Improvement Programme for England's Natura 2000 Sites (IPENS) – Planning for the Future IPENS 072

Border Mires Monitoring zones – Habitat Extent Mapping

Border Mires, Kielder – Butterburn Special Area of Conservation (SAC)

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This project is part of the IPENS programme (LIFE11NAT/UK/000384IPENS) which is financially supported by LIFE, a financial instrument of the European Community.

Foreword

The **Improvement Programme for England's Natura 2000 sites (IPENS)**, supported by European Union LIFE+ funding, is a new strategic approach to managing England's Natura 2000 sites. It is enabling Natural England, the Environment Agency, and other key partners to plan what, how, where and when they will target their efforts on Natura 2000 sites and areas surrounding them.

As part of the IPENS programme, we are identifying gaps in our knowledge, and where possible, we are addressing these through a range of evidence projects. Results from these projects will feed into Theme Plans and Site Improvement Plans. This project forms one of these studies.

The Border Mires, Kielder - Butterburn Special Area of Conservation (SAC) includes a complex of blanket and intermediate mires within the large-scale plantation of Kielder Forest in the north of England. As part of evidence project IPENS 060 'Design of a vegetation monitoring scheme for the Border Mires' a long term monitoring tool has been designed, incorporating a bog quality index, to allow the variation between the complex of mires to be accounted for against a baseline, whilst also indicating the direction of change in relation to good ecological condition.

Crucially, this tool depends on baseline vegetation maps to indicate the extents of pristine, degraded and restored interest features. This project was commissioned to produce detailed habitat extent maps for four priority Sites of Special Scientific Interest (SSSI) mires within the SAC complex. Management recommendations for individual mires have been made where appropriate.

This project will inform work towards achieving favourable conservation status, and allow long term monitoring to withstand statistically robust analysis.

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Border Mires
Monitoring Zones – Habitat Extent Mapping

Final Report

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Field Investigations and Data

Where field investigations have been carried out these have been restricted to a level of detail required to achieve the stated objectives of the work. Where any data supplied by the client or from other sources have been used it has been assumed that the information is correct. No responsibility can be accepted by EcoNorth Ltd for inaccuracies in the data supplied by any other party.

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1. Introduction

EcoNorth have been commissioned by Natural England to carry out an extent mapping survey on four of the Border Mires. The survey was commissioned as part of the IPENS programme (LIFE11NAT/UK/000384IPENS) to identify key areas of mires which could be managed to improve the overall habitat of the mire to achieve favourable condition status.

2. Methodology

Two surveyors were present on each survey. A transect route was plotted out prior to survey and both surveyors covered all areas which appeared, from aerial imagery, to be of differing habitat. The boundary of habitats was marked out on maps and locations marked using GPS technology.

Habitats types were described as per descriptions provided in proposal methodology documentation (Table 1).

Table 1 Key Mire Categories

NVC type	Description	Part of mire
M18 - *Erica tetralix* - *Sphagnum papillosum* raised and blanket mire. Sub-community a	Continuous carpet of *Sphagnum* with only patchy dwarf shrubs above. Lots of *Sphagnum papillosum*, *S. magellanicum*, *S. capillifolium* and *S. tenellum*	Main mire expanse (centre)
M18 - *Erica tetralix* - *Sphagnum papillosum* raised and blanket mire. Sub-community b	Mixtures of *Sphagnum*s and feather mosses with more vigorous dwarf shrubs. Not as much *S. magellanicum*.	Main mire expanse
M19 - *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire. Sub-community a	Mixtures of heather, cross-leaved heath, hare's-tail cottongrass and *S. capillifolium*. Little or no *S. papillosum* or *S. magellanicum*	Main mire expanse or rand
M19- *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire. Sub-community b	Like M19a, but no cross-leaved heath and often not as much *Sphagnum*.	Rand (or blanket bog)
M25 *Moilinia caerulea* – *Potentilla erecta* mire (or M20 *Eriophorum vaginatum* blanket mire)	Dominated by purple moor-grass (or hare's-tail cottongrass in M20), with little or no dwarf shrub. Some *Sphagnum* may be present but usually not the species listed above.	Rand
Various, e.g.: M4, M6, M23, S9, S10	Rushy, or sedgy vegetation, sometimes over a sloppy, green *Sphagnum* carpet	Lagg (similar to vegetation of some valley mires)

Drains were also considered on this project. Any active drains encountered were added to survey results, in particular with reference to Berry Hill mire as requested.

Four mires were assessed for the quality and extent of mire habitat on each. Meta-data for each survey is described in Table 2.

