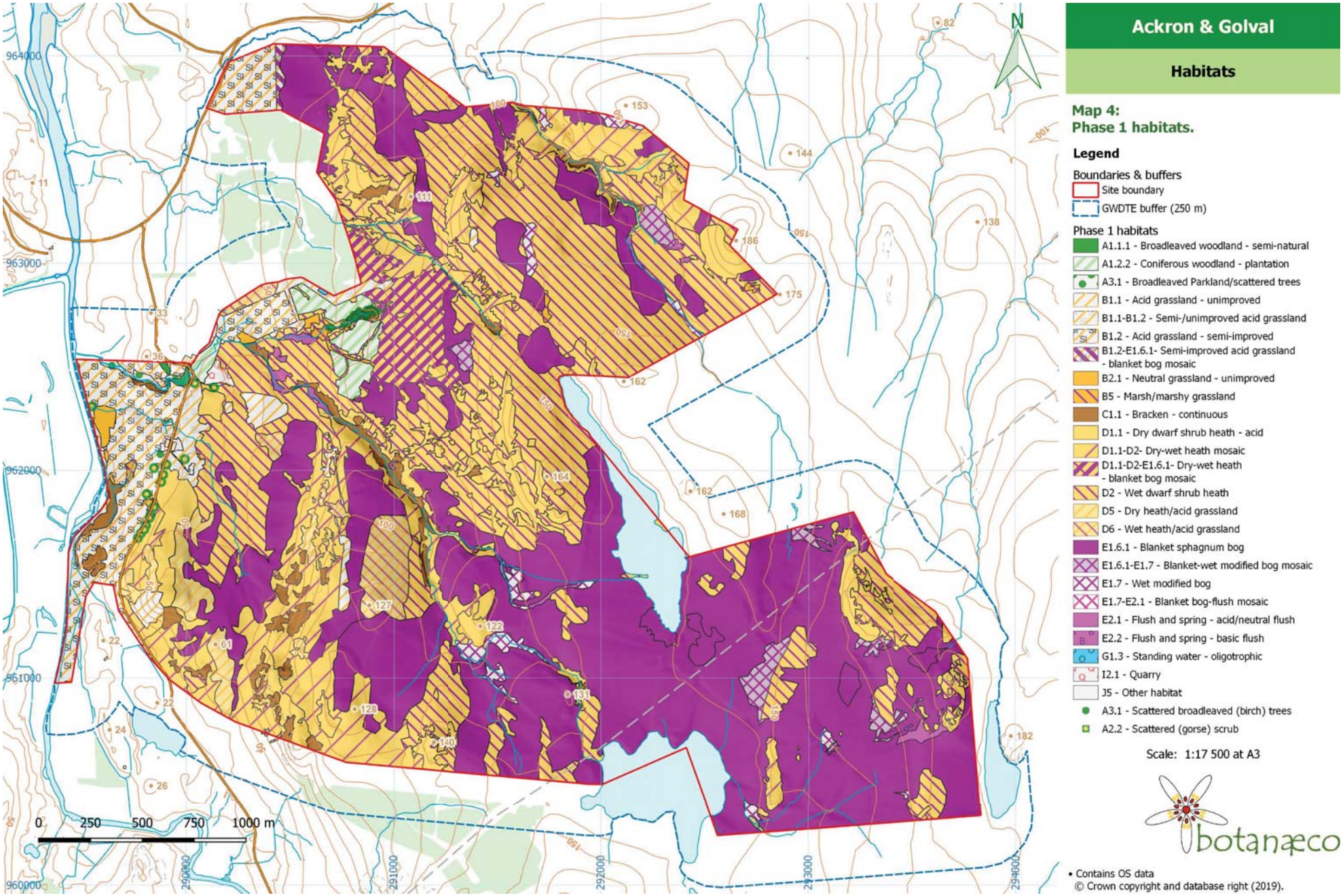
3.28 A single area of conifer plantation is present in the centre-west. It is dominated by spruce and beneath its serried ranks, there is a ground cover of moss & fallen needles (leaves) lacking vascular species except at the edge where elements of the U4a acid grassland are present.

#### A2.x Scrub

3.29 Scrub is composed of native shrubs forming an open (scattered) or continuous canopy of around 5 m tall, or less. Occasional trees may also be present.

[17] Further background on Dr Andy McMullen is available at https://botanaeco.co.uk/the-staff. Accessed 28/08/2019.

[18] Further background on Gus Routledge is available on his Twitter page at https://twitter.com/PinkfootedGus. Accessed 28/08/2019.


Ackron & Golval
Habitats
Map 4:
Phase 1 habitats.
Legend
Boundaries & buffers
Site boundary
GWDTE buffer (250 m)
Phase 1 habitats
A1.1.1 - Broadleaved woodland - semi-natural
A1.2.2 - Coniferous woodland - plantation
A3.1 - Broadleaved Parkland/scattered trees
B1.1 - Acid grassland - unimproved
B1.1-B1.2 - Semi-/unimproved acid grassland
B1.2 - Acid grassland - semi-improved
B1.2-E1.6.1- Semi-improved acid grassland - blanket bog mosaic
B2.1 - Neutral grassland - unimproved
B5 - Marsh/marshy grassland
C1.1 - Bracken - continuous
D1.1 - Dry dwarf shrub heath - acid
D1.1-D2- Dry-wet heath mosaic
D1.1-D2-E1.6.1- Dry-wet heath - blanket bog mosaic
D2 - Wet dwarf shrub heath
D5 - Dry heath/acid grassland
D6 - Wet heath/acid grassland
E1.6.1 - Blanket sphagnum bog
E1.6.1-E1.7 - Blanket-wet modified bog mosaic
E1.7 - Wet modified bog
E1.7-E2.1 - Blanket bog-flush mosaic
E2.1 - Flush and spring - acid/neutral flush
E2.2 - Flush and spring - basic flush
G1.3 - Standing water - oligotrophic
I2.1 - Quarry
J5 - Other habitat
A3.1 - Scattered broadleaved (birch) trees
A2.2 - Scattered (gorse) scrub
Scale: 1:17 500 at A3
0 250 500 750 1000 m
N
964000
963000
962000
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• Contains OS data
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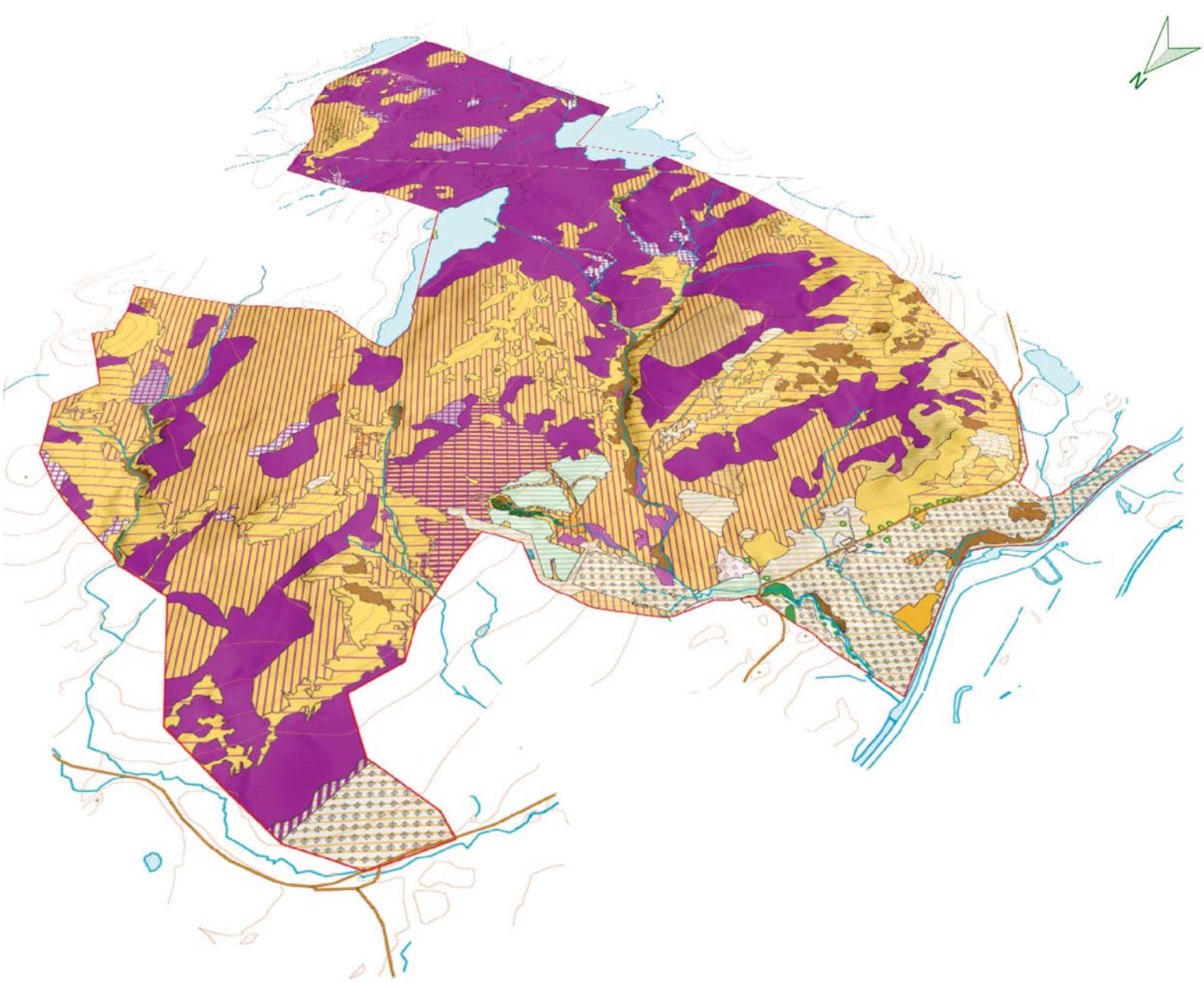

# Ackron & Golval

## Habitats

**Map 5:**
**3D Phase 1 habitats.**

**Legend**

Boundaries & buffers
- Site boundary
- GWDTE buffer (250 m)

Phase 1 habitats
- A1.1.1 - Broadleaved woodland - semi-natural
- A1.2.2 - Coniferous woodland - plantation
- A3.1 - Broadleaved Parkland/scattered trees
- B1.1 - Acid grassland - unimproved
- B1.1-B1.2 - Semi-/unimproved acid grassland
- B1.2 - Acid grassland - semi-improved
- B1.2-E1.6.1- Semi-improved acid grassland - blanket bog mosaic
- B2.1 - Neutral grassland - unimproved
- B5 - Marsh/marshy grassland
- C1.1 - Bracken - continuous
- D1.1 - Dry dwarf shrub heath - acid
- D1.1-D2- Dry-wet heath mosaic
- D1.1-D2-E1.6.1- Dry-wet heath - blanket bog mosaic
- D2 - Wet dwarf shrub heath
- D5 - Dry heath/acid grassland
- D6 - Wet heath/acid grassland
- E1.6.1 - Blanket sphagnum bog
- E1.6.1-E1.7 - Blanket-wet modified bog mosaic
- E1.7 - Wet modified bog
- E1.7-E2.1 - Blanket bog-flush mosaic
- E2.1 - Flush and spring - acid/neutral flush
- E2.2 - Flush and spring - basic flush
- G1.3 - Standing water - oligotrophic
- I2.1 - Quarry
- J5 - Other habitat
- A3.1 - Scattered broadleaved (birch) trees
- A2.2 - Scattered (gorse) scrub

Scale: 1:17 500 at A3

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**Table 3:** List of corresponding Phase 1 habitats & National Vegetation Classification plant communities, and mosaics; and their absolute & relative areas.

| Phase 1 habitat code & title | Area | | National Vegetation Classification code & title | Area | |
|---|---|---|---|---|---|
| | Absolute (ha) | Relative (%) | | Absolute (ha) | Relative (%) |
| **A1.1.1 Broadleaved woodland** | 0.62 | 0.07 | **W11** *Quercus petraea-Betula pubescens-Oxalis acetosella* woodland | 0.62 | 0.07 |
| **A1.2.2 Coniferous woodland - plantation** | 10.37 | 1.09 | n.a. | 10.37 | 1.09 |
| **A3.1 Scatted scrub** | 1.33 | 0.14 | **W23** *Ulex europaeus-Rubus fruticosus* scrub | 1.33 | 0.14 |
| **B1.1 Acid grassland - unimproved** | 7.36 | 0.78 | **U4a** *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, typical sub-community | 7.36 | 0.78 |
| **B1.1-B1.2 mosaic** | 8.08 | 0.85 | **U4a-U4b** mosaic | 8.08 | 0.85 |
| **B1.2 Acid grassland - semi-improved** | 48.02 | 5.06 | **U4b** *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, *Holcus lanatus-Trifolium repens* sub-community | 48.02 | 5.06 |
| **B1.2-E1.6.1 mosaic** | 0.96 | 0.10 | **M17a-U4b** mosaic | 0.96 | 0.10 |
| **B2.1 Neutral grassland - unimproved** | 2.42 | 0.25 | **MG9** *Holcus lanatus-Deschampsia cespitosa* grassland | 2.42 | 0.25 |
| **B5 Marsh/marshy grassland** | 4.65 | 0.49 | **M25a** *Molinia caerulea-Potentilla erecta* mire, *Erica tetralix* sub-community | 4.63 | 0.49 |
| | | | **MG10c** *Holcus lanatus-Juncus effusus* rush-pasture, *Iris pseudacorus* sub-community | 0.03 | 0.00 |
| **C1.1 Bracken - continuous** | 18.87 | 1.99 | **U20a** *Pteridium aquilinum-Galium saxatile* community, *Anthoxanthum odoratum* sub-community | 18.87 | 1.99 |
| **D1.1 Dry dwarf shrub heath - acid** | 50.09 | 5.28 | **H** - Non-NVC heath | 41.64 | 4.39 |
| | | | **H12c** *Calluna vulgaris-Vaccinium myrtillus* heath, *Galium saxatile-Festuca ovina* sub-community | 8.45 | 0.89 |
| **D1.1-D2 mosaic** | 106.23 | 11.20 | **H12a-M15b** mosaic | 4.61 | 0.49 |
| | | | **H-M15a** mosaic | 0.41 | 0.04 |
| | | | **H-M15b** mosaic | 101.21 | 10.67 |
| **D1.1-D2-E1.6.1 mosaic** | 20.58 | 2.17 | **H-M15b-M19** mosaic | 20.58 | 2.17 |
| **D2 Wet dwarf shrub heath** | 242.13 | 25.53 | **M15a** *Trichophorum cespitosum-Erica tetralix* wet heath, *Carex panicea* sub-community | 2.25 | 0.24 |
| | | | **M15b** *Trichophorum cespitosum-Erica tetralix* wet heath, typical sub-community | 239.88 | 25.30 |
| **D5 Dry heath/acid grassland** | 12.61 | 1.33 | **H12c-U4a** mosaic | 5.38 | 0.57 |
| | | | **H-U4a** mosaic | 7.23 | 0.76 |
| **D6 Wet heath/acid grassland** | 13.91 | 1.47 | **M15b-U4a** mosaic | 13.91 | 1.47 |
| **E1.6.1 Blanket *Sphagnum* bog** | 350.16 | 36.92 | **M17a** *Trichophorum cespitosum-Eriophorum vaginatum* blanket mire, *Drosera rotundifolia-Sphagnum* spp. sub-community | 341.18 | 35.98 |
| | | | **M17a-M2-M3** mosaic | 2.26 | 0.24 |
| | | | **M17b-M2** mosaic | 3.55 | 0.37 |
| | | | **M17b-M2-M3** mosaic | 1.07 | 0.11 |
| | | | **M17b-M3** mosaic | 1.55 | 0.16 |
| | | | **M19a** *Calluna vulgaris-Eriophorum vaginatum* blanket mire, *Erica tetralix* sub-community | 0.55 | 0.06 |
| **E1.6.1-E1.7 mosaic** | 9.92 | 1.05 | **M17a-M25a** mosaic | 7.82 | 0.83 |
| | | | **M19a-M25a** mosaic | 2.09 | 0.22 |
| **E1.7 Wet modified bog** | 10.66 | 1.12 | **M20** *Eriophorum vaginatum* blanket and raised mire | 4.65 | 0.49 |
| | | | **M20-M25a** mosaic | 1.38 | 0.15 |
| | | | **M25a** *Molinia caerulea-Potentilla erecta* mire, *Erica tetralix* sub-community | 4.63 | 0.49 |
| **E1.7-E2.1 mosaic** | 0.6 | 0.06 | **M25b-M6c** mosaic | 0.60 | 0.06 |
| **E2.1 Flush and spring - acid/neutral flush** | 4.78 | 0.50 | **M32b** *Philonotis fontana-Saxifraga stellaris* spring, *Montia fontana-Chrysosplenium oppositifolium* sub-community | 0.06 | 0.01 |
| | | | **M6a** *Carex echinata-Sphagnum fallax/denticulatum* mire, *Carex echinata* sub-community | 0.97 | 0.10 |
| | | | **M6a-M6c-M6d** mosaic | | 0.13 |

| Phase 1 habitat code & title | Area | | National Vegetation Classification code & title | Area | |
|---|---|---|---|---|---|
| | Absolute (ha) | Relative (%) | | Absolute (ha) | Relative (%) |
| | | | **M6b** *Carex echinata-Sphagnum fallax/denticulatum* mire, *Carex nigra-Nardus stricta* sub-community | 0.13 | 0.01 |
| | | | **M6c** *Carex echinata-Sphagnum fallax/denticulatum* mire, *Juncus effusus* sub-community | 2.43 | 0.26 |
| **E2.2 Flush and spring - basic flush** | 0.19 | 0.02 | **M10a** *Carex dioica-Pinguicula vulgaris mire, Carex viridula* subsp. *oedocarpa-Juncus bulbosus/kochii* sub-community | 0.19 | 0.02 |
| **G1.3 Standing water - oligotrophic** | 21.88 | 2.31 | n.a. | 21.88 | 2.31 |
| **I2.1 Quarry** | 1.24 | 0.13 | n.a. | 1.24 | 0.13 |
| **J5 Other habitat** | 0.88 | 0.09 | n.a. | 0.88 | 0.09 |
| **Totals:** | **948.53** | **100.00** | **Totals:** | **948.53** | **100.00** |

W23 *Ulex europaeus-Rubus fruticosus* scrub

3.30 Gorse is continuous along the watercourses on the lowest ground, amongst U4b acid grassland; and is scattered along the roadside in association with U4b acid grassland & M15b wet heath. It is identified as the W23a *Ulex europaeus-Rubus fruticosus* scrub (gorse-bramble) community, although bramble and other distinctive species are absent. As a result of this, no sub-community is assigned. However, elements of the W23a *Anthoxanthum odoratum* (sweet vernal grass) sub-community are present in the continuous stands within acid grassland, but only marginally, away from the dense shade and litter accumulations of the gorse.

