Improvement Programme for England's Natura 2000 Sites (IPENS) – Planning for the Future IPENS 070

Border Mires: Active Drainage Mapping Project

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

First published 14 February 2017

www.gov.uk/government/publications/improvement-programme-for-englands-natura-2000-sites-ipens

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. Eu LIFE, Forestry Commission and DEFRA projects between 1998 and 2010 funded deforestation and ditch blocking work on deeper mire lenses, to allow the recovery of damaged mires to begin.

Subsequent assessments by Natural England and site visits from Partner organisations such as Forestry Commission, Northumberland Wildlife Trust, Northumberland National Park, and the Ministry of Defence, suggest that there are still active ditches within specific mires. Outstanding management to restore mire hydrology is an action within the Border Mires Site Improvement Plan.

This project commissioned a survey of remaining active ditches on twelve of the Border Mires, to inform future restoration priorities.

The key audience for this work is the staff within Natural England and partner organisations including Forestry Commission, Northumberland Wildlife Trust, Northumberland National Park, and the Ministry of Defence.

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Border Mires
Active Drainage Mapping Project

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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Contents

1. Glossary

Name in Text	Explanation
Active drain	There is active flow through this section of the drain and should be dammed at this point
Dam failed	Dam is present but is failing, whether water cuts around the edge or over tops the dam
Drain blocked	Dam is functional on the drains where water is being held and is pooling / spreading
E/W and or N/S	Direction that drain is lined up or that water is flowing (East / West, North /South etc.)
Functional drain / Drain not active	Drain holds water well and there is no active flow
Open drain	Could hold more water if dammed but no active flow recorded
Ref point	Reference point – associated point / number on map
Slightly active drain	As with active drain but flow is quite slow, i.e. this point should be seen to as soon as possible as flow is only likely to increase therefore make more difficult to dam / block

2. Methodology

Two surveyors were present on each survey. A transect route was plotted out and walked for each mire. The transect route took in the boundary of the mire (to account for any perimeter drains) and also a cross section of the mire.

Any drain found on site was walked along to check for signs of activity. An active drain, for the purposes of this survey, was any drain on site which had water flowing within. Open drains were also recorded, where there was only a shallow stand of water (water was not flowing) within a deep drain. Such drains were considered to have potential to hold more water if dammed or blocked. Slightly active drains are those with only minimal flow and were somewhat full of water (compared to open drains). Any dams found along drains were also marked and were categorised as either functional or failing.

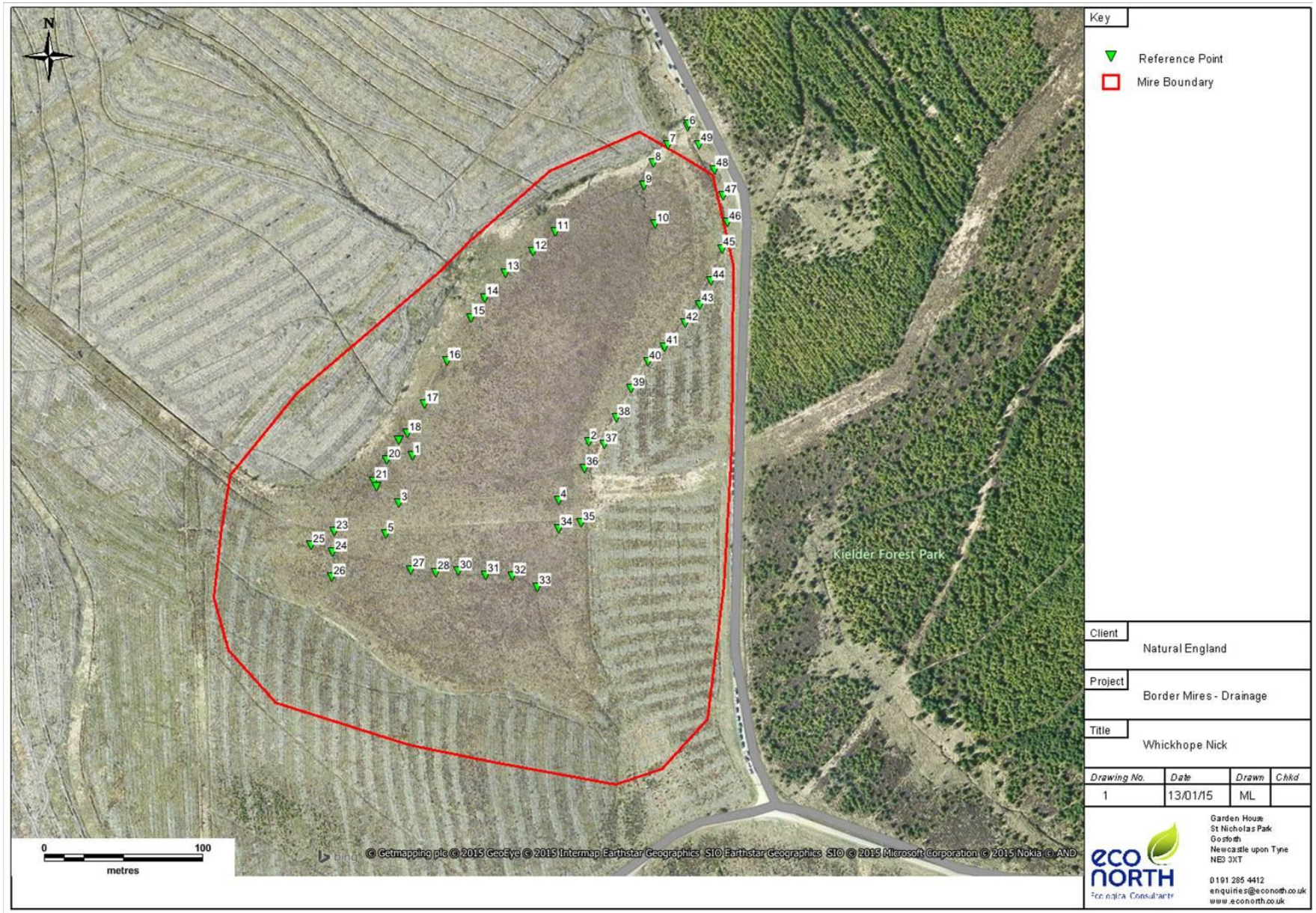
3. Constraints

The time of year the survey was carried out (between November and January) posed some constraint on this work. At times, heavy fog prevented a full search of mires and this is reflected and explained in survey results.

4. Whickhope Nick

Summary
Good central mire with a lot of failing dams and drains on perimeter. Many dams failing on all boundaries, along perimeter drains, should be addressed to improve mire Open drains are functional (i.e. hold water) but could be improved to support areas where dams are failing.

Ref Point	Notes
1	Intact ditch
2	Slight fail of same drain as 1
3-4	Drain blocked and functional along length (W/E direction, approx. 140m)
5	Drain E/W is fully blocked and functional
6-9	Dams failed on these drains at these points
10	Open drain
11-17	Dams failed – to be addressed
18-19	Open drain
20	Dam failed on this open drain, some flow recorded here
21-22	Open drain
23-25	Dam failed (as point 24)
26-28	Open drain
29	Dam failed (as point 24), point hidden behind point 28 on map
30-31	Open drain
32-33	Dam failed
34-35	Open drain
36-39	Dam failed
40	Open drain
41-45	Dam failed
46	Open drain
47-50	Dam failed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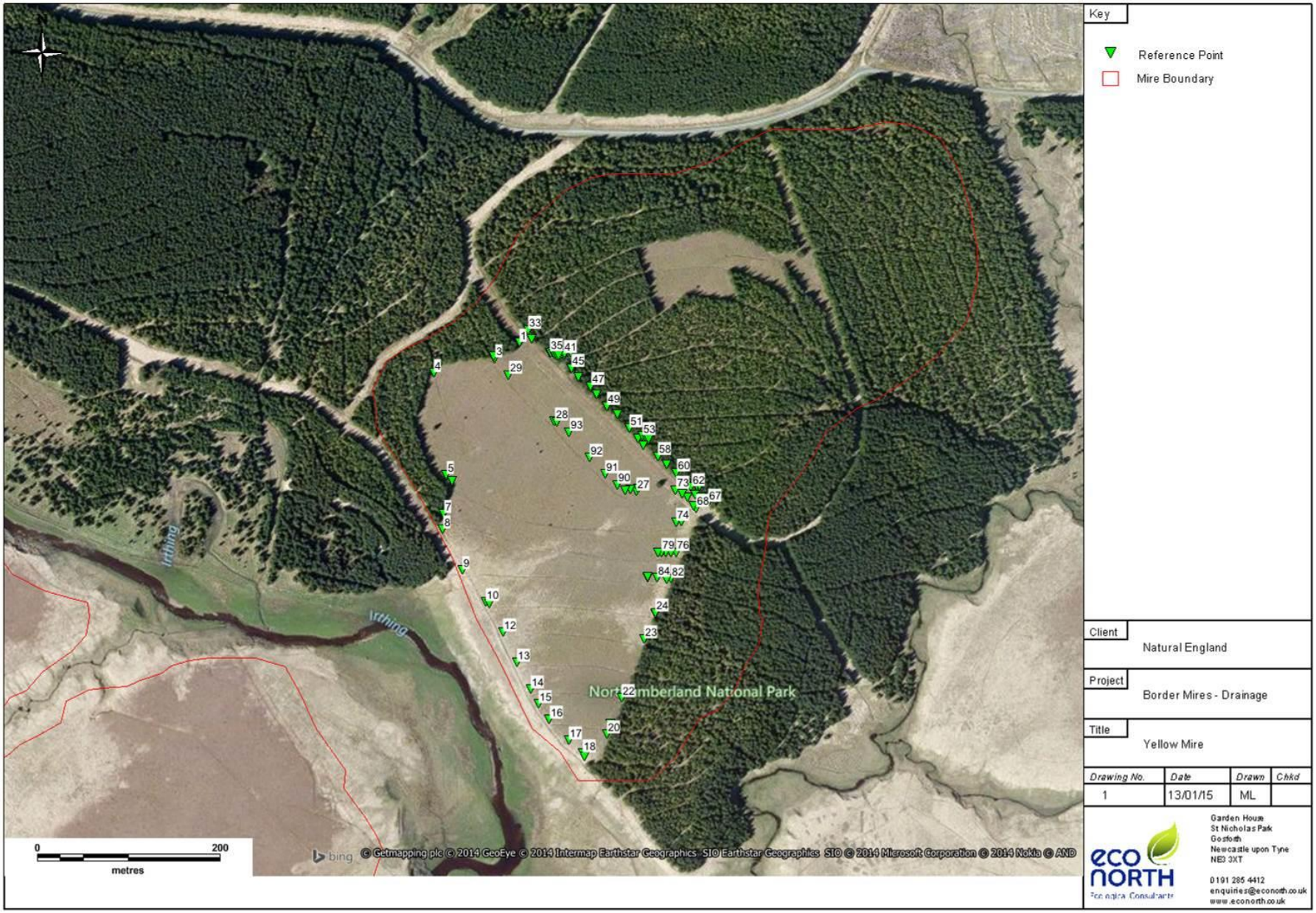
5. Yellow Mire

Summary
A number of large active drains here mainly towards the southern and western boundaries. The central section at the northern edge also has an active drain that could be dammed to hold water better.