Table 2 Survey Meta-Data

Date	Mire	Surveyors
26th November 2014	Grain Heads Moss	Maeve Lee Mark Middleton
12th January 2015	Felecia Moss	Maeve Lee Mark Middleton
26th January 2015	Wedges Rigg	Maeve Lee Mark Middleton
26th February 2015	Berry Hill East and West	Maeve Lee Mark Middleton

3. Constraints

All mires were accessible for these surveys.

4. Results

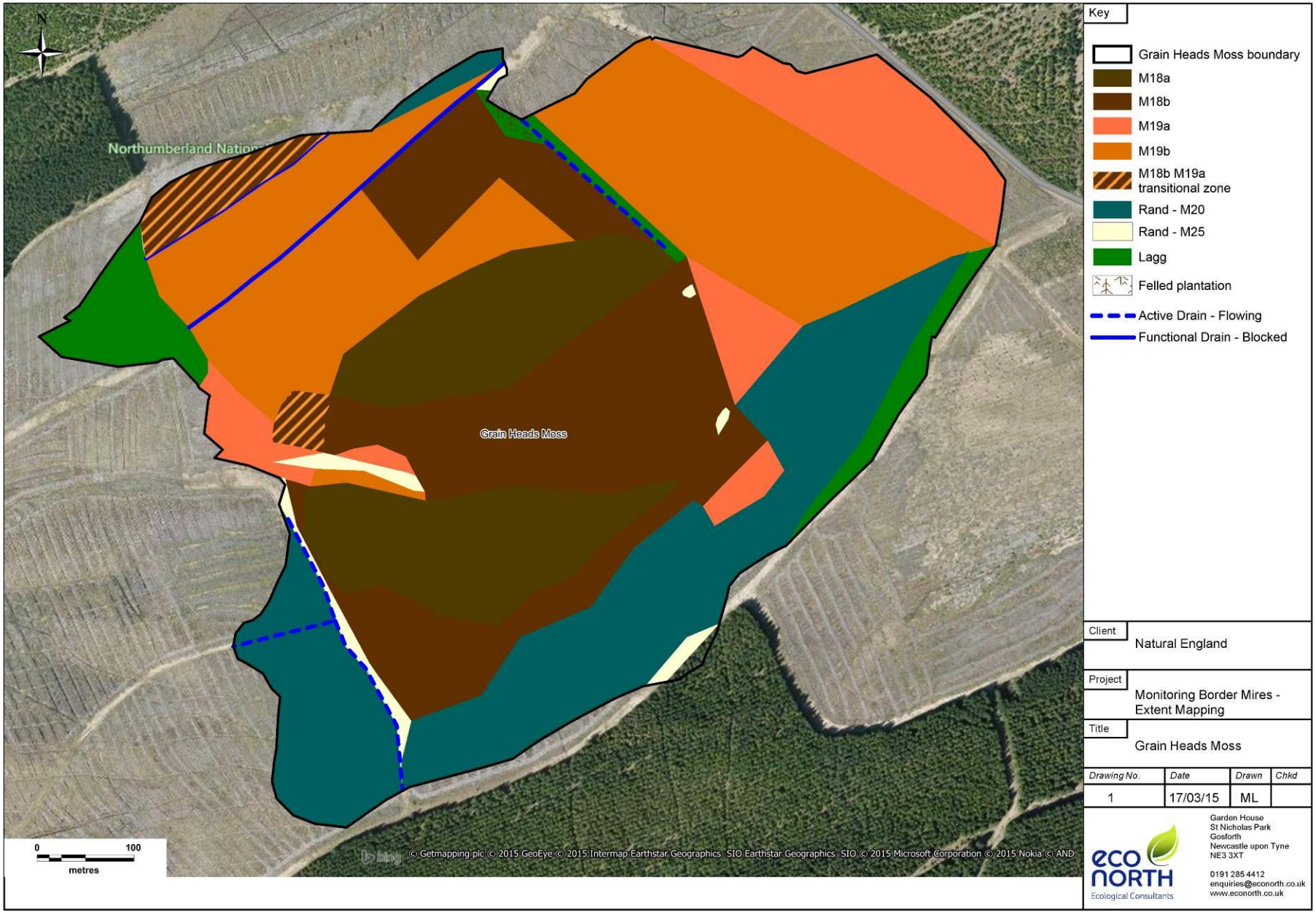
4.1 Grain Heads Moss

The central section of this mire is good quality and is classed as M18a and M18b where there is good cover of sphagnum moss *Sphagnum spp* with bog asphodel *Narthecium ossifragum* and deer grass *Trichophorum cespitosa*. The north western section of the mire is felled plantation and has been categorised as lagg for this survey. The ground here is very tussocky with a mixture of purple moor-grass *Molinia caerulea*, hares-tail cotton grass *Eriophorum vaginatum* and various moss species (not sphagnum species). There is a lot of dead wood in this section and it is not very wet. Habitat improves to the south of this lagg section where it is categorised as M19a habitat and this extends to the centre where it habitat gradually improves to good quality mire.