### B1.1 Acid grassland – unimproved

3.31 Unimproved acid grassland is typically unenclosed hill-grazing land that is present on acid soils. It is usually species-poor and often grades into wet or dry, dwarf shrub heath. When the cover of heath is greater than 25% the habitat is mapped as D5 dry heath - acid grassland mosaic.

3.32 Unimproved acid grassland is located in the west of Ackron & Golval, amongst dry heath & bracken on well-drained slopes. Grazing maintains the acid grassland in these locations that would otherwise be associated with dry heath. A single NVC community is associated with the habitat, as described in the following sections.

U4a *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, typical sub-community

3.33 The U4a *Festuca ovina-Agrostis capillaris-Galium saxatile* (sheep's-fescue - common bent - heath bedstraw) grassland, Typical sub-community is very variable, but generally species-poor, even & indistinctive. Where soils are moderately fertile, the U4a grassland has a closed, grass-dominated sward that includes abundant to frequent common bent, heath bedstraw, sheep's-fescue and sweet vernal grass; and occasional heath bedstraw, ribwort plantain, tormentil, wavy hair-grass, yarrow & Yorkshire fog. Mosses are locally abundant, especially *Hylocomium splendens, Pleurozium schreberi* & *Rhytidiadelphus squarrosus*. Heath relicts often persist in such places, especially blaeberry, deergrass, heather & *Polytrichum commune*.

3.34 Pastoral activity is sustained by the moderately productive U4a grassland. It is therefore grazed extensively by sheep.

### B1.2 Acid grassland - semi-improved

3.35 Semi-improved grassland habitat includes habitat modified by fertilisers, intensive grazing &/or drainage so that the vegetation is productive but less species-rich and even than in the natural state. It is located on the lowest ground in the west where it is enclosed and comprises the infield of the Acrkron & Golval farms.

U4b *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, *Holcus lanatus-Trifolium repens* sub-community

3.36 One NVC community is recognised in the semi-improved grassland habitat: the U4b *Festuca ovina-Agrostis capillaris-Galium saxatile* (sheep's-fescue-common bent-heath bedstraw) grassland, *Holcus lanatus-Trifolium repens* (Yorkshire fog-white clover) sub-community. It is located on the lowest ground in the north, in proximity to the farm buildings. It has evidently been improved historically and signs of this are still locally evident in the frequency of patches of 'MG6-like' vegetation with a high cover of crested dog's-tail grass, but perennial rye-grass is rare.

3.37 The species composition of the U4b semi-improved acid grassland is similar to that described for the unimproved acid grassland but less species-rich & even, with the addition of abundant Yorkshire false oat-grass; and frequent creeping buttercup & white clover. Tormentil is rare; and mosses are limited by the dense grass sward that is maintained by strongly preferential grazing.

### B2.1 Neutral grassland – unimproved

3.38 Neutral grassland is typically enclosed and usually more intensively managed than acid or calcareous grassland, except on roadside verges. This habitat encompasses a wide range of communities occurring on neutral soils (pH 5.5-7.0).

MG9 *Holcus lanatus - Deschampsia cespitosa* grassland

3.39 Stands of tufted hair-grass grass on damp ground associated with depressions adjacent to watercourses in the west are mapped as MG9 *Holcus lanatus - Deschampsia cespitosa* (Yorkshire fog-tufted hair-grass) grassland. These areas are extremely species-poor, uneven & indistinctive. Only a low cover of occasional marsh bedstraw, soft-rush & Yorkshire fog is associated with the dominant tufted hair-grass. As a result, neither of the two MG9 sub-communities is identified in the absence of distinguishing species.

3.40 This MG9 grassland is grazed but its productivity is limited by the dominance of unpalatable tufted hair-grass. Grazing is likely to be responsible for the limited number & cover of its associates.

**B5 Marsh/marshy grassland**

3.41 Marshy grassland is a poorly-defined habitat including grasslands rich in purple moor-grass, rushes and/or sedges, and pastures in which tall herbs such as meadowsweet and valerian are abundant. They are located on wet, gleyed or peaty soils that are waterlogged rather than covered by water (i.e. 'swamp').

3.42 There are two forms of marshy grassland identified at Ackron & Golval and both are scattered in the west:

- M25a *Molinia caerulea-Potentilla erecta* mire, *Erica tetralix* sub-community
- MG10c *Holcus lanatus-Juncus effusus* rush-pasture, *Iris pseudacorus* sub-community.

3.43 The former (M25a) is scattered along the line of surface water movement through wet heath. In these places, it is located on shallow peat (<0.5 m). The M25a is also present on deep peat where it is mapped as 'wet modified bog' (see Paragraph 3.72 *et seq*.). MG10c is located in a two, small locations (<0.1 ha) in the line of a minor watercourse & field drain.

M25a *Molinia caerulea-Potentilla erecta* mire, *Erica tetralix* sub-community

3.44 The areas of M25a mapped as marshy grassland are dominated by purple moor-grass with occasional species associated with wet heath (especially *Sphagnum capillifolium*, cross-leafed heath, deergrass, *Sphagnum fallax &* tormentil). Bog myrtle is locally abundant. See also Target Note 22 (in Appendix 1).

MG10c *Holcus lanatus-Juncus effusus* rush-pasture, *Iris pseudacorus* sub-community

3.45 A species-poor, even & distinctive assemblage of yellow iris, Yorkshire fog, soft rush & sorrel identifies the MG10c *Holcus lanatus-Juncus effusus* rush-pasture, *Iris pseudacorus* (yellow iris) sub-community. In both locations, in the west, it is associated with surface water collecting along the line of minor watercourses. See also Target Note 11 (in Appendix 1).

**C1.1 Bracken – continuous**

3.46 Continuous bracken is readily recognised by its vigorous canopy of fronds. It is a native species that behaves invasively by suppressing the vegetation beneath its living or shed fronds. The latter may accumulate to considerable depths so that only a low number and cover of other species can persist.

U20 *Pteridium aquilinum-Galium saxatile* community, *Anthoxanthum odoratum* sub-community

3.47 Only one NVC community is assigned to the bracken habitat, the U20a *Pteridium aquilinum-Galium saxatile* (bracken – heath bedstraw) community, *Anthoxanthum odoratum* (sweet vernal grass) sub-community. This is a sweet vernal grass-dominated variant of U4a acid grassland community with a canopy of bracken. There are also areas where the bracken frond litter has accumulated to a considerable depth so that other vegetation is suppressed. This is locally identified as the U20c community species-poor sub-community.

**D1.1 Dry dwarf shrub heath – acid**

3.48 Acid, dwarf shrub heath is usually associated with well-drained podsols and has a greater than 25% cover of heather and other sub-shrubs. It is confined to well-drained situations so at Ackron & Golval, it is generally located on steep slopes, especially along the escarpment in the west, above the road. Within these locations there are four communities, one of which is not described in the NVC. Each is described in the following sections.

H Non-NVC heath

3.49 Indistinctive stands of heather & hypnaceous mosses (*Hylocomium splendens*, *Hypnum cupressiforme/jutlandicum* & *Pleurozium schreberi*) with a very limited number & cover of associates is described as 'H' non-NVC heath. Vascular associates include occasional to rare: bell heather, deergrass, green-ribbed sedge, mat-grass, purple moor-grass, The species-poverty is a reflection of the generally dense, unbroken canopy of heather under which even the mosses are limited in their cover. In the west, where sheep grazing is concentrated, the heather is extremely close-cropped (see Target Note . See also Target Note 48 & 54 (in Appendix 1).

H10b *Calluna vulgaris-Erica cinerea* heath, typical sub-community

3.50 There is a single small area of H10b dry heath on a crag that is too small to map, other than by a target note (see Target Note 31 in Appendix 1). Heather is abundant & bell heather is frequent in the relatively open canopy. The moss *Racomitrium lanuginosum* is frequent in the moss layer and indicative of the H10b *Calluna vulgaris-Erica cinerea* (heather-bell heather) heath, *Racomitrium lanuginosum* sub-community.

3.51 Additional associates include frequent to occasional: *Bryum capillare*, common bent, common polypody, *Frullania tamarisci*, *Hedwigia ciliata*, *Hylocomium splendens*, *Hypnum cupressiforme*, sheep's-fescue & sweet vernal grass. The vegetation is consequently, moderately species -rich & even; and very distinctive in a local context.

H12c *Calluna vulgaris-Vaccinium myrtillus* heath, *Galium saxatile-Festuca ovina* sub-community

3.52 H12 *Calluna vulgaris-Vaccinium myrtillus* (heather - blaeberry) heath is distinguished by the association of blaeberry and in places, cowberry, alongside heather in the sub-shrub canopy. Grazing reduces the prominence of the sub-shrubs and permits an increased cover of grasses, especially common bent, mat grass, sheep's-fescue & wavy hair-grass. This prominence of grasses is indicative of the H12c *Festuca ovina* (sheep's-fescue) sub-community. Additional associates include frequent to occasional *Cladonia arbuscula*, green-ribbed sedge, *Hylocomium splendens*, *Hypnum jutlandicum*, pill sedge, *Pleurozium schreberi*, *Racomitrium lanuginosum*, *Rhytidiadelphus squarrosus*, sweet vernal grass & tormentil. See also Target Notes 5 & 7 (in Appendix 1).

H16 *Calluna vulgaris-Arctostaphylos uva-ursi heath*

3.53 There is a single small area of H16-like heath mapped by Target Note 45 (in Appendix 1) where a wind-clipped, dense, species-poor & uneven heather canopy is associated with scattered bearberry. No sub-community is assigned to this species-poor & uneven vegetation.

### D2 Wet dwarf shrub heath

3.54 Wet dwarf shrub heath has a more than 25% cover of heather and other sub-shrubs but it differs from the dry heath in having a range of mesic peatland species, including *Sphagnum*.

M15a *Trichophorum cespitosum-Erica tetralix* wet heath, *Carex panicea* sub-community

3.55 The M15a *Trichophorum cespitosum-Erica tetralix* (deergrass-cross-leafed heath) wet heath, *Carex panicea* sub-community is distinctive from a distance because of its pale coloration. This is a consequence of the scarcity of sub-shrubs other than cross-leafed heath and the frequency of sedges that also lend a 'grassy' appearance. There are two areas of M15a: one in the southwest where there are several small areas (see target Note 12, in Appendix 1); and a larger area in the centre-wet (see Target Note 27).

3.56 In the vicinity of Target Note 12, the areas of M15a are scattered at the base of a steep, dry slope. Their wetness in this topographic location reveals the influence of groundwater although the vegetation does not include basiphilous indicator species (e.g. common yellow-sedge). Star sedge is abundant & devil's-bit scabious is occasional and these two plants are the distinguishing floristic elements of the M15a sub-community here, in comparison to the surrounding M15b wet heath. The absence of base-indicators, other than the devil's-bit scabious, suggests that the groundwater forms a cushion beneath the habitat with surface water irrigating the upper vegetation surface.

3.57 At Target Note 27, there is a single area measuring 0.3 ha. It is 'grassy' in appearance with a moderately species-rich & very even assemblage of frequent: common bog-cotton, bog-myrtle, cross-leafed heath, heather, purple moor-grass, *Sphagnum palustre*, tormentil & velvet bent; and occasional *Sphagnum capillifolium*. The base-indicator, common yellow-sedge, is also occasional and indicative of the influence of bae-enriched groundwater.

M15b *Trichophorum cespitosum-Erica tetralix* wet heath, typical sub-community

3.58 The M15b *Trichophorum cespitosum-Erica tetralix* (deergrass-cross-leafed heath) wet heath, typical sub-community occupies an intermediate situation topographically and floristically between the basins and depressions occupied by bog habitat and the better drained slopes vegetated with dry heath or acid grassland.

3.59 Sheltered stands of wet heath have a variable assemblage of abundant heather &/or deergrass with frequent to occasional blaeberry, *Cladonia* spp., cross-leafed heath, great sundew, heath milkwort, heath rush, heath wood-rush, mat grass, *Pleurozium schreberi*, purple moor-grass, *Rhytidiadelphus squarrosus*, *Sphagnum capillifolium*, *Sphagnum compactum*, *Sphagnum cuspidatum*, *Sphagnum tenellum,* tormentil & velvet bent. This assemblage is identifiable as the M15b 'typical' community.

3.60 Much of the wet heath is influenced by grazing, especially in the west where stock is maintained on the more neighbouring, acid grassland. Grazing is most evident in the short stature of the vegetation and trampling & dunging of the moss/lichen cover. However, this does not reduce the species-richness, and it potentially increases the evenness & distinctiveness of the vegetation, such as at Target Note 8 (in Appendix 1). Elsewhere, the influence of grazing is less marked and the vegetation can be species-poor where a dense, ungrazed heather canopy is present. See also Target Note 10, in Appendix 1.

### E1.6.1 Blanket *Sphagnum* bog

3.61 Blanket bog habitat is distinctive for its accumulations of deep peat (>0.5 m) beneath a variable vegetation composition that includes sub-shrubs, sedges, and most importantly: *Sphagnum*. It is dependent upon a high precipitation:evaporation ratio & topography that favours waterlogged conditions.

3.62 At Ackron & Golval, the blanket bog is extensive in the southeast, within the designated areas; and eastward, it becomes confined to basins (e.g. Target Note 39 in Appendix 1). There are two primary NVC communities identified within the blanket bog habitat, as described in the following sections. In addition to these, there are the following admixtures:

- M2 *Sphagnum cuspidatum/recurvum* (bog-moss) bog pool community
- M3 *Eriophorum angustifolium* (common bog-cotton) bog pool community.

3.63 The M2 & M3 vegetation is respectively associated with bog pools or wet hollows dominated by *Sphagnum cuspidatum* (see Target Notes 41 & 53, in Appendix 1); and areas of bare, eroded peat that are now vegetated with scattered common bog-cotton (see target Note 44, in Appendix 1). Both communities form a minor component amongst the M17 vegetation described in the following section. Areas of high-quality blanket bog are associated with the M2 vegetation that also indicates the presence of moderate topographic diversity with shallow pools, hollows, lawns & low hummocks. Locally (e.g. Target Note 41), the pools are also associated with tall hummocks of *Racomitrium lanuginosum* indicative of the M17b sub-community.

### M17 *Trichophorum cespitosum-Eriophorum vaginatum* blanket mire

3.64 Two sub-communities of the M17 *Trichophorum cespitosum-Eriophorum vaginatum* (deergrass-hare's-tail bog-cotton) community are present. M17a is the most extensive and M17b is more restricted to areas of high quality or eroded blanket bog. They are described in the following sections.

### M17a *Drosera rotundifolia-Sphagnum* spp. sub-community

3.65 The extensive M17a *Drosera rotundifolia-Sphagnum* spp. (round-leaved sundew - bog-moss) sub-community is moderately species-rich, very even & distinctive. Common bog-cotton, cross-leafed heath, deer grass, hare's-tail bog-cotton and heather; and occasional to rare blaeberry, bog asphodel, bog-myrtle, crowberry, few-flowered sedge, great sundew & purple moor-grass form a low (<0.5 m), open sward over a relatively smooth lawn of mosses. In the latter, a species-rich and relatively even assemblage of *Sphagnum* species is frequent to locally dominant. It includes *Sphagnum capillifolium*, *Sphagnum papillosum*; and occasional to rare *Sphagnum cuspidatum*, *Sphagnum denticulatum*, *Sphagnum magellanicum*, *Sphagnum subnitens* and *Sphagnum tenellum*. Other bryophytes are frequent but subordinate to the cover of *Sphagnum*. They include *Aulacomnium palustre*, *Hypnum jutlandicum*, *Hylocomium splendens*, *Pleurozium schreberi*, *Pleurozia purpurea* and *Racomitrium lanuginosum*; and the lichens *Cladonia arbuscula* & *C. uncialis* are locally frequent.

