Welsh Government

M4 Corridor around Newport

Environmental Statement Volume 3: Appendix 10.32

River Corridor Survey 2015

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Summary

S1. RPS undertook a river corridor survey of watercourses along the route of the proposed M4 Corridor around Newport (M4CaN) between Castleton and Magor to inform the ecological baseline for the Environmental Impact Assessment (EIA) of the Scheme. The survey included land 100 metres either side of the alignment of the proposed new section of motorway to the south of Newport. The EIA is reported in the M4CaN Environmental Statement (ES) of which this document is an appendix to the chapter on Ecology and Nature Conservation.

S2. The 2015 River Corridor Survey was undertaken during August to October 2015 and focused on 19 waterbodies along the route of the new section of motorway.

1 Introduction

1.1.1 RPS was commissioned to carry out a river corridor survey (RCS) on land located within the footprint and within 100 metres (m) of the proposed alignment of the new section of motorway between Castleton and Magor. This report has been prepared by RPS to provide part of the ecological baseline required to inform the Environmental Statement (ES). The extent of the survey area is shown on Figure 1.

1.1.2 Welsh Government has previously commissioned ecological surveys which were carried out in 2014 by Arup (or sub-consultants commissioned by Arup). RPS has identified gaps in the survey coverage, largely as a result of lack of access to land. In the case of some surveys, the findings of the 2014 Arup reports themselves give rise to the requirement for additional surveys.

1.1.3 Further ecological surveys were therefore required to inform the EIA of M4CaN, based on the findings of the previous surveys and consultation with Natural Resources Wales (NRW).

1.1.4 This document reports the findings of the river corridor survey, which was undertaken from August to October 2015 in accordance with the 'River Corridor Surveys: Conservation Technical Handbook 1' guidelines (National Rivers Authority (NRA), 1992).

2 Requirements for RCS Survey

2.1.1 It is standard practice to undertake a river corridor survey (RCS) where a watercourse could be impacted upon by a new structure. The new section of motorway would cross a number watercourses, giving rise to the need for a RCS.

2.1.2 A Phase 1 habitat survey and associated baseline assessments have been undertaken for the new section of motorway and these reports are appended to Chapter 10 of the ES on Ecology and Nature Conservation. The purpose of the RCS is to provide more detailed assessment of physical characteristics and vegetation along watercourses and the potential to support protected species. In particular, RCS collects essential data regarding the reen network that is a constituent part of the Gwent Levels Sites of Special Scientific Interest (SSSIs).

2.1.3 The RCS maps the physical and biological features of a watercourse and its surroundings. Specifically, the methodology collects details of habitat types along with characteristic plant assemblages and an appraisal of the potential presence of protected species (otter, water vole, etc.) along each river corridor.

2.1.4 This information is used to inform decisions on management and quality and is needed to help inform the baseline conditions for impact assessment and consequently the level of mitigation that might be required for the new section of motorway.

3 Survey Methods

3.1 Introduction

3.1.1 The RCS was carried out from August to October 2015. This falls within the optimum period for this type of survey as most vegetation is readily identifiable. The survey area was based upon the alignment of the proposed new section of motorway, together with a 100 m wide surrounding buffer zone.

3.2 Methodology

3.2.1 The survey was conducted in accordance with the 'River Corridor Surveys: Conservation Technical Handbook 1' (NRA, 1992). The survey involved detailed mapping of the physical and vegetation features along approximately 300 m sections of the watercourses along the length of the proposed new section of motorway. The standard code and symbols used followed the NRA (1992) guidance and are presented in Annex A. Habitats within 50 m of the watercourse either side of each watercourse survey length were recorded on the RCS maps using standard Phase 1 habitat survey codes (Joint Nature Conservation Committee (JNCC), 2003).

3.2.2 For each section of watercourse (all of which were reens within the Gwent Levels) plans were produced and are shown in Figure 2. Each plan included the name of the reen, name of surveyors, date of the survey, watercourse reference, north orientation arrow, scale-bar, indication of depth and width of channel and flow direction. In addition, representative photographs of each RCS section were taken and presented in Annex B. This survey information informs an ecological evaluation of the waterbodies and their relative importance in terms of nature conservation.

3.2.3 All watercourses surveyed fall within the Gwent Levels SSSIs, which have been designated for assemblages of aquatic macrophytes and invertebrates that exist within a complex landscape of regularly managed reens and field ditches[1]. It is therefore assumed that each reen provides potential for diverse assemblages of aquatic macrophytes and aquatic invertebrates and specific reference is made only where it is known that a particular reen is of notable high quality.

3.2.4 Aquatic and emergent in-channel plant communities are described in detail in the Aquatic Macrophyte Survey Report (ES Appendix 10.30) and are therefore not covered within this report.

3.3 Limitations

3.3.1 The findings presented in this report describe the watercourses at the time of the survey. Management of the reens will give rise to seasonal changes in the vegetation cover and invertebrate communities, and also changes from year to year.

[1] Reens are regularly managed by the Natural Resources Wales; field ditches are generally managed by local landowners and are therefore subject to varying amounts of management.

3.3.2 Where there were limitations, as much relevant information within the survey criteria was collected as possible. The main limitations of the survey were as follows.

- Dense vegetation, including vegetation growing in and adjacent to the waterbody, restricting access to view into channel.
- Security fencing stopping safe access to parts of the waterbody.
- No access permission granted at the time of the survey.
- Health and safety concerns with regard to dangerous animals (e.g. cattle, horses, dogs).

3.3.3 Along some reens, vegetation management had resulted in the loss of plant species through mowing and strimming. This is likely to have resulted in a reduction in the number of plant species being recorded.

4 Results

4.1 Introduction

4.1.1 A summary description of each watercourse survey length is provided in this section. A total of nineteen reens were surveyed as part of the RCS. The locations of these watercourses are provided in Figure 1 and detailed RCS survey length maps (Figure 2), photographs (Annex B) and species lists (Annex C) are provided at the end of this report.

4.1.2 In accordance with the methodology outlined in the 'River Corridor Surveys: Conservation Technical Handbook 1' (NRA, 1992), each reen surveyed requires a description. This covers a stretch of river, its banks and adjacent land. This should include in-channel, emergent, bankside and surrounding habitats. The description provides a snapshot of each survey section at the time of survey.

4.1.3 All reens surveyed are within Gwent Levels SSSIs. These watercourses are linear features that are managed on a seven year rotation by NRW. As a consequence, the reen channel invariably contains areas of open water with marginal emergent vegetation. In many cases, as a consequence of apparently good water quality and regular management, the reens contain diverse assemblages of aquatic macrophytes and these are reported in detail within the Aquatic Macrophyte Survey 2015 Report (ES Appendix 10.30).

4.1.4 As the watercourses surveyed during the RCS are reens, the water is normally still. When this was not the case it is stated in the relevant section.

4.2 IDB27 Nant-y-Moor Reen

4.2.1 Nant-y-Moor Reen is located south of Duffryn and the Imperial Park, and east of Coedkernew towards the west of the proposed new section of motorway.

4.2.2 The sample section of the reen was split into two distinct habitat types. To the north, the reen is surrounded by semi-improved grassland with occasional scrub; and along the southern section the watercourse emerges from underneath a section of disused road and then through an area of broadleaf plantation woodland. Ordnance Survey (OS) base maps indicate that the water flows in a south easterly direction.

4.2.3 The northern section is 2.5 m wide, 0.5 m deep and has 2 m steep banks. This section curves in a south easterly direction towards a disused road. The banks along this section of reen were established with tall grassland with occasional broadleaved shrubs. The channel was established with dense emergent vegetation with few floating and submerged species present.

4.2.4 The southern section of the reen is wider than the northern section with steep sided banks. The north bank of this section had been recently mown at time of survey. The channel contains less emergent vegetation with a larger proportion of open water. A fence on top of the western bank borders an area of semi-improved grassland, this fence has become overgrown with dense bramble (*Rubus fruiticosus agg*) and provides a barrier to cattle.

4.3 IDB35 Percoed Reen

4.3.1 Percoed Reen is located to the south east of a disused road to the east of Coedkernew. The watercourse is 3 m wide in the south west and increases to 4 m wide in the north east and is 1 m deep with 1-2 m steep banks throughout. The channel is characterised by areas of dense emergent vegetation with a high quantity of floating and submerged vegetation.

4.3.2 Percoed Reen runs east to west. To the east and north of the sample area is an area of semi-natural woodland and along the northern boundary to the west tall marshy grassland with scattered scrub. Adjacent to the southern bank of the reen is a 3 m wide footpath that in turn is bordered by an overgrown field ditch containing patches of common reed (*Phragmites australis*), hawthorn (*Crataegus monogyna*) and goat willow (*Salix caprea*) with occasional mature English oak (*Quercus robur*) and ash (*Fraxinus excelsior*). Arable land is the predominant habitat to the south of the reen survey length.

4.4 IDB57

4.4.1 IDB57 is a tributary of the Percoed Reen, located to the east of the disused road in south Coedkernew. The reen is 4 m wide, 0.3 m deep and has steep 2 m banks.

4.4.2 The reen is adjacent to tall marshy grassland to the north and short ephemeral vegetation to the south. Between the area of short ephemeral vegetation and the reen are patches of dense bramble, scattered shrubs and a small footpath.

4.4.3 The reen is connected to a large pond to the north-west The watercourse is dominated by common reed with one area of open water towards the north-eastern side that is dominated by Nuttall's pondweed (*Elodea nuttallii*).

4.5 IDB34 Morfa Gronw Reen

4.5.1 Morfa Gronw Reen is positioned between Green Lane and Lighthouse Road to the south of Duffryn. According to OS base maps the water flows in a south easterly direction. The watercourse is divided into two sections by a railway track towards the north of the reen survey length. The northern section is surrounded by improved grassland with one field of semi-improved grassland to the east. The southern section is surrounded by semi-improved grassland, with the western side of the banks having been recently cut. Morfa Gronw Reen is species rich in emergent and submerged vegetation

4.5.2 The northern section is 4 m wide, 1 m deep and has shallow banks. The sample section is fairly straight and lies in a west to east direction. The bank and emergent vegetation is mostly common reed, with connecting field ditches including dense stands of blackthorn (*Prunus spinosa*), common reed and hawthorn. The centre of the watercourse is fairly open with little submerged or floating vegetation.

4.5.3 The southern section is 4 m wide, 1 m deep and has steep 1.5 m banks. The watercourse meanders through the surrounding habitat with three connecting field ditches. These connecting field ditches contain mostly common reed with the occasional hawthorn and goat willow. Nationally rare rootless duckweed

(*Wolffia arrhiza*) was locally abundant in the central section of the surveyed length. The eastern side of this section is characterised by occasional patches of common reed. The reen's channel is relatively open with the north having more emergent species than the south.

4.6 IDB37 Old Dairy Reen

4.6.1 Old Dairy Reen is situated between Lighthouse Road and Heol Pont-y-Cwcw road to the south of Duffryn. The reen is 5 m wide, 1.5 m deep and has heavily poached banks throughout.

4.6.2 The reen twists through the adjacent cattle grazed semi-improved grassland. According to the OS base map the water flows in a northerly to southerly direction. There is a species poor hedgerow 5 m south of the reen which runs parallel with the watercourse and comprises blackthorn, hawthorn and goat willow.

4.6.3 Old Dairy Reen channel has patches of a dense species rich assemblage of emergent vegetation with few submerged and floating species.

4.7 NRA10 Pont-y-Cwcw Reen

4.7.1 Pont-y-Cwcw Reen is adjacent to the east of Heol Pont-y-Cwcw Road to the south of Duffryn. The reen is 5 m wide, 0.5 m deep and has 1.5 m steep banks on the eastern side and heavily poached banks on the west.

4.7.2 The reen flows in a north westerly to south easterly direction according to the OS base map and is fairly straight. The northern point of this watercourse however curves through the landscape. The watercourse is adjacent to semi-improved grassland with a species poor hedgerow to the east containing blackthorn, hawthorn and the occasional crack willow (*Salix fragilis*). This hedgerow is divided from the reen by an unpaved road.

4.7.3 The emergent vegetation is well established throughout the reen with dense patches of arrowhead (*Sagittaria sagittifolia*).

4.8 NRA11 Sea Wall Reen

4.8.1 Sea Wall Reen is located to the east of Heol Pont-Y-Cwcw and to the west of the River Ebbw. Along the west bank, the reen is bordered by cattle grazed semi-improved grassland. The reen is separated from the River Ebbw to the west by a flood defence embankment that was grazed by horses at the time of the survey. This length of Sea Wall Reen is divided into two sections by a sluice gate, with the northern section appearing to have been recently cast (dredged).

4.8.2 North of the sluice gate the reen is 6 m wide, 2 m deep and has heavily poached banks. This section has frequent areas of open water with few patches of emergent, submerged and floating species.

4.8.3 South of the sluice gate the reen is 6 m wide, 1.5 m deep and has heavily poached banks. This section has significantly more emergent vegetation than the north with dense areas of common reed and bulrush. There is a high cover degree of water fern *Azolla filliculoides* in this section.

4.9 IDB77 Julian's Reen

4.9.1 Julian's Reen is located to the east of Meadows Road and to the north of Broad Street Common in Pye Corner. The reen is 4 m wide, 1.5 m deep and has steep 2 m banks.

4.9.2 The reen twists through cattle grazed marshy grassland in a north easterly to south westerly direction. The watercourse runs parallel with a farm access track on the western side. The western side of this access track is bordered by a species poor intact hedgerow containing ash, goat willow and hawthorn.

4.9.3 The northern section of the reen has higher plant species diversity with more bank and emergent species being present. The water surface throughout the surveyed section of Julian's Reen was 100% covered in duckweed species.

4.10 IDB68 Ellen's Reen

4.10.1 Ellen's Reen is located south of the A4810 on the western side of Tata Steelworks' land. The reen is 3.5 m wide, 1.5 m deep and has steep 1-2 m banks throughout.

4.10.2 This straight reen flows in a north-westerly to south-easterly direction. The watercourse is adjacent to dense scrub with a recently mown access track on the eastern side. This track is boarded by tall ruderal/herbs on the eastern side. There is a species poor intact hedgerow on the western side comprising ash, hawthorn and goat willow which divides the reen from the dense scrub.

4.10.3 The channel was characterised with occasional emergent vegetation and much submerged vegetation. Hairlike pondweed (*Potamogeton trichoides*) was abundant in some areas. At the south eastern point of the reen survey length the waterbody becomes dominated by water fern and duckweed species.

4.11 IDB66 Middle Reen

4.11.1 Middle Reen is located south of the A4810 and north of Broad Street Common. The reen is 4 m wide, 0.75 m deep and has 1 m deep banks.

4.11.2 This straight watercourse flows in a north westerly to south easterly direction and is a tributary of the Blackwall Reen. The watercourse is positioned between two fields of cattle grazed improved grassland. There is a defunct hawthorn hedgerow on the south western bank extending the full length of the reen. The north eastern bank had recently been cut.

4.11.3 The bank along the western side of the reen is established with a mixture of trees and shrubs. The watercourse has frequent areas of open water with little emerging and floating vegetation. There was a low cover of water fern throughout the reen survey length.

4.12 IDB67 Black Wall Reen & NRA25 Monk's Ditch

4.12.1 Black Wall Reen and Monk's Ditch are located south of the A4810 in the centre of within the Tata Steelworks land. The two reens are separated by a tall, 8 m wide flood bank inhabited by tall ruderal plant species. The two straight reens flow in a northerly to southerly direction. Black Wall Reen curves in a south westerly

direction at the southern end. The surveyed sections of both reens are situated within dense scrub, with the eastern side being dominated by Buddleia *(Buddeja davidii*). The northern points of these watercourses are adjacent to species poor defunct hedgerows comprising goat willow, with the occasional common lime (*Tilia x europaea*) and black poplar (*Populus nigra*). Following the watercourses south the western hedgerow borders improved grassland. The eastern hedgerow contains three large mature trees: ash, beech (*Fagus sylvatica*) and horse-chestnut (*Aesculus hippocastanum*) at the southern point of the reen survey length. Both watercourses share a high level of connectivity to the surrounding area through linking reens and field ditches.

4.12.2 Black Wall Reen is 3.5 m wide, 1.5 m deep and has steep 2 m banks. The banks along the reen are well established with tall ruderal species. The channel was established with frequent patches of emergent vegetation and dense sections of duckweed species. There was a diverse assemblage of submerged plants with hairlike pondweed abundant within the central section. The southern point of the reen survey area hasa low cover of water fern.

4.12.3 Monk's Ditch is 5 m wide, 2 m deep and has steep 4 m banks. The banks are dominated by common reed and bramble. This species poor watercourse has areas of open water with few emergent species being established, there no submerged or floating species were found.

4.13 Elver Pill Reen

4.13.1 Elver Pill Reen is located south of the A4810 within the Tata Steelworks land. This straight reen is 4 m wide, 1 m deep and has steep 1.5 m banks at the north side and expands to 5 m wide towards the south.

4.13.2 This watercourse is adjacent to semi-improved grassland with scattered scrub to the east and dense scrub to the west. The western bank is divided from an area of dense scrub with occasional blackthorn, crack willow, hawthorn and oak. The eastern side is separated from the grassland by a recently cut rank grassland access track.

4.13.3 The banks and emergent vegetation along the reen were established with common reed. There were few floating and submerged species within the areas of open water.

4.14 NRA21

4.14.1 NRA21 is situated on the eastern side of Tata Steelworks' land and to the west of North Row. This large watercourse is 8 m wide, 1-2 m deep and has heavily poached banks throughout.

4.14.2 The northern point of this watercourse lies in a straight north to south direction, with the southern point curving to the southwest. NRA21 is adjacent to cattle grazed semi-improved grassland throughout. There is an overgrown field ditch 15 m east of the reen, containing hawthorn. This field ditch is separated from NRA21 by a strip of semi-improved grassland. NRA21 is connected to Middle Road Reen at the northern point and Newcut Reen towards the south.

4.14.3 The eastern side of the reen has abundant common reed and the western side has a more diverse assemblage of emergent vegetation. NRA21 had a high

proportion of open water with few areas dominated by submerged or floating species.

4.15 Greenmoor Reen IDB45

4.15.1 Greenmoor Reen is located south of the A4810 and to the north of Rush Wall. Greenmoor Reen is 3 m wide, 0.5 m deep and has steep 2.5 m banks.