Hares-tail cotton grass (M20 habitat) dominates the south western and southern section of this mire. This is an area of felled plantation with a lot of dead wood. Habitats improve moving northwards to the centre of the site and it is likely that this section (M20 habitat) could regenerate to better quality mire in time.

There are small areas of flush – Rand M25 habitat – throughout the mire which are purple moor grass dominated and generally associated with drains or considerably wet areas.

There are three active drains on site and two functional drains. The active drains could be dammed to improve condition on the site, most pertinent is at the north eastern active drain which is draining steeply to the north and is taking water from the felled plantation preventing wet habitat accumulating and therefore from good mire habitat from forming to the east of the drain.


N
Northumberland National
Grain Heads Moss
0
100
metres
© Getmapping plc © 2015 GeoEye © 2015 Intermap Earthstar Geographics SIO Earthstar Geographics SIO © 2015 Microsoft Corporation © 2015 Nokia © AND
Key
Grain Heads Moss boundary
M18a
M18b
M19a
M19b
M18b M19a transitional zone
Rand - M20
Rand - M25
Lagg
Felled plantation
Active Drain - Flowing
Functional Drain - Blocked
Client
Natural England
Project
Monitoring Border Mires - Extent Mapping
Title
Grain Heads Moss
Drawing No.
Date
Drawn
Chkd
1
17/03/15
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4.2 Felecia Moss

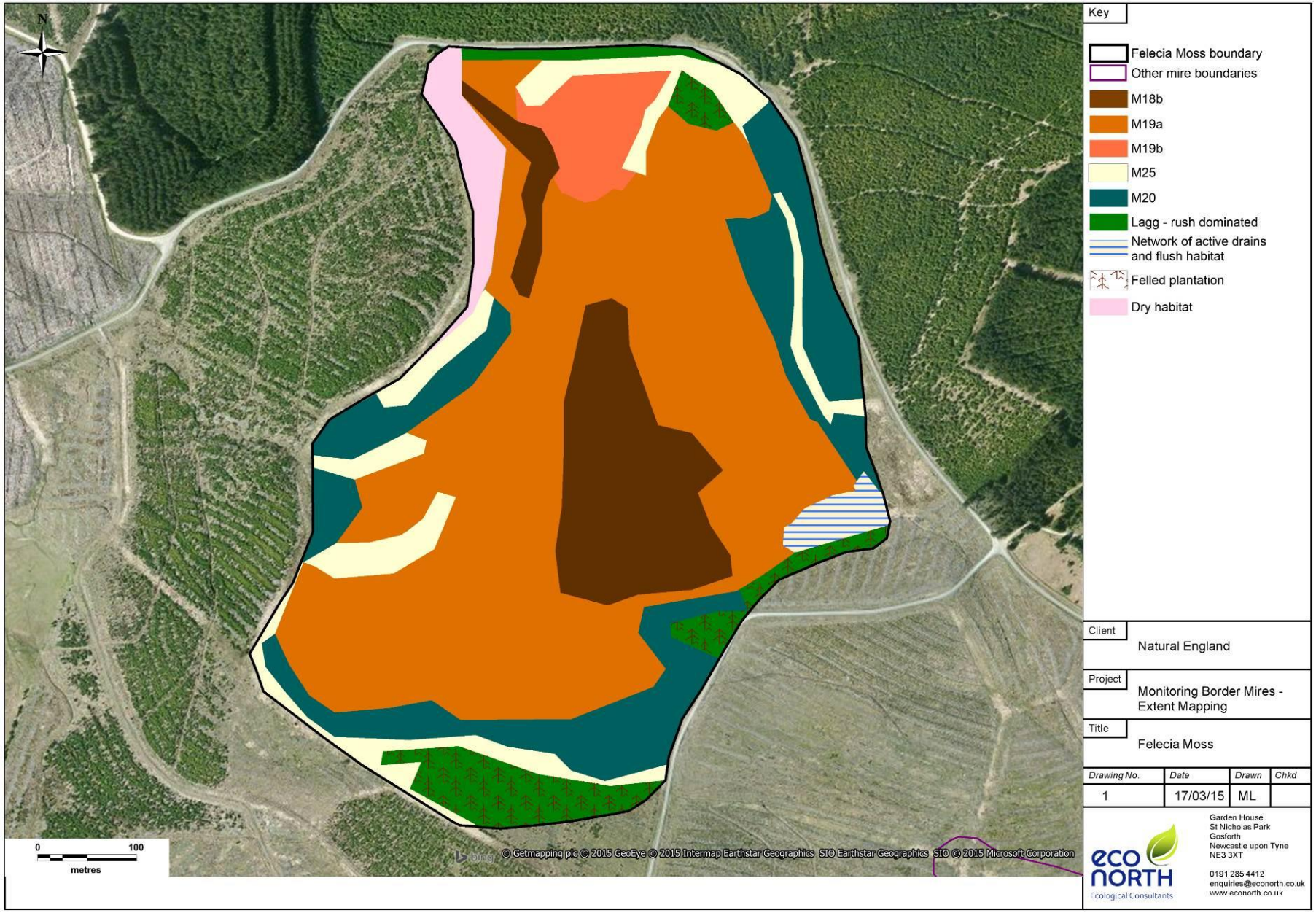
Mire habitats on Felecia Moss could be improved. The very central section is classed as M18b and this area demonstrates good mire habitat with little heather *Calluna vulgaris*, dominated by hares-tail cotton grass, bog asphodel and sphagnum moss. The surrounding habitat is M19a and has potential to be improved with management to become better quality mire.