3.66 In the north & west, the occupation of basins has made the M17a resistant to drainage. In the southeast, the location of the blanket on broad, level surfaces has resulted in a smiliair resistance to drainage. In addition, the low productivity and wet conditions underfoot are unattractive to grazing animals; and resistant to burning. As a result, these areas of peatland represent some of the least disturbed habitat at Ackron & Golval.

3.67 Drainage has been undertaken (see target Note 46, in Appendix 1) and is generally confined to the blanket bog although some extends into adjoining areas of wet heath. This drainage appears to have been undertaken to improve grazing in the absence of related cutting. In one place, adjacent to the loch, it has precipitated erosion. Otherwise, erosion of the peat is rare and localised to drains (e.g. Target Note 50, in Appendix 1).

3.68 Evidence of historical peat cutting is apparent in linear-stepped surfaces (e.g. Target Notes 28 & 30 in Appendix 1). Most of these areas have regenerated typical blanket bog vegetation so only the cut, vertical edges remain as an indicator of this past use. However, in one mosaic area, the peat has been almost wholly cut and this is described in the next section.

### H-M15b-M19 mosaic

3.69 This distinctive & extensive (21 ha) area of mosaic is located east of the plantation in the north-centre. It is the result of extensive & intensive peat-cutting that has removed virtually all of the peat from this area that is described by Target Note 35, in Appendix 1. The mineral substrate now lies close to the vegetation surface and is now associated with wet heath on a thin layer of peat (<0.1 m). Narrow ridges of dewatered peat up to 0.5 m deep are orientated down-slope and are spaced at regular intervals of *c.* 8 m. These now have a dense canopy of heather identified as 'H' dry heath vegetation, and there are rarely patches of habitat/vegetation attributable to blanket bog. The latter has a species-poor assemblage of hare's-tail bog-cotton & heather indicative of M19 blanket bog vegetation.

### M17b *Cladonia* sub-community

3.70 Areas of M17b vegetation are mapped as mosaics with bog pools (M2) or bare, eroded peat with common bog-cotton (M3). In the former, the M17b is associated with upstanding hummocks of *Racomitrium lanuginosum* and amongst the eroded peat, it is associated with dewatered peat along the flanks or small gullys. It is the dominance of *Racomitrium lanuginosum* that indicates the presence of this sub-community that otherwise has the same floristic assemblage as M17a when associated with M2 bog pools. In association with the eroded peat, the M17b has a low cover of *Sphagnum* that is otherwise replaced by *Racomitrium lanuginosum* & lichens.

### M19a *Calluna vulgaris-Eriophorum vaginatum* blanket mire, *Erica tetralix* sub-community

3.71 Two neighbouring areas of the M19a *Calluna vulgaris-Eriophorum vaginatum* (heather-hare's-tail bog-cotton) blanket mire, *Erica tetralix* (cross-leafed heath) sub-community are located in the northeast. It is identified by the co-dominance of hare's-tail bog-cotton & heather that gives the vegetation a tussocky appearance not associated with the smooth, *Sphagnum* rich lawns of M17a. One of the two areas is associated with a high cover of purple moor-grass identifiable as the M25a wet modified bog. Additional associates include frequent to occasional bog myrtle, common bog-cotton, cross-leafed heath, *Hypnum jutlandicum*, *Pleurozium schreberi*, purple moor-grass, *Sphagnum capillifolium* & *Sphagnum papillosum*.

### E1.7 wet modified bog

3.72 Wet modified bog habitat is associated with very wet areas within blanket bog where surface water flows are concentrated and somewhat stagnant. As a result, it is located in shallow valleys and at the bottom of steep slopes down which surface water flows rapidly to collect at the break-in-slope, amongst wet modified bog habitat. This results in a triangular shape to the wet modified bog areas as the water collects along a broad front. Alternatively, the water fans out when it reaches a level area, to result in an inverted, triangular shape.

### E2.1 Flush and spring - acid/neutral flush

3.73 Acid/neutral, flush/spring habitat is species-poor and supported by surface water or groundwater emerging from non-basic rock or deposits. The vegetation is variable but usually dominated by mosses and grasses, rushes &/or sedges. There are NVC two communities and five of their sub-communities associated with this habitat at Ackron & Golval. One (M32-type) is dependent upon groundwater at a spring and the other (M6) is associated with surface water.

M6 *Carex echinata-Sphagnum fallax/denticulatum* mire

3.74 The M6 *Carex echinata-Sphagnum fallax/denticulatum* (star sedge-bog moss) community is distinguished by its sward of grass, rush &/or sedge rooted in a wet lawn of *Sphagnum fallax* &/or *Polytrichum commune*. All four of if its sub-communities are present at Ackron & Golval:

- M6a *Carex echinata* (star sedge) sub-community
- M6b *Nardus stricta* (mat-grass) sub-community
- M6c *Juncus effusus* (soft rush) sub-community
- M6d *Juncus acutiflorus* (sharp-flowered rush) sub-community.

3.75 Floristic differentiation of the sub-communities is based upon the dominant species in the sward above the lawn of moss. In M6a, star sedge is dominant; mat grass is dominant in M6b; soft-rush in M6c; and sharp-flowered rush in M6d. Spatial differentiation is possible in most stands, especially where the tall soft-rush dominates in M6c, the most extensive of the M6 sub-communities. In other places, two or more M6 sub-communities are present in mosaics. Associates of the dominants are limited in number in the species-poor & uneven vegetation of the M6 flushes. In places, they are suppresses by soft-rush litter and where it is more open, there can be a variable assemblage including locally frequent to occasional: bog stitchwort, cuckooflower, common bog-cotton, common sedge, compact rush, heath wood-rush, lesser spearwort, lousewort, marsh bedstraw, marsh violet, *Sphagnum capillifolium*, *Sphagnum denticulatum*, *Sphagnum girgensohnii*, *Sphagnum mucronatum*, *Sphagnum palustre*, sweet vernal grass & tormentil. However, no one stand will have all of these associates. M6a & M6d are usually the most species rich & even sub-communities. M6b & M6c especially are species-poor & uneven

3.76 Surface water draining from the rain-fed bog & wet heath supports the M6 vegetation in shallow depressions/valleys; within drains/canalised watercourses; and alongside watercourses where such drainage accumulates. The acid/neutral water chemistry and low nutrient levels are reflected in the generally low productivity, species-richness & evenness of the vegetation. Contact with underlying bedrock where the peat depth is shallow or absent, especially amongst wet heath or alongside watercourses, results in some enrichment of the M6c vegetation, as described for Target Note 4.

3.77 See also Target Note 9, 16, 21, 29, 32, 39, 42, 45 & 52, in Appendix 1.

M32b-type spring

3.78 The M32b-type vegetation (see Target 34, in Appendix 1) is located along the watercourse entering the area of forestry in the northwest. It is an association of 'green-mosses' and a sward of sedges. In some ways therefore, it is comparable to M6 acid/neutral flush vegetation but is distinguished by the prominence of 'feather mosses' (not *Sphagnum* or *Polytrichum commune*) some of which are also indicators of base-enrichment and marked with an asterisk (*) below. Various elements of the M32 NVC community are not present, and there is no other clear analogue, so this flush is referred to as M32-type for its general characterisation as a layer of 'green mosses' & sward of herbs.

3.79 The layer of mosses is partially floating on top of a springhead, with a relatively high discharge of iron-rich water through the cohesive mat of low-stature vegetation. Mosses are dominant with abundant *Brachythecium rivulare* & *Bryum pseudotriquetrum*; and occasional *Campylium stellatum**, *Cratoneuron filicinum** & *Philonotis fontana*. Heavily grazed common sedge forms an open sward with occasional: common bog-cotton, common mouse-ear, daisy, marsh-marigold, ragged-robin & white sedge. The openness of the low-productivity sward is maintained the wet conditions and by light grazing which has resulted in very limited trampling effects.

3.80 This flushed area is very distinctive for its semi-floating ('quaking'), cohesive mat of moss and the quantity and iron-staining of the water emerging at its centre. It is also very distinctive for its location next to a basic flush of very different character described in the next section.

### E2.2 Flush and spring - basic flush

3.81 Basic flushes typically support a carpet of pleurocarpous 'brown mosses' (e.g. the genera *Drepanocladus*, *Palustriella* or *Scorpidium*), often without *Sphagnum*, overlain by an open, patchy sward of small sedges. One distinctive NVC sub-community has been recorded from this habitat at Ackron & Golval.

M10a *Carex dioica-Pinguicula vulgaris* mire, *Carex viridula* subsp. *oedocarpa-Juncus bulbosus/kochii* sub-community

3.82 Black bog-rush dominates the vegetation of the two basic flushes associated with the M10a *Carex dioica-Pinguicula vulgaris* (dioecious sedge-butterwort) mire, *Carex viridula* subsp. *oedocarpa-Juncus bulbosus/kochii* (common yellow-sedge-small rush)sub-community (see Target 34, in Appendix 1). As such it bears some affinity to the M13 & M14 of black bog-rush-dominated mires of southern Britain. However, the characteristic M13/M14 herbs are absent and distinctive elements of the M10a sub-community persist although their number & cover is very much reduced by the dominance of black bog-rush.

3.83 Within the open patches between the black bog-rush and mats of its leaf litter are frequent: carnation sedge, devil's-bit scabious & red fescue; and occasional: butterwort, cross-leafed heath, great sundew, heather, lesser clubmoss & tormentil. The moss layer is partial and this reflects a variable flow regime and periods of desiccation. *Campylium stellatum* & *Scorpidium scorpioides* are the only consistent species and both are locally abundant, especially at the sheltered margins. This distribution of the mosses further suggests seasonal periods of desiccation on unshaded surfaces.

3.84 Less distinct flushes with some affinity to M10a are located amongst the wet heath where surface water flows contact the underlying, mineral substrate (e.g. Target Notes 3 & 4, in Appendix 1). Alternatively, M29-type vegetation with abundant bog pondweed & *Sphagnum denticulatum* is present where there is shallow peat at least.

### G1.3 Open water – oligotrophic

3.85 Two large lochs are crossed by the site boundary in the southeast. They are oligrotrophic and peat-strained with very limited vegetation. Only bog pondweed was recorded (at a distance) and other aquatic plants were not detected as a consequence of peat-staining and wind ruffling the water surface. Emergent vegetation is absent from the exposed margins.

### I2.1 Quarry

3.86 An active quarry is present on the north-western boundary. It has a gravel surface bare of vegetation. A bank around its edge is associated with a fringe of species-poor neutral grassland.

### J5 Other habitat

3.87 'Other habitat' includes gardens and other surface associated with the curtilage of homes and farming activity. It flanks the road in the west.

## Notable flora

3.88 It should be noted that this report is of a habitat & vegetation survey, not a floristic survey focused upon the detection of notable species. Floristic survey requires different search methods, patterns & timings, potentially over several years; as well as an appropriate expert for each targeted group (e.g. vascular plants, bryophytes, lichens &/or fungi). However, in the course of habitat & vegetation survey, notable species are detected incidentally. These non-comprehensive records are provided & described in this section.

3.89 Only one notable species, the black bog-rush, was located in two places during the survey. It is of 'Least Concern' in the IUCN Red List but is not included on the Scottish Biodiversity List[14]. Details on its occurrence are provided in Table 4 and it is associated with the two areas of M10a basic flush. In addition, the associated, M10a floristic assemblage is distinctive in a local context because of the presence of calcicolous species.

**Table 4:** Notable flora, designations & population size.

| Species | Coordinates | | Population diameter (m) | Designations | |
|---|---|---|---|---|---|
| | X | Y | | Red List | Scottish Biodiversity List |
| Black bog-rush | 291057 | 963193 | 25 | Least Concern | × |
| | 291117 | 963073 | 15 | | |

# 4 Assessment

4.1 In this section, the baseline is assessed against legislation & guidance to identify:

- peatland condition
- valued or sensitive habitats
- groundwater dependency of Groundwater Dependent Terrestrial Ecosystems.

## Peatland Condition Assessment

4.2 A series of indicators were employed to assess the peatland condition. The indicators defined in Table 5 were found to relate to Ackron & Golval. The extent of the condition classes is illustrated in Map 7 & listed in Table 6.

**Table 5:** Peatland Condition Assessment definitions for Ackron & Golval.

| Condition | Definition |
|---|---|
| **1** Near natural | • Distinctive features present (e.g. shallow bog pools &/or low hummocks).<br>• Moderately species-rich, even & distinctive vegetation.<br>• Distinctive species present & often extensive (e.g. *Sphagnum* &/or *Pleurozia purpurea*).<br>• Bare/eroded peat & active erosion absent.<br>• Few or no signs of grazing. |
| **2** Modified | • Distinctive features scarce or absent (e.g. bog pools &/or hummocks).<br>• Moderately species-rich & distinctive vegetation but uneven & dominated by one or two species.<br>• Distinctive species scarce & rarely extensive (e.g. distinctive *Sphagnum* species are replaced by 'weedy' *Sphagnum fallax*, or by hypnaceous mosses). |
| **3** Drained | • Drains present & active with an assumed 30 m zone of effect[12].<br>• Other characteristics as '2 Modified'. |
| **3.1** Drained & cut-over | • Drainage of the peat for the purposes, and/or as a result of, peat-cutting.<br>• Other characteristics as '2 Modified'. |
| **4** Erosion | • Bare peat surfaces and other features of erosion such as slumping present. |

4.3 The '1 Near natural' blanket bog is confined to the base of shallow valleys where surface water collects to maintain very wet conditions. These low points are also likely to be coincident with the deepest peat. Near-natural wet heath is associated with the eastern parts of the site where the influence of grazing is less.

4.4 Away from the near-natural hollows, the blanket bog vegetation has been extensively modified ('2') by a combination of grazing, drainage ('3') & peat-cutting ('3.1'). In spite of these influences, the vegetation widely remains relatively even, moderately species-rich & distinctive. This includes the cut-over areas that are now wet & *Sphagnum* rich because their lowered peat surface is close to the water table. Surrounding, now elevated areas are dewatered to varying degrees. However, drainage rarely appears to be effective in completely dewatering the peat so that *Sphagnum* remains abundant in the vegetation right up to the edge of drains.

4.5 Grazing has also been a significant influence on the modified wet heath but little direct drainage has been undertaken. Other areas have also been modified by peat-cutting, such as east of the plantation (see Target Note 35, in Appendix 1) where the wet heath is present on mineral ground/thin peat exposed by peat-cutting of blanket bog.

**Table 6:** Peatland condition areas.

| Peatland condition | Area | | |
|---|---|---|---|
| | Condition class total (ha) | Absolute (ha) | Relative (%) |
| **1** Near-natural blanket bog | 131.0 (17.5 %) | 7.0 | 0.9 |
| **1** Near-natural blanket bog mosaic | | 8.8 | 1.2 |
| **1** Near-natural wet heath | | 66.4 | 8.9 |
| **1** Near natural wet heath mosaic | | 48.8 | 6.5 |
| **2** Modified blanket bog | 283.1 (37.9 %) | 43.6 | 5.8 |
| **2** Modified blanket bog mosaic | | 0.6 | 0.1 |
| **2** Modified wet heath | | 188.0 | 25.2 |
| **2** Modified wet heath mosaic | | 50.9 | 6.8 |
| **3** Drained blanket bog | 330.2 (44.0 %) | 262.9 | 35.2 |
| **3.1** Drained & cut-over blanket bog | | 65.3 | 8.7 |
| **3** Drained wet heath | | 2.0 | 0.3 |
| **4** Eroding | 2.5 (0.3 %) | 2.5 | 0.3 |
| | **Totals:** | 746.8 | 100.0 |

## Conservation importance

4.6 The conservation importance of the habitats and their constituent NVC communities is assessed in Table 7 and illustrated in Map 8.

4.7 A key feature within the southeast of the site is a series of overlapping designations: the East Halladale SSSI and the Caithness & Sutherland Peatlands Ramsar, SAC & SPA. These national & international designations extend to all of the habitats within the designated area. As such, they are by default, of International importance. Areas of habitat straddling the border are also of International importance. This includes moderately extensive M17a blanket bog contiguous with that inside the designated area. It is Internationally important because development effects on this area can result in impacts upon the designated habitat. The potential for the extension of effects requires to be assessed against hydrological & peat-depth data outside of the scope of this report.

4.8 Outside of the designated area, all of the peatland habitats (blanket bog, wet modified bog & wet heath) are assessed to be of importance at the Local level. This reflects their low to moderate species richness, evenness & distinctiveness that widely lacks sensitive species and structural features such as pools or hummock-hollow topography. The absence of these features is a consequence of drainage & grazing that leaves only a few areas in near-natural condition. However, the peatlands are a highly protected habitat type and important for ecosystem functions as carbon storage within peat accumulations. The peat is especially deep (>0.5 m) beneath the blanket bog. As such, the peatland habitats are valued at the Local level.

4.9 Other mire features are also assessed to be important at the Local level, including the acid/neutral & basic flushes & marshy grassland. All of these habitats are included in the Highland Biodiversity Action Plan & Scottish Biodiversity List. Furthermore, the acid/neutral flushes are intimately associated with the blanket bog habitat, and the basic flushes are locally distinctive for their moderate species richness & indicators of base-enrichment. Consequently, they and the other wetlands are valued at the Local level despite their small size and low to moderate species-richness, evenness & distinctiveness.