Ref Point	Notes
1-2	Perimeter drain - blocked and holding water, some flow present. Partially active drain. Blocked with moss. Extends into forestry in places, extends for likely to be whole of stand
3-7	Active drain
8-10	Drain is functional and holding water here
11-14	Active drain
15	Perimeter drain- active - flowing east
16	Active drain
17 &18	Drain is functional and holding water
19-21	Active drains – Flowing water at these points on map
22	Drain is functional and holding water
23	Active flow in drain at this point
24 & 25	Drain is functional and holding
26-30	This drain is active (i.e. flowing) at the points on the map (see detail on ref points 87-94 also)
33-67	Perimeter drain – blocked and holding water, some flow present. Partially active drain. Blocked with moss. Extends into forestry in places, extends for likely to be whole of stand.
68-71	Drain holding water, clogged with mosses and grasses runs parallel to perimeter drain. No noticeable flow
72	Plastic dam – effective – holds water
73	Drain holding water, clogged with mosses and grasses runs parallel to perimeter drain. No noticeable flow
74-75	Drain - very effective in holding water, with dams maturing into moss tussocks and pools.
76-81	Drain functional, holding water and has strong mossed tussocks
82-86	Drain partially flowing, blocked with moss and grass in places however slight flow (active) at points on map
87-94	Blocked with sedges with some flow along length (active / flow points at ref points 26-30)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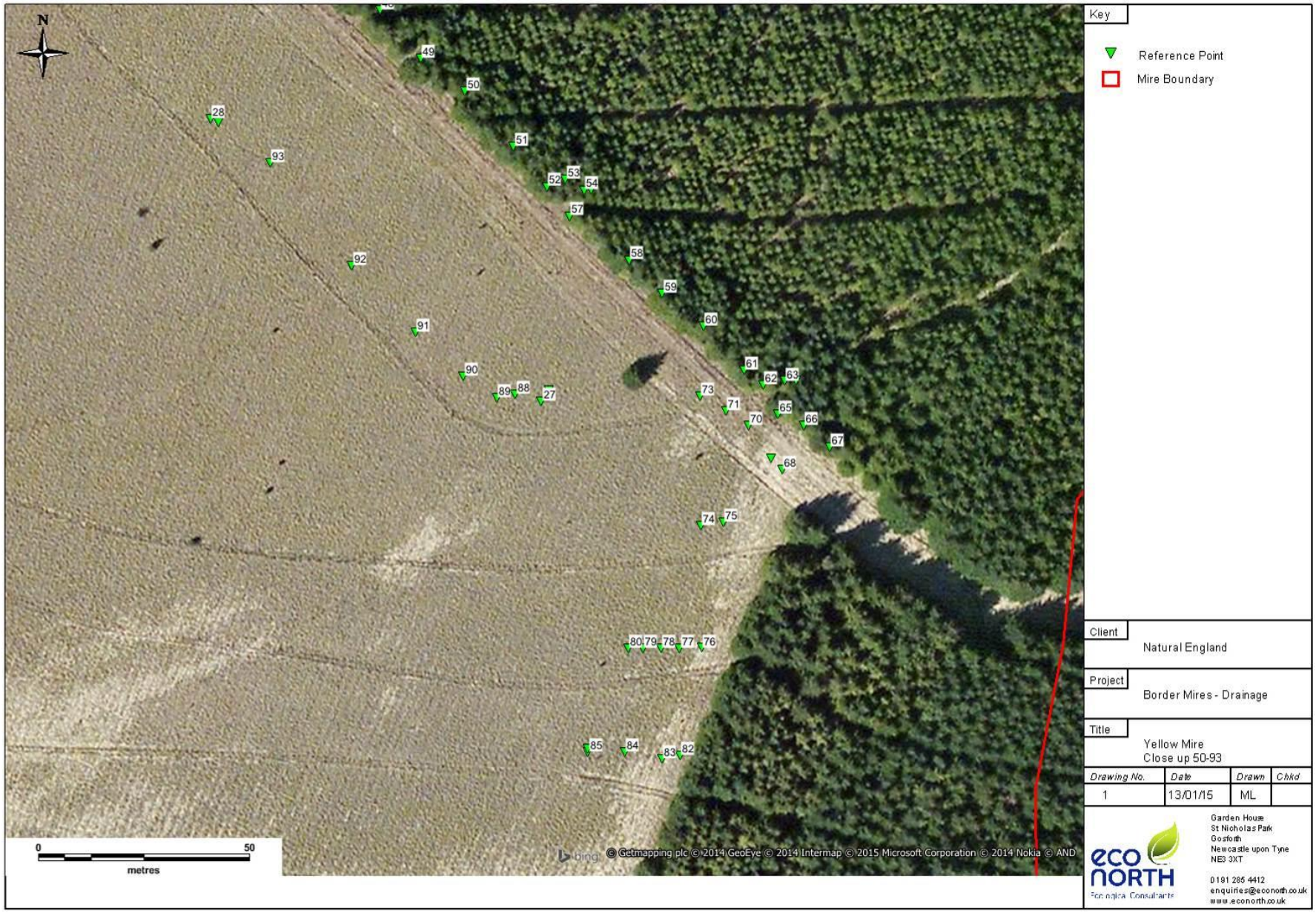
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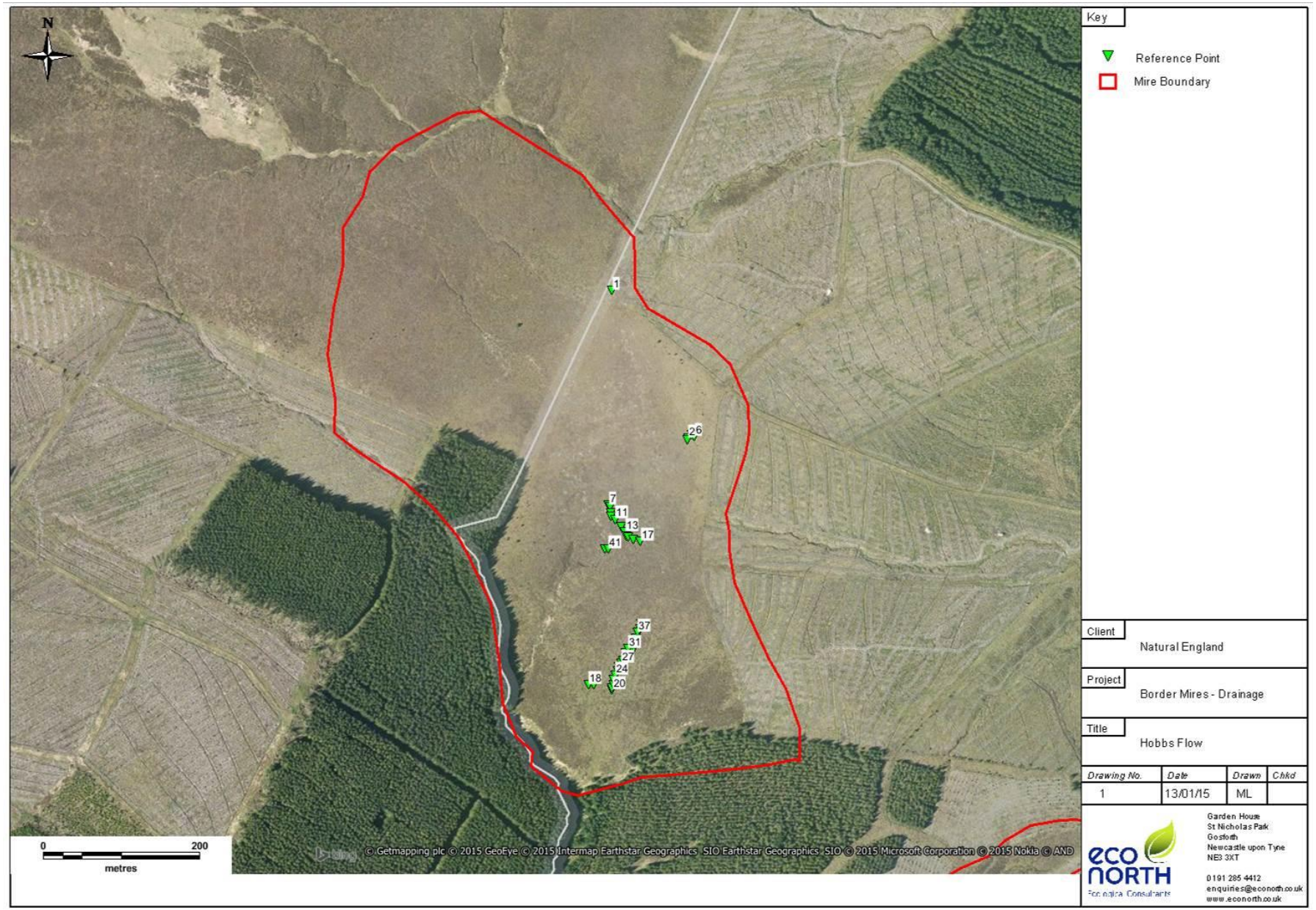
6. Hobbs Flow

Summary
Visible drains on the aerial - these are mostly active and not dammed. There is potential to dam these to improve mire. Relatively good mire habitat on NW section - not all could be walked as heavy fog reduced visibility.

Ref Point	Notes
1	Mire boundary
2-3	Small empty drain with no standing water - potential to hold water
4	Flowing drain – active
5	Start
6	End
7 -11	Active drain
13 -16	Active drain
18	Active drain
19	Active drain
20-31	Active drain
32-41	Active drain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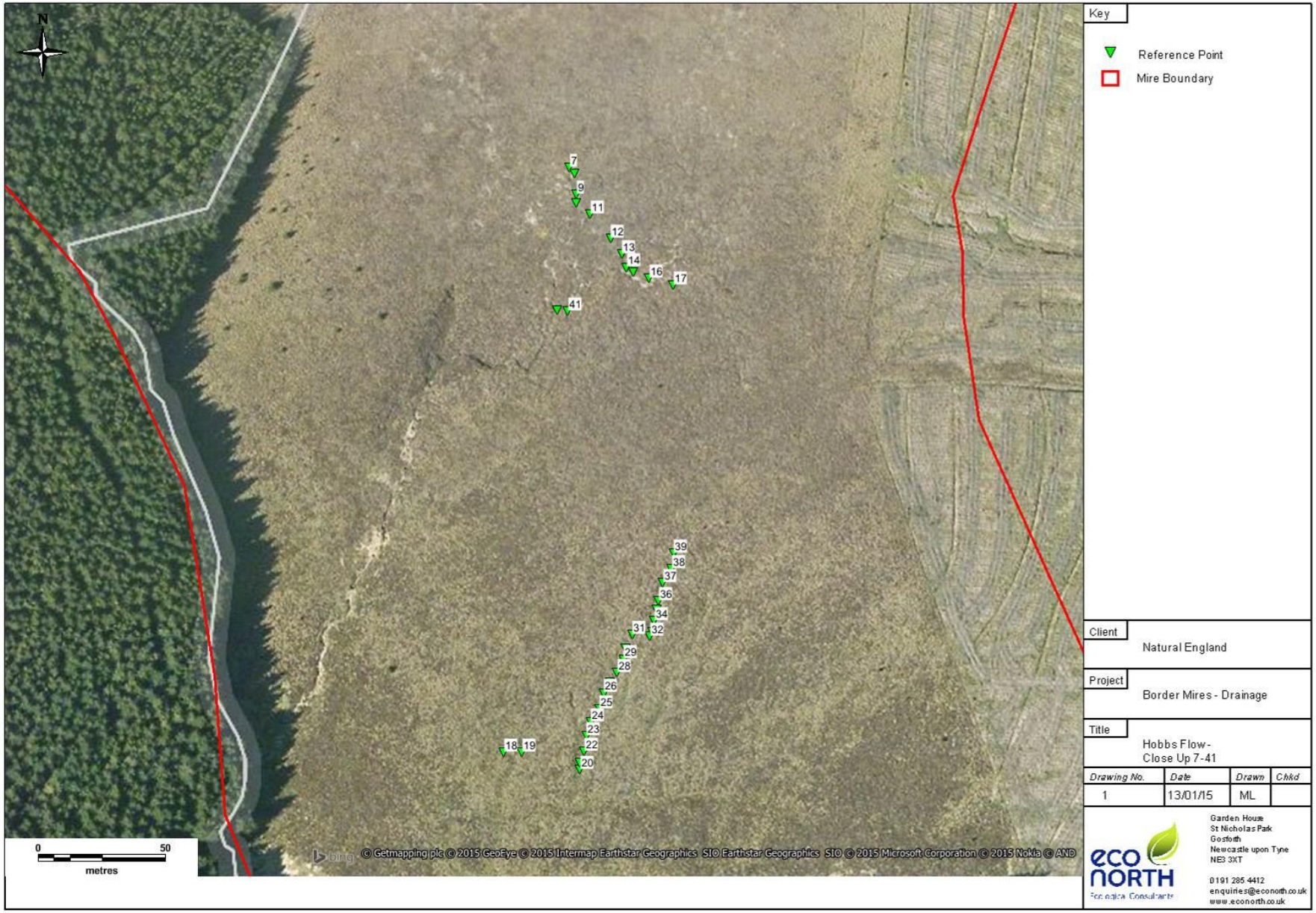
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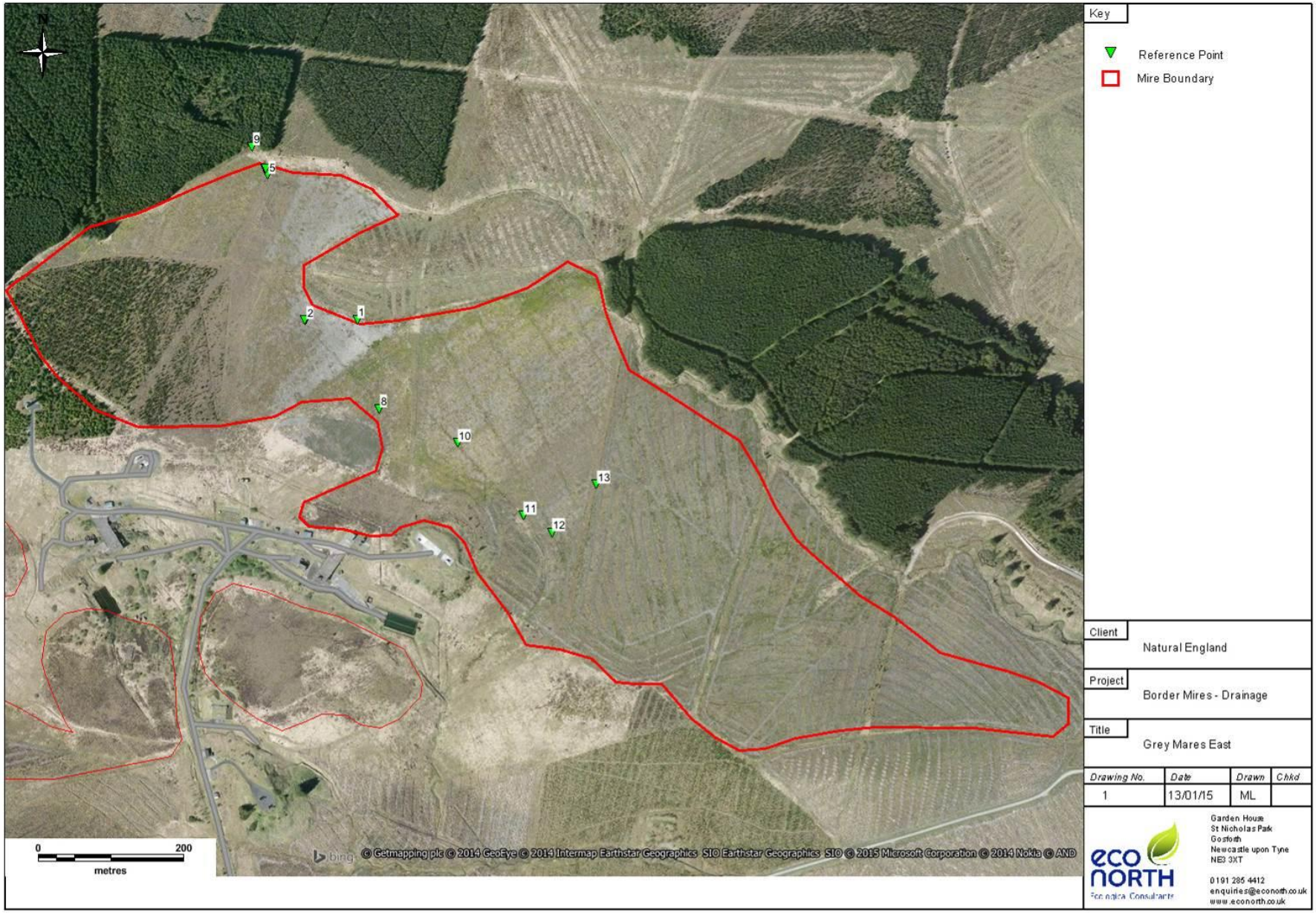
7. Grey Mares East

Summary
West of Grey Mares East is wet, holds water well. All drains were full with no flowing water and sphagnum covered. Some water was pooling in places with sphagnum covering. Hill to the north of the west section is dry with little mire habitat. Unable to access the south eastern section of this mire where the habitat was unsafe to cross. Semi-mature trees and felled tree debris made it unpassable. See point 13 for notes.