4.15.2 This straight watercourse flows in a northerly to southerly direction. The reen is situated between two fields of improved grassland used for silage production. The northern side of the reen is enclosed by dense bramble with occasional shrubs. This watercourse is a tributary to Cock's Street Reen.

4.15.3 The banks along this reen were well established with tall grassland vegetation. The watercourse is characterised by a dense mat of duckweed, with few emergent and submerged species present.

4.16 NRA20a Petty Reen

4.16.1 Petty Reen is located south of the A4810 at Llandevenny and to the southeast of the A4810. The reen is 4 m wide, 1.5 m deep and has shallow 1 m banks.

4.16.2 This watercourse flows in a northwest to southeast direction. The reen is adjacent to cattle grazed semi-improved grassland to the west and marshy grassland to the east. The reen has a high level of connectivity with surrounding reens as it is connected to both Rushwall Reen and Stutwall East Reen.

4.16.3 There is a barbed wire fence on the western side protecting the banks from becoming poached by cattle. The bank vegetation is dominated by herbacious vegetation with the occasional dense scrub. The watercourse has frequent emergent and submerged vegetation throughout. Duckweed species covered some 50% of the water's surface.

4.17 NRA20b Petty Reen

4.17.1 NRA20b is located south of the A4810 and north of the Rush Wall track. The water flow is sluggish and in a westerly direction. The watercourse is divided into two sections by a small farm bridge. The western section is situated to the south of an area of mixed broadleaf woodland comprising crack willow, goat willow and hawthorn, with cattle grazed improved grassland adjacent to the southern boundary of the reen. The eastern section of the reen is adjacent to cattle grazed semi-improved grassland to the north and marshy grassland to the south. The southern side of both sections had been recently mown. There are two species rich field ditches connected to the centre of this reen and the east of the watercourse connects to NRA20a Petty Reen.

4.17.2 The western section is 8 m wide and 1.5 m deep with gently sloped banks. The bank is unfenced on the southern side with occasional poaching from livestock. The banks of the reen have been recently cut removing the majority of the vegetation cover. The channel is dominated by duckweed species, with few emergent or submerged species.

4.17.3 The eastern section is 8 m wide, 1.5 m deep with shallow sloped banks. This section of the reen is protected from potential poaching by a barbed wire fence on both sides of the banks. Tall grassland species with the occasional dense scrub were established on the banks. The channel of the reen was dominated by duckweeds with a noticeable increase in emergent species compared with the western section.

4.18 IDB46a Stutwall East Reen

4.18.1 Stutwall East Reen is located south of Barecroft Common to the south of Llandevenny. The Reen is 3 m wide, 1 m deep and has steep 1-2 m banks.

4.18.2 This linear watercourse flows in a westerly to easterly direction and passes through a Site of Importance for Nature Conservation (SINC). Stutwall East Reen is separated from the surrounding rush pasture by a barbed wire fence. The waterbody has a high level of connectivity to the surrounding landscape through the joining field ditches and reens.

4.18.3 The bank vegetation is dominated by herbaceous vegetation. The channel was characterised by patches of dense emergent species with a diverse assemblage of submerged vegetation. Hairlike pondweed was abundant throughout this reen. The south-western side of the watercourse has areas of open water with frequent duckweed, whereas the eastern side on the reen is dominated by duckweed.

4.19 IDB47a Bareland Street East Reen

4.19.1 This watercourse is located to the east of A4810 and to the north of Barecroft Common. The reen is 4 m wide, 1 m deep and has steep 1 m banks throughout.

4.19.2 Bareland Street East Reen meanders through the landscape with the water flowing in a north-easterly to south-westerly direction. The western section runs parallel with the A4810 in the west and is enclosed by dense scrub; in the east it is adjacent to marshy grassland. The central section of the reen is adjacent to horse grazed semi-improved grassland to the north and marshy grassland to the south. The north-eastern point of the watercourse is next to marshy grassland to the west and residential property to the east.

4.19.3 The central section of the reen has a barbed wire fence on either side preventing potential damage to the bank from livestock. The banks alongside the central section of the reen are characterised by tall grassland vegetation. The reen's channel has dense patches of emergent vegetation with occasional floating and submerged species.

4.20 Protected Species

4.20.1 Table 4.1 below provides a summary of the potential for, or know presence of protected species within each reen corridor described above.

Table 4.1: Summary of the potential for, or known presence of protected species

Reen Reference	Species potential / presence	Notes
IDB27 Nant-y-Moor Reen	Amphibians	The well vegetated banks and a high density of emergent species provide shelter and foraging opportunities for amphibians.
	Water vole	2014 survey found water vole activity in the northern sections of the watercourse (ES Appendix 10.8).
	Otter	Adjacent woodland provides suitable laying-up and holt habitat.
	Grass snake	The northern section provides suitable foraging, hibernation and basking sites.
	Badger	Adjacent woodland provides a suitable environment for setts.
IDB35 Percoed Reen	Badger	Adjacent woodland provides a suitable environment for setts.
	Grass snake	The northern side of the reen provides suitable foraging sites.
	Otter	Adjacent woodland provides suitable laying-up and holt sites. Presences of fish in the watercourse provides foraging opportunities.
	Water vole	Steep banks and suitable vegetation provide suitable habitat for water vole.
IDB57	Amphibians	The well vegetated banks and a high density of emergent species provide suitable habitat for amphibians.
	Badger	Surrounding habitats provide suitable foraging areas.
	Grass snake	Adjacent habitat provides suitable foraging, basking and hibernation sites.
IDB34 Morfa Gronw Reen	Amphibians	The well vegetated banks and a high density of emergent species provide suitable habitat for amphibians.
	Water vole	Steep banks and suitable vegetation provide a suitable environment for water voles. Water vole activity was recorded in this reen during the 2014 survey (ES Appendix 10.8).
IDB37 Old Dairy Reen	Amphibians	The well vegetated banks and a high density of emergent species provide suitable habitat for amphibians. The short pasture provides foraging opportunities.
	Badger	Surrounding semi-improved grassland provides suitable foraging areas.
	Otter	Possible commuting route to more favourable habitat.

Reen Reference	Species potential / presence	Notes
NRA10 Pont-y-Cwcw	Amphibians	The well vegetated banks and a high density of emergent species provide suitable habitat for amphibians.
	Badger	Surrounding semi-improved grassland provides suitable foraging areas.
	Water vole	Steep banks and suitable vegetation provide suitable habitat for water vole.
Julian's Reen	Otter	The intact hedgerow provides potential holt and laying up environment.
	Water vole	Steep banks and suitable vegetation in the northern section of the reen provide suitable habitat for water vole. Water vole activity was recorded to the south of the surveyed area during the 2014 surveys (ES Appendix 10.8).
IDB68 Ellen's Reen	Amphibians	The well vegetated banks on the western side and the occasional emergent plant species provide amphibians with shelter and foraging opportunities.
	Badger	The habitat to the north west of Ellen's Reen provides suitable habitat for badger setts. Badger faeces were found on the access track to the east of Ellen's Reen.
	Otter	Otter spraint was present on the northern bridge. The surrounding area provides suitable habitat for holts and laying up.
	Grass snake	Surrounding dense scrub provides suitable habitat for basking, foraging, hibernation and shelter.
IDB66 Middle Reen	Otter	A potential otter slide was found in the southern side of Blackwall Reen, which is closely connected to Middle Reen. The defunct hedgerow provides suitable holt and laying up opportunities.
IDB67 Blackwall Reen & NRA25 Monk's Ditch	Amphibians	The well vegetated banks and a high density of emergent plant species provide suitable habitat for amphibians.
	Badger	The surrounding dense scrub provides suitable habitat for badger setts.
	Otter	A potential otter slide was found in the south-west of Blackwall Reen. The surrounding dense scrub provides a suitable environment for holts and laying up.
	Grass snake	Grass snakes were found during the 2015 survey in the Buddleia scrub to the east of Monk's Ditch (ES Appendix 10.27).
	Water vole	The steep and well vegetated banks provide suitable habitat for water voles. Water vole activity was recorded in the Monk's Ditch in the 2014 surveys (ES Appendix 10.8).
Elver Pill Reen	Amphibians	The well vegetated banks and a high density of emergent species provide suitable habitat for amphibians.
	Badger	Badger faeces were found on the south-eastern section of the access track. The dense scrub to the west provides suitable habitat for badger setts.
	Otter	The dense scrub to the west provides suitable habitat for

Reen Reference	Species potential / presence	Notes
		holts and laying up.
	Grass snake	Surrounding dense scrub provides suitable habitat for basking, foraging, hibernation and shelter.
	Water vole	Steep banks and suitable vegetation throughout the reen provide suitable habitat for water vole.
NRA21	Amphibians	The occasional emergent species and slowing water provide a suitable habitat for amphibians. The short pasture provides good foraging areas.
	Badger	The overgrown field ditch to the east has potential for badger setts.
	Otter	The overgrown field ditch to the east provides a suitable environment for holts and laying up
	Water vole	2014 survey found water vole field signs within this watercourse (ES Appendix 10.8).
Greenmoor Reen	Amphibians	The well vegetated banks and a high density of emergent species provide suitable habitat for amphibians.
	Badger	The dense scrub to the northern section of the watercourse provides suitable habitat for badger setts.
	Otter	The dense scrub to the northern section of the watercourse provides suitable habitat for otter holts and laying up.
	Grass Snake	The dense scrub at the northern section of the reen provides a suitable environment for grass snake activity.
	Water vole	Water vole activity was found in Greenmoor during the 2015 water vole and otter survey (ES Appendix 10.25).
NRA20a Petty Reen	Grass snake	The marshy grassland to the east of Petty Reen provides a suitable habitat for foraging.
	Water vole	Water vole field signs were found in Petty Reen during the 2015 water vole and otter survey (ES Appendix 10.25).
NRA20b Petty Reen	Amphibians	The well vegetated banks and occasional emergent plant species provides amphibians with a suitable area to forage and find shelter .
	Badger	Adjacent woodland provides a suitable environment for setts.
	Otter	Adjacent woodland provides a suitable environment for holts and laying up.
	Water vole	Water vole field signs were found throughout this watercourse during the 2015 water vole and otter survey (ES Appendix 10.25).
IDB47a Bareland Street East Reen	Amphibians	The well vegetated banks and cover of emergent species provide suitable habitat for amphibians.
	Badger	The dense scrub in the south-western section of the reen provides a suitable area for badger setts.
	Otter	The dense scrub in south-western section of the reen provides opportunities for otter holts and laying up.
	Water vole	Water vole activity was found throughout the central section of this reen during the 2015 water vole and surveys (ES Appendix 10.25).

5 Discussion

5.1 Introduction

5.1.1 This RCS provides baseline information for the nineteen watercourses surveyed between August and October 2015.

5.2 Survey findings

5.2.1 The reens surveyed during the RCS survey period were at various stages and types of management. Each reen provides different ecological niches potentially supporting a diverse range of wildlife. Detailed information on the aquatic species assemblage from the RCS is presented in ES Appendix 10.30. Other protected species found within these reens are discussed in the Water Vole and Otter 2015 Report (ES Appendix 10.25), Great Crested Newt Survey 2015 Report (ES Appendix 10.22) and Phase 1 Habitat Survey 2015 Report (ES Appendix 10.19).

5.2.2 All reens are within the Gwent Levels SSSIs and are main features for which the SSSIs have been designated. Consequently, the reen system is of national importance for nature conservation.

5.2.3 The survey findings confirmed that the new section of motorway would cross a significant length of ecologically rich reens and associated habitats that are a constituent part of the Gwent Levels SSSIs.

5.2.4 The survey findings provide a baseline understanding of the reen systems within the SSSIs and will inform the mitigation adopted for the new section of motorway. The information provided within this report provides a valuable record of the sections of reen that would be lost under the footprint of the new motorway and will also act as a template for the replacement reens.

References

JNCC (2003) A Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit.

National Rivers Authority (1992). River Corridor Surveys. Conservation Technical Handbook Number 1. http://www.cieem.net/habitats-aquatic#sthash.nEruSToO.dpuf

Figures

Legend

- River Corridor Survey
- 100m Study area

Study area shown reflects the scheme design at the time of the survey

Llywodraeth Cymru
Welsh Government

Appendix 10.32 River Corridor Survey Report

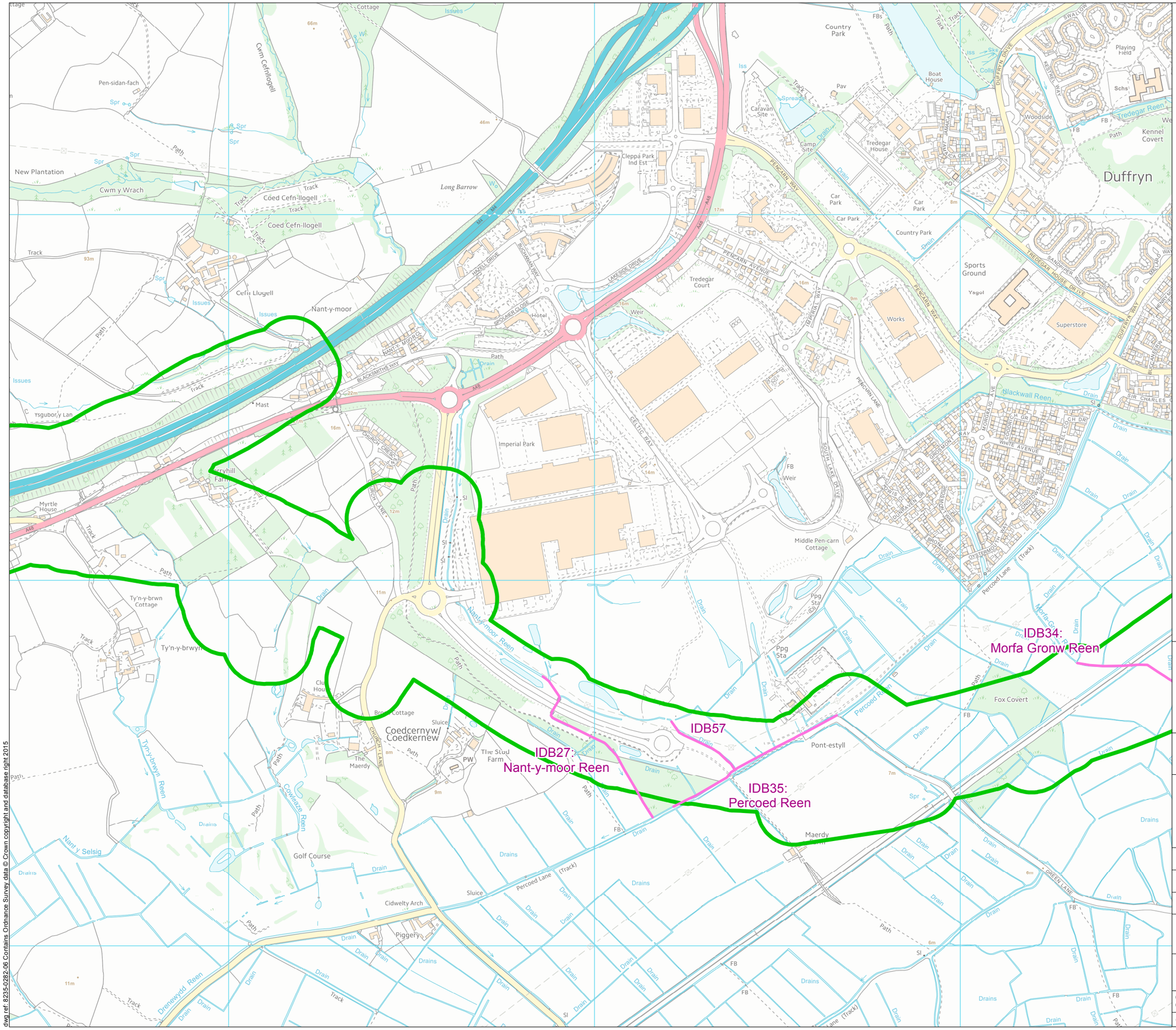
River Corridor Survey Site Locations

Figure: 1a	Revision: -
Date: March 2016	Status: AT ISSUE
Drawn: MS	Checked: KJ

Scale: A3 @ 1:10,000
0 250 500m

N

dwg ref: 8235-0282-06



Legend

- River Corridor Survey
- 100m Study area

Study area shown reflects the scheme design at the time of the survey

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Appendix 10.32 River Corridor Survey Report

River Corridor Survey Site Locations

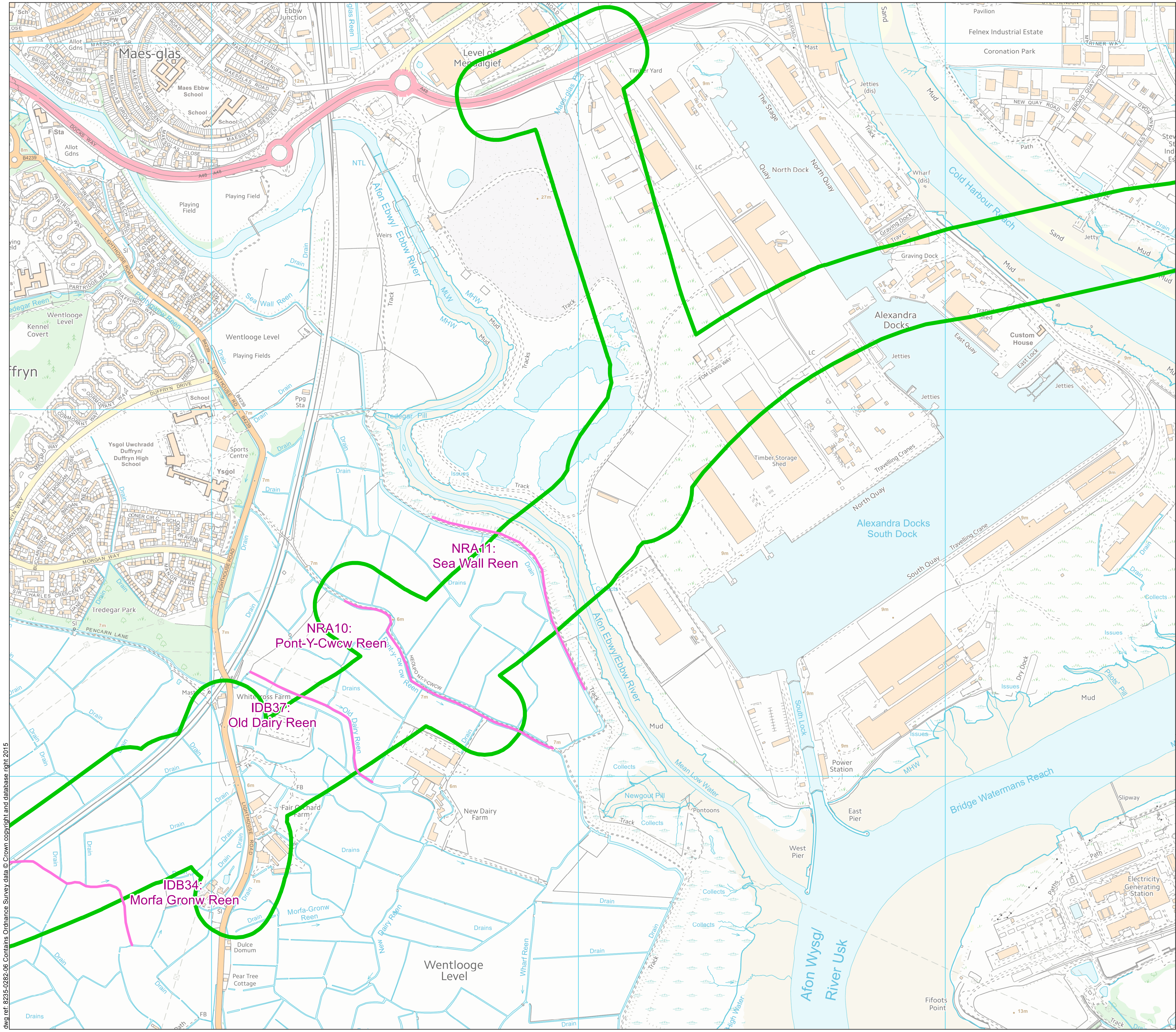
Figure: 1b	Revision: -
Date: March 2016	Status: AT ISSUE
Drawn: MS	Checked: KJ