4.10 Dry heath habitat is valued at the Local level for the same reasons as the peatland & wetland habitats (i.e. low to moderate species-richness, evenness & distinctiveness; and inclusion in legislation). However, the non-NVC heath 'H' is valued at the site level for its extremely low species-richness, evenness & lack of distinction.

4.11 The remaining habitats, including the broadleaved woodland, bracken; conifer plantation; scrub; neutral grassland; other habitat; and unimproved & semi-improved, acid grassland are valued at the Site level. This reflects their low species-richness & distinction; and modification by agricultural activity.

## Groundwater dependency

4.12 British Geological Society hydrogeological mapping[19] identifies that Ackron & Golval is mostly located on one geological unit: the migmatic rock of the Moine Supergroup. This has the character of a "low productivity aquifer" where "flow is virtually all through fractures and other discontinuities", with "small amounts of groundwater in [the] near surface weathered zone and secondary fractures."[19] West of the road, the lowest ground is an "unnamed igneous intrusion" with similar hydrological characteristics to the Moine Supergroup. Another such intrusion crosses the southeast boundary. Lower & Middle Old Red Sandstone underlies the northernmost parts. Although these units have differing characteristics, they are both "moderately productive" aquifers[19].

4.13 There is therefore limited potential across most of the site for the presence of Groundwater Dependent Terrestrial Ecosystems (GWDTE), except in the extreme north, where Old Red Sandstone is present. GWDTE are assessed in relation to their potential groundwater dependency in Table 8 and their distribution is illustrated in Map 9 & Map 10.

4.14 Five potential GWDTE NVC communities have been recorded, as listed in Table 8 and bulleted below:

- MG10c *Holcus lanatus-Juncus effusus* rush-pasture, *Iris pseudacorus* sub-community
- M25a *Molinia caerulea-Potentilla erecta* mire, *Erica tetralix* sub-community
- M15 Trichophorum cespitosum-Erica tetralix wet heath
  - Carex panicea sub-community
  - M15b Typical sub-community
  - M15c *Cladonia* spp. sub-community
- M25a *Molinia caerulea-Potentilla erecta* mire, *Erica tetralix* sub-community
- M6 *Carex echinata-Sphagnum fallax/denticulatum* mire
  - M6a *Carex echinata* sub-community
  - M6b *Nardus stricta* sub-community
  - M6c *Juncus effusus* sub-community
  - M6d *Juncus acutiflorus* sub-community
- M32b-type spring

4.15 Assessment of the GWDTE is undertaken in Table 8 and mapped in Map 8 & Map 9.

4.16 MG10c is associated with surface water movement along minor watercourses, or its collection in depressions, in topographic locations unlikely to support groundwater emergence. As such, it is not assessed to be groundwater dependent. Likewise, the M25a marshy grassland & wet modified bog habitat is dismissed as groundwater dependent because of its location in shallow depressions & valleys conducting surface water from the wet heath & blanket bog habitat

[19] British Geological Survey: 1:625 000 hydrogeology map. Available at https://www.bgs.ac.uk/research/groundwater/datainfo/hydromaps/home.html. Accessed 28/08/2019.

respectively. Furthermore, although the M25a is occasionally associated with breaks-in-slope, it also occurs in the midst of flat areas of peatland where groundwater emergence is very unlikely.

4.17 M15 wet heath includes three sub-communities: M15a, M15b & M15c. The latter two are associated with rain-fed locations but the first (M15a) is evidently influenced by groundwater. It is located in two places (see Target Notes 12 & 27, in Appendix 1), both on steep slopes that would not otherwise maintain such wet conditions without inputs of groundwater. A moderate degree of groundwater dependency is assigned, as per the guidance, because the absence of indicators of base-enrichment and other distinctive species suggests there is a not a strong groundwater influence.

4.18 Surface water draining from the blanket bog & wet heath collects towards flushed & riparian areas associated with M6 vegetation. The low productivity and species-poor assemblage of the M6 vegetation relates this input of water, and the absence of groundwater influence that would enhance the vegetation's productivity, species richness & distinctiveness (see also Target Note 33).

4.19 Indicators of base-enrichment in the M10a vegetation, and groundwater emerging from obvious springs, relates the groundwater dependency of this GWDTE. The influence of base-enrichment is especially evident in the localised dominance of back bog-rush. As a consequence, this GWDTE is assessed to be of high groundwater dependency (see also Target Notes 9, 16, 21, 29, 32, 42, 45, 50 & 52).

4.20 The M32b-type flush is associated with an obvious springhead & groundwater discharge. There are no indicators of base enrichment and the water is thought to derive from a pipe within the blanket bog vegetation above. This water appears to have had some contact with the mineral substrate beneath the peat because of the iron-rich discharge and the moderate productivity of the vegetation.

## Constraints

4.21 The key constraints to development identified by the survey & assessment are the following:

- Internationally important habitat & designations
- Local importance blanket bog & its related deep peat
- High groundwater dependency M10a & M32b-type flushes
- Moderate groundwater dependency M15a wet heath.

4.22 The distribution of these features is illustrated in Map 11.

## Biodiversity Net Gain

4.23 Biodiversity Net Gain seeks to improve habitats alongside development. At Ackron & Golval, the most obvious focus for ecological enhancement is damming of the drains within the '3 Drained' peatland habitat. This could be further supplemented by bunds & reprofiling in the cut-over areas. Some reduction of grazing in the drained & '2 Modified' areas would also benefit the peatland habitat in terms of its structure & function.

4.24 Woodland creation is possible on the less productive areas of dry heath, especially the extremely species-poor 'H' non-NVC heath. This is likely to be capable of supporting a W17-type, birch-oak woodland according to some of the species already present (including woodland relicts) and the frequency of grazed rowan, for example. Areas of U20 bracken would be suitable for restoration to W17-type birch-oak woodland. This would also reduce the productivity of the bracken.

**Table 7:** Assessment of conservation importance.

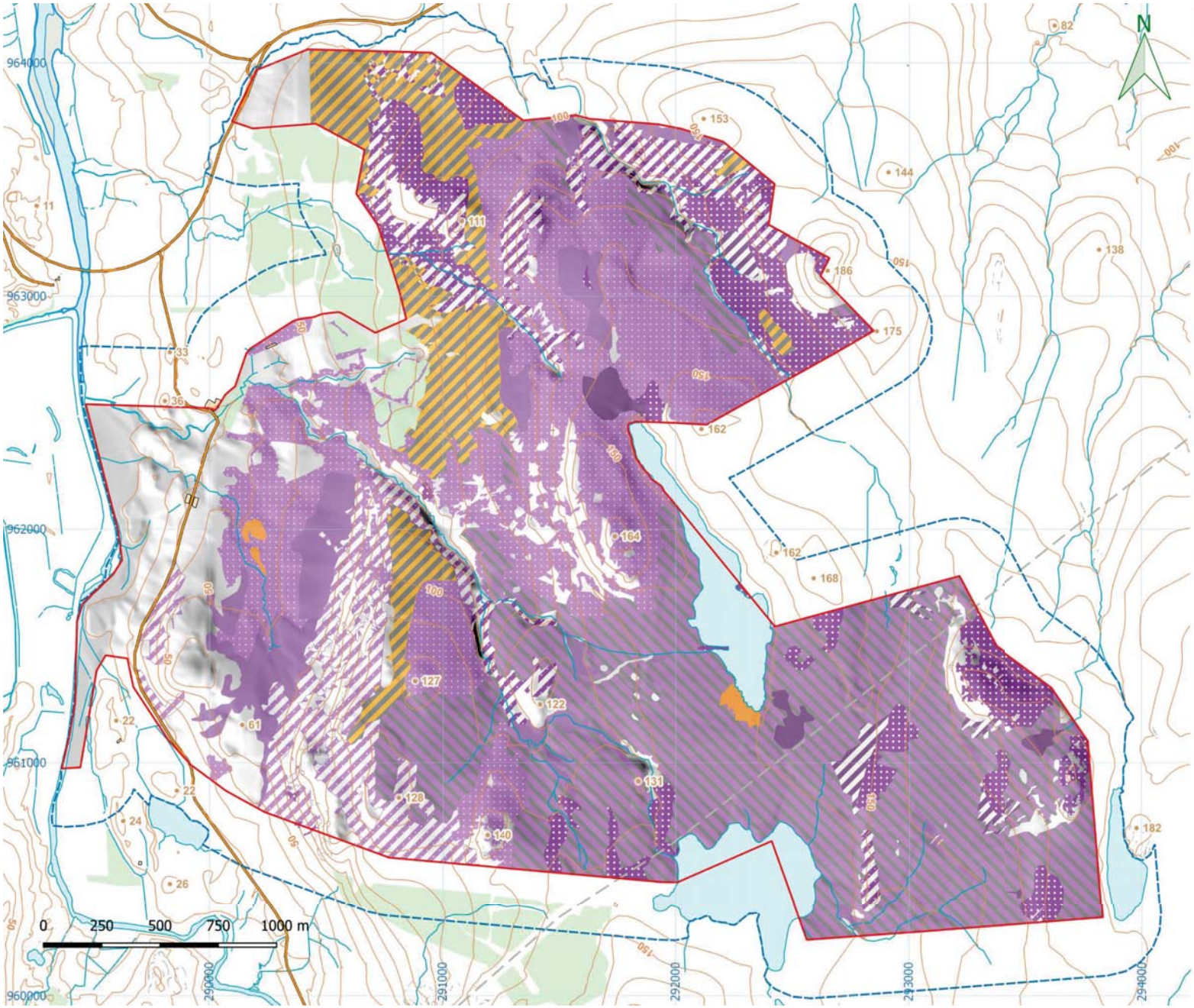
| Phase 1 habitat code & title | National Vegetation Classification code & title | Notes | Importance |
|---|---|---|---|
| **A1.1.1 Broadleaved woodland** | **W11** *Quercus petraea-Betula pubescens-Oxalis acetosella* woodland | **Qualities**<br>• Small area (0.6 ha) of species-poor, uneven & indistinctive habitat.<br>• Distinctive forms (not present at Corriegarth) are included within the Highland Biodiversity Action Plan, Scottish Biodiversity List or Habitats Directive<br>**Extent**<br>• Extent in Highland or Sutherland not known. | Site |
| **A1.2.2 Coniferous woodland - plantation** | n.a. | **Qualities**<br>• Moderate area (10.4 ha) of species-poor & uneven habitat dominated by commercial, non-native species.<br>**Extent**<br>• Habitat area not known in Sutherland or Highland and likely to change regularly. | Site |
| **A2.x Scrub** | **W23** *Ulex europaeus-Rubus fruticosus* scrub | **Qualities**<br>• Small (1.3 ha), frequently scattered areas of species-poor, native scrub of low species-richness, evenness & distinction.<br>• Not included within the Highland Biodiversity Action Plan, Scottish Biodiversity List or Habitats Directive.<br>**Extent**<br>• Extent in Highland or Sutherland not known. | Site |
| **B1.1 Acid grassland - unimproved** | **U4a** *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, typical sub-community | **Qualities**<br>• Scattered areas (2.4 ha in total) of species-poor, moderately even, indistinctive vegetation.<br>• Secondary habitat derived from dry heath through grazing.<br>• Included within the Highland Biodiversity Action Plan as a target for biodiversity enhancement.<br>**Extent**<br>• Extent in Highland or Sutherland not known. | Site |
| **B1.2 Acid grassland - semi-improved** | **U4b** *Festuca ovina-Agrostis capillaris-Galium* saxatile grassland, *Holcus lanatus-Trifolium repens* sub-community | **Qualities**<br>• Moderate area (48.0 ha) of low species-richness, evenness & distinctiveness as a result of ongoing grazing & management/improvement.<br>• Included within the Highland Biodiversity Action Plan as a target for biodiversity enhancement.<br>**Extent**<br>• Extent in Highland or Sutherland not known. | Site |
| **B2.1 Neutral grassland - unimproved** | **MG9** *Holcus lanatus-Deschampsia cespitosa* rush-pasture, typical sub-community | **Qualities**<br>• Small area (<2.4 ha) of low species-richness & evenness, but distinctive for the tall sward of yellow iris.<br>• Not included within the Highland Biodiversity Action Plan, Scottish Biodiversity List or Habitats Directive.<br>**Extent**<br>• Extent in Highland or Sutherland not known. | Site |
| **B5 Marsh/marshy grassland** | **MG10c** *Holcus lanatus-Juncus effusus* rush-pasture, *Iris pseudacorus* sub-community | **Qualities**<br>• Small area (<0.1 ha) of low species-richness & evenness, but distinctive for the tall sward of yellow iris.<br>• Included within the Scottish Biodiversity List but not the Highland Biodiversity Action Plan or Habitats Directive.<br>**Extent**<br>• Extent in Highland or Sutherland not known. | Local |
| | **M25a** *Molinia caerulea-Potentilla erecta* mire, *Erica tetralix* sub-community | **Qualities**<br>• Small area (4.6 ha) of low species-richness & evenness, and moderate distinctiveness.<br>• Included within the Scottish Biodiversity List but not the Highland Biodiversity Action Plan or Habitats Directive in this 'marshy grassland' form (*cf.* 'wet modified bog').<br>**Extent**<br>• Extent in Highland or Sutherland not known. | Site |

| Phase 1 habitat code & title | National Vegetation Classification code & title | Notes | Importance |
|---|---|---|---|
| **C1.1 Bracken - continuous** | **U20a** *Pteridium aquilinum-Galium saxatile* community, *Anthoxanthum odoratum* sub-community | **Qualities**<br>• Moderately extensive (18.9 ha) across numerous patches.<br>• Species-poor, uneven & indistinctive vegetation dominated by a single, invasive species.<br>• Not included within the Highland Biodiversity Action Plan, Scottish Biodiversity List or Habitats Directive.<br>**Extent**<br>• Extent in Highland or Sutherland not known. | Site |
| **D1.1 Dry dwarf shrub heath - acid** | **H** Non-NVC heath | **Qualities**<br>• Extremely species-poor, uneven & indistinctive vegetation dominated by a single species.<br>• Included within the Highland Biodiversity Action Plan, Scottish Biodiversity List & Habitats Directive.<br>• South-eastern parts are included within international (Ramsar, SAC & SPA) designations and are International importance. Other areas are of Site importance.<br>**Extent**<br>• Extent in Highland or Sutherland not known. | Site<br>International (where designated) |
| | **H10b** *Calluna vulgaris-Erica cinerea* heath, *Racomitrium lanuginosum* sub-community<br>**H12c** *Calluna vulgaris-Vaccinium myrtillus* heath, *Galium saxatile-Festuca ovina* sub-community<br>**H16** *Calluna vulgaris-Arctostaphylos uva-ursi* heath | **Qualities**<br>• Small areas (≈8.5 ha) of patchy habitat of low to moderate species-richness, evenness & distinctiveness.<br>• Areas of H10b & H16 are so small they are target-noted only (see Target Notes 31 & 47, in Appendix 1).<br>• Included within the Highland Biodiversity Action Plan, Scottish Biodiversity List & Habitats Directive.<br>**Extent**<br>• Extent in Highland or Sutherland not known. | Local |
| **D2 Wet dwarf shrub heath** | **M15a** *Trichophorum cespitosum-Erica tetralix* wet heath, *Carex panicea* sub-community<br>**M15b** *Trichophorum cespitosum-Erica tetralix* wet heath, typical sub-community<br>**M15c** *Trichophorum cespitosum-Erica tetralix* wet heath, *Cladonia* spp. sub-community | **Qualities**<br>• Extensive habitat (242.2 ha).<br>• Low to moderate species-richness, evenness & distinctiveness.<br>• M15a is distinctive locally for the presence of species indicative of groundwater-derived, base-enrichment.<br>• Included within the Highland Biodiversity Action Plan, Scottish Biodiversity List & Habitats Directive.<br>• South-eastern parts are included within international (Ramsar, SAC & SPA) designations and are international importance. Other areas are of Local importance.<br>**Extent**<br>• Extent in Highland or Sutherland not known. | Local<br>International (where designated) |
| **E1.6.1 Blanket *Sphagnum* bog** | **M17a** *Trichophorum cespitosum-Eriophorum vaginatum* blanket mire, *Drosera rotundifolia-Sphagnum* spp. sub.<br>**M19a** *Calluna vulgaris-Eriophorum vaginatum* blanket mire, *Erica tetralix* sub-community | **Qualities**<br>• Extensive habitat (350.1 ha).<br>• Low to moderate species-richness, evenness & distinctiveness.<br>• Variably influenced by grazing & drainage; and very locally, by erosion.<br>• Associated with deep peat deposits (>0.5 m).<br>• Included within the Highland Biodiversity Action Plan, Scottish Biodiversity List & Habitats Directive.<br>• South-eastern parts are included within international (Ramsar, SAC & SPA) designations and are international importance. Other areas are of Local importance.<br>**Extent**<br>• Extent in Highland *c.* 200,000 ha. | Local<br>International (where designated) |
| **E1.7 Wet modified bog** | **M20** *Eriophorum vaginatum* blanket and raised mire | **Qualities**<br>• Small areas of habitat (totalling 10.7 ha).<br>• Very low species-richness, evenness & distinctiveness. | Local |

| Phase 1 habitat code & title | National Vegetation Classification code & title | Notes | Importance |
|---|---|---|---|
| **E2.1 Flush and spring - acid/neutral flush** | **M25a** *Molinia caerulea-Potentilla erecta* mire, *Erica tetralix* sub-community | • Associated with deep peat deposits (>0.5 m).<br>• Included within the Highland Biodiversity Action Plan, Scottish Biodiversity List & Habitats Directive.<br>• South-eastern parts are included within international (Ramsar, SAC & SPA) designations and are international importance. Other areas are of Local importance.<br>**Extent**<br>• Extent (of blanket bog types) in Highland *c.* 200,000 ha. | International (where designated) |
| | **M6** *Carex echinata-Sphagnum fallax/denticulatum* mire<br>• **M6a** *Carex echinata* sub-community<br>• **M6b** *Nardus stricta* sub-community<br>• **M6c** *Juncus effusus* sub-community<br>• **M6d** *Juncus acutiflorus* sub-community | **Qualities**<br>• Small scattered areas totalling 4.8 ha.<br>• Low to locally moderate species-richness, evenness & distinctiveness.<br>• Included within the Highland Biodiversity Action Plan & Scottish Biodiversity List but not the Habitats Directive.<br>**Extent**<br>• Extent in Highland or Sutherland not known. | Local<br>International (where designated) |
| | **M32b**-type spring | **Qualities**<br>• Single, small area.<br>• Moderate species-richness & evenness; and highly distinctive.<br>• Included within the Highland Biodiversity Action Plan & Scottish Biodiversity List but not the Habitats Directive.<br>**Extent**<br>• Extent in Highland or Sutherland not known. | Local |
| **E2.2 Flush and spring - basic flush** | **M10a** *Carex dioica-Pinguicula vulgaris* mire, *Carex viridula* subsp. *oedocarpa-Juncus bulbosus/kochii* sub-community | **Qualities**<br>• Small areas (totalling 0.2 ha) of moderate species-richness & evenness; and distinctive locally for the presence of base-enrichment indicators.<br>• Included within the Highland Biodiversity Action Plan & Scottish Biodiversity List but not the Habitats Directive.<br>**Extent**<br>• Extent in Highland or Sutherland not known. | Local |
| **G1.3 Open water -** | n.a. | • Not subject to detailed survey.<br>• Included within the Highland Biodiversity Action Plan & Scottish Biodiversity List but not the Habitats Directive. | Local |
| **J5 Other habitat** | n.a. | • Artificial or highly modified built, curtilage & farming-related areas.<br>• Distinctive for the presence of some common ruderal herbs. | Site |