A network of active drains was recorded in the south east section of the site. There are some dams here but all are failing and therefore a lot of water is likely draining from the site to this area taking water offsite. Similarly with areas of flush (M25 habitat) to the west and south which is likely draining water offsite given the gradient of the land here (west and south gradient respectively).

The sections of felled plantation on site are dominated by dead wood and are classed as lagg habitat. These areas are somewhat wet underfoot but do not represent mire habitat and are dominated by rush *Juncus spp* and sedges.

The dry habitat to the west of the site is felled plantation but is on a hill therefore likely all water is draining to the southern area where it is dominated by moor-grass and hares-tail cotton grass

Overall there is scope to block up active drains on this mire to prevent further degradation of central mire where there is a relatively small section which is good quality. The habitats surrounding this central area are classed as M19a which can be upgraded to better quality mire through management of the active drains and flush areas on site.


N
Key
Felecia Moss boundary
Other mire boundaries
M18b
M19a
M19b
M25
M20
Lagg - rush dominated
Network of active drains and flush habitat
Felled plantation
Dry habitat
0
100
metres
© Getmapping plc © 2015 GeoEye © 2015 Intermap Earthstar Geographics SIO Earthstar Geographics SIO © 2015 Microsoft Corporation
Client
Natural England
Project
Monitoring Border Mires - Extent Mapping
Title
Felecia Moss
Drawing No.
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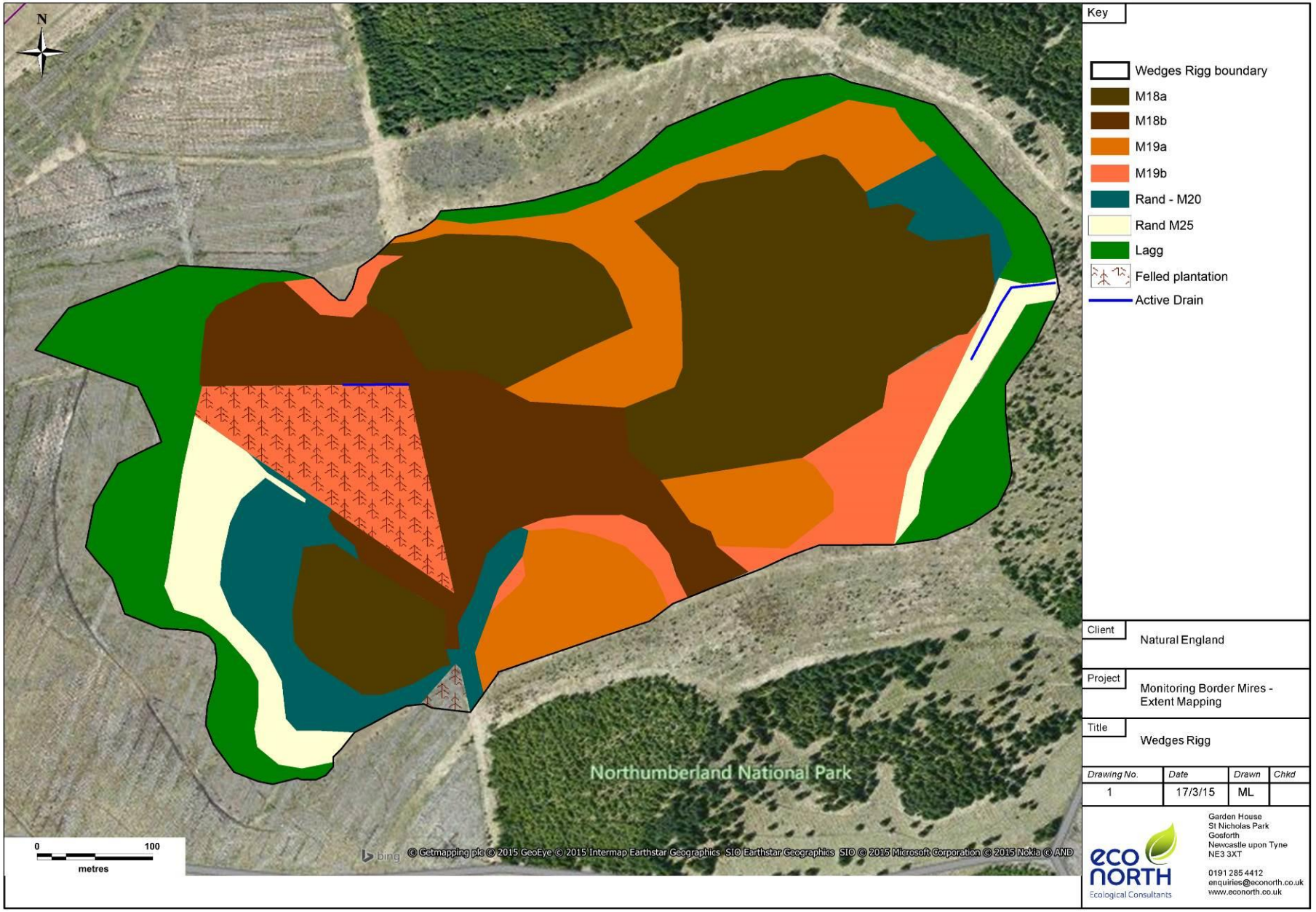
4.3 Wedges Rigg

Overall Wedges Rigg represents good quality mire habitat with the best quality mire in the centre classified as M18a, dominated by sphagnum mosses, bog asphodel and cranberry *Vaccinium oxycoccus*. There is little management required in the central section of this mire.