Scale: A3 @ 1:10,000

0 250 500m

N

dwg ref: 8235-0282-06



Legend

- River Corridor Survey
- 100m Study area

Study area shown reflects the scheme design at the time of the survey

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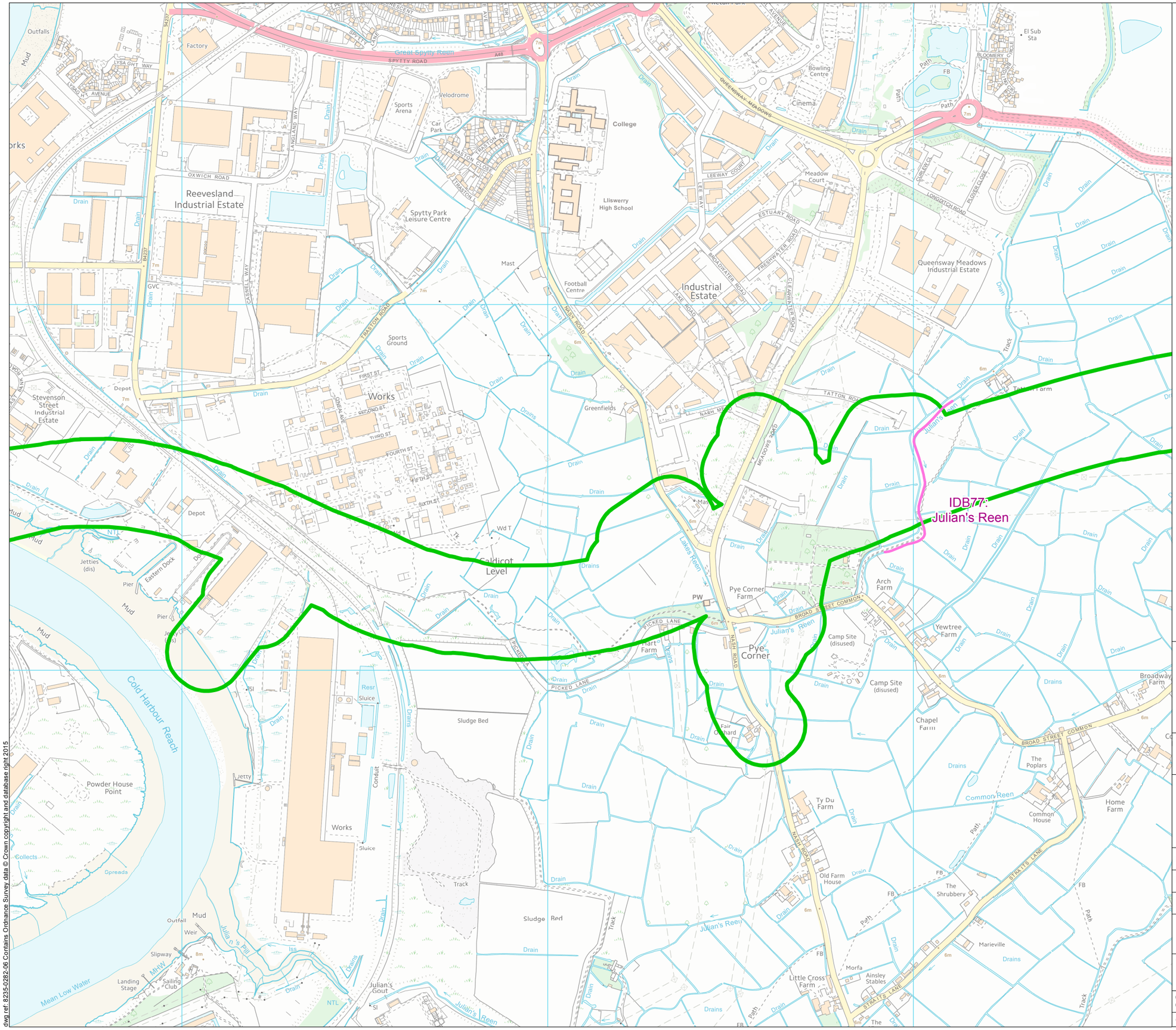
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Site Locations

Figure: 1c	Revision: -
Date: March 2016	Status: AT ISSUE
Drawn: MS	Checked: KJ

Scale: A3 @ 1:10,000
0 250 500 m
N

dwg ref: 8235-0282-06



Legend

- River Corridor Survey
- 100m Study area

Study area shown reflects the scheme design at the time of the survey

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Appendix 10.32 River Corridor Survey Report

River Corridor Survey Site Locations

Figure: 1d	Revision: -
Date: March 2016	Status: AT ISSUE
Drawn: MS	Checked: KJ

Scale: A3 @ 1:10,000

0 250 500m

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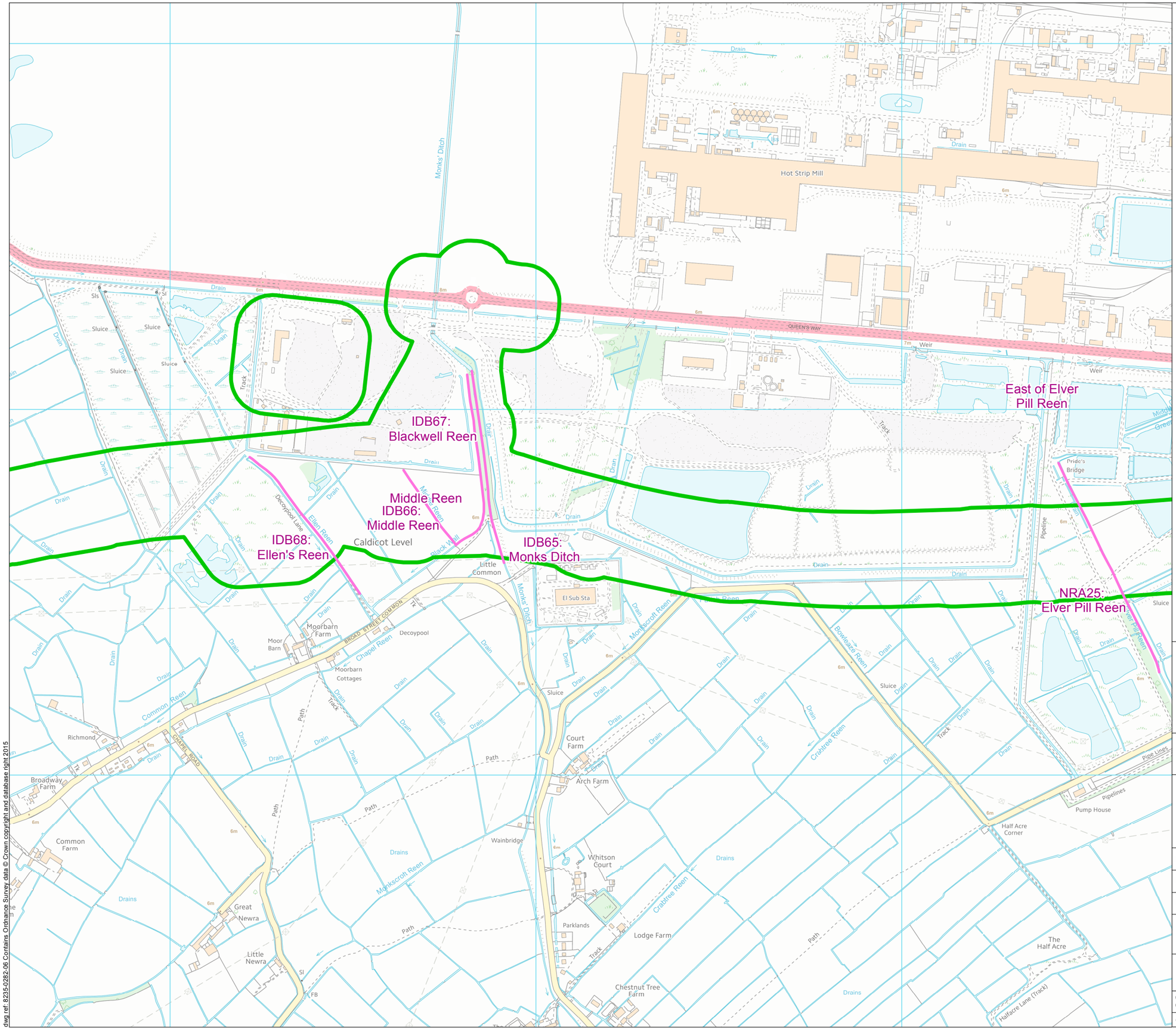

Legend

- River Corridor Survey
- 100m Study area

Study area shown reflects the scheme design at the time of the survey

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Appendix 10.32 River Corridor Survey Report

River Corridor Survey Site Locations

Figure: 1e	Revision: -
Date: March 2016	Status: AT ISSUE
Drawn: MS	Checked: KJ

Scale: A3 @ 1:10,000

0 250 500m

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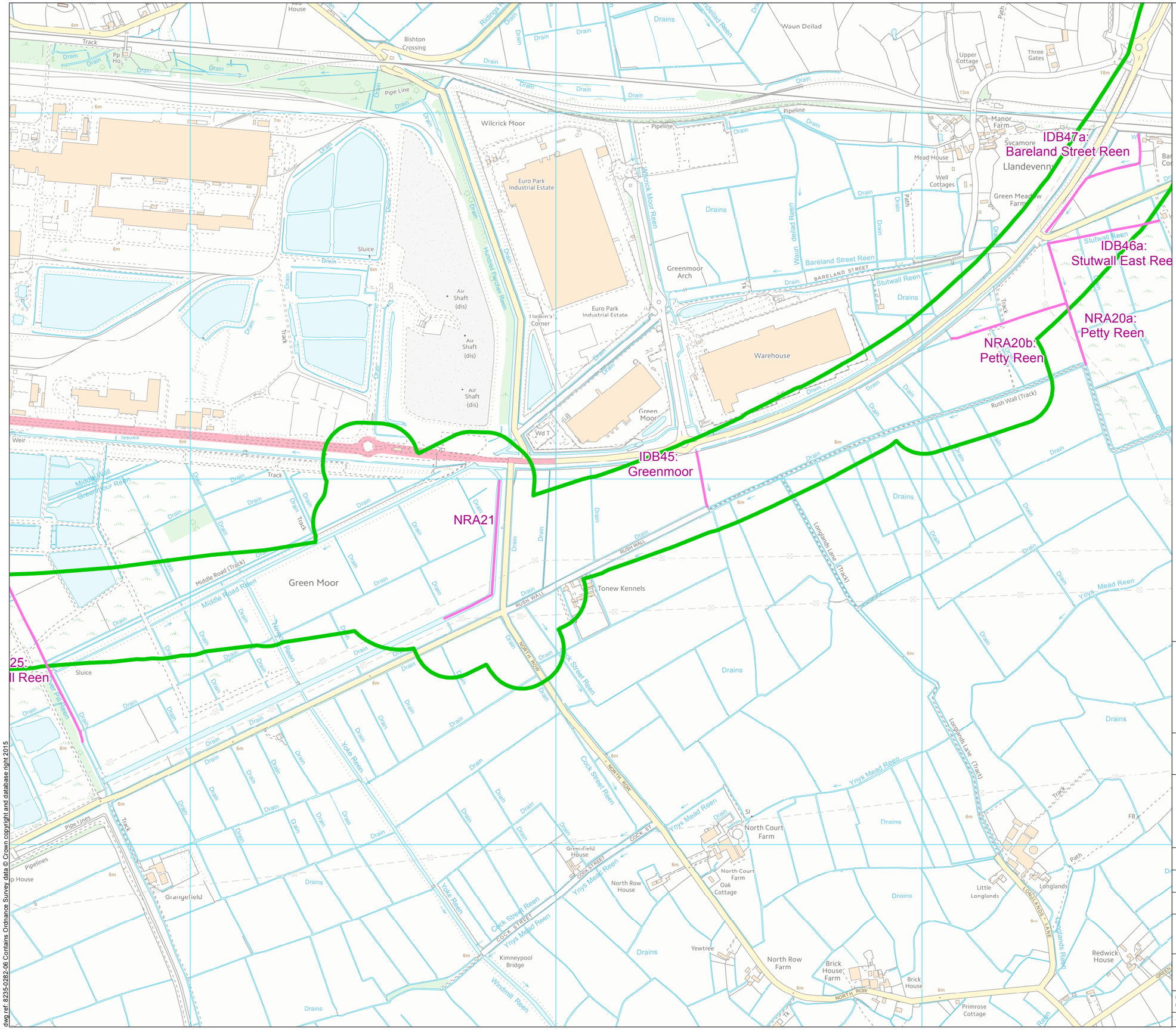

Legend

- River Corridor Survey
- 100m Study area

Study area shown reflects the scheme design at the time of the survey

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Appendix 10.32 River Corridor Survey Report

River Corridor Survey Site Locations

Figure: 1f	Revision: -
Date: March 2016	Status: AT ISSUE
Drawn: MS	Checked: KJ

Scale: A3 @ 1:10,000
0 250 500m

N

dwg ref: 8235-0282-06

Legend

- River Corridor Survey
- 100m Study area

IDB47a: Bareland Street Reen

IDB46a: Stutwall East Reen

NRA20a: Petty Reen

NRA20b: Petty Reen

Study area shown reflects the scheme design at the time of the survey

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Welsh Government

Appendix 10.32 River Corridor Survey Report

River Corridor Survey Site Locations

Figure: 1g	Revision: -
Date: March 2016	Status: AT ISSUE
Drawn: MS	Checked: KJ

Scale: A3 @ 1:10,000

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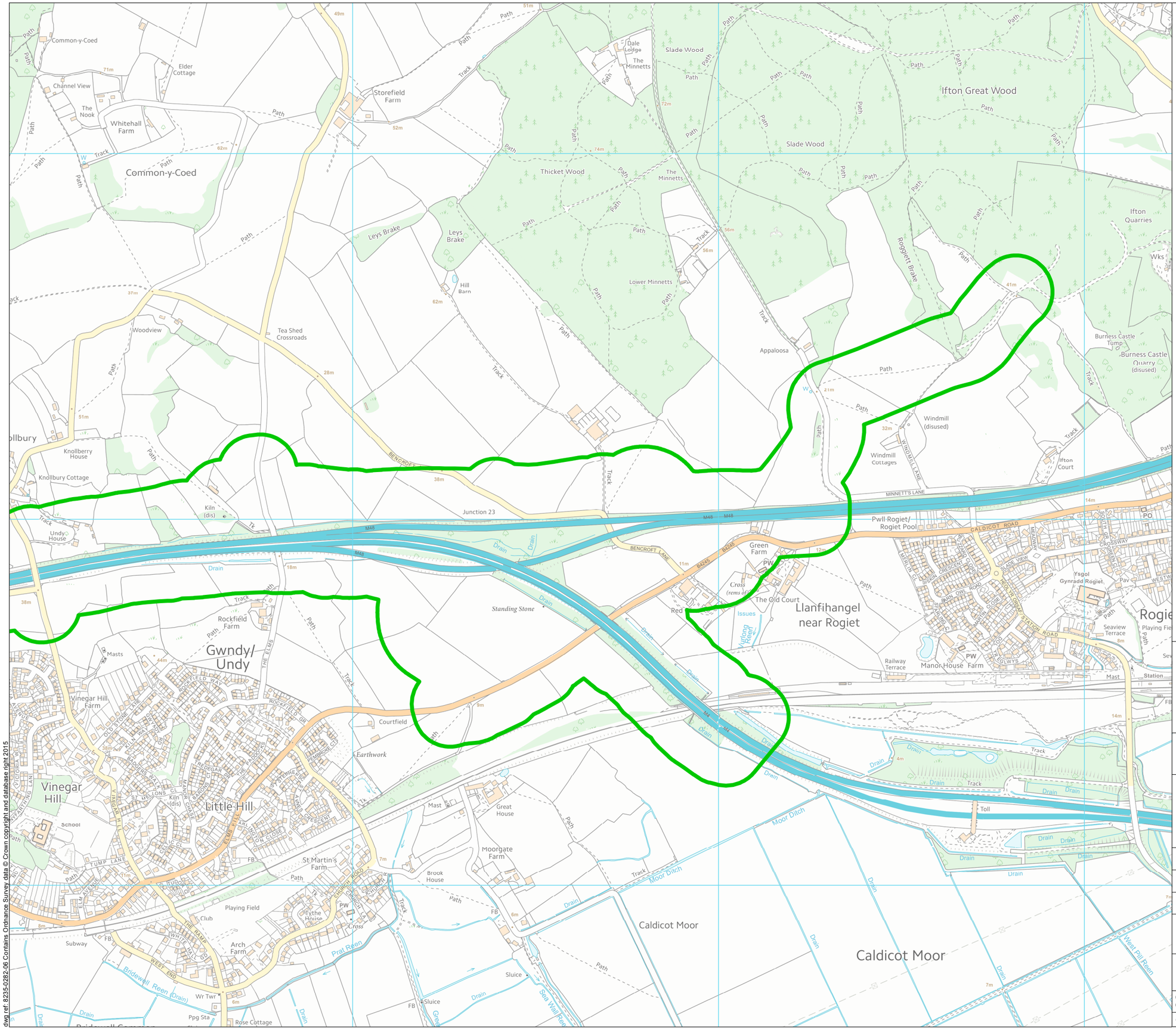
dwg ref: 8235-0282-06