**Table 8:** Assessment of groundwater dependency by habitat & NVC community, notes and the guidance & site-specific groundwater dependency.

| Phase 1 habitat code & title | National Vegetation Classification code & title | Notes | Groundwater dependency | |
|---|---|---|---|---|
| | | | Guidance | Site-specific |
| **B5 Marsh/marshy grassland** | **MG10c** *Holcus lanatus-Juncus effusus* rush-pasture, *Iris pseudacorus* sub-community | • Located in the line of watercourses and obviously associated with surface water.<br>• Located in topographic situations where a suitable aquifer or point of discharge would not typically be present.<br>• See also Target Note 11, in Appendix 1. | Moderate | Low |
| | **M25a** *Molinia caerulea-Potentilla erecta* mire, *Erica tetralix* sub-community | • Located in depressions & shallow valleys where surface water collects within wet heath.<br>• See also Target Note 22, in Appendix 1. | Moderate | Low |
| **D2 Wet dwarf shrub heath** | **M15a** *Trichophorum cespitosum-Erica tetralix* wet heath, *Carex panicea* sub-community | • Located on a steep, well-drained slope that would otherwise be well-drained without inputs of groundwater.<br>• Distinctive, sedge-rich vegetation lacking in base-rich indicators suggests the groundwater is not base-rich, or that it forms a 'cushion' beneath the vegetation surface without influencing its chemistry & floristic composition. For this reason, the M15a areas are classified as 'moderate GWDTE'<br>• See also Target Notes 12 & 27 in Appendix 1. | Moderate | Moderate |
| | **M15b** *Trichophorum cespitosum-Erica tetralix* wet heath, typical sub-community<br>**M15c** *Trichophorum cespitosum-Erica tetralix* wet heath, *Cladonia* spp. sub-community | • Extensive areas of habitat located on rain-fed, water-shedding slopes; and often above the likely zone of groundwater emergence.<br>• There are no floristic elements (e.g. yellow-sedges) that suggest base-enrichment derived from groundwater. | Moderate | Low |
| **E1.7 Wet modified bog** | **M25a** *Molinia caerulea-Potentilla erecta* mire, *Erica tetralix* sub-community | • Located in depressions & shallow valleys where surface water collects within wet heath.<br>• See also Target Note 36 & 43, in Appendix 1. | Moderate | Low |
| **E2.1 Flush and spring - acid/neutral flush** | **M6** *Carex echinata-Sphagnum fallax/denticulatum* mire<br>• **M6a** *Carex echinata* sub-community<br>• **M6b** *Nardus stricta* sub-community<br>• **M6c** *Juncus effusus* sub-community<br>• **M6d** *Juncus acutiflorus* sub-community | • Located in shallow, waterlogged depressions amongst blanket bog and in riparian settings.<br>• Not associated with obvious, diffuse or point sources of groundwater emergence.<br>• There are no floristic elements (e.g. yellow-sedges) that suggest base-enrichment derived from groundwater. | High | Low |
| | **M32b**-type spring | • Associated with an obvious springhead discharging groundwater from a point source. | High | High |
| **E2.2 Flush and spring - basic flush** | **M10a** *Carex dioica-Pinguicula vulgaris* mire, *Carex viridula* subsp. *oedocarpa-Juncus bulbosus/kochii* sub-community | • Obviously associated with groundwater emergence at springs & the influence of this is apparent in the frequency of floristic indicators of base-enrichment. | High | High |




## Ackron & Golval

### Peatland

**Map 6:**
**Peatland Condition Assessment.**

**Legend**

Boundaries & buffers
- Site boundary
- GWDTE buffer (250 m)

Peatland Condition Assessment
- 1 Near natural blanket bog
- 1 Near-natural blanket bog mosaic
- 1 Near natural wet heath
- 1 Near natural wet heath mosaic
- 2 Modified blanket bog
- 2 Modified blanket bog mosaic
- 2 Modified wet heath
- 2 Modified wet heath mosaic
- 3 Drained blanket bog
- 3 Drained wet heath
- 3.1 Drained & cut-over
- 4 Actively eroding

Scale: 1:17 500 at A3

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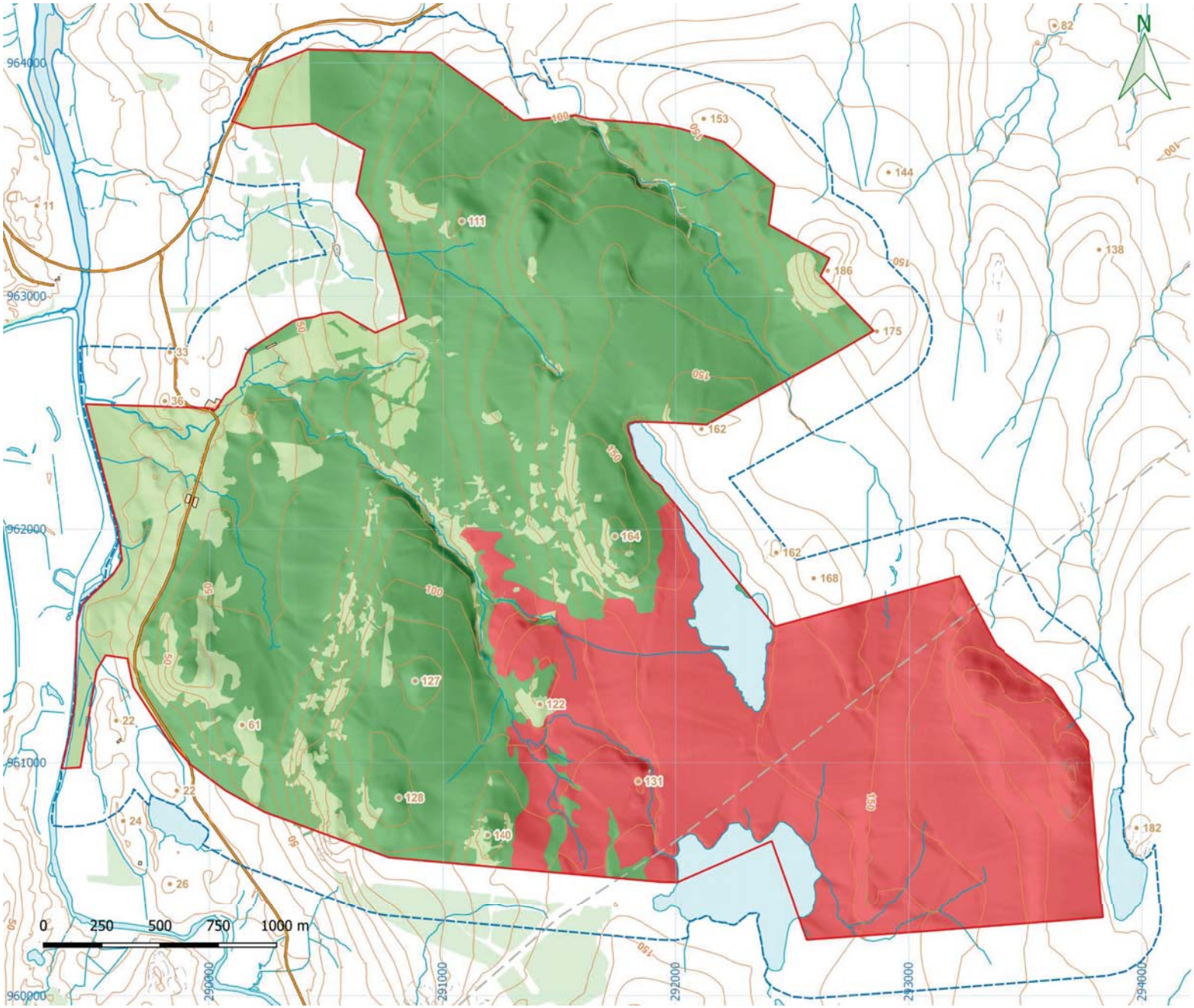


## Ackron & Golval

### Conservation importance

**Map 7:**
**Conservation importance.**

**Legend**

Boundaries & buffers
- Site boundary
- GWDTE buffer (250 m)

Conservation importance
- International
- Local
- Site

Physical features
- Point height (m)
- Contour (m)
- Building
- Crags
- Electricity transmission line
- Foreshore
- High water mark
- Low water mark
- Road
- Tidal water
- Waterbodies
- Watercourses
- Woodland

Scale: 1:17 500 at A3

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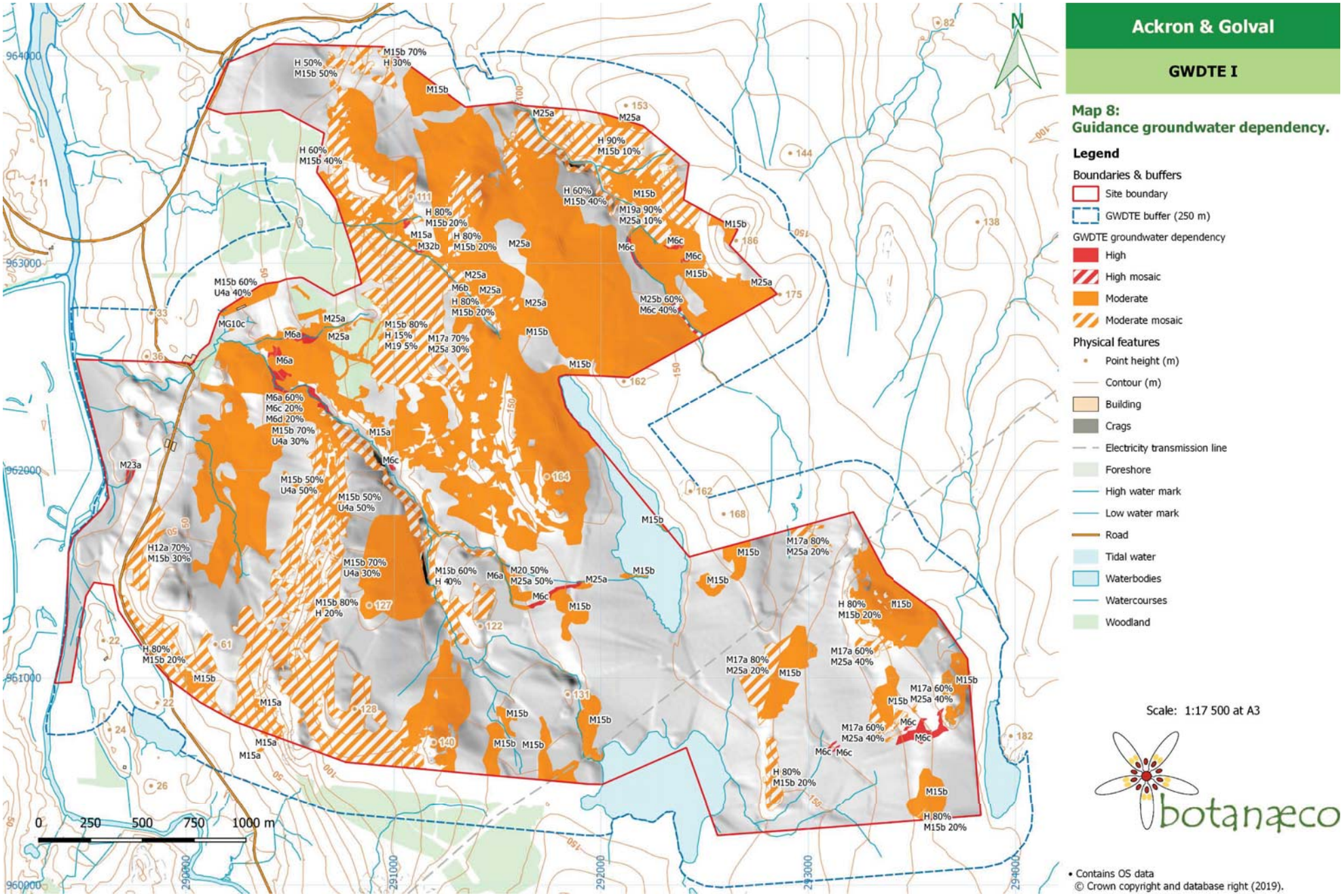
Ackron & Golval
GWDTE I
Map 8:
Guidance groundwater dependency.
Legend
Boundaries & buffers
Site boundary
GWDTE buffer (250 m)
GWDTE groundwater dependency
High
High mosaic
Moderate
Moderate mosaic
Physical features
Point height (m)
Contour (m)
Building
Crags
Electricity transmission line
Foreshore
High water mark
Low water mark
Road
Tidal water
Waterbodies
Watercourses
Woodland
N
0 250 500 750 1000 m
Scale: 1:17 500 at A3
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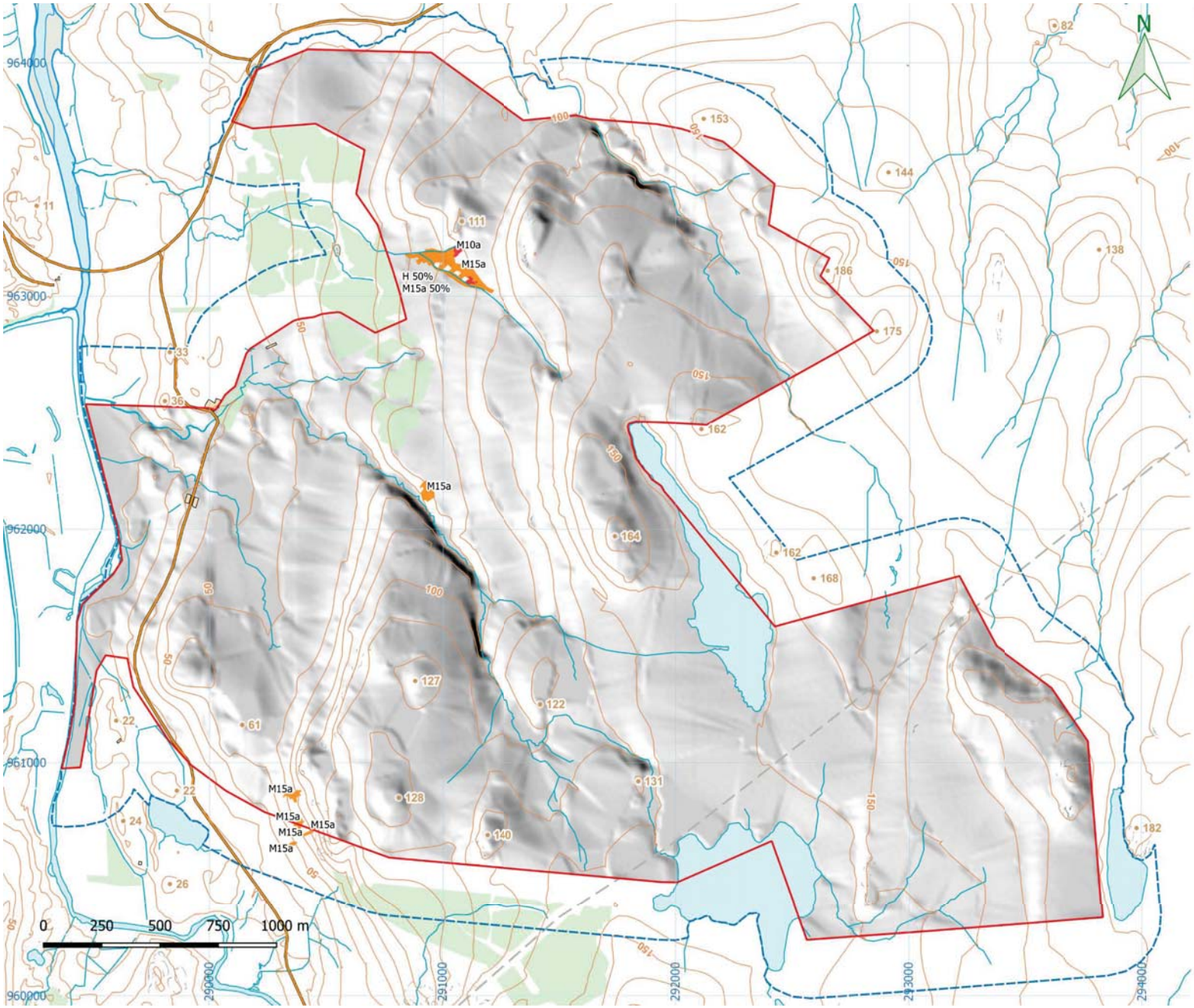
• Contains OS data
© Crown copyright and database right (2019).