Mire habitat decreases towards the west of the site. There is an area of felled plantation which has been categorised as M19b and is dominated by heather with little cross-leaved heath *Erica tetralix* nor sphagnum. This area is dominated by dead wood and also there is evidence of some tree regeneration which will draw up water.

Further west the area changes to M20 sub-community dominated by hares-tail cotton grass with some small pockets of water visible between tussocks and dead wood. There is a large area of flush here (M25 classification) which is quite wet. No active drains were recorded but given that this habitat is dominated by moor-grass it is likely to be active at some point and therefore draining surrounding habitats, reducing mire quality.

One active drain was recorded on this mire on the eastern boundary. This drain is surrounded by moor-grass (M25 habitat) and could be dammed to hold water thereby increasing the surrounding habitats which are currently classed as poor quality mire M19b.


N
Key
Wedges Rigg boundary
M18a
M18b
M19a
M19b
Rand - M20
Rand M25
Lagg
Felled plantation
Active Drain
Northumberland National Park
0
100
metres
© Getmapping plc © 2015 GeoEye © 2015 Intermap Earthstar Geographics SIO Earthstar Geographics SIO © 2015 Microsoft Corporation © 2015 Nokia © AND
Client
Natural England
Project
Monitoring Border Mires - Extent Mapping
Title
Wedges Rigg
Drawing No.
Date
Drawn
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4.4 Berry Hill East

Berry Hill East is dominated by moderate mire habitat, M19a and M19b type with some representation of good mire, M18b, also found. The M18b habitat is dominated by cranberry and cross-leaved heath with a good cover of sphagnum and bog asphodel.

The M19a habitat which surrounds M18b is dominated by heather tussocks and cross-leaved heath with little sphagnum mosses. This M19a habitat is also dominated by tree regrowth. There is a lot of tree regeneration in these areas which could be causing the site to be drier than it should.