Legend

- River Corridor Survey
- 100m Study area

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Welsh Government

Appendix 10.32 River Corridor Survey Report

River Corridor Survey Site Locations

Figure: 1h	Revision: -
Date: March 2016	Status: AT ISSUE
Drawn: MS	Checked: KJ

Scale: A3 @ 1:10,000
0 250 500m

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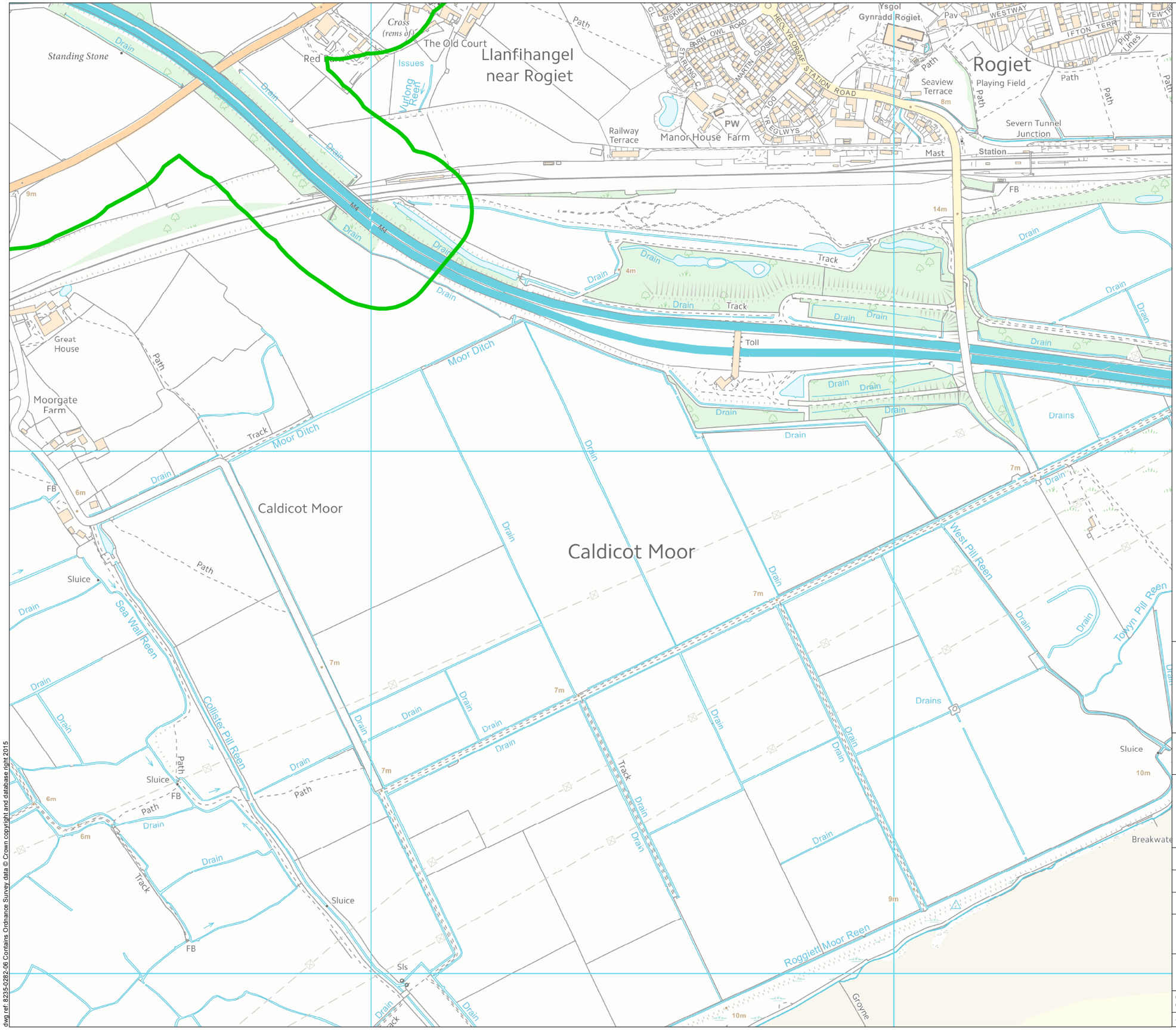

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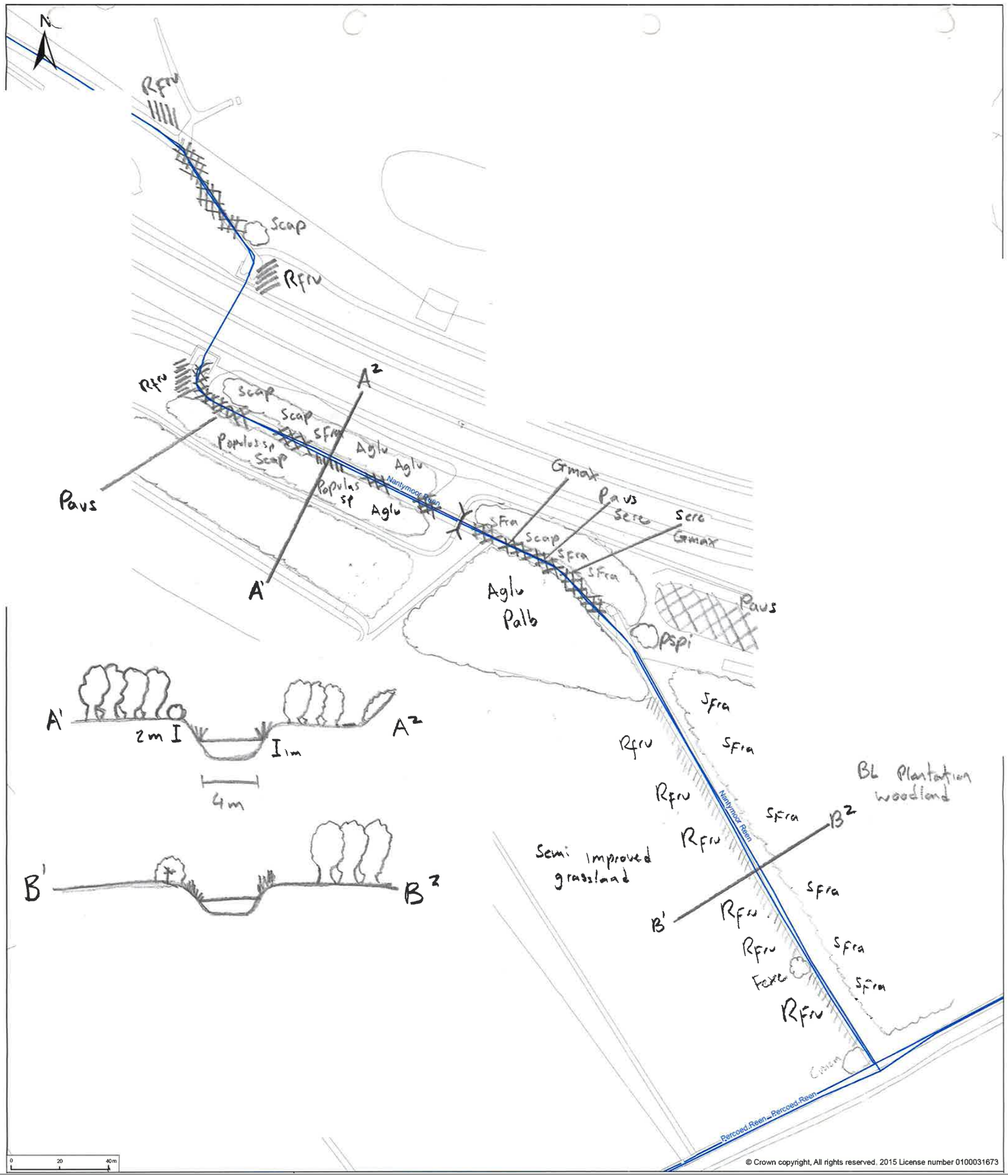

2.9.15
SF, NR
90% Cloud cover

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Welsh Government

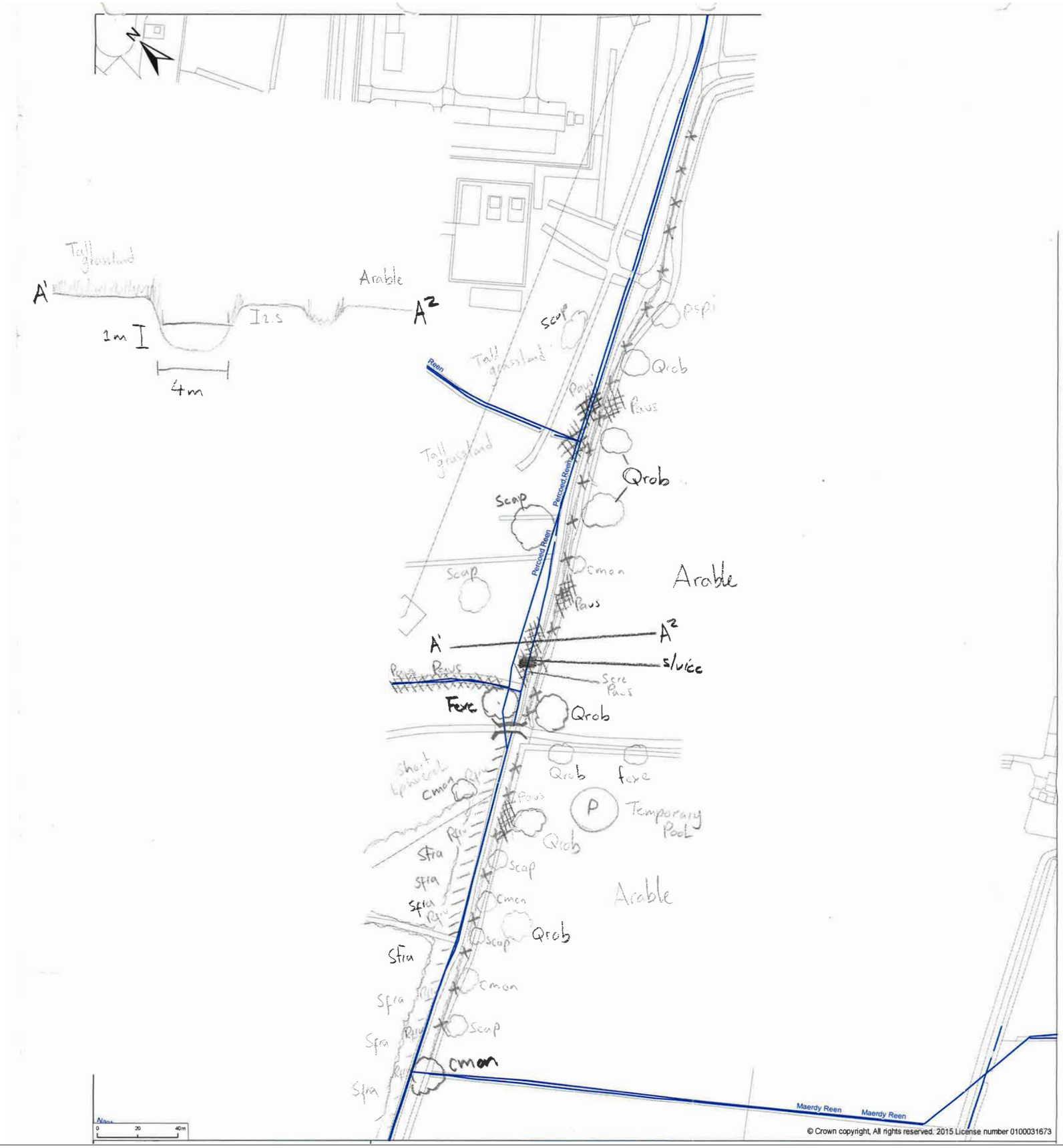
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
IDB27: Nant-y-moor Reen

Figure: 2a	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



2.9.15
SF, NR

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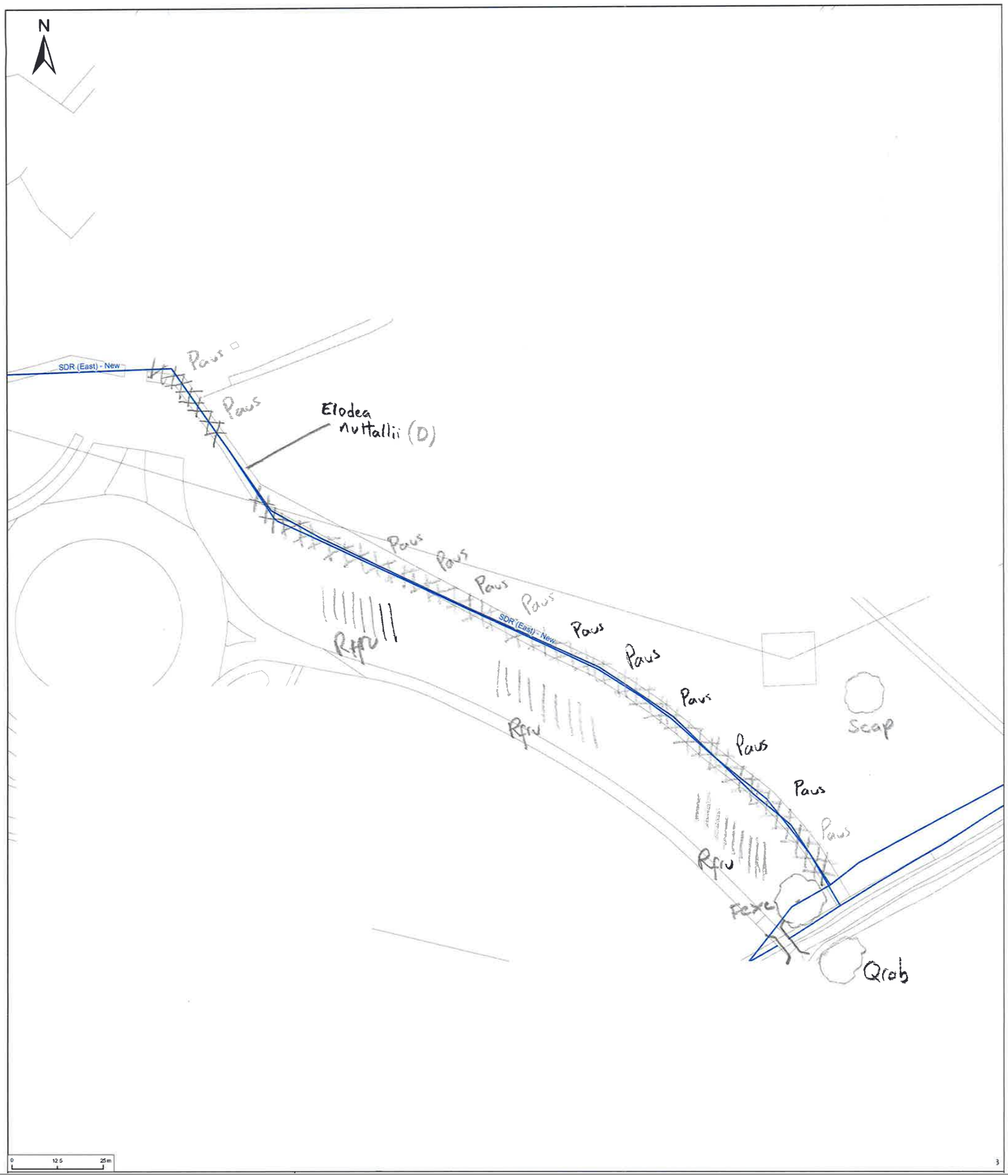
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
IDB35: Percoed Reen

Figure: 2b	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



2.9.15
SF. NR
90% cloud cover, no wind

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Welsh Government

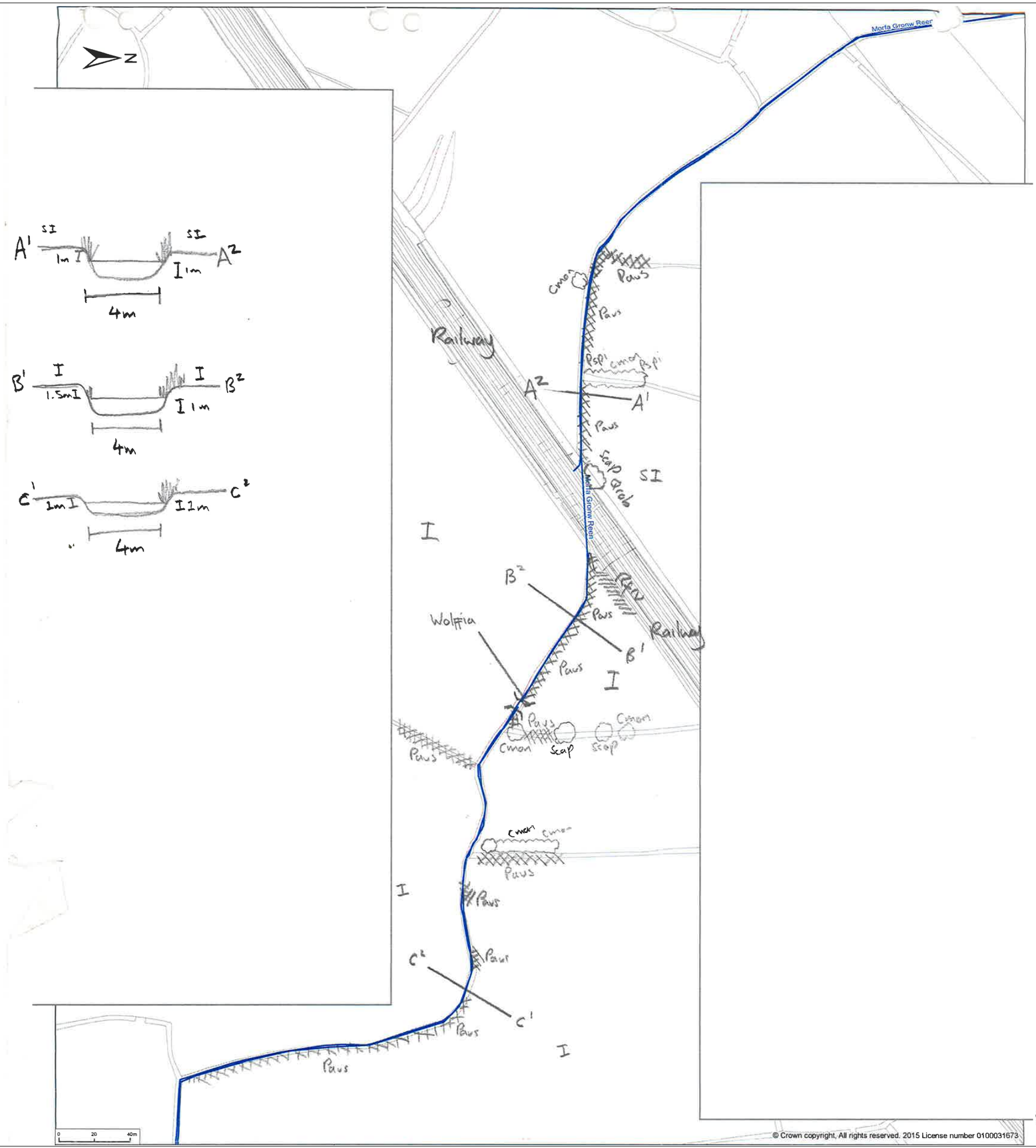
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
IDB57

