



# LLYN TEGID EMBANKMENTS, BALA,

## GWYNEDD:

# PRELIMINARY ECOLOGICAL APPRAISAL

### A REPORT ON BEHALF OF NATURAL RESOURCES WALES

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### 1.0 Introduction

- 1.1 Enfys Ecology Limited were commissioned by Natural Resources Wales (NRW) to carry out a Preliminary Ecological Appraisal (PEA) of the impounding embankments and surrounding areas at Llyn Tegid (Bala lake) at Bala, Gwynedd. NRW are currently appraising a project of reservoir safety improvement works, which is likely to involve raising the height of the embankments by 1 to 1.5m in places. The exact works are dependent on the findings from the ongoing appraisal. A proposed extension to the Bala lake Railway across the Dee may also affect the proposals.
- 1.2 The survey included the impounding embankments and adjacent shoreline of the north-eastern end of Llyn Tegid, plus the flood defence embankments and control works along the River Dee at its exit from the lake, and the River Tryweryn above its confluence with the Dee at Bala. The exact area to be surveyed was discussed and agreed with NRW staff at the site, immediately prior to carrying out the survey.
- 1.3 This survey was commissioned to gain baseline ecological data on the species and habitats present on the site(s) and therefore identify any possible ecological constraints (or opportunities) on the works arising from the site or surrounding area, and recommend suitable general mitigation and/or compensation strategies for these issues, as appropriate.
- 1.4 The PEA included an extended Phase 1 Habitat survey of the site, incorporating a protected species survey. A desk study examining local ecological records including those provided by NRW was also carried out, using records held for the specific catchment areas. The report includes a habitat map of the site and part of the surroundings. Recommendations for further phase 2 surveys are made as appropriate, and invasive non-native species are identified and mapped.
- 1.5 This report will be used as a baseline survey to inform an environmental assessment and Habitat Regulations Assessment (HRA), to be carried out (as a separate assessment) by NRW. This is required under the Conservation of Habitats and Species Regulations (2017) as the potential works area includes part of Statutory sites of European Importance (in this case a Special Area of Conservation (SAC) and RAMSAR site covering Llyn Tegid), which may potentially be affected by the works. This report is intended to provide information to inform this process, and makes no recommendations on the HRA process or outcome.

### 2.0 Site Description

#### 2.1 *Survey area*

The surveyed area includes the north-eastern end of Llyn Tegid, which is lined with a broad area of marginal vegetation, gradually drying out into rough grassland and scattered scrub, as well as some dense bramble. North of this is a broad embankment topped with a footpath, large mature trees and short grassland, behind which are pasture fields. The River Dee flows

out of the lake in the southeast, and is lined with reinforced earth and rock embankments topped with improved and semi improved pasture grassland, hedgerows and trees. The river Tryweryn is included in the survey area between the A494 Bridge in Bala and its confluence with the Dee, and is lined with short grassland and scattered scrub, with bands of reedbeds and marginal vegetation becoming broader nearer the confluence. To the east is a high embankment of short grassland, before open fields and a small woodland. Around the confluence of the rivers are several weirs and spillways, and reedbeds.



**FIGURE 1. THE APPROXIMATE SURVEY AREA IS OUTLINED IN RED.**  
IMAGE © GOOGLE 2017.

2.2 The approximate survey boundary used is shown on figure 1, above. This area was confirmed with NRW at the Bala office immediately prior to the survey, but was also slightly constrained by land access (this primarily means that we were unable to enter the fields/properties behind the embankments (on the landward side)), but these were viewed from the embankments as much as possible. The location of the embankments which are the focus of the ongoing project are shown on figure 2, overleaf. The River Dee is the larger river which flows out of the lake at its eastern end, the Tryweryn is the (slightly) smaller river which joins the Dee from the north of the image.

2.3 The western end of the surveyed area is at approximate OS grid reference SH 9200 3549.

The easternmost point around the Tryweryn spillway at approximately SH 9349 3571.