Ref Point	Notes
1-2	Functional drain
3	Active drain lined up N/W to S/E
4	Functional drain
5	Active drain with slow flow N/S
6	Functional drain
7	Active drain - slow flow and very deep, flowing from south to north / west and towards burn
8	Functional drain - holds water well and is a perimeter drain
9	Water flowing from west from mire to natural burn at edge of forestry. Could be dammed to hold water flowing from mire
10	Drain well plugged and holding water
11	Active drain same drains as ref point 10 but not plugged here and actively flowing
12	Drain blocked here and pooling to the west. A drain found to the east of this point is empty and could hold water if dammed further east.
13	Convergence of drains that border the mire habitat. Plantation woodland to east has been cut but regen is dense and could not be walked through, not mire habitat beyond this point and could not be surveyed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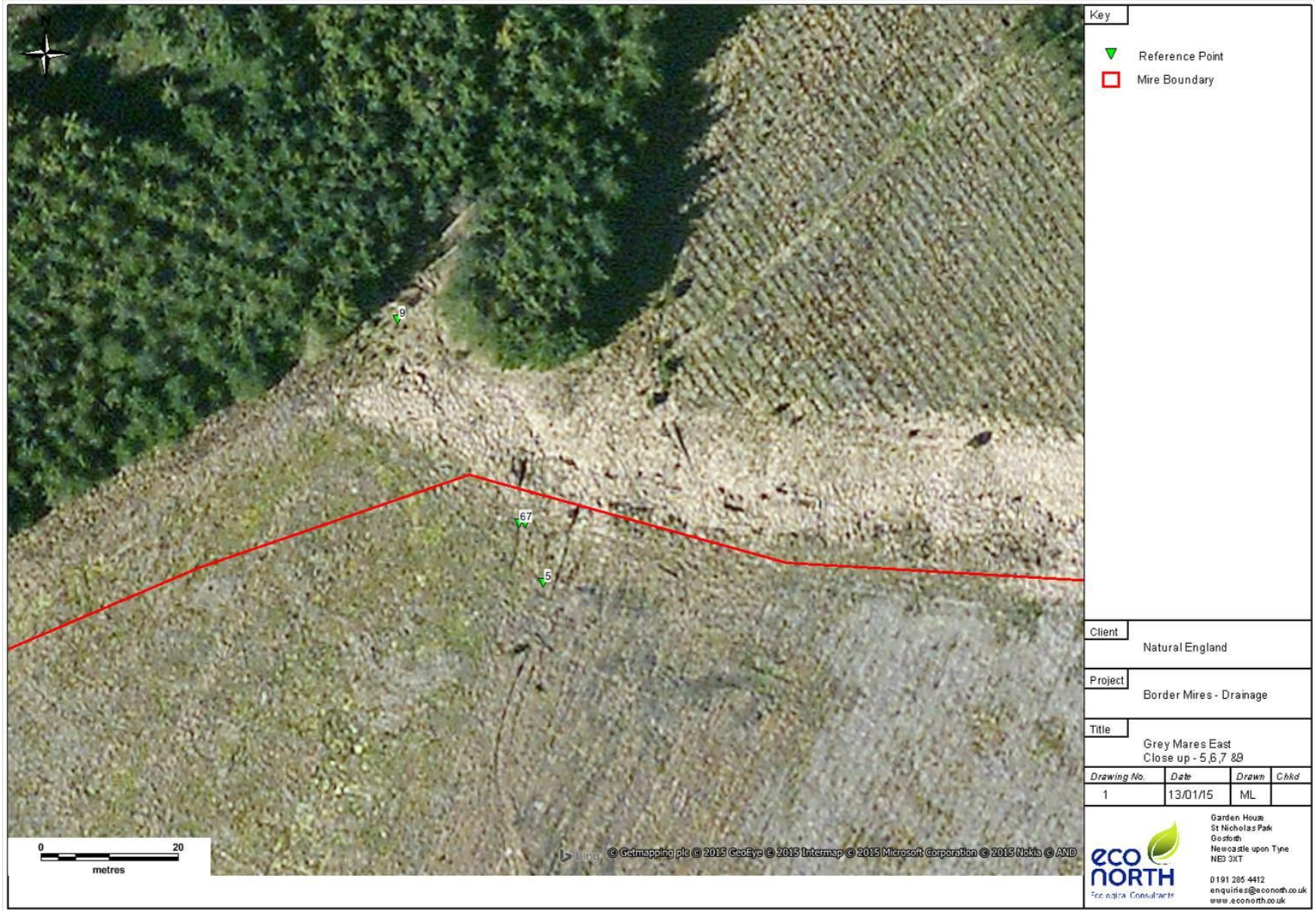
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8. Grey Mares West

Summary

Many drains are outside the mires and these were checked for possibility of activity.

Points 1-29 Perimeter drain is wet and holds some water. Mire is quite dry – drains leading to perimeter drain (and also perimeter drain) could be blocked to allow water to pool on mire.

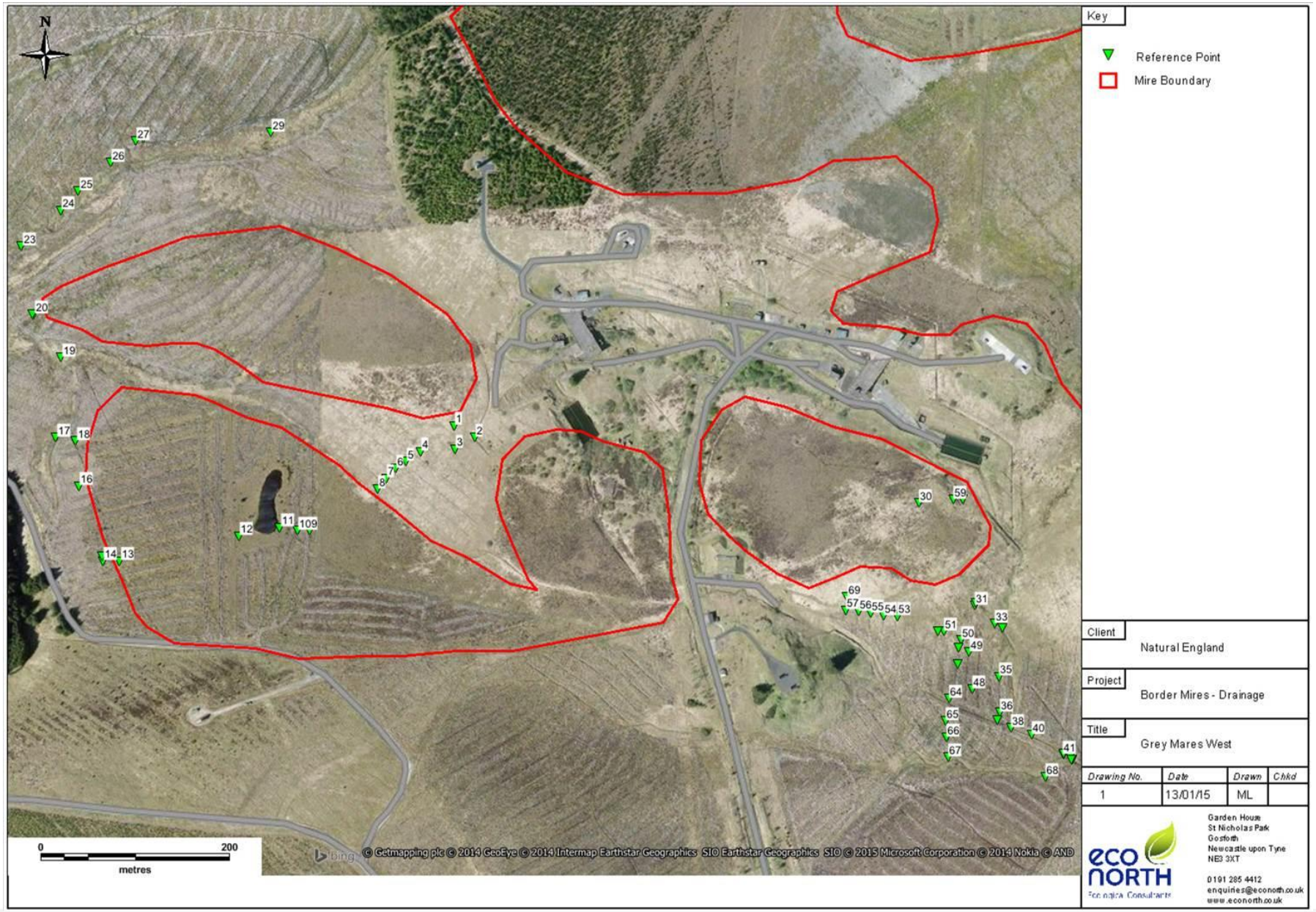
Points 30-39 Habitats here are more like wet grassland than mire, a lot of water likely draining to perimeter stream.
Tussocky habitat with some moss but also grass and thistles, active streams and drains to southern area likely taking a lot of water and could be dammed to create a wetter habitat in the mire.

Where forest tracks are evident, these are all old plantation and covered with dead wood with some mossy tussocks however drains not holding a lot of water and could be dammed to create a better central mire habitat

Ref Point	Notes
1	Drain E/W direction shallow approx. 200m in length. Could hold more water if dammed along length
2	Active point on perimeter drain - likely flow from other drains on site that are draining to here. These other drains could be dammed along length to hold more water on the mire
3	Drain running N/S is shallow (as ref point 1) but sounds of flowing water likely to perimeter drain
4-7	As point 3 - drains not holding much water - grass and rush covered – could be dammed
8	Same drain layout as 4-7 but holds more water - change of habitat here to more wet. Less grass and more moss as you move west
9	Moving to old plantation that has been felled, not good mire habitat but is relatively wet moving west, potential to advance to mire in time
10	Active drain E/W and meet a N/S drain – both could be dammed
11	Pond with very wet surrounding
12	Open pools, some are dry, around this part. Could hold water
13	Active drain N/S direction, shallow drain little water within could be dammed
14	Confluence of drains active - flowing towards road maybe under to stream on other side in woodland

Ref Point	Notes
15	Good drain filled with moss for approx. 40m (N/S), holding water i.e. functional
16	Moving west drier habitat, higher slope, water from here likely drains to west and north many furrows between point 15-16 (see aerial image) all similar type, quite dry and could hold more water along length
17	Drain running N/S water filled likely water from surrounding drains (i.e. those on E/W direction) draining to here as these are dry (See point 16)
18	Shallow drain deep sided, N/S direction for approx. 100m (joins Point 14)
19-20	Active drain E/W direction, likely all drains further south are leading to here and flowing west and then corners to point 20
21	Active flow running E/W likely towards stream at point 22
23	Active drain heavy flow
24	Otter evidence - anal jelly and feeding remains on active stream at base of small hill
25	Drain leading to point 23 - not active flow but could hold more water
26	Wet habitat some moss heavy rush stream (point 23) drain flowing around base of hill - hill is quite dry with heather and grass
27	Drain from west active flow to ref point 23 stream/ drain
28	Wet area approx. 3m wide some active flow
29	Some drains in this area are not active nor hold a lot of water – can be dammed. Drains all seem to lead to stream at base of hill (East) stream is heavy flow, these drains could be blocked. This area is quite grassy and not very mire like
30&31	Drains not active, i.e. holding water, functional
32	Slightly active drain, adjacent to drain at 31
33	Drain not active, functional
34	Active stream – perimeter
35	Slightly active drain – can be dammed
36	Drain not active – functional
37	Active drain – can be dammed
38	Drain not active – functional
39	(adjacent to point 40)Active drain – could be dammed here and further north to hold more water to aid mire development to the west
40-42	Drain not active, functional
43	Active drain – may be dammed as with point 39
44-47	Drain not active – functional
48	Active drain – may be dammed to stop flow to perimeter drain
49-57	Active drains, flowing – all could be dammed to hold water from flowing from mire to perimeter drain.
58	(hidden under point 30 on map) Dry tussocks - top layer (heather etc.) in this area, with some wet underneath, little sphagnum
59	Active stream from direction of RAF base flow is N/S direction
60	Failed wooden dam on stream (Pic ref GMW3 POI3)
61	(adjacent to point 31 on map) Drain shallow leads to stream (N/W – S/E

Ref Point	Notes
	direction, 40m approx.) no active flow but could hold more water if blocked
62	Drain in same direction as 61 (100m approx.) – deep no active flow with only shallow water – drain could be dammed
63	Functional dam at this point, drain is as described in 62 (100m approx.)
64	Active flow from here to stream to south
65	Active drain flow to S/E can be dammed to hold water further north
66	Active section of drain same direction as ref point 65 parallel drain
67	Perimeter stream active flow E/W direction meandering to N/S direction
68	Pools along stream edge on S side more than N side, wetter on southern side
69	Shallow drain slightly active (as point 57) - lined up N/S direction (linked to active stream to South). If dammed would hold water to support mire to the north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9. Jamie's Lodge

Summary

Jamie's Lodge has some slumps and on a couple of occasions the water appeared to disappear under ground.

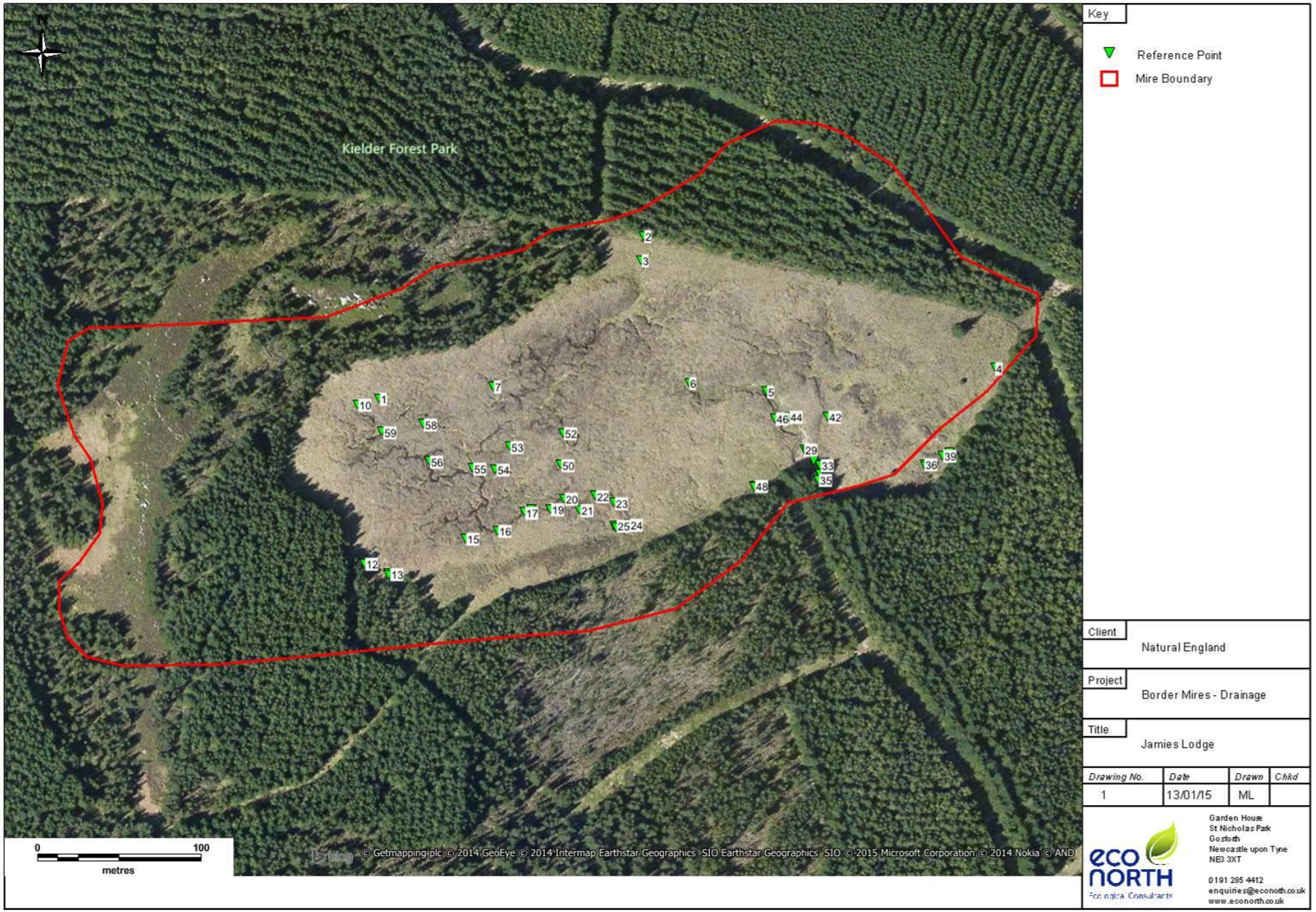
There are a lot of slumps visible on Jamie's Lodge with channels running though. The mire habitat atop the slumps is good however and overall the site is not dry and represents some good wet habitat.