Figure: 2c	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



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Welsh Government

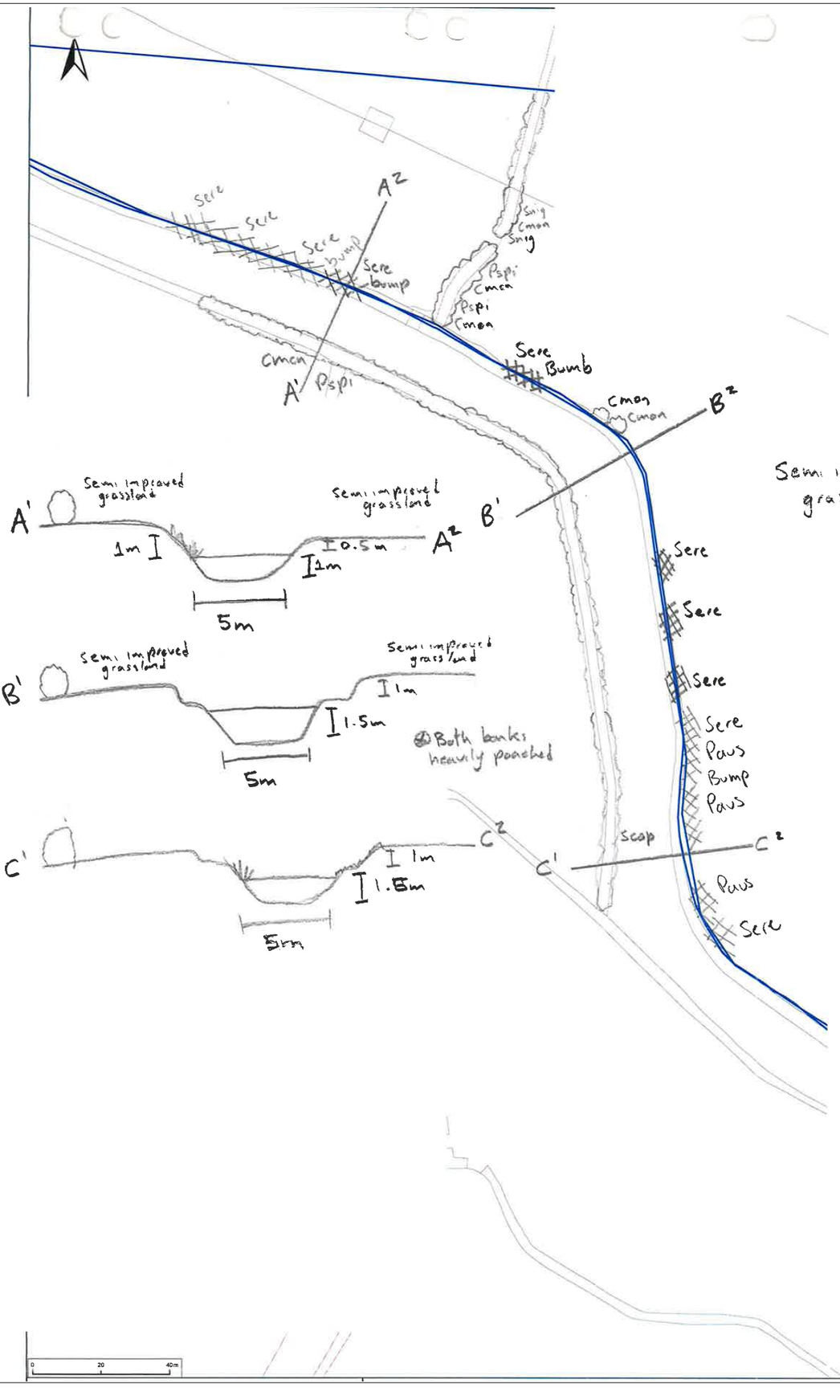
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
IDB34: Morfa Gronw Reen

Figure: 2d	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



24.8.15
EW SF

- Turbidity 3
- Heavily poached
- 50% channel emergent
- ~20% algae

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Welsh Government

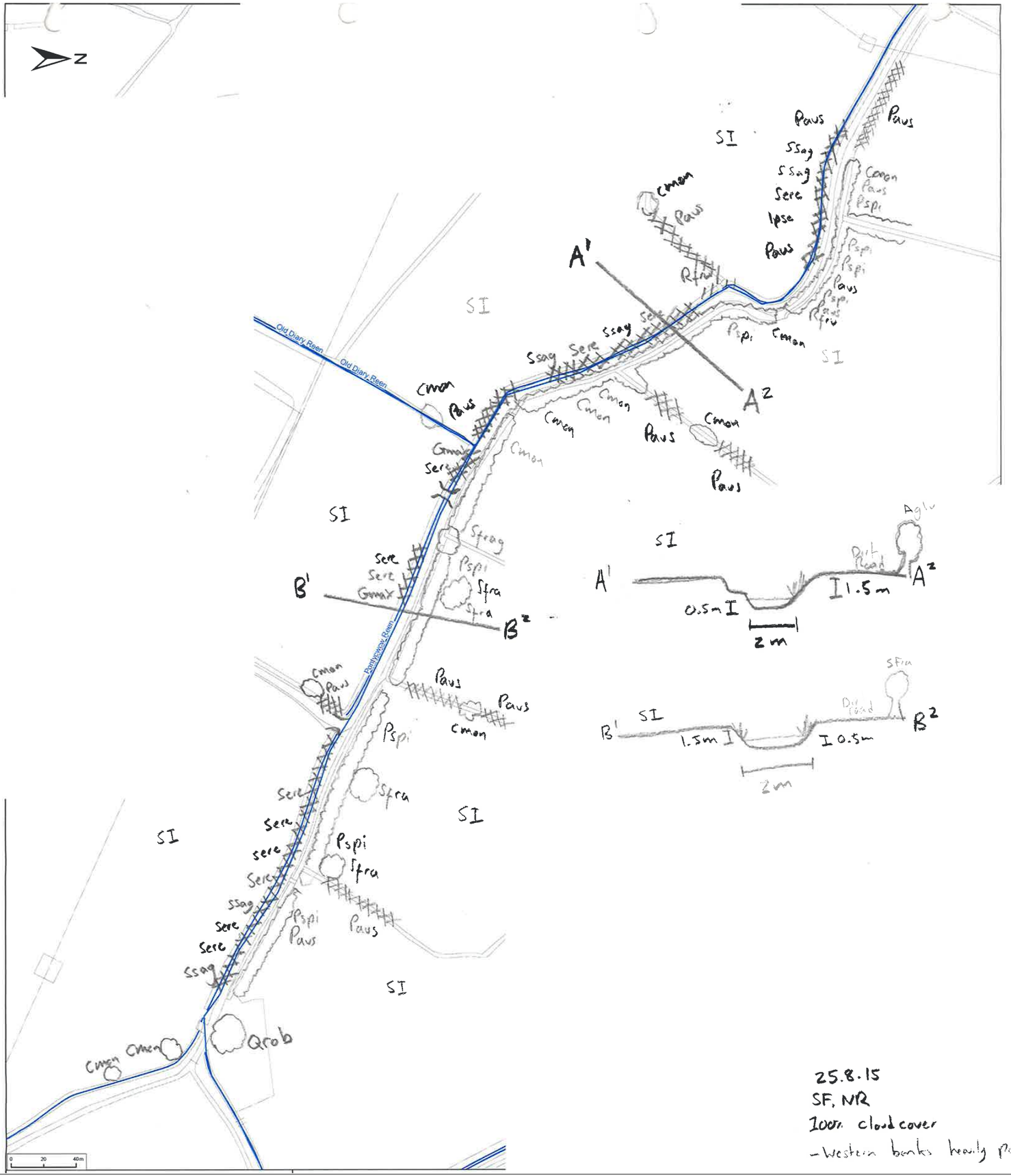
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
IDB37: Old Dairy Reen

Figure: 2e	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



25.8.15
SF, NR
100% cloud cover
- western banks heavily poached on pontygwaith Reen

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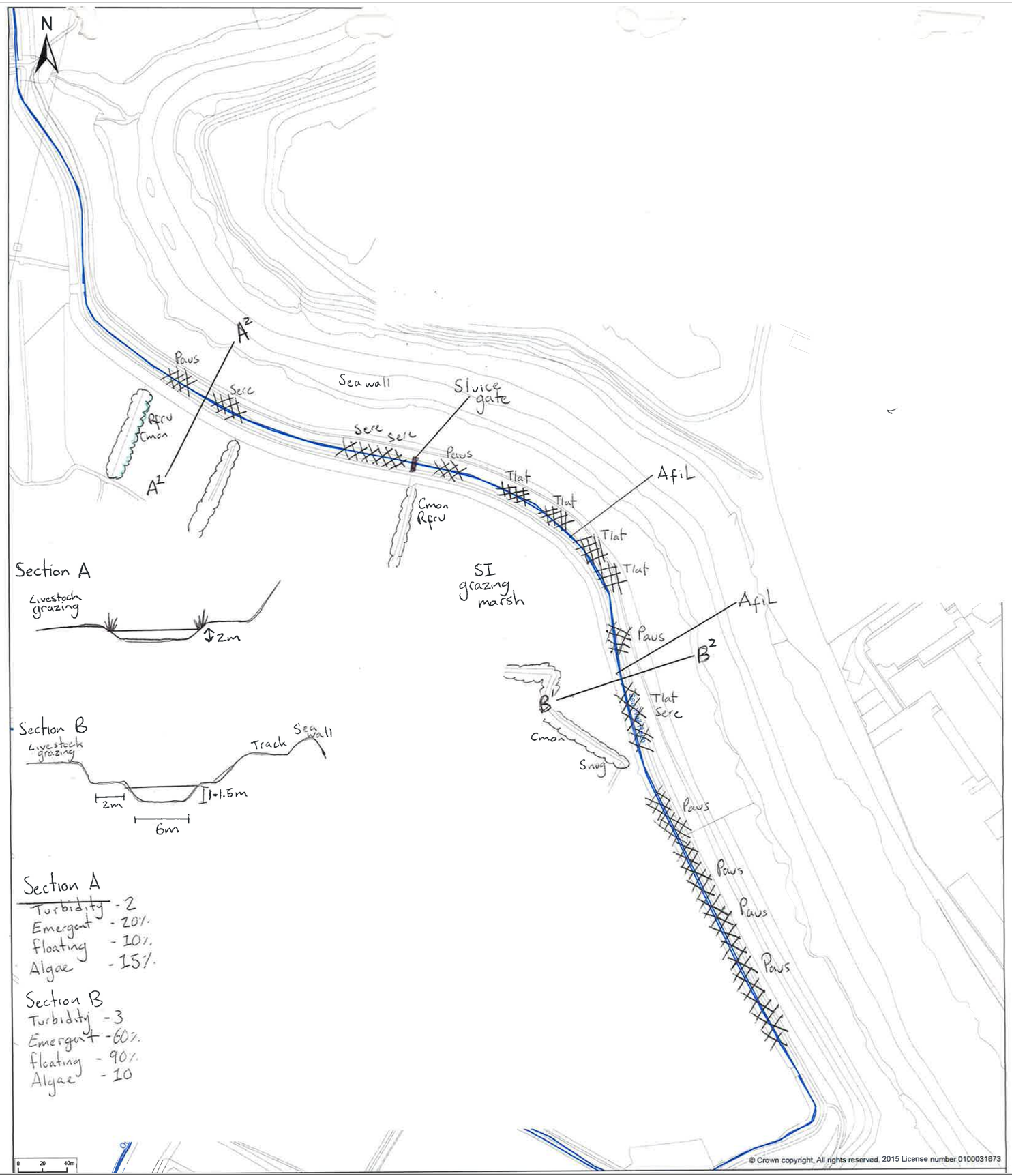
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
NRA10: Pont-Y-Cwcw Reen

Figure: 2f	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



23.8.15 SF - NR
100% Cloud cover, Light rain

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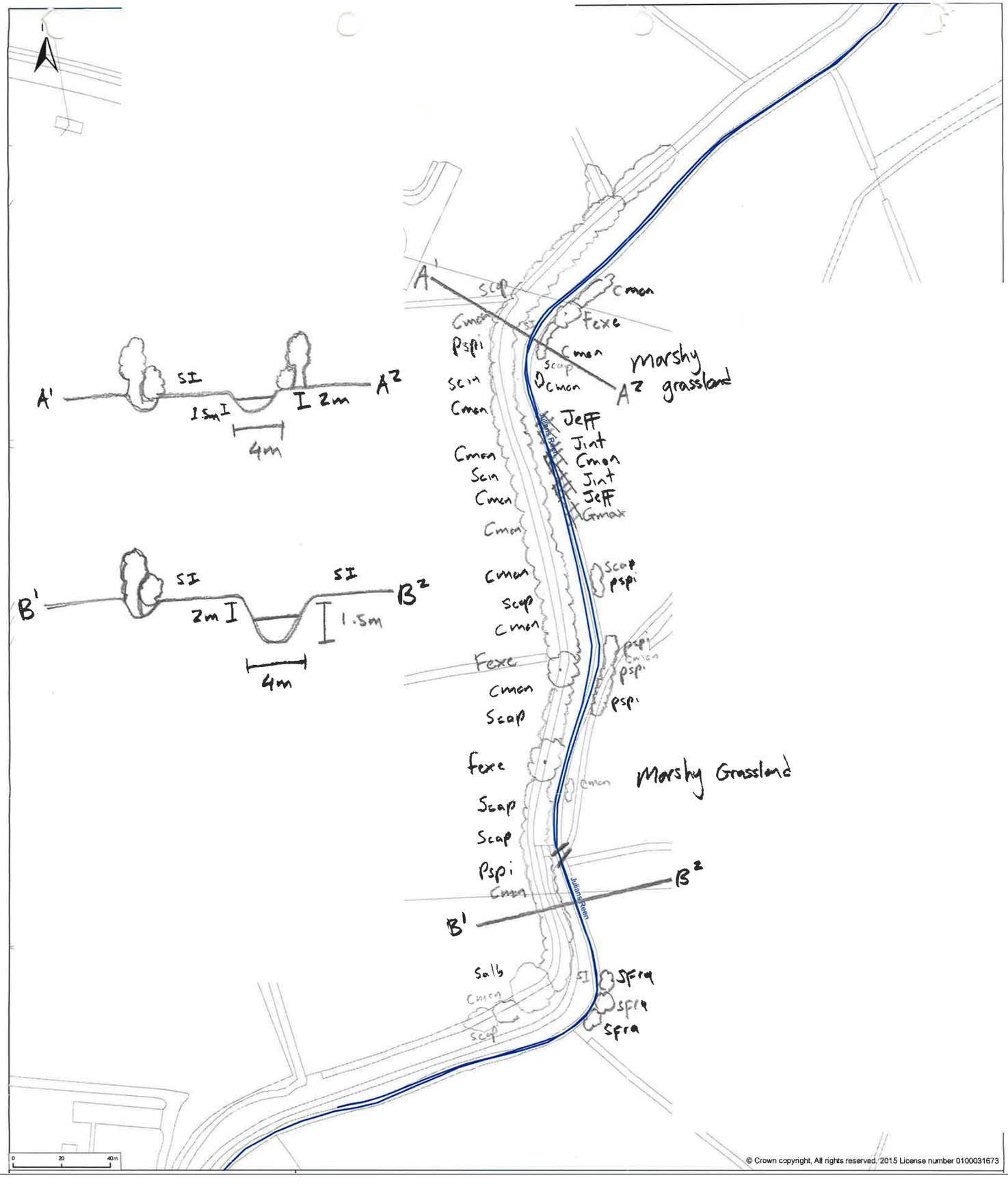
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps NRA11: Sea Wall Reen