## Ackron & Golval

### GWDTE II

**Map 9:**
**Site-specific groundwater**

**Legend**

Boundaries & buffers
- Site boundary
- GWDTE buffer (250 m)

GWDTE groundwater dependency
- High
- Moderate
- Moderate mosaic

Physical features
- Point height (m)
- Contour (m)
- Building
- Crags
- Electricity transmission line
- Foreshore
- High water mark
- Low water mark
- Road
- Tidal water
- Waterbodies
- Watercourses
- Woodland

Scale: 1:17 500 at A3

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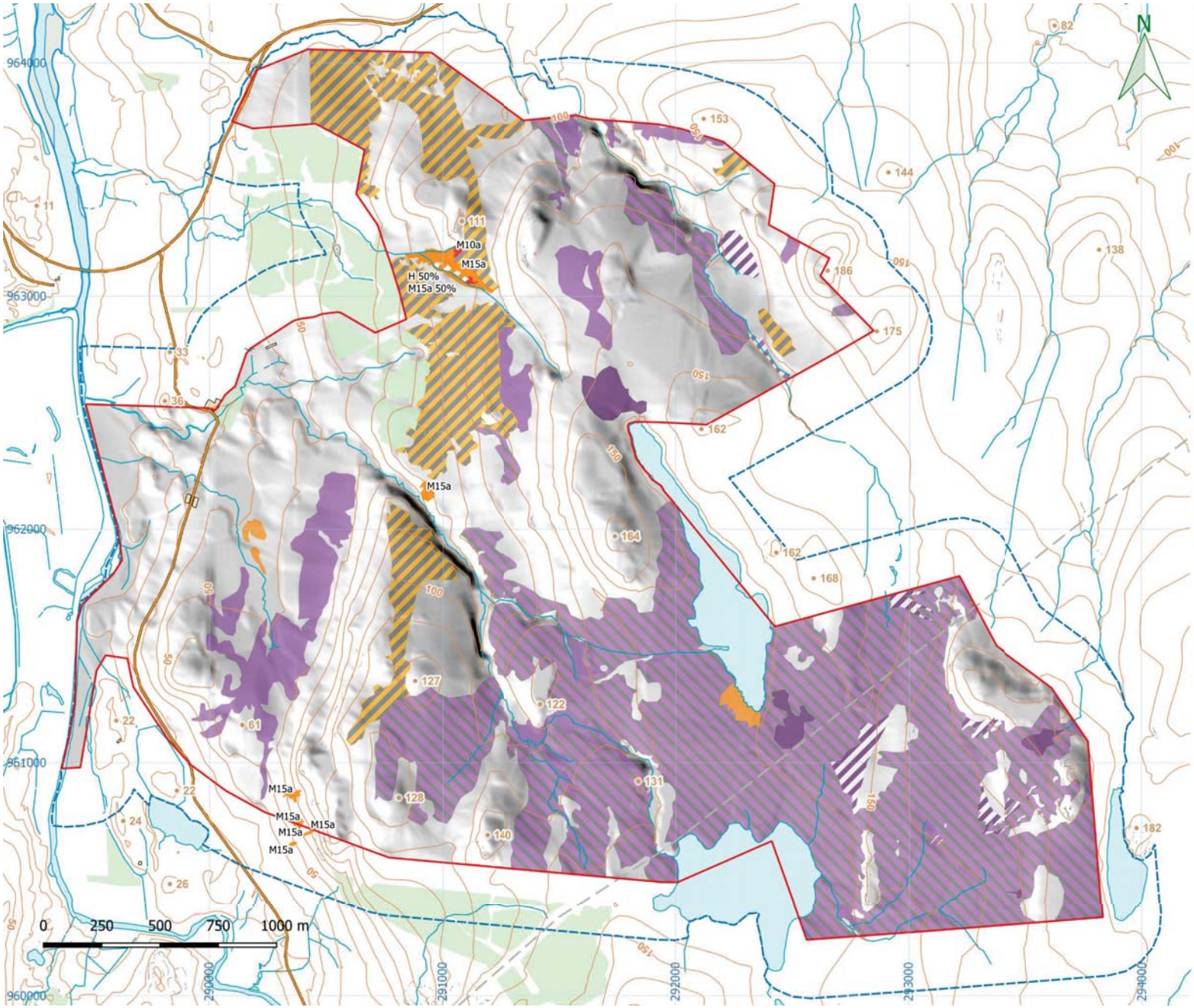


## Ackron & Golval

### Constraints

**Map 10: Constraints.**

**Legend**

Boundaries & buffers
- Site boundary
- GWDTE buffer (250 m)

Site-specific groundwater dependency
- High
- Moderate
- Moderate mosaic

Peatland Condition Assessment (deep peat/bog only)
- 1 Near natural blanket bog
- 1 Near-natural blanket bog mosaic
- 2 Modified blanket bog
- 2 Modified blanket bog mosaic
- 3 Drained blanket bog
- 3.1 Drained & cut-over
- 4 Actively eroding

Scale: 1:17 500 at A3

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# 5 Conclusions

5.1 **Ackron & Golval** encompasses 944 ha on the oceanic, north coast of Scotland. It includes extensive peatland habitats (blanket bog & wet heath) with smaller patches of bracken & dry heath; and there is pastoral grassland on the low ground. There are also two large lochs (≈2 ha).

5.2 Golval is included within several **designations**:

- the East Halladale Site of Special Scientific Interest (SSSI).
- Caithness & Sutherland Peatlands Ramsar, Special Area of Conservation (SAC) & Special Protection Area (SPA).

5.3 The **Carbon & Peatland Map** predicts extensive peatland across Ackron & Golval and that it is absent from only the steepest slopes.

5.4 The are no **Ancient Woodland Inventory** Sites within Ackron & Golval.

5.5 Peatland **habitats** including blanket bog (350 ha, 37 %), wet modified bog (11 ha, 1 %) and their mosaics (32 ha, 2 %); and wet heath (242 ha, 26 %) and its mosaics (120 ha, 13 %) collectively extended across a total of 755 ha or 79 % of Ackron & Golval.

5.6 **Peatland Condition Assessment** identifies 'near natural' blanket bog in shallow valleys and more extensive blanket bog & wet heath vegetation that has been modified by a combination of grazing, drainage & peat-cutting.

5.7 The **conservation importance** of designated habitats in the southeast is 'International'. Non-designated peatland & related mire habitats are of Local importance. The remaining habitats are of Site importance.

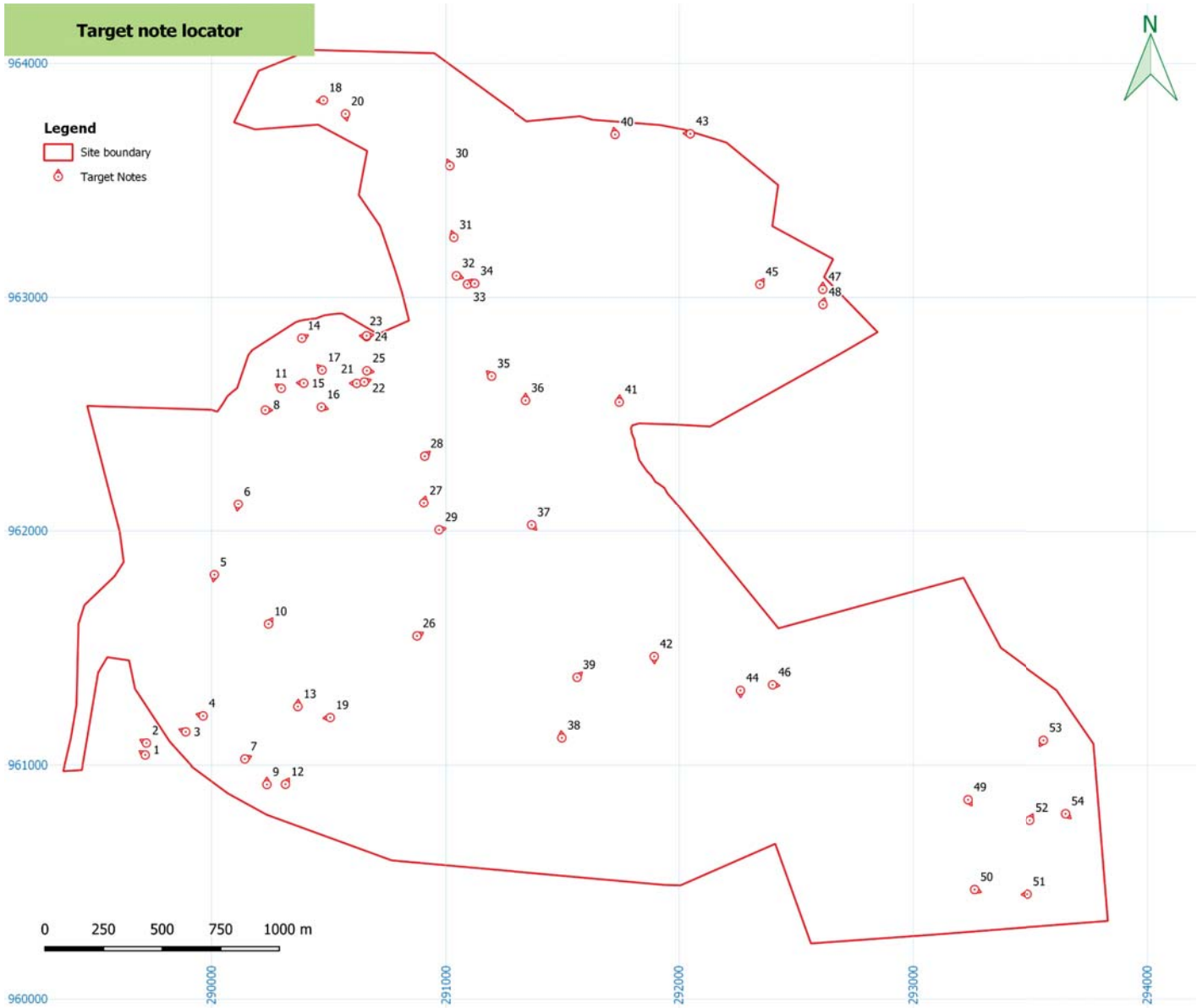
5.8 Highly to moderately groundwater dependent **GWDTE** are localised and include: M10a basic springs; M15a wet heath; & an M32b-type spring.

5.9 The key **constraints** to development identified by the survey & assessment are the following:

- Internationally important habitat & designations
- Local importance blanket bog & its related deep peat
- High groundwater dependency M10a & M32b-type flushes.

# Appendix 1

## Target Notes


Target note locator
Legend
Site boundary
Target Notes
N
964000
963000
962000
961000
960000
290000
291000
292000
293000
294000
0 250 500 750 1000 m

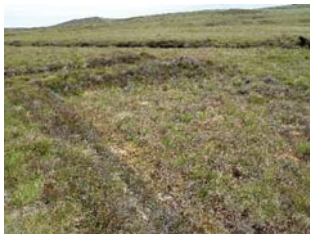
| Target No. & cords. | Description | Photograph |
|---|---|---|
| **1**<br>289717<br>961042 | **M23a marshy grassland**<br>Sharp-flowered rush is abundant in this stand of M23a marshy grassland. Associates include a moderately species-rich & even assemblage of frequent to occasional: lesser spearwort, marsh bedstraw, marsh thistle, *Polytrichum commune*, soft-rush, sorrel, *Sphagnum palustre* & Yorkshire fog.<br>A ditch flows through the centre of this marshy grassland and it is associated with *bog pondweed*, *Bryum pseudotriquetrum* & *Philonotis fontana*. |  |
| **2**<br>289722<br>961093 | **Rushes**<br>Soft rush is invading into the grassland in damp valley-bottoms & hollows where surface water will collect to maintain damp conditions. There is a slightly elevated cover of Yorkshire fog in comparison to surrounding areas; and false oat-grass & yellow iris are occasional. |  |
| **3**<br>289890<br>961141 | **Sedge-rich flush**<br>Similar to the flush described at Target Note 4. However, common yellow-sedge is also present, alongside carnation sedge. |  |
| **4**<br>289964<br>961209 | **Carnation sedge flush**<br>Surface water flushing where the peat layer is thin results in a sward rich in carnation sedge with frequent *Campylopus introflexus*. See also Target Note 3. |  |
| **5**<br>290012<br>961813 | **H12c dry heath**<br>Grazing has resulted in the formation of a low, dense heather canopy (<0.1 m tall). Heather is domain over a moss layer dominated by Hylocomium splendens. Associates include frequent *Cladonia arbuscula*, common bent, mat-grass, *Hypnum jutlandicum*, *Racomitrium lanuginosum*, *Rhytidiadelphus loreus* & *Rhytidiadelphus squarrosus*. |  |

| Target No. & cords. | Description | Photograph |
|---|---|---|
| **6**<br>290114<br>962116 | **M29 soakway**<br>The vegetation within this soakway has been eroded by trampling. Where vegetation persists, bog pondweed & sharp-flowered rush are present. |  |
| **7**<br>290142<br>961025 | **H12c dry heath**<br>An example of the typical H12c dry heath. Most other stands of dry heath are dominated exclusively by heather & hypnaceous mosses.<br>In this stand, common bent, heather, *Hylocomium splendens*, *Rhytidiadelphus squarrosus*, sweet vernal grass & wavy hair-grass are abundant. |  |
| **8**<br>290229<br>962519 | **M15b wet heath**<br>Heavily-grazed & poached wet heath. As a result of grazing, the vascular plant component is reduced and mosses are prominent.<br>Deergrass is abundant. *Racomitrium lanuginosum* & *Sphagnum* are frequent (*Sphagnum capillifolium*, *Sphagnum compactum*, *Sphagnum cuspidatum* & *Sphagnum tenellum*); and the following are frequent to occasional: carnation sedge, *Cladonia* spp. (lichens), cross-leafed heath, great sundew, heath rush, heath wood-rush, heather, lousewort, *Pleurozium schreberi* & purple moor-grass. |  |
| **9**<br>290236<br>960918 | **M6a acid/neutral flush**<br>A soakway with a sward of abundant common bog-cotton and frequent star sedge. *Sphagnum denticulatum* is abundant in the moss layer, not the more typical *Sphagnum fallax*. |  |

| Target No. & cords. | Description | Photograph |
|---|---|---|
| **10**<br>290243<br>961602 | **M15b wet heath**<br>Purple moor-grass & bog myrtle are abundant in this area of wet heath located alongside a small watercourse. The vegetation is moderately species-rich & even and it includes frequent to occasional: bog asphodel, bottle sedge, common bog-cotton, cross-leafed heath, devil's-bit scabious, heath wood-rush, heather, soft rush & velvet bent. |  |
| **11**<br>290297<br>962612 | **MG10c marshy grassland**<br>This area of MG10c marshy grassland is located in a damp, disturbed hollow. It appears to escape grazing because of the mild toxicity of the domain yellow iris. The sward between the irises is dense and dominated by Yorkshire fog with frequent sorrel. |  |
| **12**<br>290315<br>960919 | **M15a wet heath**<br>This and the neighbouring areas of M15a are weakly influenced by groundwater at the base of a steep, dry slope. Their wetness in this topographic location reveals the influence of the groundwater as the vegetation does not include basiphilous species (e.g. common yellow-sedge). Star sedge is abundant & devil's-bit scabious is occasional and these two plants are the distinguishing floristic elements of the M15a sub-community in comparison to the M15b wet heath. |  |
| **13**<br>290368<br>961249 | **Soakway**<br>This small soakway has a variable & patchy cover of black bog-rush, bog pondweed, common bog-cotton, common spike-rush, cross-leafed heath & star sedge. |  |
| **14**<br>290385<br>962826 | **Rushes in U4a acid grassland**<br>Patches of rushes are present throughout the acid grassland. Yorkshire fog is abundant in these places and the vegetation consequently shifts towards the composition of the MG10 *Holcus lanatus-Juncus effusus* rush-pasture. |  |