The channels at Jamie's Lodge suggest that in wetter times the water flows through.

There is also a lot of pooling water that is spreading, especially in the centre and west of the site and around pools.

Ref Points	Notes
1	N/W direction, likely drains from surrounding area no obvious flow but could hold water if dammed
2-3	Active drain from ref point 2 to ref point 3. Flowing from treeline north-south direction, goes underground at ref point 3
4	Drain running along old forest boundary from N/S direction across mire edge, no water within but is moss covered, no active flow heard. Has potential to hold water if dammed
5-6	Active drain from ref point 5 to ref point 6 large cavern at ref point 6 land has slumped
7	Channels that may flow when not frozen over, i.e. active. These appear natural however, therefore should they be dammed?
8 & 9	Start / End Point
10	Open drain – not flowing but could hold more water if dammed
11-12	Open pools of water – some spread from here to surrounding areas
13	Open drain – not flowing but could hold more water if dammed
14-15	Open pools of water – some spread from here to surrounding areas
16	Drain with active flow
17-25	Open drain – not flowing but could hold more water if dammed
26	Sink hole
27-29	Open drain – not flowing but could hold more water if dammed
30	Active drain
31-35	Open drain – not flowing but could hold more water if dammed
36	Active drain
37-40	Open drain – not flowing but could hold more water if dammed
41	Drain not active
42	Open drain – not flowing but could hold more water if dammed
43	Active drain
44	Open drain – not flowing but could hold more water if dammed

Ref Points	Notes
45	Active drain
46	Open drain – not flowing but could hold more water if dammed
47	Drain not active
48	Open drain – not flowing but could hold more water if dammed
49	Side drain active
50	Open drain – not flowing but could hold more water if dammed
51-54	Open pools of water – some spread from here to surrounding areas
55	Active drain
56	Open drain – not flowing but could hold more water if dammed
57	Active drain
58-59	Open pools of water – some spread from here to surrounding areas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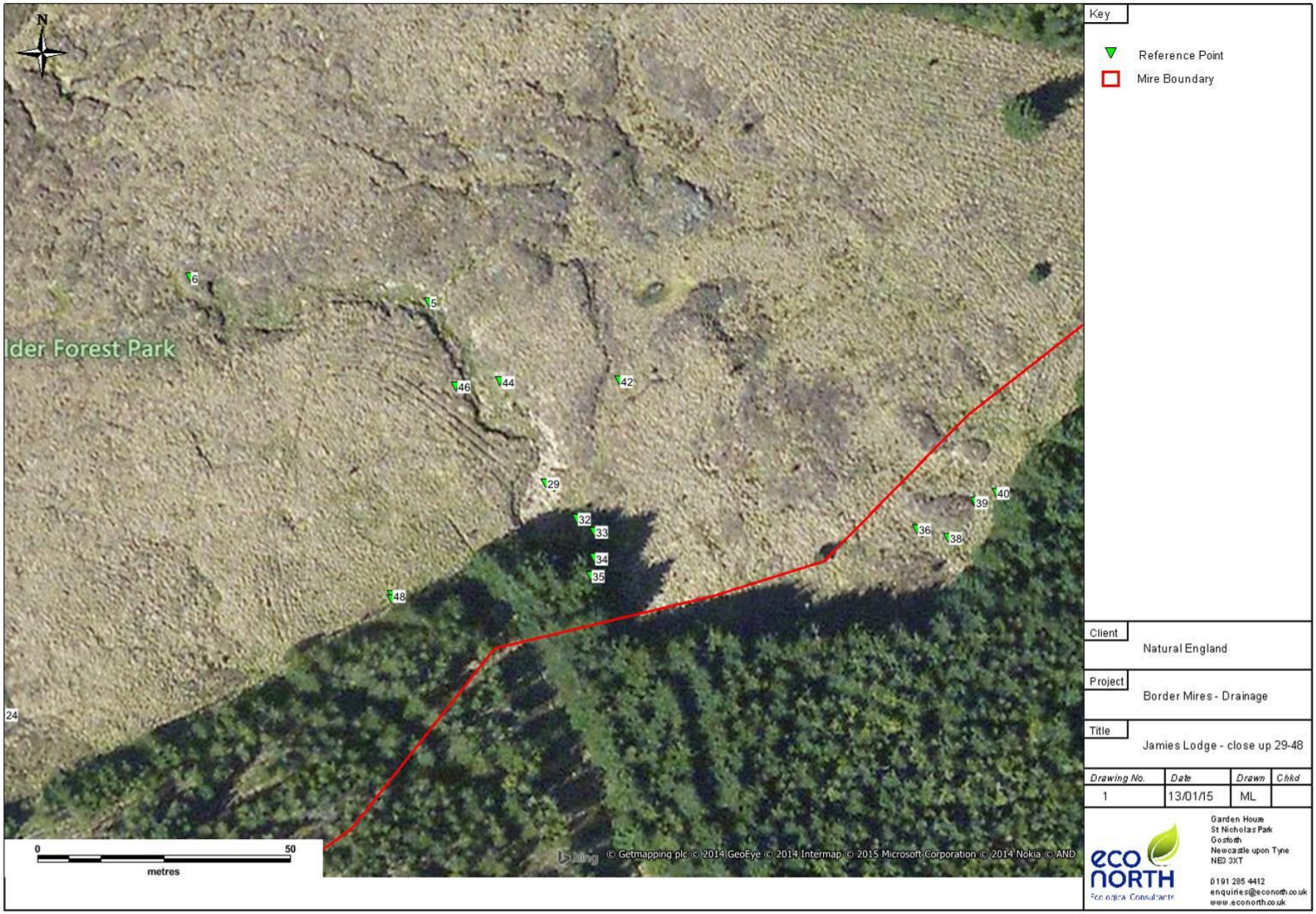
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10. Long Moss

Summary

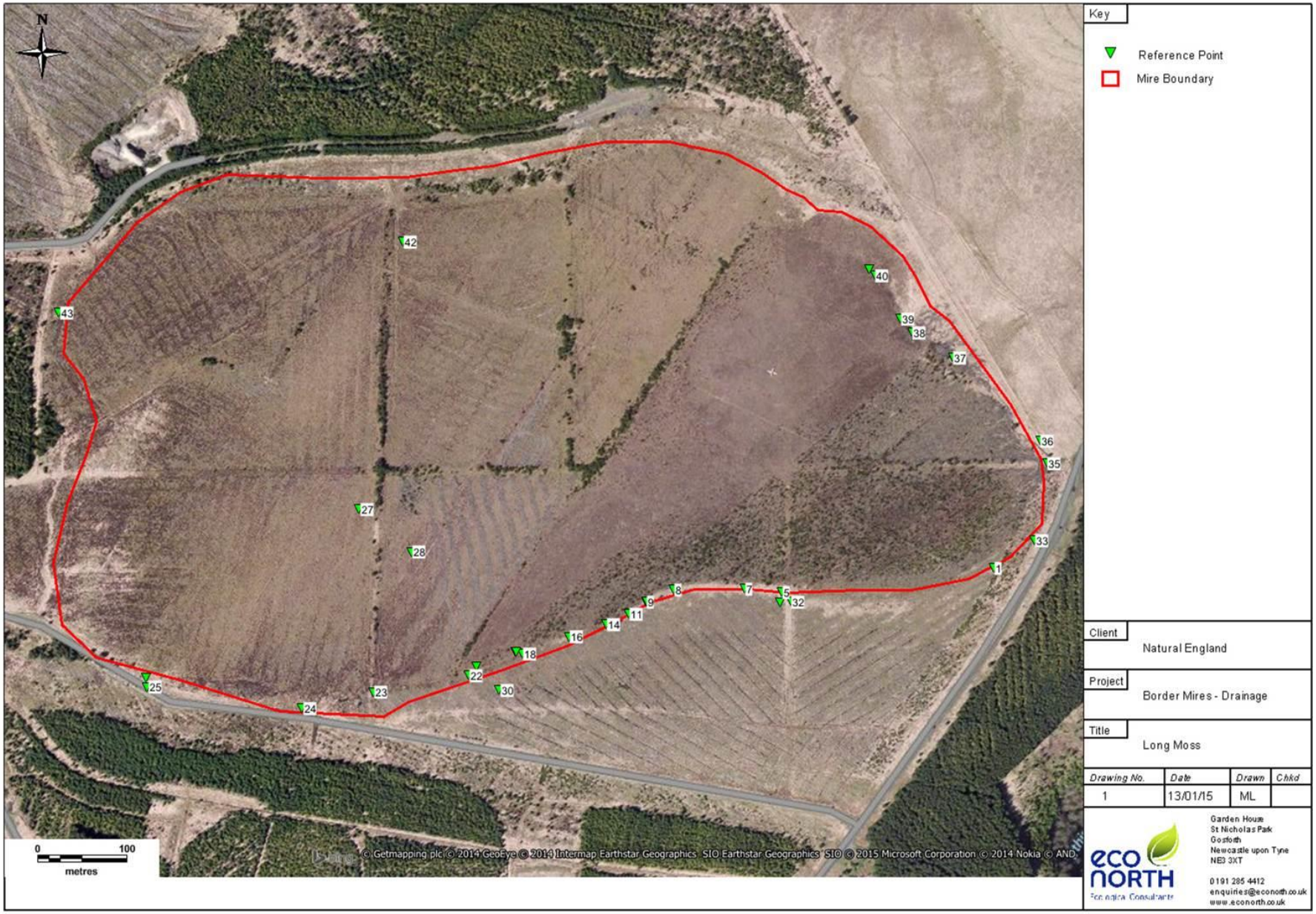
This mire is an example of leaving forestry debris to colonise as mire. The main habitat is quite wet underfoot with heather and moss tussocks.

Perimeter stream is very active and fast flowing - likely a lot of mire water is flowing to here, could block / dam drains on eastern boundary to hold water on mire.

There is a lot of tree regeneration in this mire also - considered to remove this, some trees are now quite mature - approx. 5yo?

Ref Point	Notes
1-2	Drain not active
4	Active drain
5	Drain not active
6-8	Active drain
9	Drain not active
10	Dammed drain - functional
11-12	Drain not active
13	Dammed drain - functional
14-18	Drain not active
19	Dammed drain - functional
20	Drain not active
21-22	Dammed drain - functional
23-26	Active drain
27	Slightly active drain
28	Slightly active drain
29	Active drain
30	Drain not active
31-32	Active drain
33	Drain not active
34	Active drain
35	Active drain flowing E to river outside mire boundary
36	Perimeter stream active flow
37	Active drain running to stream at perimeter cannot track it as it is covered in vegetation

Ref Point	Notes
38	Drain is full but active flow towards perimeter drain - same every metre approx. where there is active flow west to perimeter stream - confluence of N/S drain and E/W drains
39	Last of west flowing drains these can all be dammed to hold water from flowing to stream
40-41	As ref point 38 active drains flowing towards west from n/s direction
42	Flush with rushes dominating from here curving east to treeline to north
43	Perimeter drain here, functional, holding water and is deep surrounding areas also holding a lot of water but also much heather and grass, not sphagnum dominated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11. Prior Lancy

Summary

Tussocky mire no good central wet area, cross-leaved heath and heather dominate with some moss underfoot. Somewhat wet.

Old runway seems well dammed up (2 parallel drains along length) with only failing dams towards west (see notes) some open pools also present

Points 43-45 & 56-57 Active flow in this area with failing dams – issue to be addressed

Ref Point	Notes
1-4	Open drain - functional
5	Failed dam
6-11	Functional dams on parallel drains on runway
12-14	Failed dams on parallel drains on runway
15	Functional dam
16	Active drain
17	End of parallel drains – water holds here
18-21	Open drains running N/S - functional holding water, some shallow (see point 48)
22-25	Functional dams on drains, holding water within (drains running N/S and parallel to each other for approx. 400m)
26	Open drain – functional, not flowing (N/S direction crossing runway for approx. 90m)
27	Functional dam on drain at point 26
28	Open drain – functional – holding water well central drain, N/S direction crossing runway
29	Failed dam on drain adjacent to point 28
30	Functional dam
31	Open drain – functional, holds water
32	Failed dam on a side drain next to point 31
33	Active drain running NE/SW direction (same drain as points 40 and 50)
34	Functional dam
35	Open drain - functional
36	Failed dam on side drain from point 35 (point 36 hidden under point 35 on map)
37	Flush area, not mire
38	Functional dam
39-40	Active drains that could be dammed to hold more water
41	Open drain – functional, holding water
42	Active drain directly adjacent to functional drain (point 41) and could be

Ref Point	Notes
	dammed to stop flow
43	Open drain – functional, holding water
44-45	Active drains to be dammed along length. Drain is old forestry line and curves from point 44 to 45 and continues north
46	Perimeter drains(2) in parallel to tree line both dry, holding a little water at end, moss covered, could hold more water, i.e. would benefit from being dammed
47	Wet central section (western end of site) but not good mire - see pic (POI2 PL) - grass and moss dominate. Could be improved
48	2 parallel deep drains shallow not holding much water
49	Wet flush with active stream and deep pools visible on aerial
50	Deep shallow drain difficult to follow as very tussocky - small bit of flow likely flowing to stream in flush
51	Remnants of a wet flush on boundary relatively dry not holding much water
52	Blocked drain functioning but adjacent areas quiet dry
53	Same drain as ref point 52 but less water here, up to ref point 53, appears drier further west same on South of track at edge of old forestry
54	Lake permanent likely drains water from surrounding land and drains adjacent to track
55	Active flow over failing dam, flow from central flush (ref point 49) to lake (ref point 54)
56	Failing dam
57	Active flow from car park direction