Figure: 2g	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



8.9.15
SF · GK

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Welsh Government

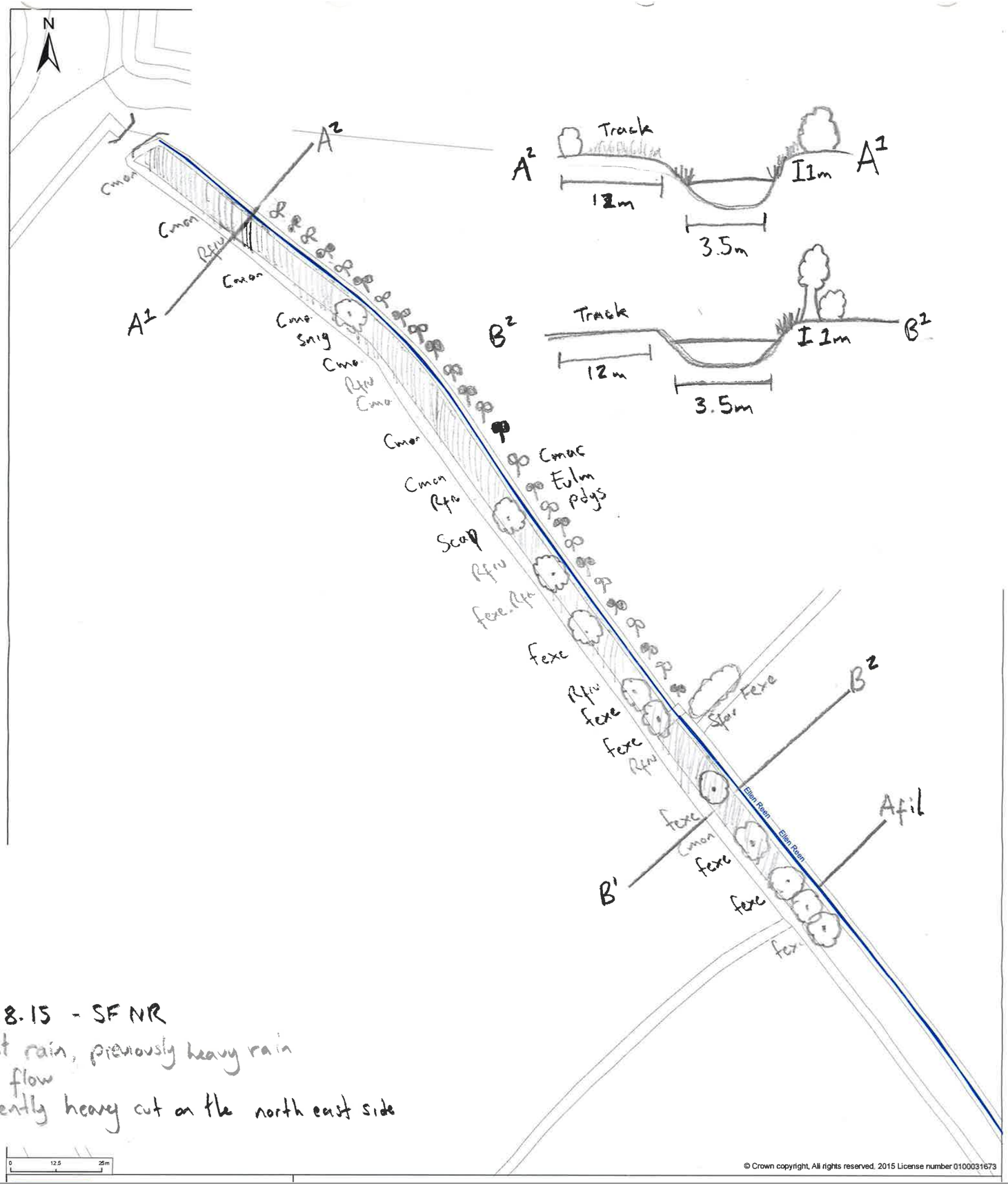
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
IDB77: Julian's Reen

Figure: 2h	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



14.8.15 - SF NR
- Light rain, previously heavy rain
- No flow
- Recently heavy cut on the north east side

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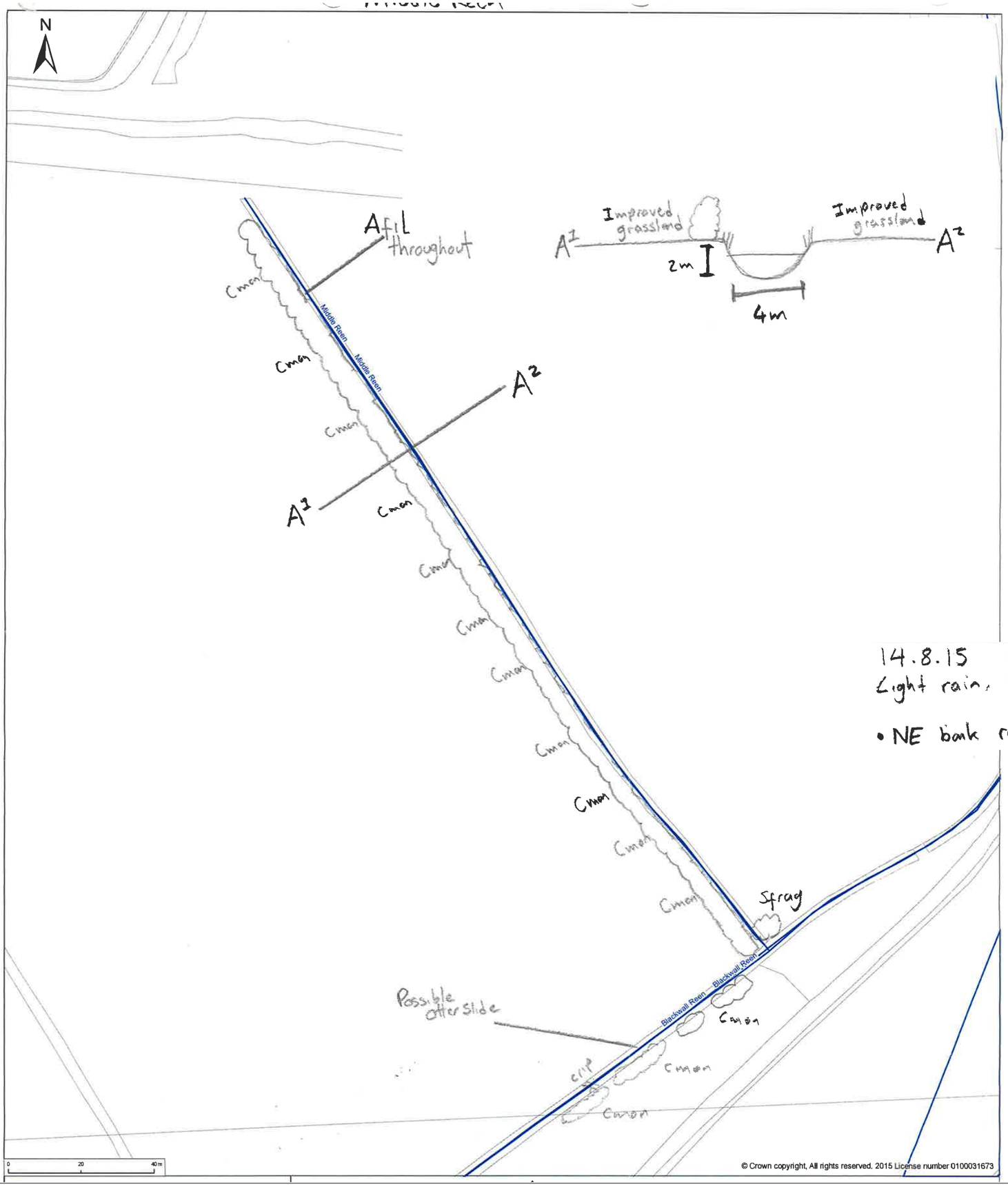
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
IDB68: Ellen's Reen

Figure: 2i	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



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Welsh Government

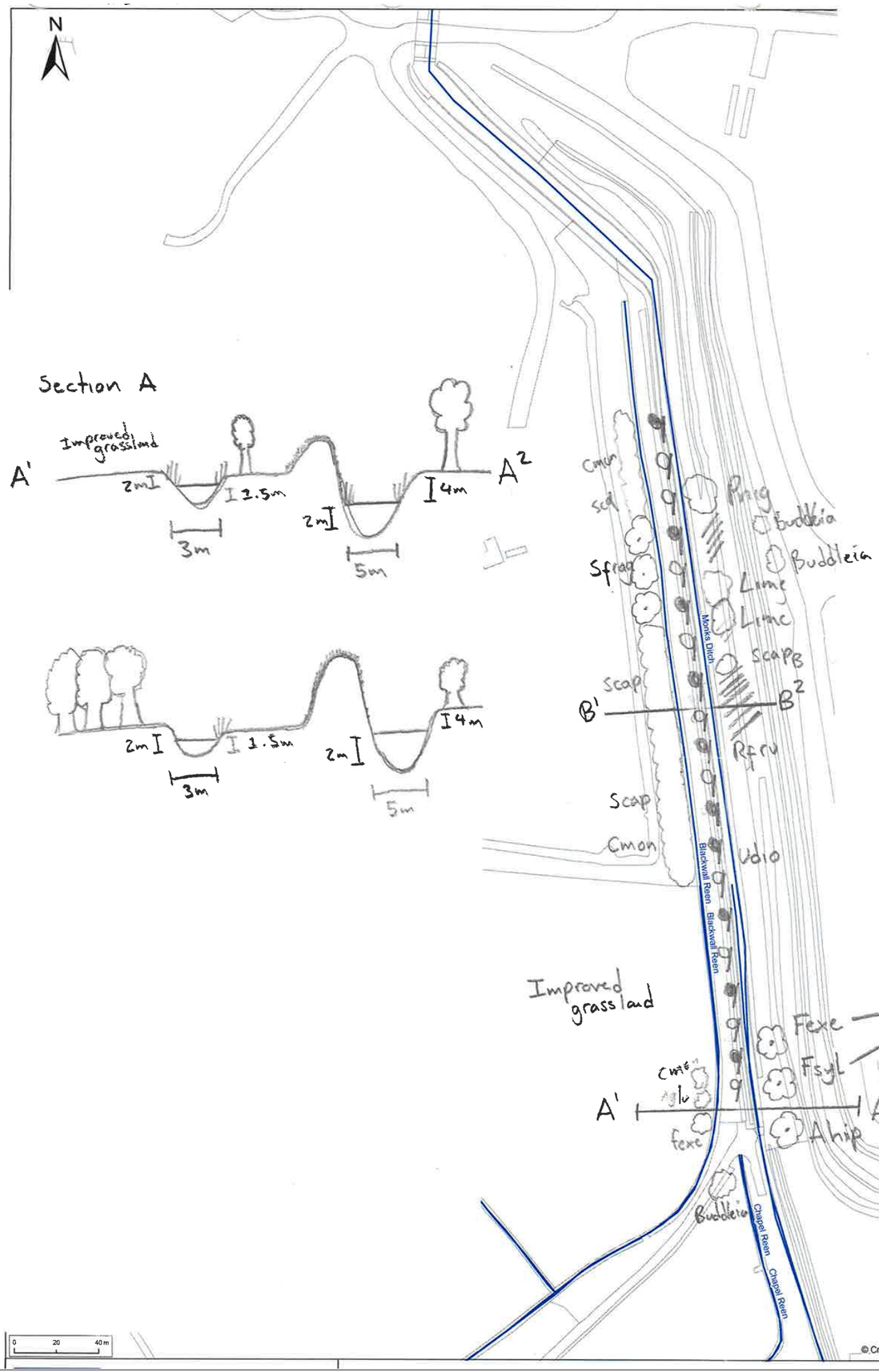
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
IDB66: Middle Reen

Figure: 2j	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



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Welsh Government

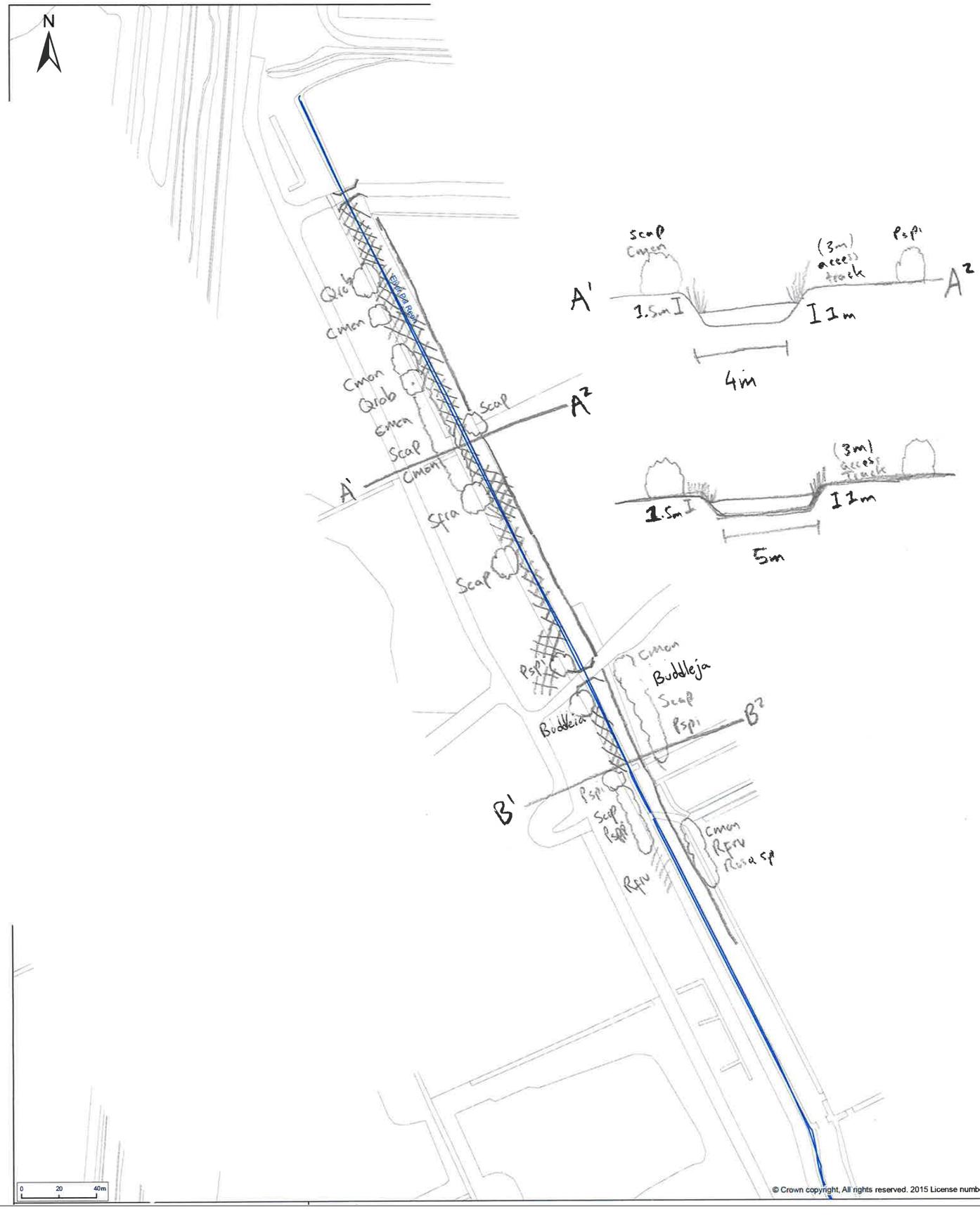
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
IDB67: Blackwell Reen

Figure: 2k	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



22/10/15
SF, NR
100% cloud cover, no wind
no flow
- East bank cut

dwg ref: 8235-0299-04 Contains Ordnance Survey data © Crown copyright and database right 2015

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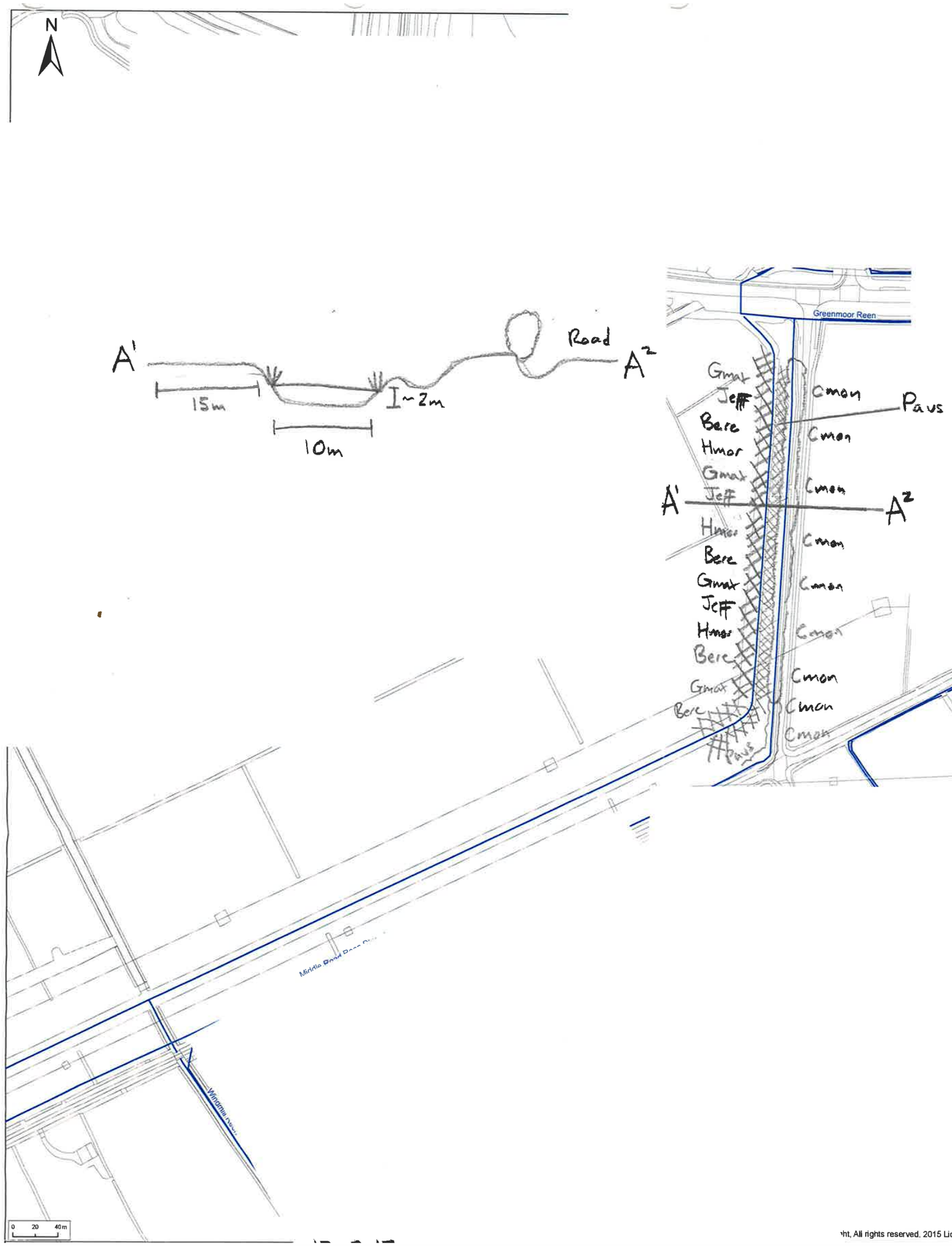
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
NRA25: Elver Pill Reen