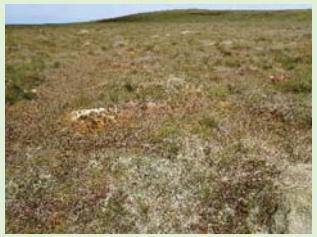
| Target No. & cords. | Description | Photograph |
|---|---|---|
| **15**<br>290393<br>962634 | **M23a marshy grassland**<br>Located along the flanks of the watercourse, this area of M23a marshy grassland is dominated by sharp-flowered rush. Herbs are frequent including: lesser spearwort, selfheal, sorrel, sweet vernal grass & water forget-me-not. Mosses are scarce because of the density of the vascular vegetation and accumulations of rush litter.<br>This area is evidently grazed and is somewhat poached. |  |
| **16**<br>290468<br>962532 | **M6a acid/neutral flush**<br>Common sedge is dominant in the grazed sward of this flushed area. Associates in the sward include frequent to occasional: heath wood-rush, lesser spearwort, purple moor-grass, smooth meadow-grass, star sedge & water forget-me-not. Ragged-robin is occasional.<br>As a result of the grazing, vascular plant cover is limited so that bryophytes are abundant, including: *Brachythecium rivulare*, *Calliergonella cuspidata* & *Philonotis fontana*. |  |
| **17**<br>290471<br>962690 | **U4b semi-improved acid grassland**<br>A tall grass sward (*c.* 0.5 m high) is enclosed & ungrazed. Common bent, red fescue, smooth meadow-grass & Yorkshire fog are abundant; and bracken, field buttercup & foxglove are occasional. |  |
| **18**<br>290477<br>963843 | **Acid grassland-blanket bog mosaic**<br>The mosaic of acid grassland & blanket bog here is the result of agricultural improvement (fertilising, liming & re-seeding) and grazing by livestock. |  |
| **19**<br>290506<br>961202 | **Peaty flush**<br>A typical peaty flush within the M15b wet heath vegetation. The mineral substrate has a thin skein of peat through which a sparse cover of carnation sedge is rooted. No other vegetation is present and this is presumed to reflect the variable, surface water-driven hydrology combined with the albedo of the peat. |  |

| Target No. & cords. | Description | Photograph |
|---|---|---|
| **20**<br>290571<br>963785 | **Extensive peat-cutting**<br>Extensive peat cutting has been undertaken across this level area and up the slope above. The cut-over peat is 1.0 m to 1.5 m deep and the uncut baulks are up to 0.8 m high. These features are dewatered and vegetated with a dense canopy of heather & deergrass, frequent lichens and occasional *Sphagnum capillifolium*. |  |
| **21**<br>290619<br>962633 | **M6a acid/neutral flush**<br>Bog myrtle is abundant & distinctive within this area of acid/neutral flush and it extends up the flans of the shallow valley into adjoining areas of wet heath. |  |
| **22**<br>290651<br>962639 | **M25a marshy grassland**<br>This area of M25a is mapped as marshy grassland rather than wet modified bog because of the absence of deep peat (>0.5 m). It is dominated by purple moor-grass with occasional species associated with wet heath from which it appears to have been derived through grazing. Bog myrtle is abundant. |  |
| **23**<br>290661<br>962837 | **Pond**<br>The drain at 24 passes through this pond. The water clarity & quality are high and there is a large diversity & number of invertebrates. Bulbous rush is abundant with frequent floating sweet-grass, lesser spearwort & water horsetail in the margins, and common water-starwort in the water column. |  |
| **24**<br>290661<br>962833 | **Ditch**<br>The ditch alongside the track has a moderately spec-rich, even & distinctive flora including: *Calliergonella cuspidata*, *Dichodontium palustre*, ivy-leaved water crowfoot, lesser spearwort, *Philonotis fontana*, water forget-me-not & water horsetail. Drains to the pond at 23. |  |

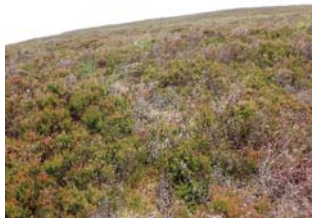
| Target No. & cords. | Description | Photograph |
|---|---|---|
| **25**<br>290662<br>962687 | **Scattered alder & birch**<br>Scattered alder & birch have established in unplanted parts of the fenced conifer plantation. The fence is evidently now porous to deer. This has resulted in the failure of more recent regeneration and an evident browse line in the trees. |  |
| **26**<br>290876<br>961551 | **D5 acid grassland/dry heath**<br>Mosses (*Hylocomium splendens* & *Pleurozium schreberi*) dominate throughout this stand of D5 acid grassland/dry heath mosaic. Common bent, green-ribbed sedge, mat-grass & sheep's-fescue also occur throughout but are of lower cover where the heather canopy of the dry heath is present. |  |
| **27**<br>290905<br>962121 | **M15a wet heath**<br>This distinctive area of wet heath is located on the flank of a riparian valley, at the base of a slope. It is 'grassy' in appearance with a moderately species-rich & very even assemblage of frequent: common bog-cotton, bog-myrtle, cross-leafed heath, heather, purple moor-grass, *Sphagnum palustre*, tormentil & velvet bent; and occasional common yellow-sedge & *Sphagnum capillifolium*. |  |
| **28**<br>290909<br>962322 | **M17a blanket bog: cut-over**<br>Stepped edges up to 0.6 m high indicate the extent of historical peat-cutting that has left a peat depth of around 1 m. M17b is prominent around the edges of the cut areas where the peat has dewatered. It is distinct for its pale appearance, the consequence of abundant lichens.<br>Away from the dewatered edges, the vegetation is moderately species rich, even & distinctive. Cross-leafed heath, deergrass, hare's-tail bog-cotton, heather & *Sphagnum capillifolium* are abundant. Bog-myrtle, great sundew, *Sphagnum magellanicum* & *Sphagnum papillosum* are frequent to occasional. |  |

| Target No. & cords. | Description | Photograph |
|---|---|---|
| **29**<br>290970<br>962005 | **M6c acid/neutral flush**<br>M6c acid/neutral flush located in a shallow valley receiving surface water from the surrounding blanket bog.<br>*Polytrichum commune, Sphagnum fallax* & soft-rush are abundant in the species-poor, even & indistinctive vegetation. Velvet bent & Yorkshire fog are frequent. |  |
| **30**<br>291016<br>963563 | **Peat-cutting**<br>Peat-cutting here has proceeded up-slope to avoid the need for drains. The vegetation has recovered and it remains wet with only a 0.5 m step remaining to indicate the activity. |  |
| **31**<br>291033<br>963257 | **H10b dry heath**<br>This small area of H10b dry heath is located on a crag and too small to map, other than by a target note.<br>Heather is abundant & bell heather is frequent in the relatively open canopy. *Racomitrium lanuginosum* is frequent in the moss layer and indicative of the H10b *Calluna vulgaris-Erica cinerea* (heather-bell heather) heath, *Racomitrium lanuginosum* (a moss) sub-community.<br>Additional associates include frequent to occasional: *Bryum capillare*, common bent, common polypody, *Frullania tamarisci*, *Hedwigia ciliata*, *Hylocomium splendens*, *Hypnum cupressiforme*, sheep's-fescue & sweet vernal grass. The vegetation is consequently, moderately species -rich & even and very distinctive in a local context. |  |
| **32**<br>291044<br>963093 | **M6a-M6c acid/neutral flush**<br>A typical stand of the M6a-M6c acid/neutral flush associated with riparian locations. The M6a is quite species-rich, even & distinctive. Within it, star sedge is abundant to dominant in a lawn of abundant to frequent *Sphagnum fallax* & *Sphagnum palustre*. Additional species include: bog stitchwort, cuckooflower, common bog-cotton, common sedge, compact rush, lesser spearwort, lousewort, *Sphagnum mucronatum*, *Sphagnum girgensohnii* & Yorkshire fog. Bog pondweed, marsh arrowgrass & *Warnstorfia fluitans* are rare. |  |

| Target No. & cords. | Description | Photograph |
|---|---|---|
| **33**<br>291091<br>963057 | **M10a basic flush**<br>Black bog-rush dominates the vegetation of this basic flush. Carnation sedge, devil's-bit scabious, & red fescue are frequent and the following are occasional: butterwort, cross-leafed heath, great sundew, heather, lesser clubmoss & tormentil.<br>The moss layer is partial and this may reflect a variable flow regime and periods of desiccation. *Campylium stellatum* & *Scorpidium scorpioides* are locally abundant, especially at the sheltered margins. |  |
| **34**<br>291122<br>963060 | **M32-type flush**<br>A distinctive springhead with a relatively high discharge of iron-rich water through a partially floating/'quaking', cohesive mat of low-stature vegetation. Mosses are dominant with abundant *Brachythecium rivulare* & *Bryum pseudotriquetrum*; and occasional *Campylium stellatum* & *Cratoneuron filicinum*. Heavily grazed common sedge forms an open sward with occasional: common bog-cotton, common mouse-ear, daisy, marsh-marigold, ragged-robin & white sedge. |  |
| **35**<br>291194<br>962664 | **Dry/wet heath-blanket bog mosaic: cut-over bog**<br>This area has been extensively & intensively cut to the mineral substrate below the peat. These areas are now associated with wet heath. Narrow ridges of dewatered peat up to 0.5 m deep are spaced at regular intervals of c. 8 m. These now have dry heath vegetation and there are rarely patches of habitat/vegetation attributable to blanket bog. |  |
| **36**<br>291345<br>962560 | **M17a/M25a blanket bog/wet modified bog mosaic**<br>Surface water draining from the slope above runs across this area of blanket bog. As a result, conditions are very wet. Purple moor-grass is extensive, covering around 75 % of the area. M17a-type vegetation accounts for the other 20 % of the vegetation cover. The 'swamping' of the M17a vegetation with leaf litter from the purple moor-grass suggest that the latter is a recent invader. |  |
| **37**<br>291371<br>962026 | **Crag**<br>The outcrop is representative of others in the area in having a partial, species-poor cover of crustose lichens. A diminutive plant of common polypody (two fronds above the pencil) is a distinctive element. |  |

| Target No. & cords. | Description | Photograph |
|---|---|---|
| **38**<br>291500<br>961115 | **M20 wet modified bog**<br>Located at the union of two watercourses, this area of M20 wet modified bog is in a depression and it collects water. As such, it is quite wet. Hare's-tail bog-cotton is dominant, velvet bent & wavy hair-grass are abundant; and cross-leafed heath, heath bedstraw, *Pleurozium schreberi*, *Sphagnum capillifolium*, *Sphagnum fallax* & tormentil. See also Target Note 39. |  |
| **39**<br>291565<br>961374 | **M20 wet modified bog**<br>Located at the union of two watercourses, this area of M20 wet modified bog is in a depression and it collects water. As such, it is quite wet. Hare's-tail bog-cotton is dominant, velvet bent & wavy hair-grass are abundant; and cross-leafed heath, heath bedstraw, *Pleurozium schreberi*, *Sphagnum capillifolium*, *Sphagnum fallax* & tormentil. Patches of M6c vegetation are also present. See also Target Note 38. |  |
| **40**<br>291727<br>963697 | **M19a blanket bog**<br>This area of blanket bog is associated with M19a vegetation. Hare's-tail bog-cotton, heather & *Sphagnum capillifolium* are abundant with frequent to occasional: common bog-cotton, cross-leafed heath, heather, *Hypnum jutlandicum* & tormentil. Deergrass is absent and a point of distinction from the M17 blanket bog vegetation. |  |
| **41**<br>291745<br>962553 | **M17b blanket bog: high quality**<br>This small area of M17b blanket bog habitat is very high quality. It is especially distinct for its juxtaposition of tall, *Racomitrium lanuginosum*-dominated hummocks and shallow M2 *Sphagnum cuspidatum* pools. Otherwise, it is no more species rich or floristically distinctive than any of the other M17a vegetation. See also Target Note 44. |  |
| **42**<br>291894<br>961463 | **M6c acid/neutral flush**<br>This stand of M6c has an exceedingly dense sward of soft-rush and accumulations of its litter. This limits the cover of its associates. |  |

| Target No. & cords. | Description | Photograph |
|---|---|---|
| **43**<br>292048<br>963700 | **M25a wet modified bog**<br>On this gently-sloping area of wet modified bog, purple moor-grass is dominant with frequent to occasional: heather, cross-leafed heath, *Hypnum jutlandicum* & tormentil. The ground cover has a limited moss cover because of the accumulations of purple moor-grass litter. |  |
| **44**<br>292262<br>961318 | **M17b blanket bog: eroding**<br>Drains have been cut in the bog at the edge of the loch. Slumping has subsequently resulted in widening as the flanks have collapsed. Dewatering of the adjoining peat mass has resulted in the expansion of M17b vegetation with a high cover of lichens in place of the *Sphagnum*.<br>In spite of the dewatering of the peat, the vegetation remains moderately species-rich, even & distinctive. *Cladonia* lichens, deergrass & heather are abundant; common bog-cotton, cross-leafed heath, great sundew, hare's-tail bog-cotton, *Hypnum jutlandicum*, *Racomitrium lanuginosum* & *Sphagnum capillifolium*. Bog asphodel & bog myrtle are occasional. |  |
| **45**<br>292345<br>963056 | **M6c acid/neutral flush**<br>M6c acid/neutral flush vegetation forms scattered lines and more extensive patches within the blanket bog here in the line of rills conducting surface water. Soft-rush is domain with abundant *Sphagnum fallax* in the very wet conditions. Associates include frequent to occasional: common sedge, heath wood-rush, marsh bedstraw, marsh violet, *Sphagnum palustre*, sweet vernal grass & tormentil. |  |
| **46**<br>292399<br>961342 | **Drain**<br>An example of the slit-type drains that appear to have been installed in one phase as they all have similar dimensions (0.3 m to 0.4 m wide & 0.7 m deep). This example is very active and erosion has deepened it to around 1 m deep in places. |  |

| Target No. & cords. | Description | Photograph |
|---|---|---|
| **47**<br>292613<br>963035 | **H16 dry heath**<br>Weakly developed H16 heath where bearberry grows through dense, short, wind-clipped heather. The only associate in this small area is green-ribbed sedge (c. 30 $m^2$). Otherwise, heather, its litter & bare peat form the ground cover. |  |
| **48**<br>292614<br>962970 | **H non NVC heath**<br>Rank dry heath composed of mature heather over a dense layer of moss. Associates include occasional bell heather, deergrass, green-ribbed sedge & purple moor-grass. These suggest affinities with wet heath although the heath is on a relatively steep slope. |  |
| **49**<br>293233<br>960853 | **M17a blanket bog**<br>The blanket bog in the base of shallow depressions within larger extents of bog is distinctive. This is likely to reflect periodic, partial flooding of these low points with surface water.<br>Deergrass is abundant with frequent: bog-myrtle, common bog-cotton, cross-leafed heath, heather; and more occasional: common cow-wheat, *Cladonia portentosa*, *Cladonia uncialis*, *Pleurozia purpurea*, *Sphagnum cuspidatum*, *Sphagnum magellanicum*, *Sphagnum papillosum* & *Sphagnum tenellum*. |  |
| **50**<br>293261<br>960469 | **Erosion**<br>Ongoing block erosion of the flanks here may have been precipitated by the historical installation of drains or canalisation of existing watercourses. M6c vegetation has established in the base of the channel. |  |

| Target No. & cords. | Description | Photograph |
|---|---|---|
| **51**<br>293491<br>960449 | **M20 wet modified bog**<br>Hare's-tail bog-cotton is dominant with abundant velvet bent and frequent *Hylocomium splendens*, *Polytrichum commune*, *Sphagnum palustre* & tormentil; and occasional: bog-myrtle & soft-rush. |  |
| **52**<br>293502<br>960765 | **M6c acid/neutral flush**<br>M6c acid/neutral flush vegetation along a small watercourse. In places, the sward of soft-rush is absent and a variable mix of heath rush & sweet vernal grass of very low cover (<10 %) is present. *Sphagnum* is dominant in the moss later, *Sphagnum fallax* especially. |  |
| **53**<br>293560<br>961107 | **M17b blanket bog: high quality**<br>This small area of M17a blanket bog habitat is very high quality and comparable to that at Target Note 41. It is especially distinct for its juxtaposition of tall, *Racomitrium lanuginosum*-dominated hummocks and shallow M2 *Sphagnum cuspidatum* pools. Otherwise, it is no more species rich or floristically distinctive than any of the other M17b vegetation. |  |
| **54**<br>293654<br>960793 | **H non-NVC heath**<br>A typical stand of the non-NVC heath dominated by a tall, mature canopy of heather. This suppresses the underlying vegetation that is species-poor, uneven & indistinctive; and dominated by hypnaceous mosses (*Hylocomium splendens* & *Hypnum jutlandicum*). |  |

# Appendix 2

## Map 11: Habitats & NVC vegetation communities

## List of NVC community codes & titles

**H -** Non-NVC heath

**H12c** *Calluna vulgaris-Vaccinium myrtillus* heath, *Galium saxatile-Festuca ovina* sub-community

**M10a** *Carex dioica-Pinguicula vulgaris* mire, *Carex viridula* subsp. *oedocarpa-Juncus bulbosus/kochii* sub-community