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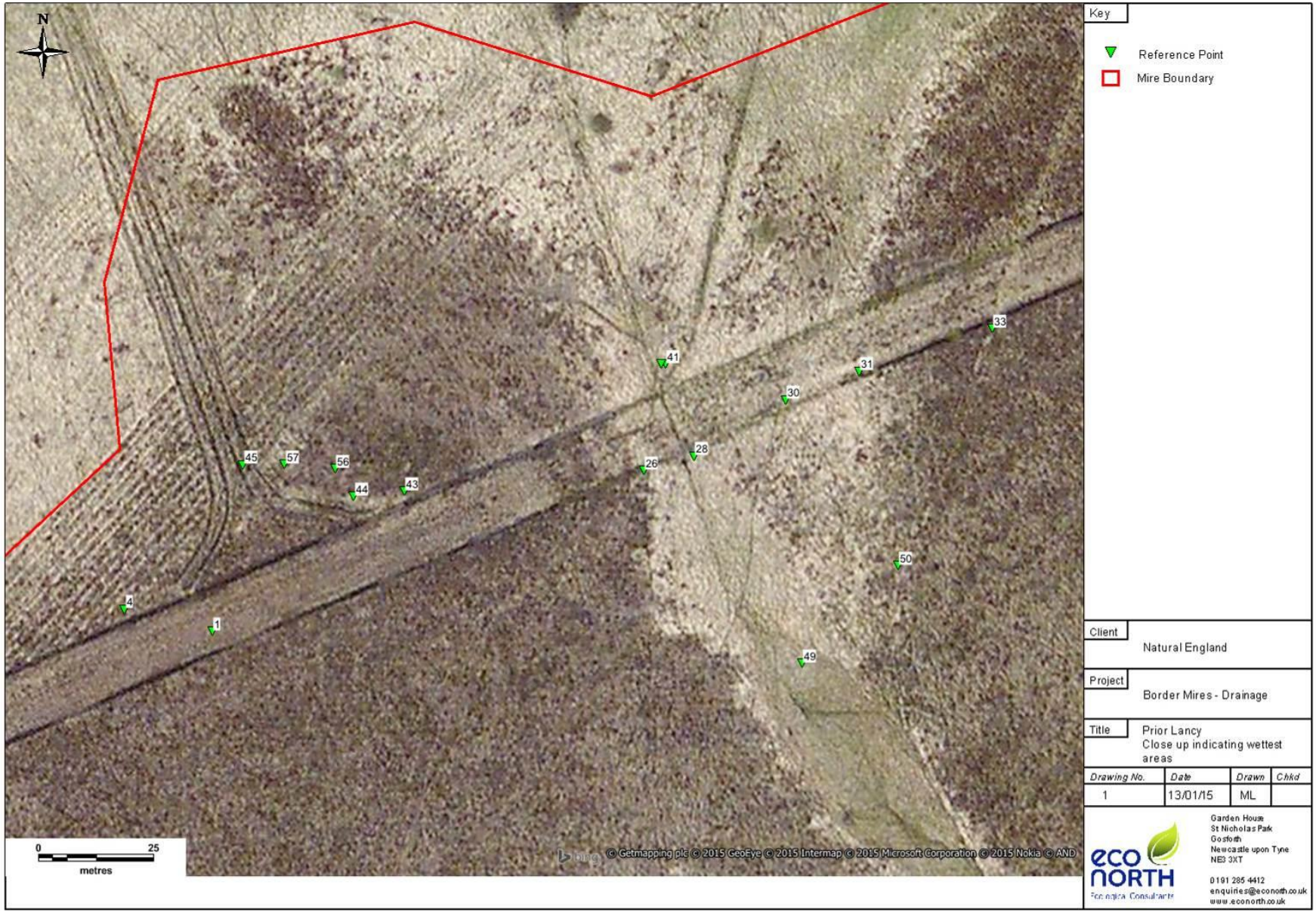
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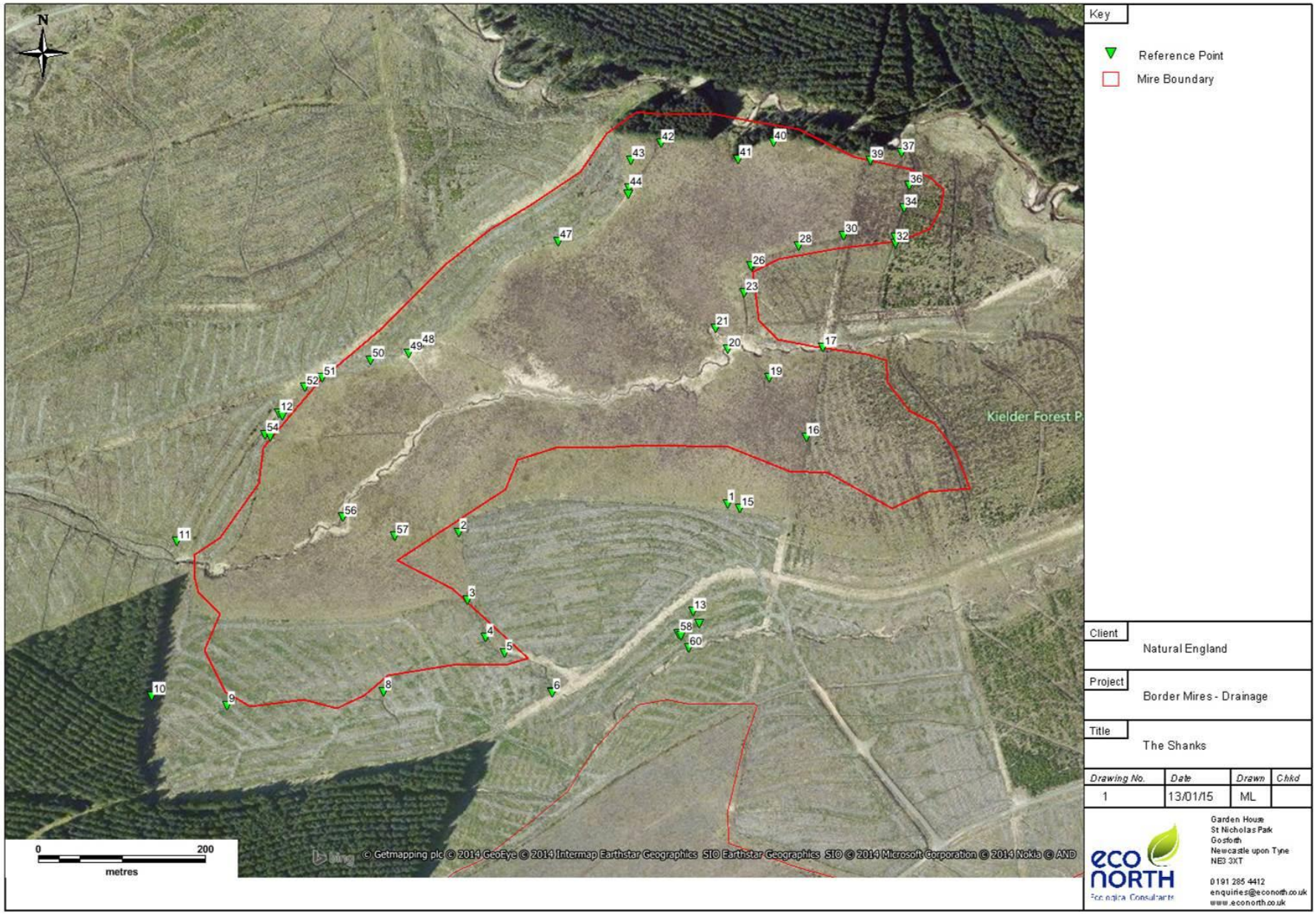
12. The Shanks

Summary
Reference points 2-7 Active drains at south flowing to perimeter drain **Reference points 11-12** From the confluence of the burn walking between two drains both are moss filled but not very high i.e. only holding some water and most likely flowing to the burn. Recommend block one or two of these parallel drains to hold water but still feed the burn i.e. not blocking all drains. Many parallels to length walked from confluence to north.

Ref Point	Notes
1	Perimeter drain with plugs that appear to hold water, moss filled, holds water further north east - drain runs in N/E / S/W direction
2	Perimeter drain bends around to south has plugs but not holding a lot of water, could hold more, some brash covers it
3	Drain is deep and shallow with water, not full but covered with cotton grass and moss in places has some plugs lines north / south direction for approx. 180m
4	Active drain lined in a w/e direction flowing towards drain at ref point 3
5	As ref point 4 - parallel to ref point 4 runs to drain at ref point 3 and is flowing, is active
6	Parallel to Ref point 4 runs to drain at Ref point 3 and is flowing, is active
7	(hidden under point 6 on map) Parallel to Ref point 4 runs to drain at Ref point 3 and is flowing, is active
8	Drain active - branches N/S to E/W direction for approx. 200m towards ref point 9
9	There are some plugs in the drain further west which appear functional with pools behind further east this drain is active and flowing (towards ref point 8)
10	Perimeter drain along length of tree line functional holding water with moss and not shallow no obvious flow
11	Drains flowing fast from North to burn flowing east
12	2 drains lined west / east very mossy no standing water and no flow, could hold more water – likely?
13	Active drain flowing west to east
14	Active drain - perimeter drain flowing west to east
15	Plugs are functional along southern edge (as point 1)
16	Active drain, N/S direction to point 17 and to burn / stream
17	Drain to burn / stream – some flow
18	Flowing stream (at Point 17, hidden on map)
19	Active drain flowing north to stream 40m approx. length
20-22	Drain active and flowing to burn with flush surrounding, joining at point 20
23-25	Drain – active to burn N/S direction for approx. 50m (hidden under point 23 on map)

Ref Point	Notes
26-29	Drains not active (E/W direction)
30	Drain is active at this point from point 29
31	Drain holding water
32	Side drain is active
33	Main drain is active
34	Drain with slight flow
35-36	Side drain is active from main drain (along point 33 and 34)
37	Drain not active here
38	Side drain is active
39-44	Active drain along forest edge and then in N/S direction
45	Drain is less active at this point
46-47	Active drains to point 48
48	Drain not active – holds water at this point
49	Drain is active to main burn / stream S/E direction, flush area
50-55	Active drains in N/S direction mostly
56	Burn / stream
57	Drain
58-59	Active drain
60	Burn / stream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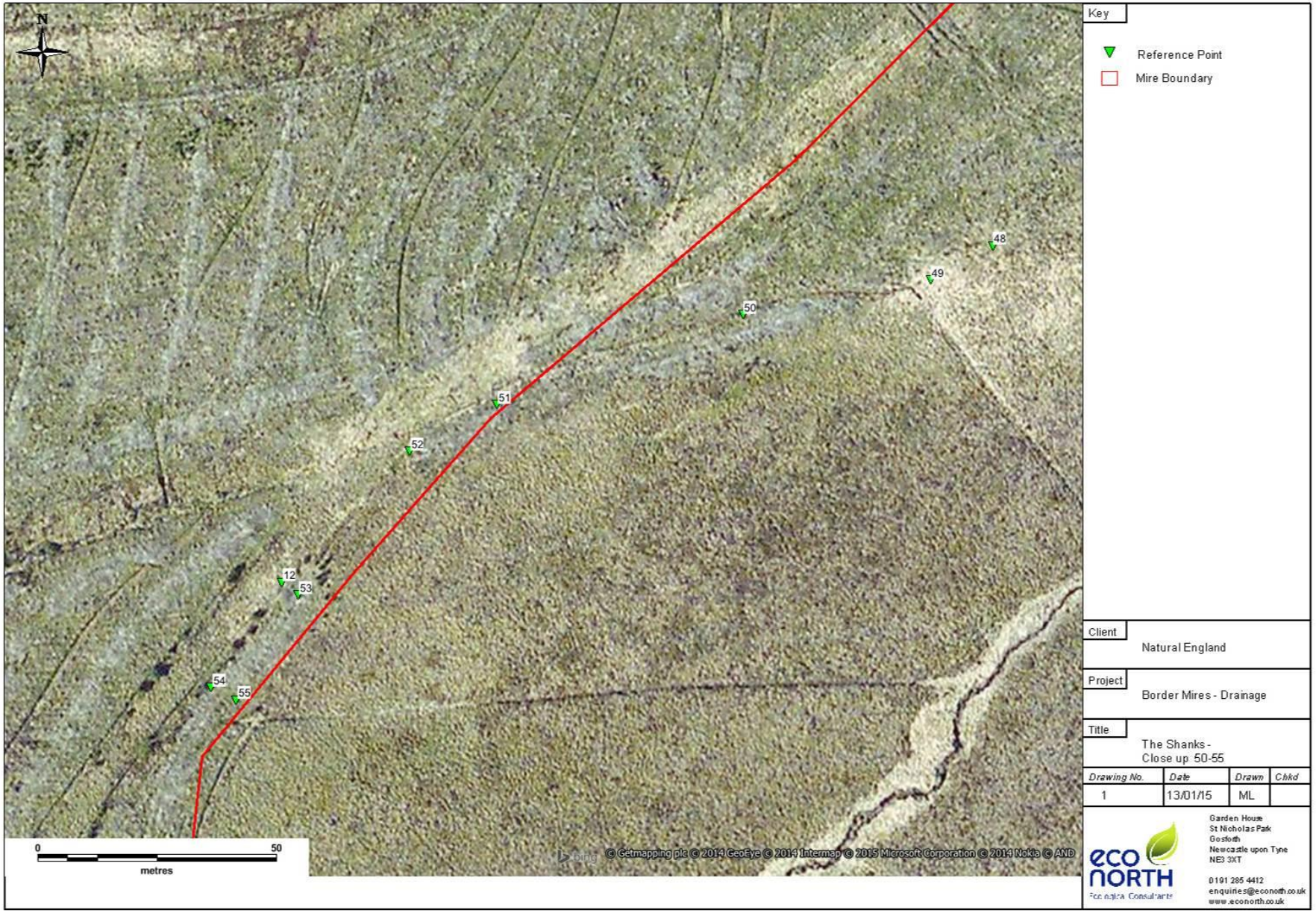
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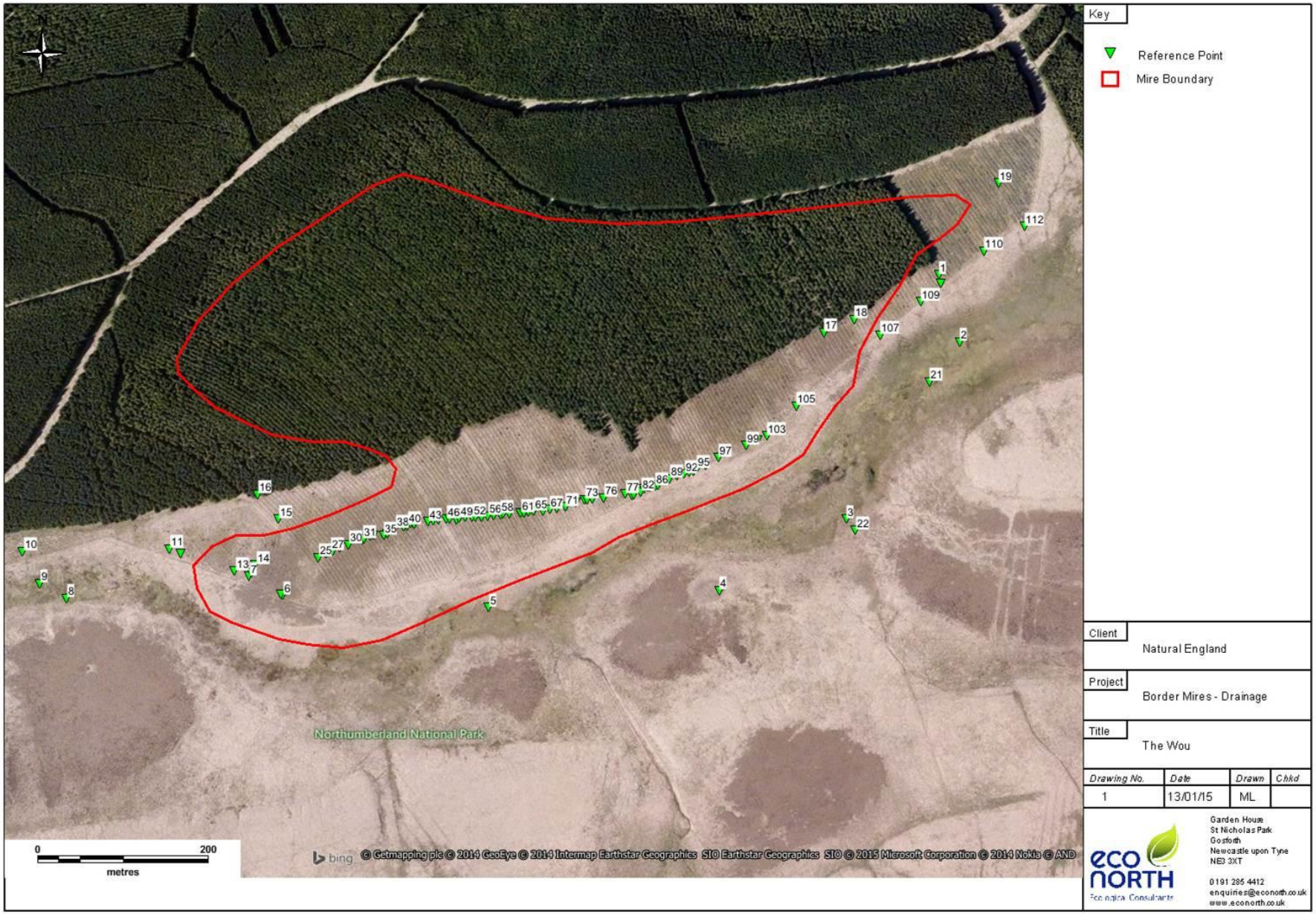
13. The Wou