Figure: 2l	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



13.8.15
SF NR
No flow

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Welsh Government

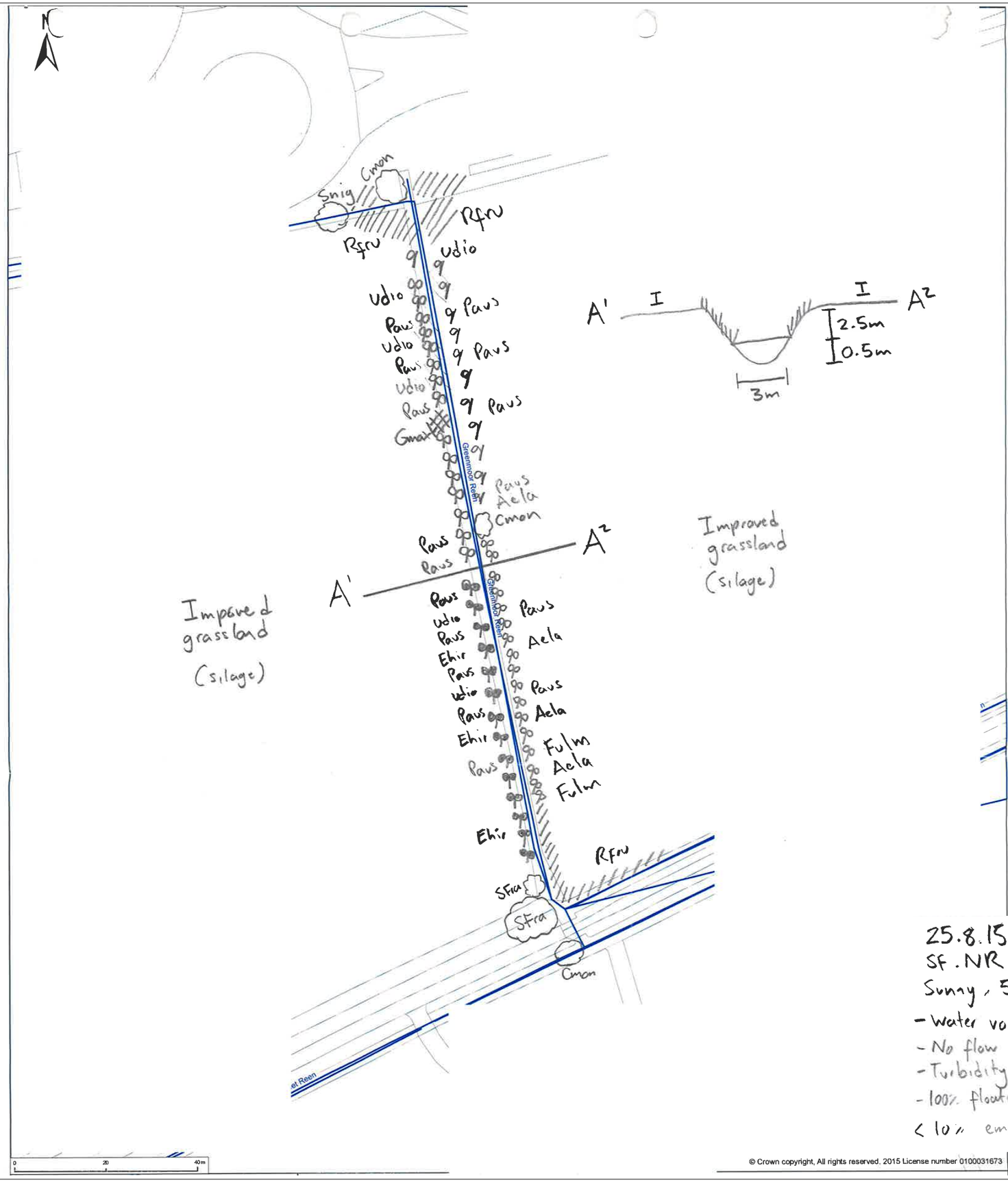
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps NRA21

Figure: 2m	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



25.8.15
SF. NR
Sunny, 50% cloud cover, windy
- water vole present
- No flow
- Turbidity 3
- 100% floating (lemna covers)
< 10% emergent

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Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
IDB45: Greenmoor

Figure: 2n	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

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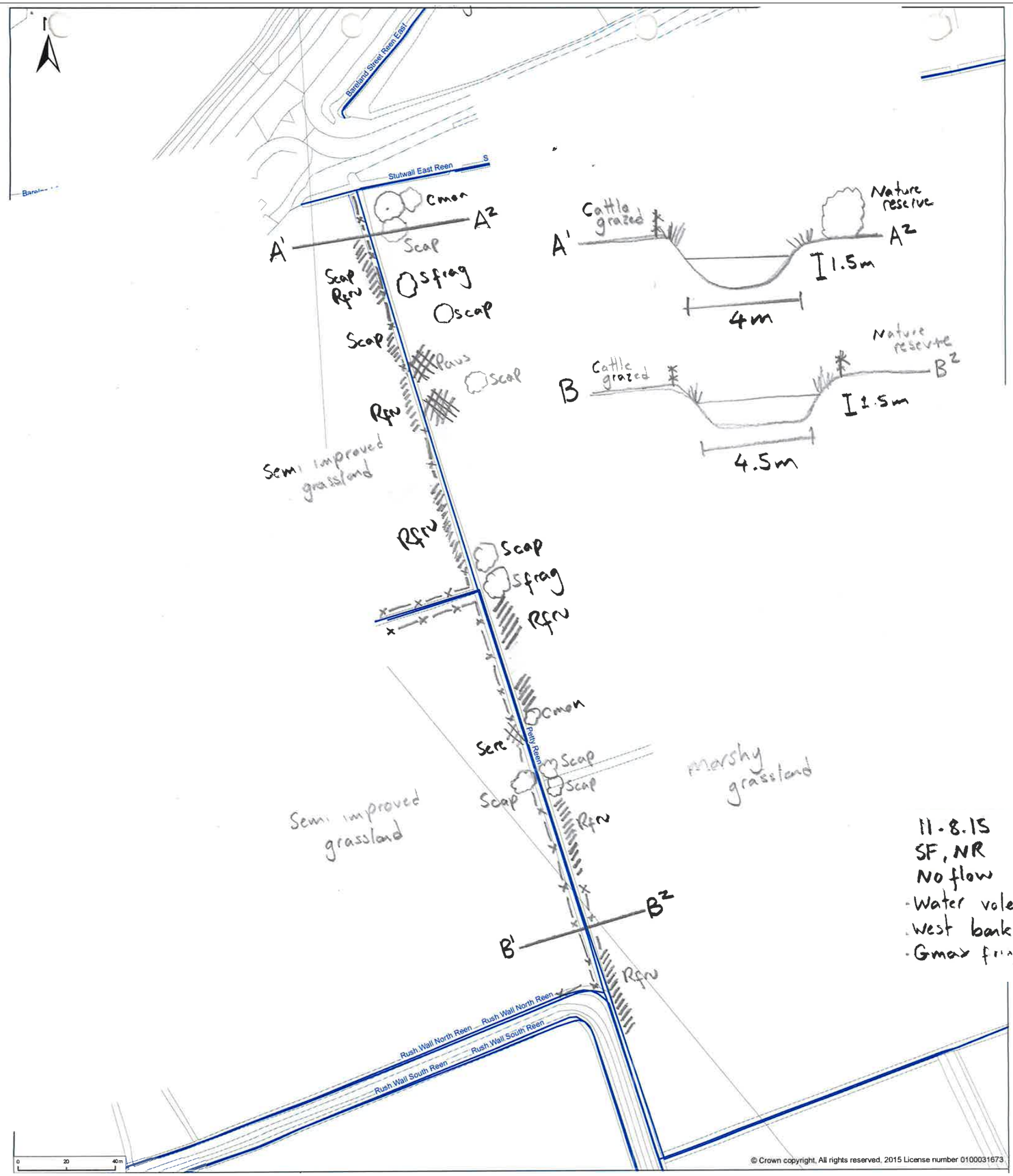

dwg ref: 8235-0299-04 Contains Ordnance Survey data © Crown copyright and database right 2015

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Welsh Government

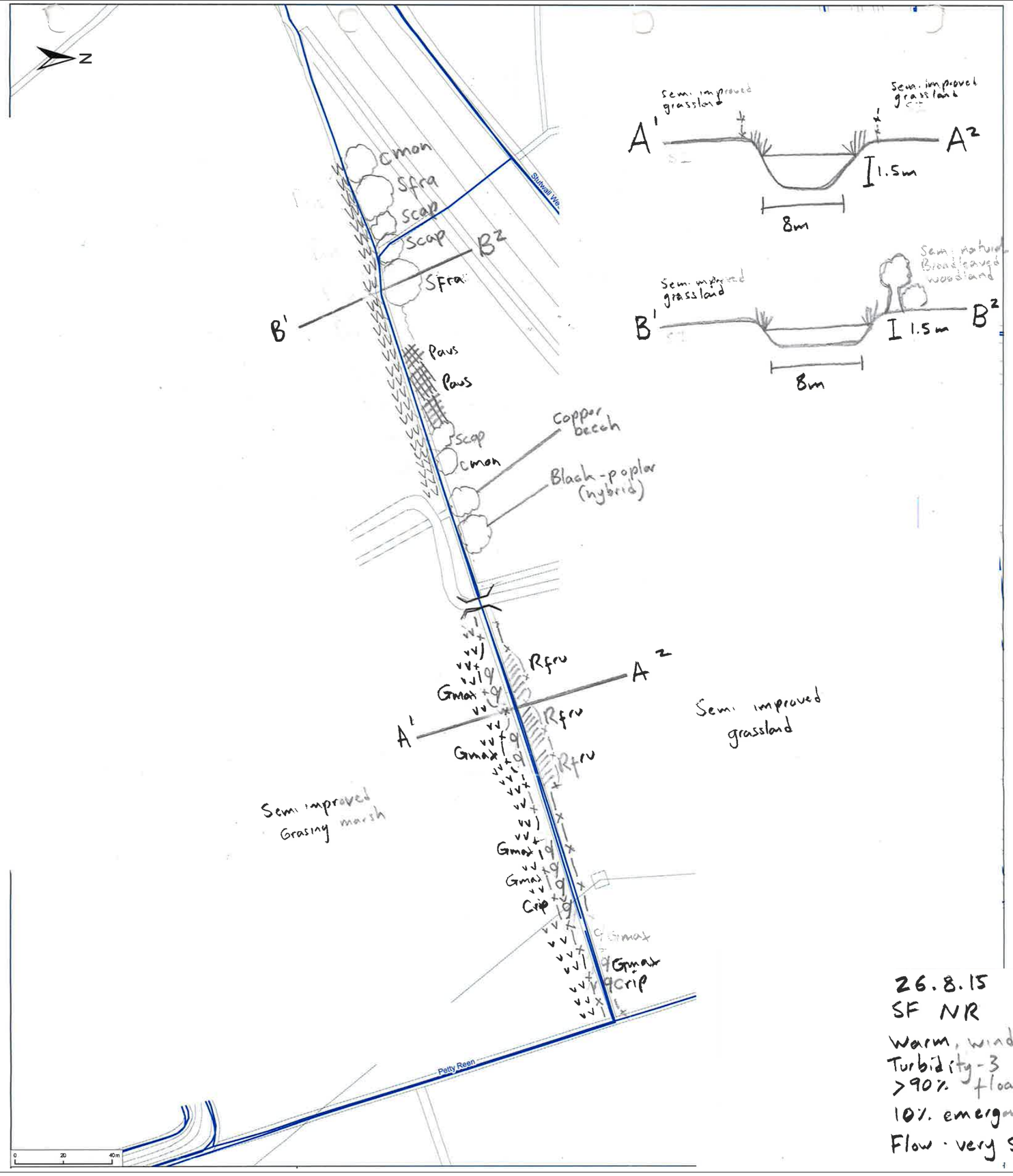
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
NRA20: Petty Reen

Figure: 2o	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



26.8.15
SF NR
Warm, windy, 30% cloud cover.
Turbidity - 3
>90% floating
10% emergent
Flow - very small east → west

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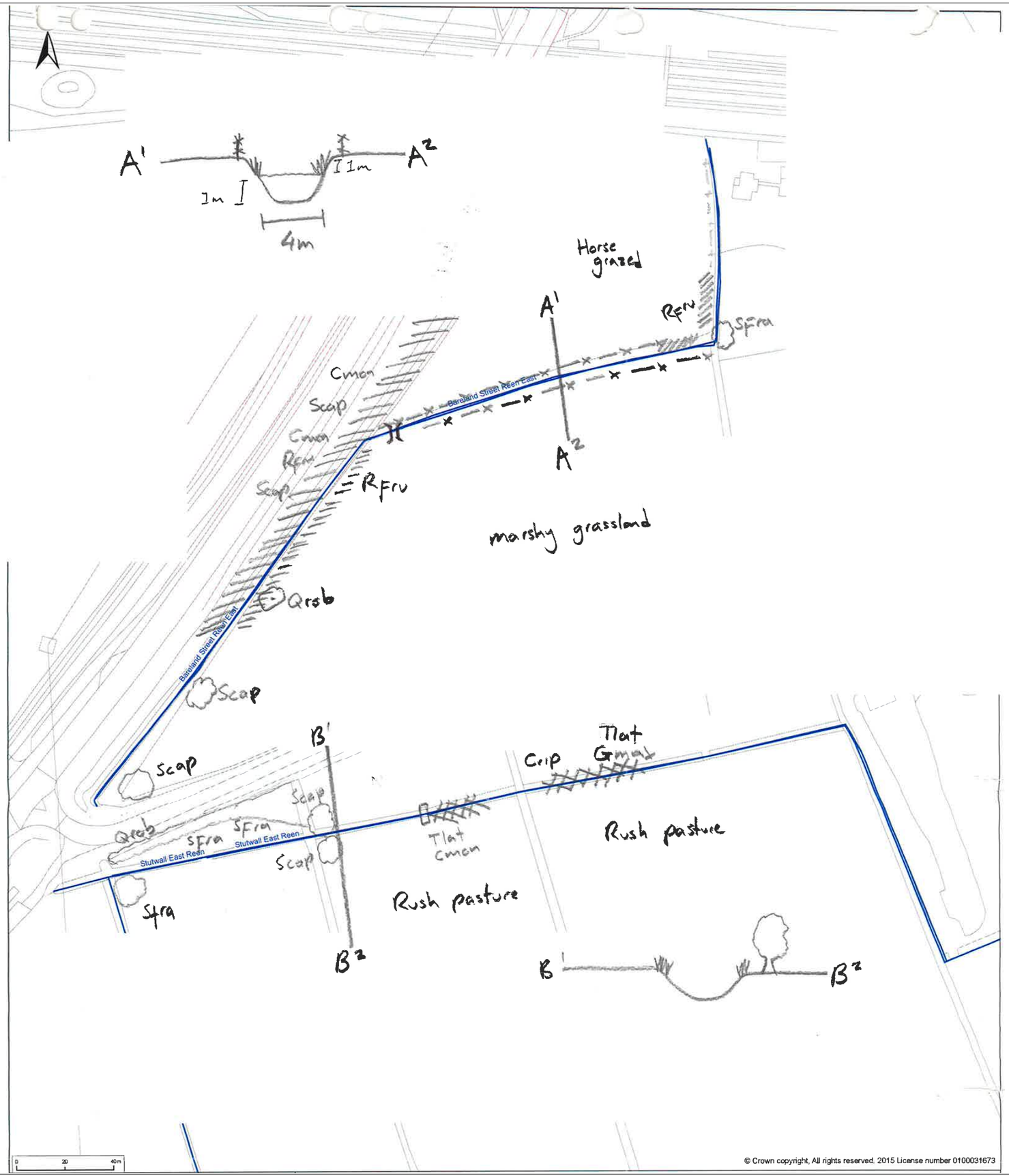
Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
IDB46a: Stutwall East Reen

Figure: 2p	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04



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Appendix 10.32 River Corridor Survey Report

River Corridor Survey Maps
IDB47a: Bareland Street Reen

Figure: 2q	Revision:
Date: March 2016	Status: AT ISSUE
Drawn: RM	Checked: NF

Scale: A3 @ NTS

dwg ref: 8235-0299-04

Annexes

Annex A

Standard Symbols for use in the River Corridor Surveys

Standard Symbols for use in River Corridor Surveys

AQUATIC AND MARGINAL ZONES

CHANNEL FEATURES

- Bridge (road/track)
- Footbridge
- Lock
- Inlet
- Weir
- Pool
- Riffle
- Rapids
- Run
- Waterfall
- Protruding rock
- Island (with vegetation)
- Direction of flow

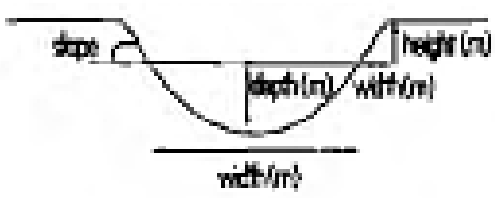
SUBSTRATE

- Mud
- Sand
- Bare gravel/ shingle
- Vegetated gravel/shingle
- Cobbles
- Boulders

CHANNEL VEGETATION

- Emergent Monocots
- Emergent Dicots
- Submerged Monocots
- Submerged Dicots
- Bryophytes
- Floating leaves

CHANNEL CROSS-SECTION



SURVEY INFORMATION

- Direction of survey/bank used
- Photograph

BANK AND ADJACENT LAND ZONES

BANK FEATURES

- Base of bank
- Top of bank
- Slump
- Stable earth cliff
- Eroding earth cliff
- Rock cliff
- Artificial bank protection
- Cattle drink
- Shelf / berm
- Spring / flush
- Inflow stream
- Outfall
- Dredgings/spoil

ADJACENT LAND FEATURES

- Fence
- Gate
- Road / track
- Railway
- Footpath
- Power lines
- Building
- S.T.W. — Sewage works
- Flood bank
- [ ] — Land use category / Defined name / Phase 1 code

VEGETATION

Trees

- Conifer
- Broadleaf
- - overhanging
- - fallen
- - exposed roots
- Woodland + symbol for type
- *P + symbol* — Pollarded tree
- *(P) + symbol* — Tree needs pollarding
- *C + symbol* — Coppiced tree
- Sapling

Shrubs/hedgerows

- Shrub (single)
- Dense shrubs
- Sparse shrubs
- Hedgerow
- Hedgerow with trees

Grasses and herbs

- Reed / sedge
- Tall grass
- Tall herb / ruderal
- Tall grass with herbs
- Short grass
- Mown