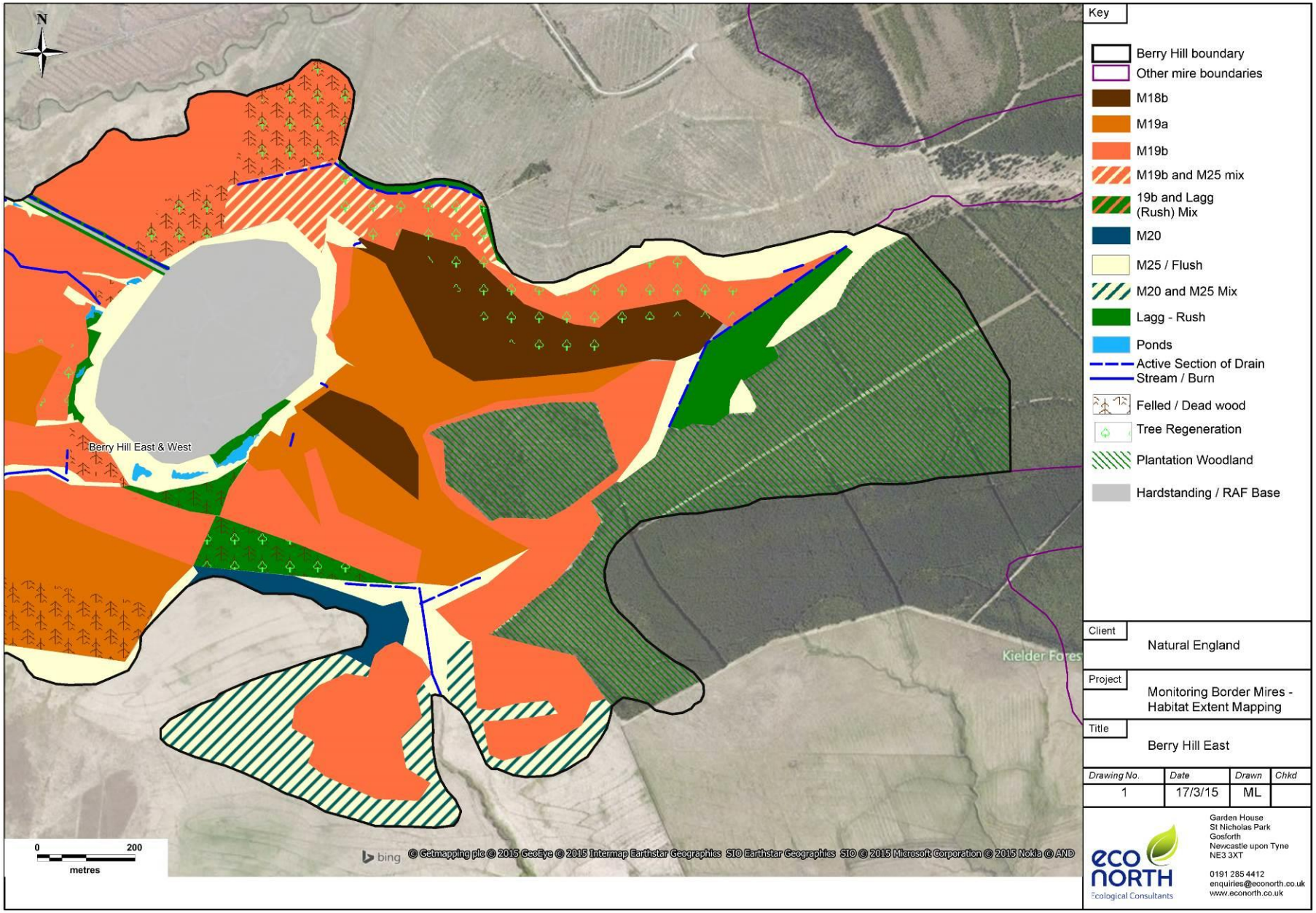
The eastern section of the site is covered with planation woodland with typical lagg and flush habitat on the border.

There are a number of active drains on the site the main ones located to the north and south of this section of the mire. The drain to the north of the site is significant but appears to drain water from the north which is a hill of felled plantation woodland and not within the mire boundary. This drain could be managed to improve mire habitat to the south and similarly with the drain to the east.

There is a stream in the southern section which has two active drains flowing into it, likely draining the surrounding habitat which is all low quality mire habitat. This southern section is fenced off and is grazed by sheep which may also contribute to the low quality of the mire where sheep will actively graze on heather, leaving moor-grass and rush to dominate.

The area surrounding the RAF base is dominated by wetland, ponds, flush (M25 habitat) and felled plantation. Immediately beyond these habitats are moderate quality mire, with some patchy areas of sphagnum and bog asphodel dominating, particularly east towards the central section where the habitat improves and transitions from M25 to M19a and to M18b. There is a little tree regeneration within these habitats (M19a and M18b) and this should be managed to increase the quality of the mire.