Summary
The Wou has a large flush / marsh area in the centre. Water may drain to here from surrounds, slight gradient. All plough lines to the north are of similar composition - wetter closer to the trees, some standing water within but drains are not filled. Potential for these to be filled if some were blocked up to create spread of water coming from tree line.

Ref Point	Notes
1	Drain parallel to the tree line. 3ft deep approx. and 0.5m wide. drains perpendicular to drain 1 up to tree line
2	Marshy standing water not walked through for drains approx. 4ft deep
3	Marshy deep water maybe draining from the south
4	Animal run with standing water possibly a drain - not active
5	Dry run between rush maybe water pools in central bit from surrounding hills and flows to burn to the west. Generally flat however with no obvious flow
6	Drain with shallow water at base parallel to fence E/W direction
7	Drain shallow as 6 and lined up towards tree line from ref point 6 not active i.e. not flowing
8	Molina / reed habitat with rushes, pond like habitat
9	Wet stand of water no obvious flow from a source
10-12	Drain quite moss filled running between fence and tree line parallel no flowing water to ref point 11 approx. starts again at ref point 12 back to ref point 6
13	Drain running from ref point 12 to trees first one along this stretch from trees
14-16	Large drain from ref point 12 towards tree line, dry not holding a lot of water runs to tree line. Slightly dry at ref point 15 then runs to ref point 16. Some plough lines hold water near the tree line but dry up further south
17	Drain blocked at ref point 17 holding water behind on tree side quite dry on South side
18	Ref point 18 as ref point 17 holds water to north dry to south
19	Blocked with trees / branches but no pooling water, drain in N/S direction, could hold more water if dammed
20	Active drain
21	Flush
22	Slightly active drain - some water within
23	Drain not active
24-29	Slightly active drains all parallel to each other in N/W / S/E direction
30	Active drain (N/W / S/E direction) parallel to others on map

Ref Point	Notes
31-79	Open drains but not active, could hold more water if dammed by treeline
80-97	Main drain active here, runs W/E direction along southern end of drains 29-79 for length of mire (same drain as at point 1)
98	Dam failed (point hidden under point 97 on map)
99	Drain holds water here, although likely there is slight flow around failed dam
100-103	Obvious active flow in drain again at this point
104	Area up on a high point
105	Functional drain – holding water in a N/S direction across main perimeter drain
106	Active drain - flow to the east
107-109	Functional drain, holding water, running East / West direction
110	As point 19
111	Active drain (point is hidden under point 110 on map). Drain is lined up in an E/W direction (not N/S as Point 110)
112	As point 19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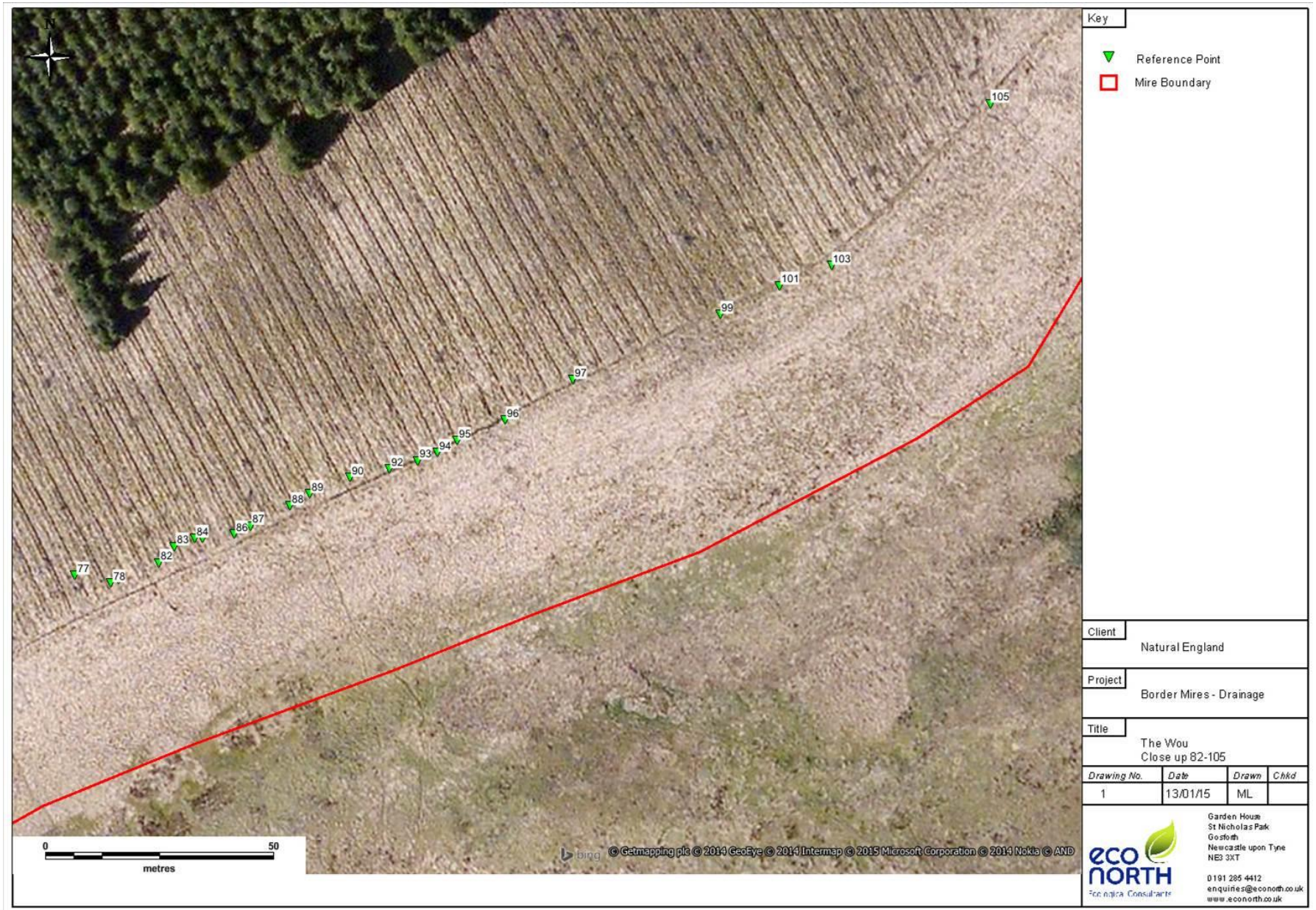
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14. Butterburn

Summary

Lots of standing water around ref point 1 and 2 (Butterburn 1).

Perimeter drain is wet with no active flow; at ref point 4 is the only apparent active drain from the north. This drain is likely collecting water from the surrounding areas and feeding to this drain and to the river (Butterburn 1).

Recommendation - creating other drains along perimeter to block to stop all water draining to perimeter drain and then to river.

To the west, adjacent to the river, is more marshy grassland than mire, with some natural flushes leading to the river but these are not extensive.

14.1 Butterburn 1

Ref Point	Notes
1	Failing dams - natural channels dammed but some water flow through
2	Drain flowing e/w some standing water at surface also moss -functional
3	Perimeter drain, holding water at this point, wet flushes adjacent, hillocks of moss and rush
4	Decent flow from perimeter drain to river Irthing (flow from South) - active drain
5	Wet area next to river with some standing water adjacent areas are much drier however water likely collected in this wet area from surrounds and flows to river
6	Active drain running to the river from South - visible in the aerial. Drain is narrow and grass covered water flow is audible therefore is under grass
7	Drain only active to this point, gathers a lot of surrounding water here and flows directly to river - block potential here further south of ref point 7 a drain is not as obvious but there is a lot of standing water and sphagnum
8	Drain running N/S direction - little water within, approx. 50cm deep
9	Lost the drain from ref point 8, backed up with sphagnum maybe? No obvious drain on the landscape very hilly
10	Defunct drain at edge of mire habitat, to the north towards river is drier; drain is not flowing but no obvious water within
11	Drain holds some water
12	Active drain flowing north from South to river
13	Natural drain to river no apparent active flow, moss and rush covered - drain from South to north
14	Natural valley to drain at ref point 13. Comes S/E direction and joins ref point 13 drain
15	Nice mire surrounds standing water and sphagnum, also cotton grass dominates with some deer grass no apparent drains to river

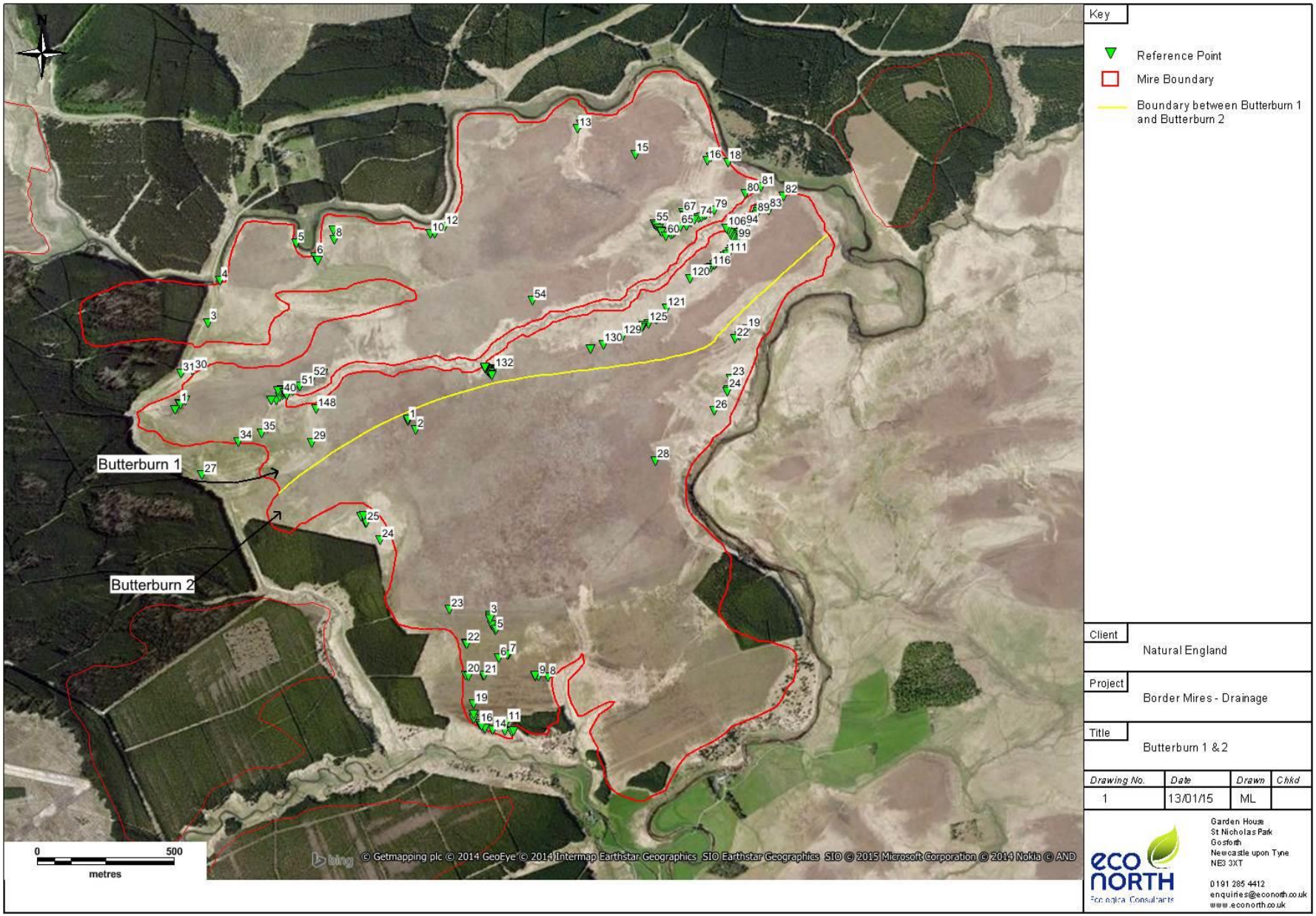
Ref Point	Notes
16-17	Narrow drain in a N/S direction not holding much water runs towards river, lose it at ref point 17 blocked up, with veg and water / moss surrounds
18	Natural drain to the river doesn't extend to the mire
19-20	Drain with shallow water from west to river visible for approx. 100m west, not apparent where it runs to river
21-22	Drain from west opens out very active water flow to river. Drain follow track to ref point 22 where it starts, no apparent water flow from this point
23	Confluence of 2 drains. Drain to North is narrow holding some water but could hold more drain E/W is wide with rushes within
24	Defunct drain E/W Direction covered with grass with some water beneath no flow but not full lines from 'mire' to river
25-27	Slightly shallow drain running N/S drains from mire may lead to this but is not flowing but also not full therefore must be draining elsewhere follow straight path between ref point 25 and 27
28	Moves to better quality mire much wetter and no apparent drains surround - distance from river an effect on wetness?
29	Natural wet flush holding water well with rush and sphagnum
30	Start Point
31	End Point
32-33	Natural erosion channels, blocked by plastic and timber dams which are effective in some areas however, water is flowing around some and flowing through in an E/W direction
34-36	Straight channels, however is likely natural. Flow at base of hill but some areas are water logged with moss and rushes, possibly the beginning of the burn
37-39	Area of erosion, lot of flow towards start of burn - open water and flowing
40-54	Ditch blocked with vegetation which opens to eroded area with flowing water. Many areas where ground has been dry
55-59	Small ditches from top of hill that flows to a marshy rush flush. Ditches are small with water flowing, some plugs hold water
60	Wet flush, possibly natural with many rushes. Draining from hill from the north to the burn - wet flush is approx. 10-20m wide
61-66	Drains from top of hill, some with active flow
67-74	Some blockages on drain by grass, however, this is not significant
75	As with 67-74 but with more water present
76	As with 75 however with a lot more standing / pooling water suggesting more functional blockage
77	Some small flow to burn
78-82	Drain are blocked better here, holding more water, likely to be related to flatter gradient than further west along burn
83-87	Small natural drain, with water present that separates mire from grassland. Leads to an area of slipped land that drains to burn. Some areas in slipped land hold water well