Annex B

Photographs of the Watercourses

IDB27 Nant-y-Moor Reen

IDB27 Nant-y-Moor Reen

Client:	Welsh Government				
Project:	M4CaN				
Job Ref:	JER6591	Checked By:		Date:	10/2015

IDB27 Nant-y-Moor Reen

IDB35 Percoed Reen

Client:	Welsh Government				
Project:	M4CaN				
Job Ref:	JER6591	Checked By:		Date:	10/2015

IDB35 Percoed Reen

IDB35 Percoed Reen

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591 Checked By: Date: 10/2015

IDB57

IDB34 Morfa Gronw Reen

Client:	Welsh Government				
Project:	M4CaN				
Job Ref:	JER6591	Checked By:		Date:	10/2015

IDB34 Morfa Gronw Reen

IDB37 Old Dairy Reen

Client:	Welsh Government				
Project:	M4CaN				
Job Ref:	JER6591	Checked By:		Date:	10/2015

IDB37 Old Dairy Reen

IDB37 Old Dairy Reen

Client:	Welsh Government			
Project:	M4CaN			
Job Ref:	JER6591	Checked By:	Date:	10/2015

IDB37 Old Dairy Reen

NRA10 Pont-y-Cwcw

Client:	Welsh Government			
Project:	M4CaN			
Job Ref:	JER6591	Checked By:	Date:	10/2015

NRA10 Pont-y-Cwcw

NRA10 Pont-y-Cwcw

Client:	Welsh Government			
Project:	M4CaN			
Job Ref:	JER6591	Checked By:	Date:	10/2015

NRA11 Sea Wall Reen

NRA11 Sea Wall Reen

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591
Checked By:	
Date:	10/2015

NRA11 Sea Wall Reen

NRA11 Sea Wall Reen

Client:	Welsh Government
Project:	M4CaN
Job Ref:	JER6591
Checked By:	
Date:	10/2015

IDB77 Juilan's Reen

IDB68 Ellen's Reen

Client:	Welsh Government				
Project:	M4CaN				
Job Ref:	JER6591	Checked By:		Date:	10/2015

IDB68 Ellens's Reen

IDB67 Black Wall Reen

Client:	Welsh Government			
Project:	M4CaN			
Job Ref:	JER6591	Checked By:	Date:	10/2015

IDB67 Black Wall Reen

NRA25 Elver Pill Reen

Client:	Welsh Government				
Project:	M4CaN				
Job Ref:	JER6591	Checked By:		Date:	10/2015

NRA25 Elver Pill Reen

NRA25 Elver Pill Reen

Client:	Welsh Government		
Project:	M4CaN		
Job Ref:	JER6591	Checked By:	Date: 10/2015

NRA21

IDB45 Greenmoor Reen

Client:	Welsh Government			
Project:	M4CaN			
Job Ref:	JER6591	Checked By:	Date:	10/2015

NRA20b Petty Reen

NRA20a Petty Reen

Client:	Welsh Government				
Project:	M4CaN				
Job Ref:	JER6591	Checked By:		Date:	10/2015

NRA20a Petty Reen

IDB46a Stutwall East Reen

Client:	Welsh Government				
Project:	M4CaN				
Job Ref:	JER6591	Checked By:		Date:	10/2015

IDB46a Stutwall East Reen

IDB47a Bareland Street East Reen

Client:	Welsh Government				
Project:	M4CaN				
Job Ref:	JER6591	Checked By:		Date:	10/2015

Annex C

Species list from the River Corridor Surveys

Bank vegetation		NUMBER OF SPECIES																																		
Scientific name	Common name	IDB27 Nant-Y-Moor Reen			IDB35 Percord Reen			IBD57	IDB34 Morfa Gronw Reen		IDB37 Old Dairy Reen	NRA10 Pont-y-Cwcw Reen	NRA11 Sea Wall Reen		IDB77 Julians Reen			IDB68 Ellen's Reen	IDB66 Middle Reen	IDB67 Black Wall Reen			NRA26 Monks Ditch	NRA25 Elver Pill Reen	NRA21		IDB45	NRA20			IDB46a		IDB47a
		6	13	11	6	10	7	11	5	5	10	11	8	7	4	3	14	16	23	5	19	6	2		21	9	7	6	15	9	13	8	17		
		R1	R2	R3	R5	R6	R7	R4	RCS1	RCS2	RCS3	RCS4	RCS5	RCS6	R9	R10	R12	R16	R20	R17	R18	R19	RCS7	RCS8	R24	R25	R27	R29	R32	R34	R35	R37	R36		
Agrostis capillaris	Common Bent							F	O								O				O				O										
Agrostis stolonifera	Creeping Bent		O					O													O					O			O	R	O				
Alnus glutinosa	Alder		R																																	
Angelica sylvestris	Wild Angelica																				O			R												
Alopecurus geniculatus	Marsh foxtail								O																				O							
Anthriscus sylvestris	Cow-parsley				R	R						R												R												
Arrhenatherum elatius	False Oat-grass	A	O	O	O	O		A			O	F			A	A	O	F	O	O	F						F			O	F	A	A			
Artemisia vulgaris	Mugwort																																			
Bromus hordeaceus	Soft brome																		R																	
Calystegia sepium	Hedge Bindweed				R														O														O			
Carex acutiformis	Lesser Pond-sedge																																			
Carex hirta	Hairy sedge																		R																	
Carex otrubae	False Fox-sedge																		O						O				O							
Carex riparia	Greater Pond-sedge																	O	O		F(LA)								F							
Centaurea nigra	Common Knapweed	R																	F						O											
Cirsium arvense	Creeping Thistle		R	O		R		O			O			F		O			O		R					R										
Cirsium palustre	Marsh Thistle																														O					
Cirsium vulgare	Spear Thistle																								O											
Crataegus monogyna	Hawthorn					R	R								R		O		A (W)	A		R			F			R							
Dactylis glomerata	Cock's-foot	F	R	R		O		O				F			O			O			O	R		A	O		O			O	O				
Dipsacus fullonum	Teasel							R											O																	
Elymus repens	Common Couch																				O										R				
Epilobium hirsutum	Great Willowherb		O	F		R	F	O				O						O	F		O			O	F		LA		F	F	F	R	R		
Cynosurus cristatus	Crested Dogstail																R									O			R						
Epilobium ciliatum	Americal willowherb																																			
Equisetum fluviatile	Water Horsetail																																			
Eupatorium cannabinum	Hemp-agrimony											F									F			O												
Filipendula ulmaria	Meadowsweet			O		O	O	O			F	O						F	F		F			F						F	F					

Fraxinus excelsior	Ash																R																
Gallium aparine	Cleavers																															O	O
Galium palustre	Marsh-bedstraw																												R				
Geranium dissectum	Cut leaved cranesbill													R							R											
Glyceria maxima	Reed sweet grass																													F			
Heracleum sphondylium	Common Hogweed			R				O			O							F		O	O			R	O						R	O
Holcus lanatus	Yorkshire-fog		O	R				F			R		O				A		O	O	O											
Hordeum brachyantherum	Meadow barley																																
Hypericum perforatum	Perforate St. John's Wort																																
Hypericum tetrapterum	Square stalked st. john's wort												R	R																			
Iris pseudacorus	Yellow Flag Iris																		O							O	O						
Juncus acutiflorus	Sharp-flowered Rush																												F				
Juncus articulatus	Jointed rush																											O	R				
Juncus effusus	Soft Rush							R		O							O								O				O				
Juncus inflexus	Hard Rush												F				O		F					O	O								
Lathyrus latifolius	Everlasting pea																							R									
Lathyrus pratensis	Meadow Vetchling																																
Leucanthemum vulgare	Oxeye Daisy																				O												
Lolium perenne	Perennial Rye-grass									F	O	O					O									F							
Lotus pedunculatus	Greater Bird's-foot-trefoil							O					O	O					F						O				F	R			
Lycopus europaeus	Gypsywort																												R				
Lysimachia vulgaris	Yellow Loosestrife																	R															
Medicago lupulina	Black medic																				R												
Mentha aquaticum	Water mint																								R				F				
Oenanthe crocata	Hemlock Water-dropwort	F	A	A	O	F	F	O	O	O								F	O			R				O	O	O					
Oenanthe fistulosa	Tubular Water-dropwort																								F								
Persicaria maculosa	Redshank									O	R																						
Picris echioides	Bristly Oxtongue																		R														
Phalaris arundinacea	Reed Canary-grass																								O								
Phleum bertolonii	Small timothy																																
Phleum pratense	Timothy												F																				
Phragmites australis	Common Reed		A	A	A	A	A		D													A	D	A		O (LA)		D	O	F		O (LA)	LA
Poa trivialis	Rough meadow grass																											O					
Polygonium amphibium	Amphibious bistort																																
Populus alba	White Poplar																																
Potentilla anserina	Silverweed																																

Prunus spinosa	Blackthorn																																
Pulicaria dysenterica	Common Fleabane																		O										R				
Ranunculus acris	Meadow Buttercup										R		R																	R	R		
Ranunculus repens	Creeping Buttercup		O				R			O	O		O	O	O																		
Rosa canina	Dog Rose																																
Rosa sp.																			R														
Rumex conglomeratus	Clustered Dock			O							R	R	R					O	O						O				R	O	R		
Rubus fruticosus agg.	Bramble	O (LA)	F	D (s)	A		R	R				LA						F (LA)	R	O			A			F	F						
Rumex crispus	Curled Dock																	R															
Rumex obtusifolius	Broad-leaved Dock																																
Salix caprea	Goat Willow								R							R																	
Salix cinerea	Grey Willow																				O												
Salix c.f. fragilis	Willow species																	O				O								O			
Salix sp.	A willow																																
Scrophularia nodosa	Common Figwort																																
Scutellaria galericulata	Skullcap																																
Senecio Sp	Ragwort	R																															
Sonchus asper	Prickly Sow-thistle							O				R		O				R															
Sonchus oleraceus	Smooth sow thistle																															R	R
Stachys palustris	Marsh Woundwort																	R												O			
Urtica dioica	Common Nettle		F			R	R	R				LA		F			F					O		O	F	F	F	O			O	A (LD)	
Valeriana officinalis	Common valarian																				R												
Vicia cracca	Tufted Vetch																	F							O								
Vicia sativa	Common Vetch																	F						O									
Vicia tetrasperma	Smooth Tare							O																									
Hypericum pulchrum	Slender St Johns Wort																				R												
Emergent Vegetation																																	
Scientific name	**Common name**	**3**	**7**	**3**	**5**	**4**	**4**	**7**	**7**	**12**	**20**	**12**	**21**	**18**	**0**	**0**	**4**	**7**	**8**	**3**	**5**	**2**	**2**	**0**	**13**	**9**	**2**	**1**	**9**	**4**	**5**	**5**	4
		R1	**R2**	**R3**	**R5**	**R6**	**R7**	**R4**	**RCS1**	**RCS2**	**RCS3**	**RCS4**	**RCS5**	**RCS6**	**R9**	**R10**	**R12**	**R16**	**R20**	**R17**	**R18**	**R19**	**RCS7**	**RCS8**	**R24**	**R25**	**R27**	**R29**	**R32**	**R34**	**R35**	**R37**	**R39**
Agrostis stolonifera	Creeping Bent										O (LA)		LA	O																			
Alisma plantago-aquatica	Water-plantain			R	R			R		R	R		R													R				R		R	R
Alisma lanceolata	Narrow leaved water-plantain									R			R	R																			
Alopecuris geniculatus	Marsh fowtail												R	R																			
Angelica sylvestris	Wild Angelica								R												R												

Apium nodiflorum	Fool's-watercress									R	R		O														R				
Berula erecta	Lesser Water-parsnip		O	R					O	O	O	F	O (LA)	O				O	F					R	R	R			O				
Bidens cernua	Nodding bur-marigold										R																						
Butomus umbellatus	Flowering rush										R		O	R																			
Carex acutiformis	Lesser Pond Sedge																O									R							
Carex hirta	Hairy Sedge																								O								
Carex otrubae	False Fox-sedge																																
Carex pseudocyperus	Cyperus Sede																													O			
Carex riparia	Greater Pond-sedge										R							F	F		F							O					
Carex remota	Remote Sedge																	R							R								
Catabrosa aquatica	Whorl grass																											O					
Eleocharis palustris	Common spikerush																		R						O								
Epilobium hirsutum	Hairy Willow-herb			R					R																								
Equisetum fluviatile	Water Horsetail							R			R										R												
Eriophorum palustris	Common spiked rush												R						R														
Filipendula ulmaria	Meadowsweet																	O	F						O								
Galium palustre	Common marsh-bedstraw							R		R	R			R											O								
Glyceria fluitans	Floating sweet grass		O							O	R	F	O				R								F							O (LA)	
Glyceria maxima	Reed Sweet-grass	F (LA)	F			F	F	A		O (LA)		F (LA)	O (LA)	O			F			F	O				F	F	F		C	F	F			
Iris pseudacorus	Yellow Iris				R			O	R		O			R				F	O	O	O						O			O		R		
Juncus acutiflorus	Sharp-flowered Rush										O		R	R															O				
Juncus articulatus	Jointed Rush									R																							
Juncus effusus	Soft Rush										O	F	O	O			O									O							
Juncus inflexus	Hard Rush										R			R					O														
Juncus acutiflorus																			O														

Lycopus europaeus	Gypsywort												R																				
Lythrum salicaria	Purple Loosestrife																	O			R												
Mentha aquatica	Water Mint																							O				O					
Myosotis laxa	Tufted forget-me-not									R	R													O	O								
Myosotis scorpioides	Water forget-me-not																											R					
Myosotis Sp.																			R														
Oenanthe crocata	Hemlock Water-dropwort	R	O		R	R		F	R		R	O						O				F		R	O						R		
Oenanthe fistulosa	Tubular Water-dropwort									O	O		O	R											F	O								
Persicaria amphibia	Amphibious bistort				R																												
Phalaris arundinacea	Reed Canary Grass																	O			O							R					
Phragmites australis	Common Reed		F			O	F	X(LA)		O		LA	O (LD)	A								A		D		F		F					
Polygonium amphibium	Amphibious bistort																														R	R	
Ranunculus flammula	Lesser spearwort												R																				
Rorippa nasturtium-aquaticum	Watercress											O																					
Rumex hydrolapathum	Water dock						R						R	R											R			R	O	O			
Sagittaria sagittifolia	Arrowhead					O	O				R	O (LA)	O	R											R	O							
Salix caprea	Goat Willow																																
Salix fragilis	Crack Willow																																
Scrophularia auriculata	Water figwort											R										R											
Scutellaria galericulata	Skullcap												R	R																			
Senecio aquaticus	Marsh ragwort								R			R	R	R									O										
Solanum dulcamara	Bittersweet											O																					
Sparganium erectum	Bur-reed	R	R							F	F	A	O						F				R					R		F			
Stellaria uliginosa	Bog Stitchwort																																
Typha latifolia	Bulrush				O									O (LA)										R	O				R		O	O	
Urtica dioica	Common nettle																																
Impatiens capensis	Orange balsam								R																								
Veronica beccabunga	Brooklime										R																						
Veronica catenta	Pink Water Speedwell																			R													R
Submerged and floating vegetation																																	
Scientific name	**Common name**	**0**	**3**	**2**	**9**	**8**	**9**	**4**	**9**	**8**	**5**	**4**	**9**	**9**	**0**	**4**	**3**	**4**	**6**	**7**	**6**	**3**	**0**	**0**	**10**	**9**	**6**	**7**	**8**	**9**	**8**	**8**	**8**
		R1	**R2**	**R3**	**R5**	**R6**	**R7**	**R4**	**RCS1**	**RCS2**	**RCS3**	**RCS4**	**RCS5**	**RCS6**	**R9**	**R10**	**R12**	**R16**	**R20**	**R17**	**R18**	**R19**	**RCS7**	**RCS8**	**R24**	**R25**	**R27**	**R29**	**R32**	**R34**	**R35**	**R37**	**R39**
Azolla filliculoides	Water fern													O (LA)					R	R		F											
Callitriche obtusangula	Blunt-fruited Water-starwort																																

Callitriche sp.	Starwort species		F	O	R	R	O	O	O																				O		O	O
Catabrosa aquatica	Whorl grass																												X	O				
Ceratophyllum demersum	Rigid Hornwort				A (LD								O (LA)	R		R			R	A	R			F	A	A		F(LA)	R	R	R	A(LD)	
Chara vulgaris agg.	Common stonewort									R																							
Elodea nuttallii	Nuttall's Pondweed		F	R		O	F	O	O		O	O	O (LA)							F	O				O	O		O		O			O (LA)
Elodea canadensis	Canadian pondweed																																
Enteromorpha sp.	An algae										R																				O		
Hydrocharis morsus-ranae	Frogbit				D	F	R		F	O (LA)	O (LA)	R	O	R					O	R	O			R	O	R			R	O	R	O	
Lemna gibba	Fat Duckweed								R	R			R	R		F	F								R	R	F	F	R				R
Lemna minor	Common Duckweed				F	R	O	O	A	O				F		A	A	R	O	O	R	F		F	O	O	O	F	A	O	R	F	F
Lemna minuta	Least Duckweed				O		X				F			O (LA)										O(LA)			F		O			O	
Lemna trisulca	Ivy-leaved Duckweed					R	R		O	R		O		O										A	F			R		O	R		R
Myriophyllum spicatum	Spiked water milfoil												R																				
Potamogeton berchtoldii	Small pondweed								R																								R
Potamogeton crispus	Curled Pondweed		R		R		X	R										R								O					R	R	
Potamogeton natans	Broad-leaved Pondweed												R																				
Potamogeton pectinatus	Fennel pondweed												O (LA)												F(LA)								
Potamogeton pusillus	Lesser Pondweed				F	O	R																				R		X	R	R	F	
Potamogeton trichoides	Hairlike Pondweed				R	F	O		R	R			R	R				D	A(D)	R	A			R	VR	F	O	F		A	A		R
Rorippa nasturtium officinale	Watercress																																
Sparganium emersum	Unbranched bur-reed											O (LA)																					
Spirodela polyrhiza	Greater Duckweed				O	R			R	R	R		R	R		O	F	O	F	F	O	R		O	O	O	O	F	F	F	F	O	R
Wolffia arrhiza	Rootless duckweed									R (LA)																							
Zanichella paulustris	Horned pondweed																																
Leptodictum riparium	Kneb's feather moss				O																												