Overall management on this section of Berry Hill should be focussed on removing the trees which have begun to regenerate on the site, particularly within the M18b and M19a habitats to improve the quality of the mire and to prevent further degradation. The active drains on the site should also be inspected for potential for damming.


N
Berry Hill East & West
Kielder Fores
0
200
metres
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Key
Berry Hill boundary
Other mire boundaries
M18b
M19a
M19b
M19b and M25 mix
19b and Lagg (Rush) Mix
M20
M25 / Flush
M20 and M25 Mix
Lagg - Rush
Ponds
Active Section of Drain
Stream / Burn
Felled / Dead wood
Tree Regeneration
Plantation Woodland
Hardstanding / RAF Base
Client
Natural England
Project
Monitoring Border Mires - Habitat Extent Mapping
Title
Berry Hill East
Drawing No.
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Date
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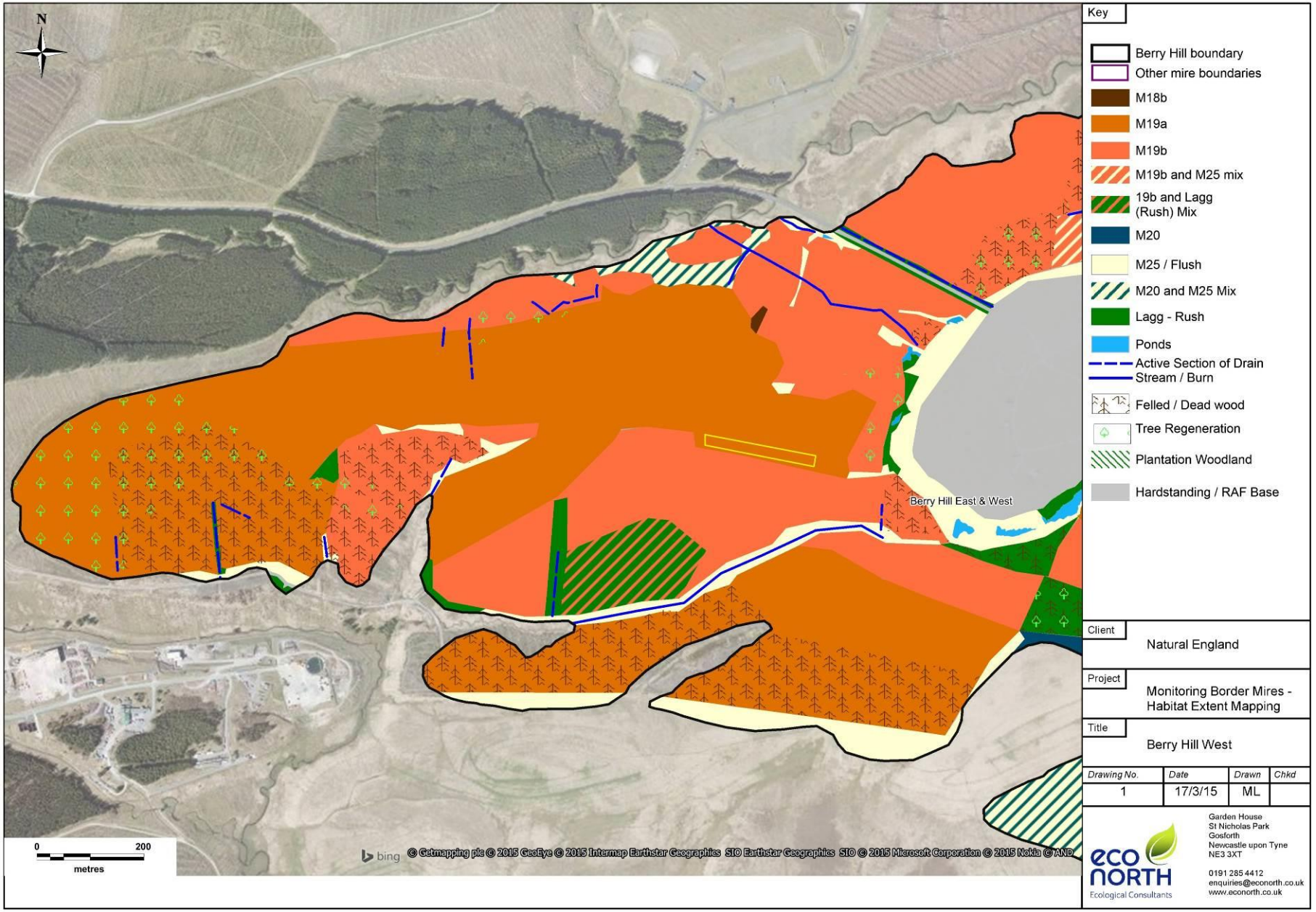
4.5 Berry Hill West

Berry Hill West is dominated by poor to moderate mire habitat (M19b and M19a) with some tree regeneration in the western section. There are at least six active drains on site which could contribute to the quality of mire.