Ref Point	Notes
88-99	Drain with water flow - to point 87 - audible flowing water in parts. Drains lined up in S/W to N/E direction
100-121	Drain extends directly north in straight line to burn, some water within the drain, appears dry in parts. No audible water flow however, could hold more water
122-131	Drain is dry in places however, is wetter as slopes towards the burn where it holds more water. Functional at this section
132-147	Drain forks, leading to burn (active) and mire (holds water)
148	Area has been tracked over by large vehicles - sleepers cover the tracks and quite churned up

14.2 Butterburn 2

Ref Point	Notes
1-2	Deep pool water flowing in but no apparent flow out drain from S/W dirn
3	Active drain confluence drain is quite empty at W/E, N/S drain is flowing round and under tussocks to river likely wet to ref point 4 then moss covered from here with some water Beneath i.e. functional from ref point 4
4	Parallel drain to ref point 3 same as ref point 4 i.e. functional to direction of river
5	Deep drain from tree line to South West (Ref point 22) ends at Ref point 5 holds some water but drain not full
6-7	Drain from N/E / S/W dirn has dam in at ref point 6 somewhat functional but slight flow South West likely plugs further south towards trees no other dams - deep drains flowing heavier further north east to ref point 7 approx. no further dams were recorded and drains not as deep - likely to start from North just beyond ref point 7
8	Dam along major drain to burn is not effective has moved likely from power of the water and water now flowing underneath see pic also same further west along drain - very deep drain likely being eroded under the dams as well as the edges
9	Very heavy flow at ref point 9 and drain is very deep but not water filled - dam failing here
10	Another failed dam here water flow not as strong but still heavy flow
11	Narrow drain leading towards the river some water within light water flow. Drain is steep and could hold more water. Lined n/s direction
12	Drain with dam lines up n/s but very little water within. Steep drain with potential to hold water also side channels from west are dry. Side channels at ref point 12 lead to area other drain also very dry

Ref Point	Notes
13	Ref point 12 merges at ref point 13 with drain linked to river but little water within rush dominated and surrounding habitat appears drier
14-16	Drains within this area are many and all are quite dry and hold only shallow water with shallow moss filled. Could hold more water. drain with failing dams some water flow at ref point 14
17-19	Dominant drains, parallel to each other. Tussocky habitat with no water flow however, no pooling water. Drains here with a lot of potential to hold more water if blocked / dammed. Some natural damming with tussocks but not as wet as should be
20	Drain from N/E / S/W dirn that leads to ref point 6 - See notes above
21	Drain leads from tree line to Ref point 8. At this point drain is function, holding water
22	Deep drain from tree line to South West (ref point 22) ends at ref point 5 holds some water but drain not full
23	Fence line - distinct change in habitat, some spreading water / pooling to north of fence
24	Drains in this section are deep but relatively shallow, some hillocks/tussocks and no active flow but could hold more water
25	Area is very churned up and has some pooling water but only where vehicles have churned up ground. Not mire habitat
26	Drains leading to ref points 1 and 2 originate from this area
27	Start
28	End
36-37	Drains within this area are many and all are quite dry and hold only shallow water with shallow moss filled. Could hold more water
38-39	Drain leads from tree line to Ref point 8. At this point drain is functional, holding water
40	Deep drain from tree line to South West (ref point 22) ends at ref point 5 holds some water but drain not full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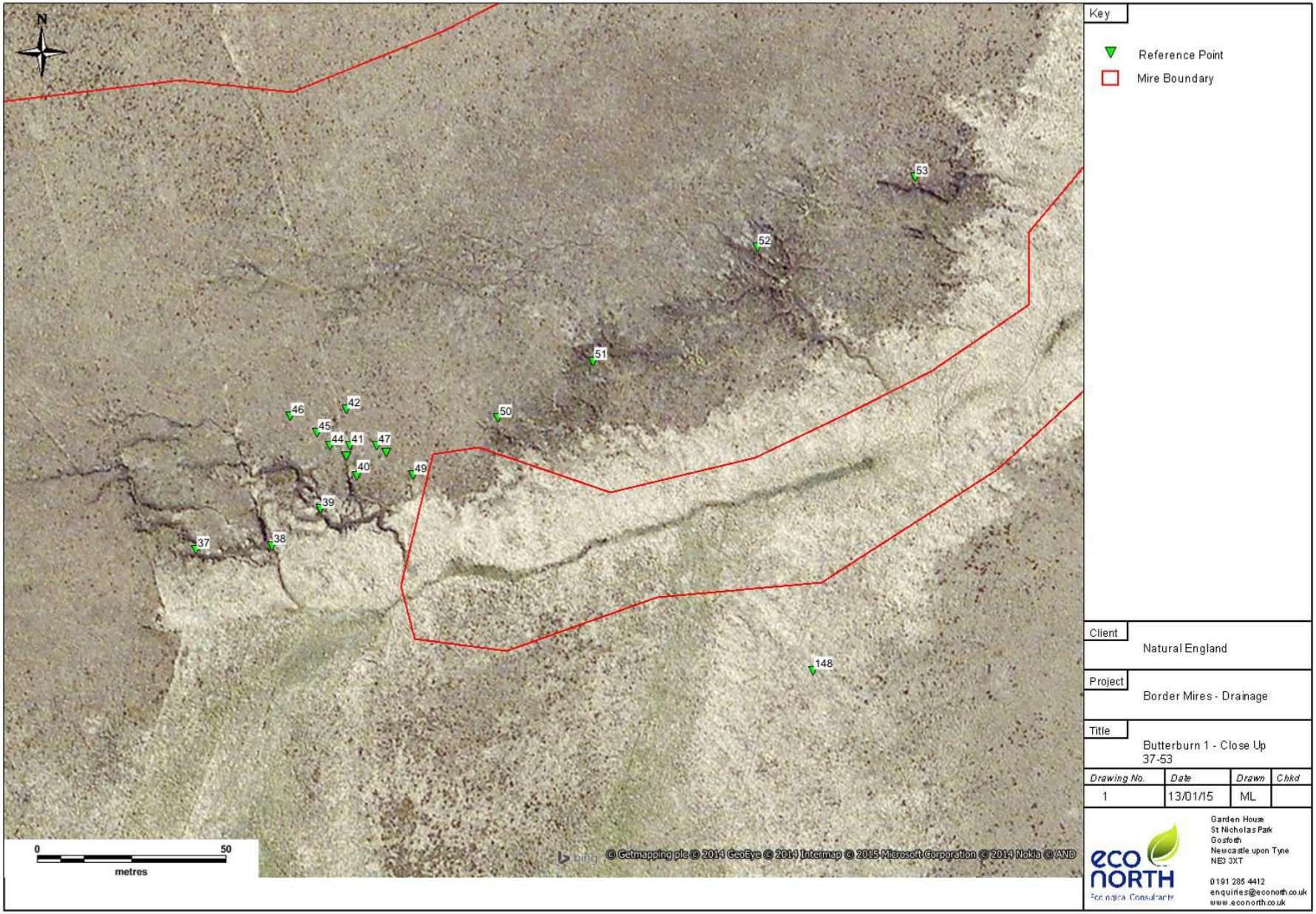
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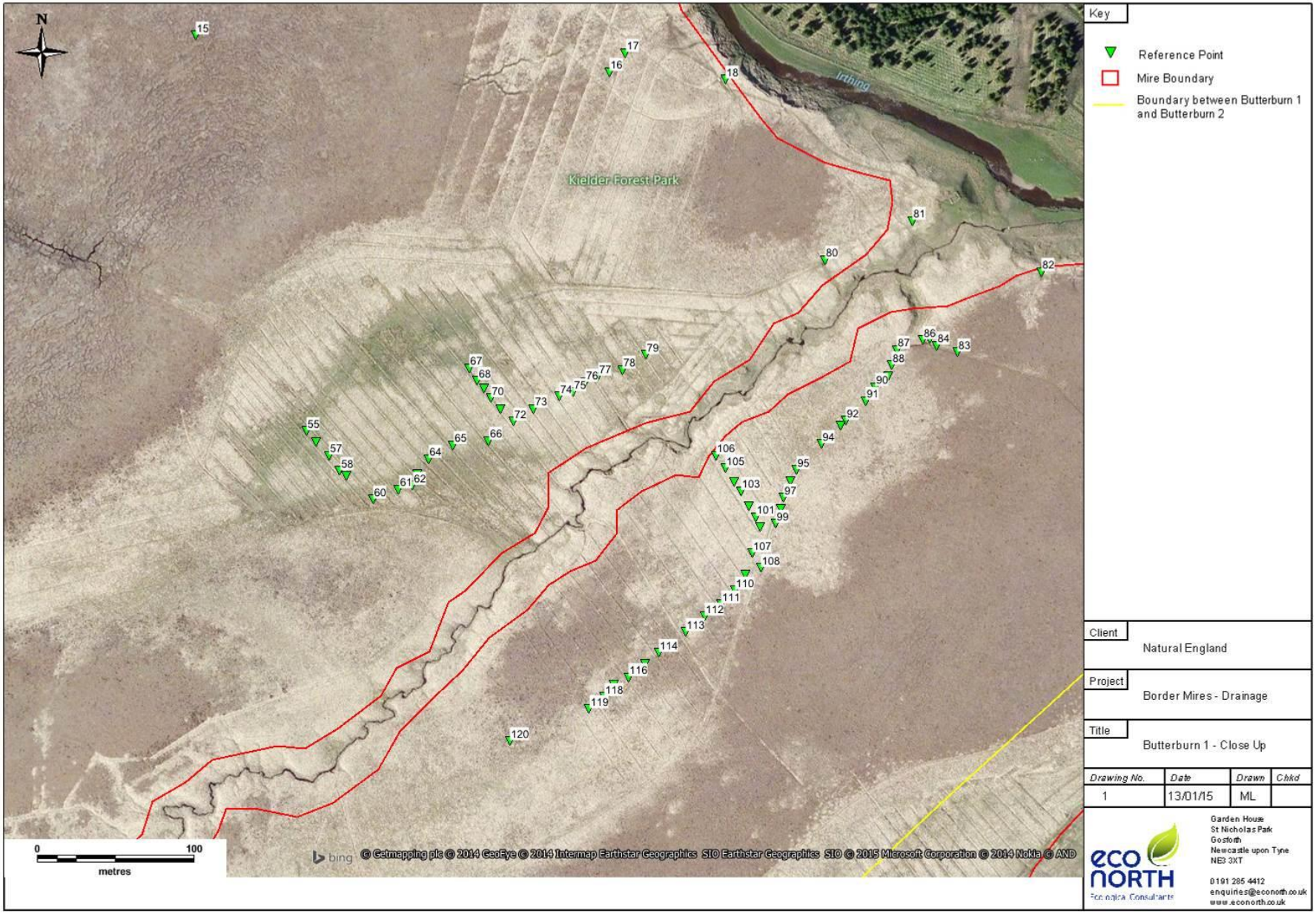
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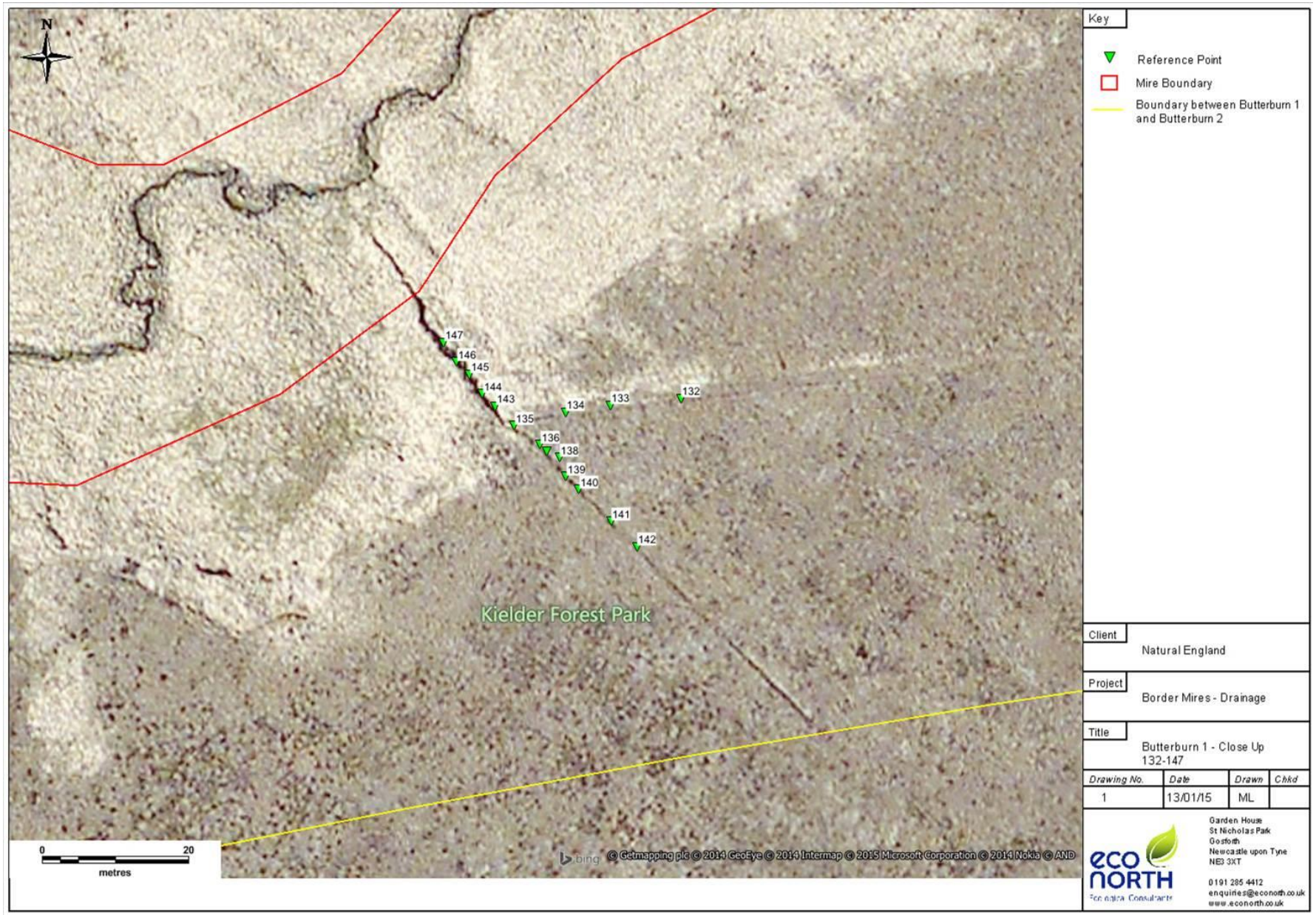
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15. Coom Rigg

Summary

Top central section of the mire is in good condition. Most of the active drains are to the south west and north west sections. Most of the water flows west.