**M15a** *Trichophorum cespitosum-Erica tetralix* wet heath, *Carex panicea* sub-community

**M15b** *Trichophorum cespitosum-Erica tetralix* wet heath, typical sub-community

**M17a** *Trichophorum cespitosum-Eriophorum vaginatum* blanket mire, *Drosera rotundifolia-Sphagnum* spp. sub-community

**M19a** *Calluna vulgaris-Eriophorum vaginatum* blanket mire, *Erica tetralix* sub-community

**M20** *Eriophorum vaginatum* blanket and raised mire

**M25a** *Molinia caerulea-Potentilla erecta* mire, *Erica tetralix* sub-community

**M32b** *Philonotis fontana-Saxifraga stellaris* spring, *Montia fontana-Chrysosplenium oppositifolium* sub-community

**M6a** *Carex echinata-Sphagnum fallax/denticulatum* mire, *Carex echinata* sub-community

**M6b** *Carex echinata-Sphagnum fallax/denticulatum* mire, *Carex nigra-Nardus stricta* sub-community

**M6c** *Carex echinata-Sphagnum fallax/denticulatum* mire, *Juncus effusus* sub-community

**M6d** *Carex echinata-Sphagnum fallax/denticulatum* mire, *Juncus acutiflorus* sub-community

**MG10c** *Holcus lanatus-Juncus effusus* rush-pasture, *Iris pseudacorus* sub-community

**MG9** *Holcus lanatus-Deschampsia cespitosa* grassland

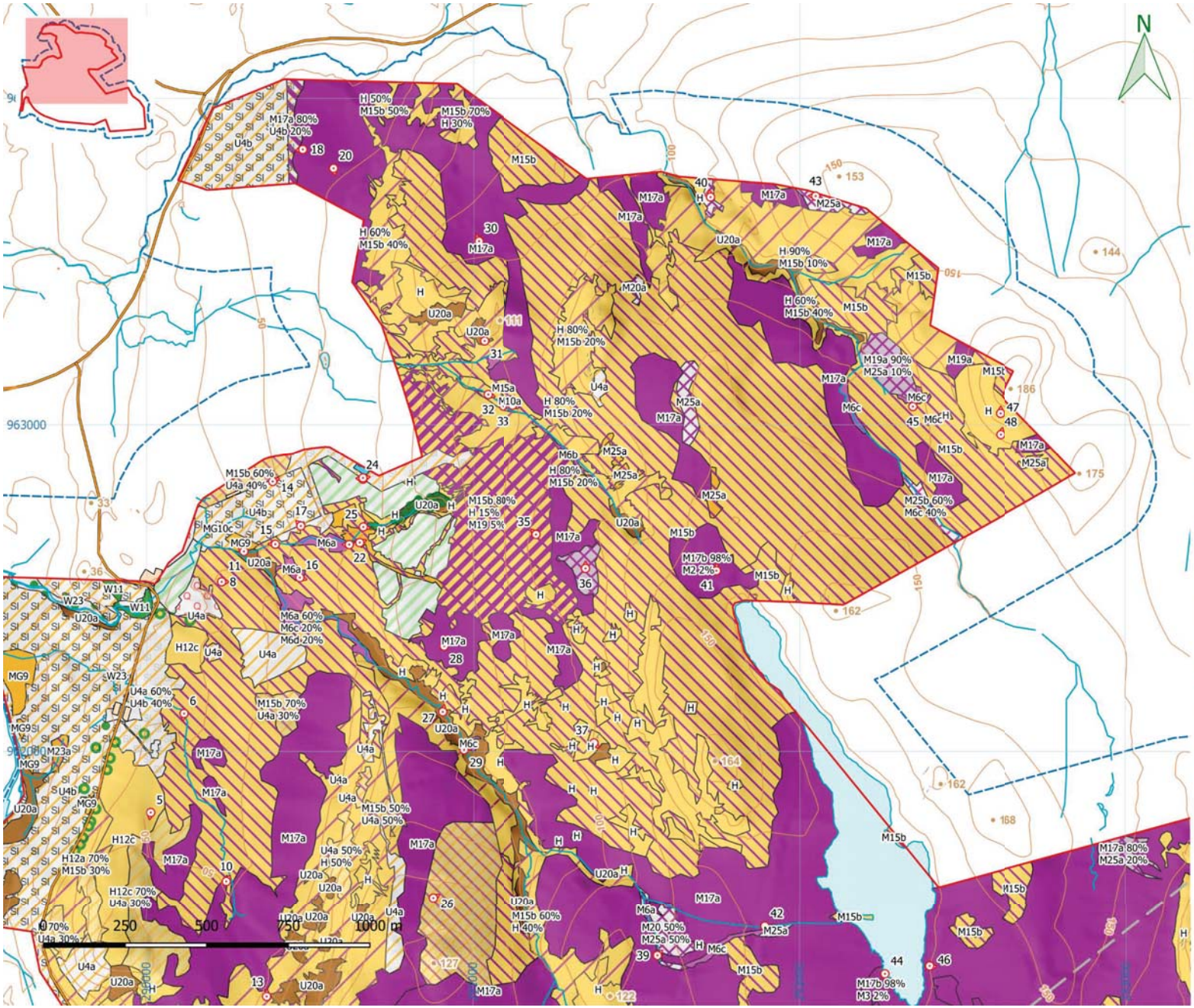
**U20a** *Pteridium aquilinum-Galium saxatile* community, *Anthoxanthum odoratum* sub-community

**U4a** *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, typical sub-community

**U4b** *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, *Holcus lanatus-Trifolium repens* sub-community

**W11** *Quercus petraea-Betula pubescens-Oxalis acetosella* woodland

**W23** *Ulex europaeus-Rubus fruticosus* scrub




## Ackron & Golval

### Habitats & vegetation

**Map 11.1:**
**Phase 1 habitats.**

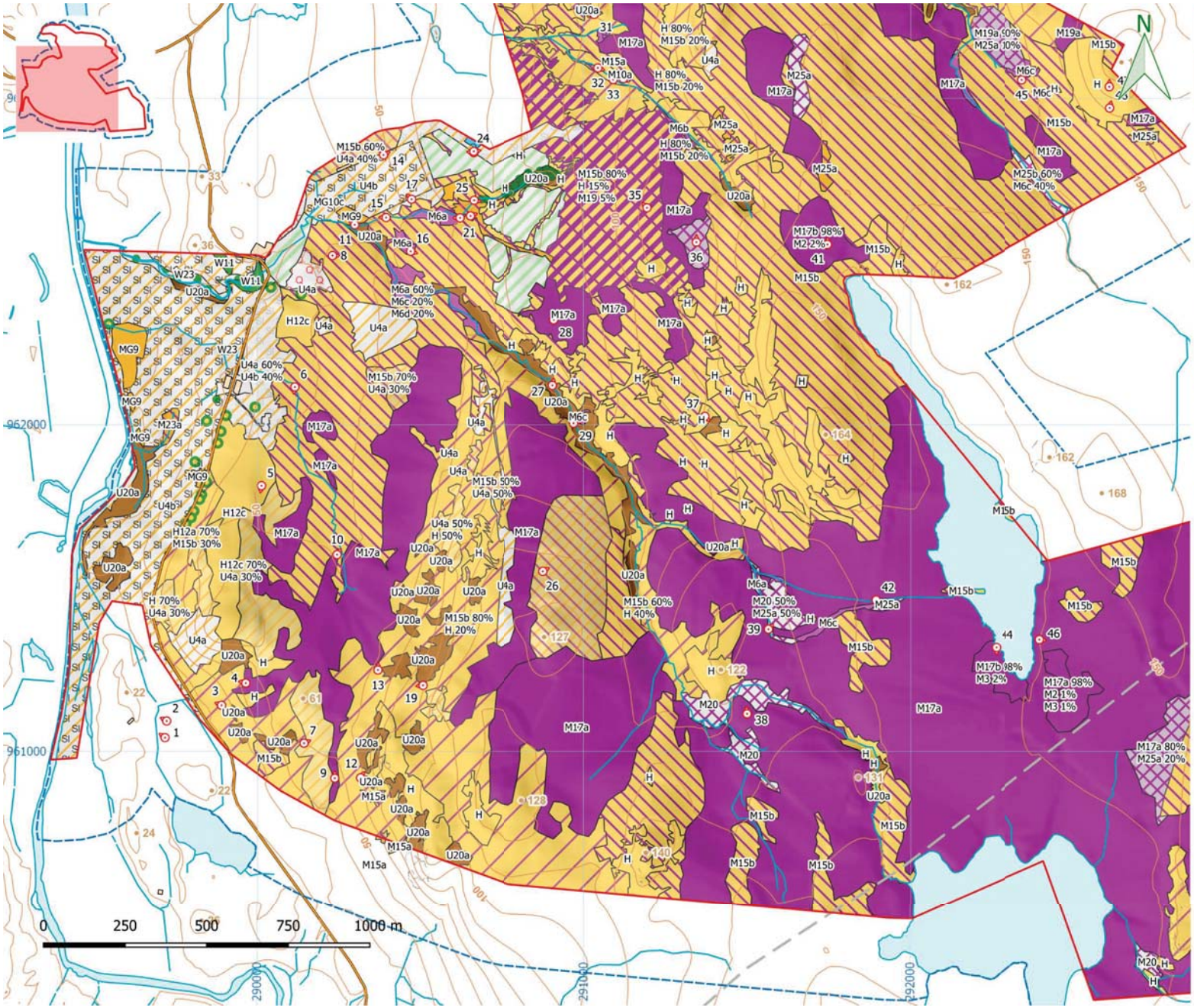
**Legend**

Boundaries & buffers
- Site boundary
- GWDTE buffer (250 m)

Phase 1 habitats
- A1.1.1 - Broadleaved woodland - semi-natural
- A1.2.2 - Coniferous woodland - plantation
- A3.1 - Broadleaved Parkland/scattered trees
- B1.1 - Acid grassland - unimproved
- B1.1-B1.2 - Semi-/unimproved acid grassland
- B1.2 - Acid grassland - semi-improved
- B1.2-E1.6.1- Semi-improved acid grassland - blanket bog mosaic
- B2.1 - Neutral grassland - unimproved
- B5 - Marsh/marshy grassland
- C1.1 - Bracken - continuous
- D1.1 - Dry dwarf shrub heath - acid
- D1.1-D2- Dry-wet heath mosaic
- D1.1-D2-E1.6.1- Dry-wet heath - blanket bog mosaic
- D2 - Wet dwarf shrub heath
- D5 - Dry heath/acid grassland
- D6 - Wet heath/acid grassland
- E1.6.1 - Blanket sphagnum bog
- E1.6.1-E1.7 - Blanket-wet modified bog mosaic
- E1.7 - Wet modified bog
- E1.7-E2.1 - Blanket bog-flush mosaic
- E2.1 - Flush and spring - acid/neutral flush
- E2.2 - Flush and spring - basic flush
- G1.3 - Standing water - oligotrophic
- I2.1 - Quarry
- J5 - Other habitat
- A3.1 - Scattered broadleaved (birch) trees
- A2.2 - Scattered (gorse) scrub

Scale: 1:12 500 at A3

botanæco




## Ackron & Golval

### Habitats & vegetation

**Map 11.2: Phase 1 habitats & NVC plant communities.**

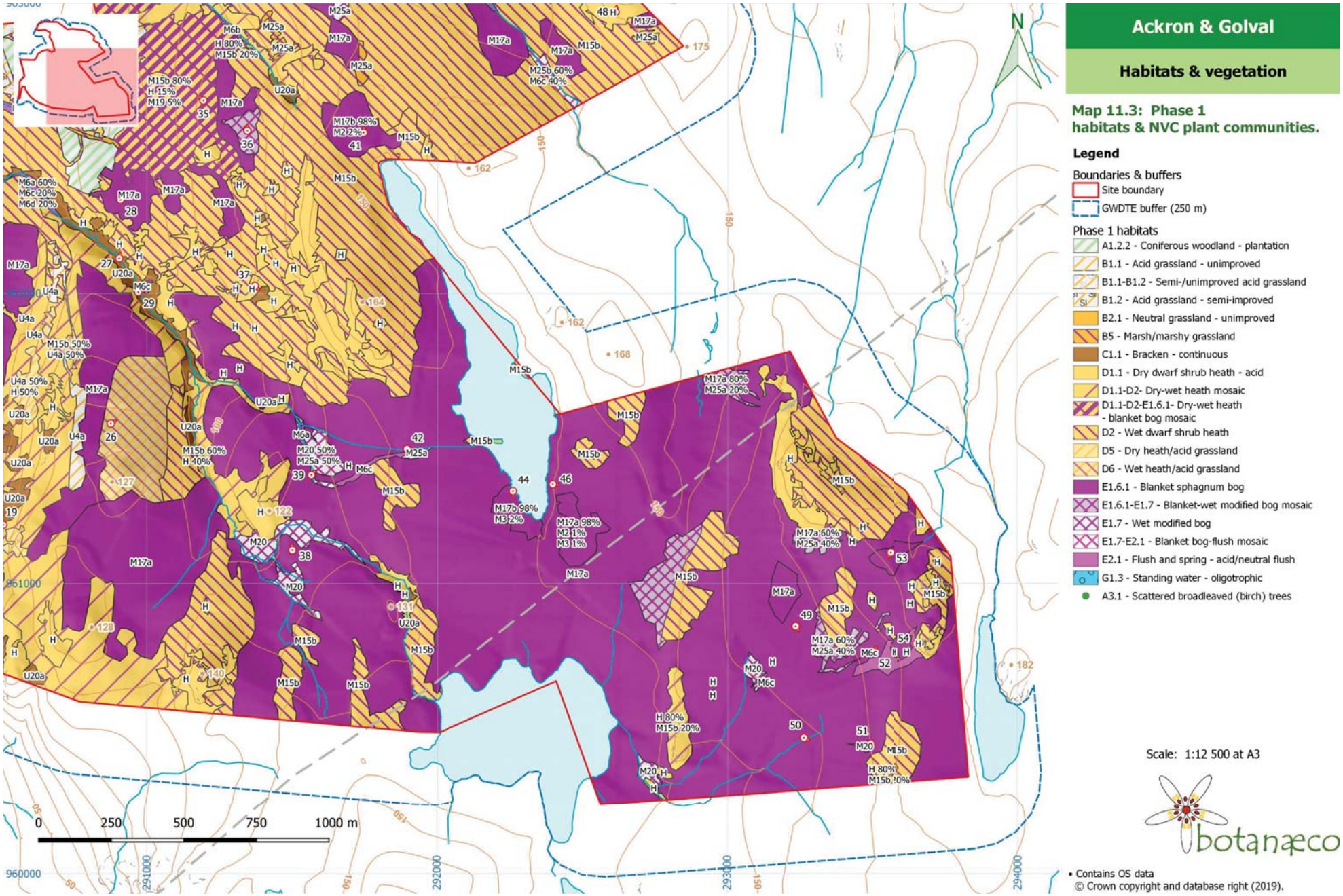
**Legend**

Boundaries & buffers
- Site boundary
- GWDTE buffer (250 m)

Phase 1 habitats
- A1.1.1 - Broadleaved woodland - semi-natural
- A1.2.2 - Coniferous woodland - plantation
- A3.1 - Broadleaved Parkland/scattered trees
- B1.1 - Acid grassland - unimproved
- B1.1-B1.2 - Semi-/unimproved acid grassland
- B1.2 - Acid grassland - semi-improved
- B2.1 - Neutral grassland - unimproved
- B5 - Marsh/marshy grassland
- C1.1 - Bracken - continuous
- D1.1 - Dry dwarf shrub heath - acid
- D1.1-D2- Dry-wet heath mosaic
- D1.1-D2-E1.6.1- Dry-wet heath - blanket bog mosaic
- D2 - Wet dwarf shrub heath
- D5 - Dry heath/acid grassland
- D6 - Wet heath/acid grassland
- E1.6.1 - Blanket sphagnum bog
- E1.6.1-E1.7 - Blanket-wet modified bog mosaic
- E1.7 - Wet modified bog
- E1.7-E2.1 - Blanket bog-flush mosaic
- E2.1 - Flush and spring - acid/neutral flush
- E2.2 - Flush and spring - basic flush
- G1.3 - Standing water - oligotrophic
- I2.1 - Quarry
- J5 - Other habitat
- A3.1 - Scattered broadleaved (birch) trees
- A2.2 - Scattered (gorse) scrub

Scale: 1:12 500 at A3

botanæco


Ackron & Golval
Habitats & vegetation
Map 11.3: Phase 1 habitats & NVC plant communities.
Legend
Boundaries & buffers
Site boundary
GWDTE buffer (250 m)
Phase 1 habitats
A1.2.2 - Coniferous woodland - plantation
B1.1 - Acid grassland - unimproved
B1.1-B1.2 - Semi-/unimproved acid grassland
B1.2 - Acid grassland - semi-improved
B2.1 - Neutral grassland - unimproved
B5 - Marsh/marshy grassland
C1.1 - Bracken - continuous
D1.1 - Dry dwarf shrub heath - acid
D1.1-D2- Dry-wet heath mosaic
D1.1-D2-E1.6.1- Dry-wet heath - blanket bog mosaic
D2 - Wet dwarf shrub heath
D5 - Dry heath/acid grassland
D6 - Wet heath/acid grassland
E1.6.1 - Blanket sphagnum bog
E1.6.1-E1.7 - Blanket-wet modified bog mosaic
E1.7 - Wet modified bog
E1.7-E2.1 - Blanket bog-flush mosaic
E2.1 - Flush and spring - acid/neutral flush
G1.3 - Standing water - oligotrophic
A3.1 - Scattered broadleaved (birch) trees
N
0 250 500 750 1000 m
Scale: 1:12 500 at A3
botanaeco
• Contains OS data
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