There is a large area of flush (M25 and M20 mix) in the north western section of the site which is also where some drains flow to a perimeter stream. This stream is outside of the mire boundary but likely takes a lot of water from the mire. Active drains to the south and south western sections of the mire should be inspected for the potential to dam as they will be taking a lot of water offsite, in particular to the burn / stream which flows through the mire (southern section).

Berry Hill West is dominated by felled plantation there is a lot of dead wood still present on site (indicated by felled plantation key on map). Within these sections of the mire there is a lot of tree regeneration which should be managed to prevent degradation of the mire.

Overall the active drains on site and tree regeneration should both be managed to increase the quality of the mire. There is scope for the mire to be improved to the level of the eastern section. There are small patches of the mire which demonstrate good quality mire, most notably towards the RAF base (highlighted yellow on map) and also where a small section of M18b is identified. Within these areas there were denser carpets of sphagnum mossed identified and also patches of bog asphodel, cranberry and cross-leaved heath and with management these areas could be extended to improve the overall quality of the mire.


N
Berry Hill East & West
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Key
Berry Hill boundary
Other mire boundaries
M18b
M19a
M19b
M19b and M25 mix
19b and Lagg (Rush) Mix
M20
M25 / Flush
M20 and M25 Mix
Lagg - Rush
Ponds
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Felled / Dead wood
Tree Regeneration
Plantation Woodland
Hardstanding / RAF Base
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5. Recommendations

5.1 Site Specific

The following recommendations relate to individual mires:

- **Grains Head Moss**: Install a series of dams along the active drains, to west and north in particular.
- **Felicia Moss**: Repair and install series of dams along drains around west, north and east perimeters of site, to retain water in these areas
- **Wedges Rigg**: Install series of dams on eastern drain in particular to retain water in the eastern half of the site.
- **Berry Hill East:** Install series of dams along main drain flowing east out of the site, on the northern perimeter and southern perimeter – all of which are rather active. In addition, large scale conifer sapling removal should be undertaken in this eastern section as this threatens some of better areas of mire in this part of the site
- **Berry Hill West:** The small sections of active drains in the extreme west of the site should be dammed as this area is responding well to tree removal, and similar should be employed along the small drains to the north of this area. The main stream within the site to the south may be difficult to dam due to its size and function though smaller upstream sections could be attempted and monitored. Conifer sapling removal should be undertaken in the south east side of Berry Hill West as this area is also recovering well after large scale plantation removal.

5.2 Monitoring

Monitoring should be undertaken periodically within all the mire sites; ideally at defined locations within areas categorised as follows:

- Where there are high quality mire communities e.g. M18, to detect changes in quality
- In the transitional mire areas e.g. M19 those areas affected by drainage or tree re-growth – which may deteriorate over time if not action is not taken
- In the rand areas e.g. M20/25 where trees have been removed – areas that should be improving over time and developing better quality mire habitat once management has been undertaken

The maps produced define the different areas of mire vegetation communities and these should be used to select the monitoring locations to detect any changes. The number of monitoring locations will be dependent on the number of main communities present

Monitoring should be undertaken ideally on a biennial basis, or at least on a 5 year rotation. Changes such as sphagnum colonisation and re-wetting can take place rapidly in mire habitats if drains are blocked and trees removed, similarly deleterious changes such as conifer re-colonisation and dam failure can also be rapid and have detectable change

6. Conclusions

The surveyed mires vary in quality, and quality varies within each mire. Typically the highest quality mire is located in the central areas away from the effects of perimeter drains and areas of forestry, whether still present or recently felled.

All mires have the potential to improve in quality through active management as highlighted in Section 5, and signs of mire regeneration are apparent in several areas such as the west end of Berry Hill West, which is encouraging. Active Management is important for maintaining and protecting the botanical interest of the best areas of mire habitat but also enhancing the peripheral and rand areas thus increasing the quantity of high quality mire habitat across the sites.

7. Bibliography

JNCC, 2001. National Vegetation Classification: Field Guide to mires and heaths.