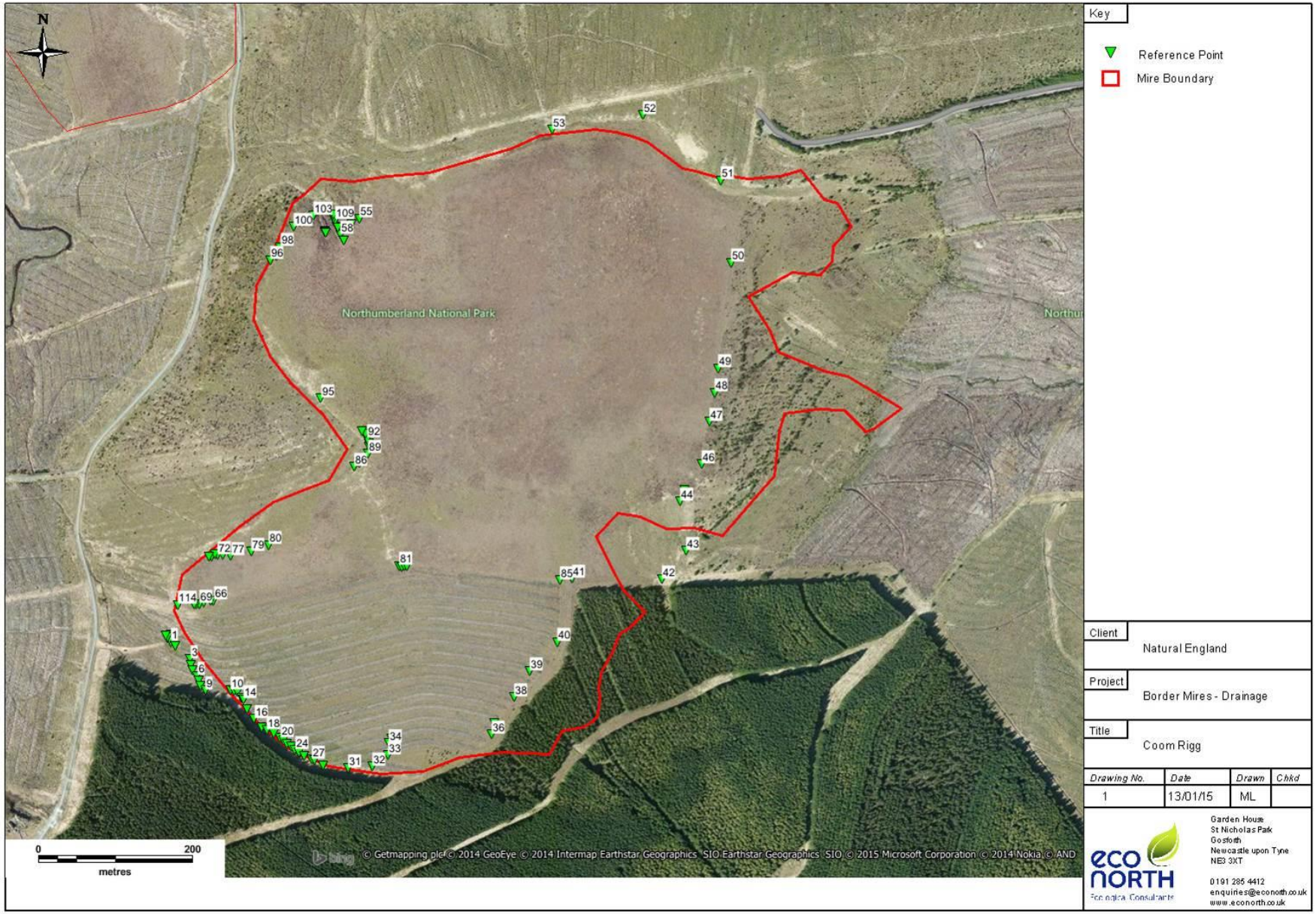
A flush is present on the eastern boundary that appears to hold water well. Water also holding well at the south eastern corner.

Southern section is in relatively good condition despite it being comprised of track lines from forestry.

North west section of the site will require dam repairs and extra dams put in place

Ref Point	Notes
1-2	Drain in good condition, holding water well
3	Drain present - not active, holding water
4-6	Active drains
7	Drain in good condition, holding water
8	Main drain along tree line - active flow through for length to point 10 (100m approx.)
9	Drain in good condition, holding water along length (parallel to point 8 drain)
10-14	Drain present - not active until point 15
15-27	Active flow along this drain – perimeter drain
28-31	Drain is ok here but still slightly active
32	Flow increases again on this drain at this point
33	Drain (E/W direction) in good condition, no active flow
34	Drain has little flow here
35-41	Drains in good condition holding water well – perimeter drains on edge of old forestry (N/S and E/W directions)
42	Slightly active drain with flush surrounding
43	North/south drain active at this point
44	Flush leading to mire type habitat (north of this point)
45	Active drain leading to flush (point 44)
46	Perimeter drain appears to hold water well, not active
47	Drain in good condition
48	Failed dam present on same drain (as point 46) here, however, drain still holds water
49	Drain in good condition
50	Active side drain to perimeter drain
51	Perimeter flush active flow to here, could be dammed

Ref Point	Notes
52	Slightly active drain, potential to be dammed
53	Drain present (N/S) - not active
54	Slightly active drain (E/W direction) hidden under point 53 on map
55	Active flush with water entering from surrounding drains
56	Functional dam holding water on drains from north
57	Functional dam holding water on drains from north
58	Failed dam present here
59	Active drain to be dammed
60-61	Very active perimeter drain (south west corner of mire)
62-65	Active drains in this section (south west corner). Moss within drains, 0.2m deep, 0.3m wide, extends down to track to south west
66-71	Natural flow in small ditch - natural sink where fast flowing water runs both over land and under, predominantly underground flow towards track to west.
72-80	Natural flow same as drain ref point 66 - 71, with sphagnum build up. Blocked with moss in places where it holds the water well.
81-84	Effective intact plastic dam – plastic dam that is not damaged is holding water behind with moss in places, some water running past.
85	Very effective old plastic dam – almost entirely covered with moss, very effective
86-103	Small boundary drain – small, some flow but not much clogged with moss. Moss holding water in places
104	Large partially effective dam - water backed up but escapes
105-107	Large dam effective in holding water – moss growing behind, holding water
108-109	Large partially effective dam – water backed up but escapes
110-113	Large drainage system at north of mire – large 2m wide fissures draining water from mire. Water running off but blocked with vegetation in places. Number of large plastic dams in places.
114	Fast flowing ditch from forest drains – lots of running water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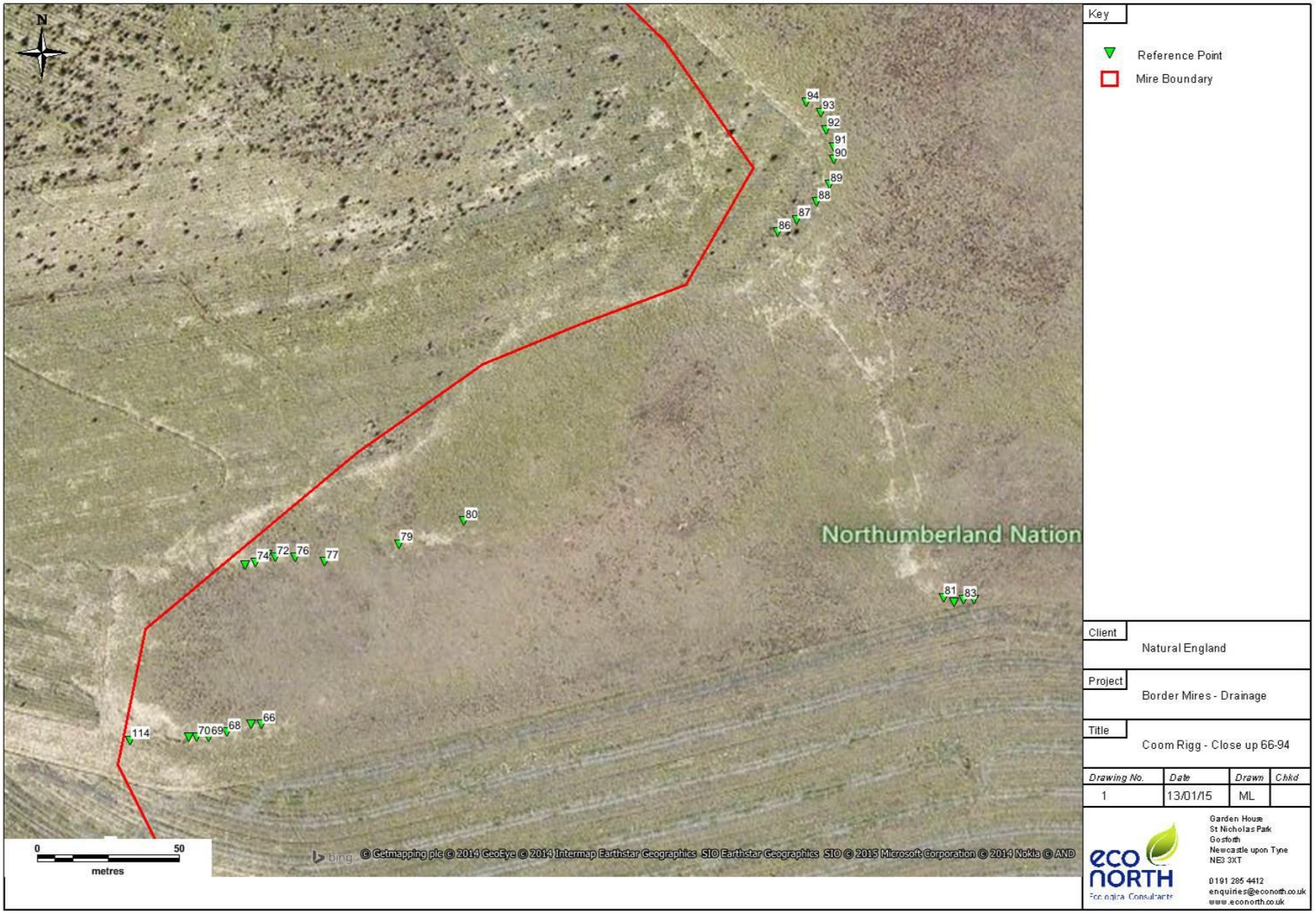
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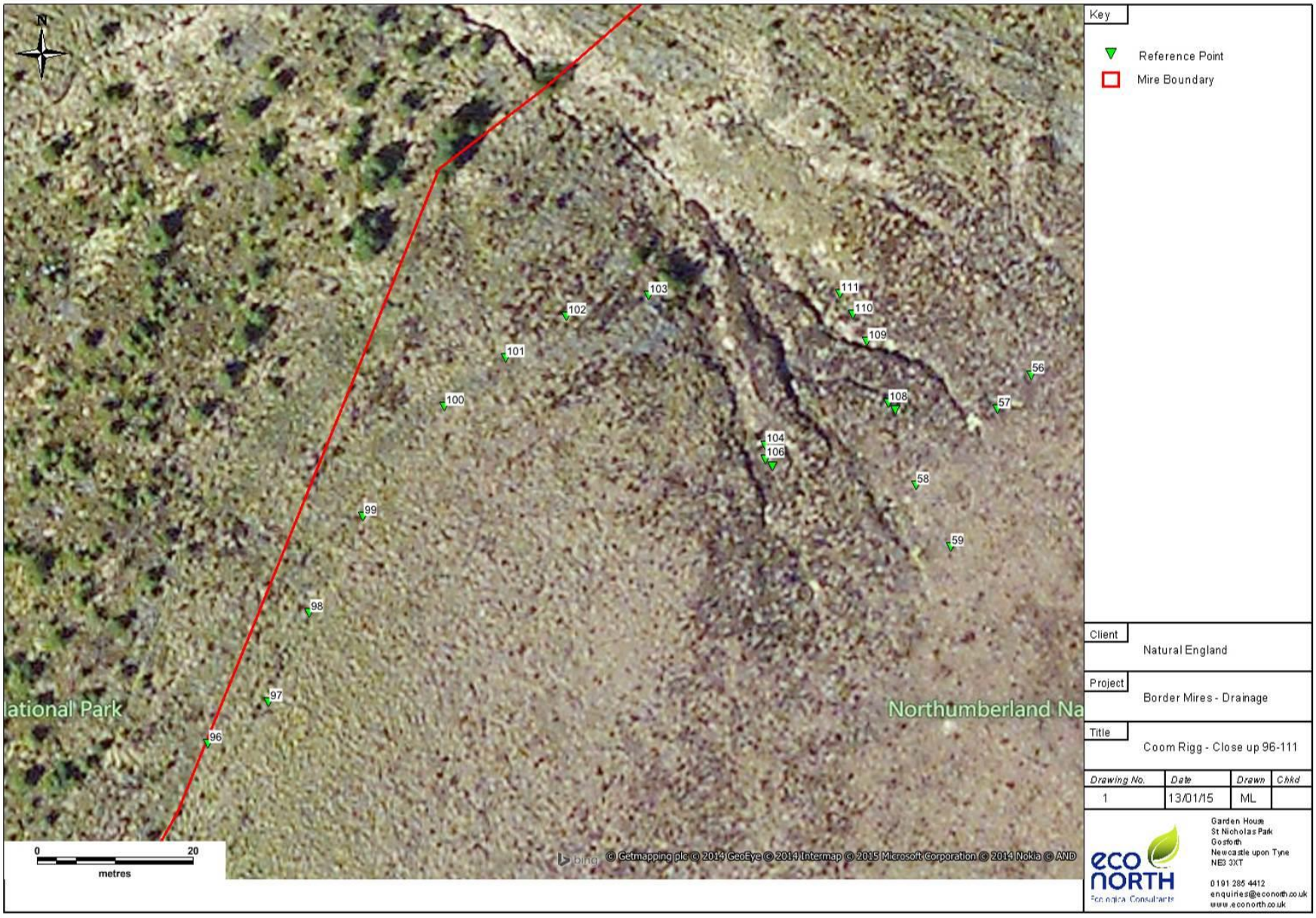
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