### 2.4 Surrounding Areas

The surveyed area (also hereafter described as “the site”) forms a rough semicircle surrounding the town of Bala on three sides (to the east, south, and west along the lakeshore). Inside the semicircle are several pasture fields, with tall hedgerows and scattered trees, and then the town itself, a built up area with houses and small gardens, and an industrial park which is largely buildings and hardstanding in the east. Outside the area Llyn Tegid forms a large body of water (4.8km<sup>2</sup>) stretching over 6km to the southwest. The river Dee flows to the northwest in a broad valley which is mostly pasture grassland in large open fields, with some hedgerows. There are scattered small areas of woodland throughout the area, most commonly to the north, and immediately south of the site. The closest upland heath areas are around 1km to the south.



**FIGURE 2. EMBANKMENT LOCATIONS. –**  
*THIS IMAGE IS EXCERPTED FROM A PLAN PROVIDED BY NRW*

- 2.4 The lakeshore and riverbank habitats within the survey area have very good habitat connectivity with surrounding areas, being linked in to the catchments of the lower Dee, Tryweryn, and upper Dee via Llyn Tegid. The upper Tryweryn in particular appears to have diverse riverside habitats including woodlands, grassland and numerous trees, with adjacent habitat including marshy grassland and wet meadows on both rivers.

### 3.0 Methodology

#### 3.1 Desk study

3.1.1 The desk study was carried out using data supplied by the client (NRW), which included data from Cofnod, the local environmental record centre for North Wales, internal NRW consultation responses and Snowdonia National Park Warden records. A 1km search radius, (or buffer) was used. A consultation was also carried out with local bodies who might hold relevant information: North Wales Wildlife Trust (NWWT) and any other Local interest groups. The records include information on the presence of statutory and non-statutory sites for nature conservation, and records of protected, notable, or (formerly) Biodiversity Action Plan (BAP) species and habitats from within and around the proposed works. The records are used to inform the survey and recommendations, and to provide context for evaluating the species and habitats found during the survey.

3.1.2 Most of the reviewed data was from the Cofnod search obtained by NRW. Additional data is held at 10km resolution by NWWT, who confirmed that any recent data held was also uploaded to Cofnod. The MAGIC map application (accessed online through Natural England: (<http://www.natureonthemap.naturalengland.org.uk/MagicMap.aspx>) but covering all of the UK) was used to cross reference protected sites. At the time of writing no data has yet been received from any other group.

#### 3.2 Extended Phase 1 Habitat Survey and Protected Species Survey.

A survey of the site was conducted by an experienced ecologist walking over the site. The habitats present were classified into a series of categories according to the standard phase 1 habitat survey methodology (JNCC 2010). Notes were taken on the habitats and their suitability for protected species, and target notes were used to record any habitats or features of particular note. A list of floral species was recorded, and where relevant a measure of frequency and abundance of such species was given using the DAFOR scale<sup>1</sup>. A GPS enabled iPad with mapping software was used to roughly map habitat types (later refined in the office using QGIS software) and to pinpoint locations including target notes. A search for evidence of protected species was carried out, including amphibians (including great crested newt *Triturus cristatus*), bats and reptiles. Evidence of badgers (*Meles meles*) including setts, dung pits, hairs, footprints, and scratching posts or trees was searched for.

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<sup>1</sup> DAFOR scale – abundance and frequency categories.

Abbreviation	Frequency	Cover
D	Throughout	>50%
A	Throughout	10-50%
F	50 – 100%	<10%
O	<50%	<10%
R	A few plants or clumps	<<10%

Trees with suitable features for roosting bats, including knot holes and other crevices, hollow trunks and dense ivy (*Hedera helix*) coverage were identified.

3.3 The extended Phase 1 Habitat survey was conducted on the 3<sup>rd</sup> October 2017 by Ecologist Tim Yardley and an assistant.

### 3.4 *Limitations*

The survey was carried out in October, which is slightly outside the optimal time of year for habitat survey; many plants may no longer be in flower and so harder to identify, and some species may have died back so may be missed. However, surveys may still be carried out at this time and most plants will still be evident, so the survey still provides a valid assessment of the habitats present and ecological constraints on the development. If necessary additional surveys may be recommended at appropriate times of year.

3.5 The results consist only of those species encountered in a single visit during October 2017. Species that use the site infrequently or at different times may not have been recorded, and the absence of a species from the results does not mean that it is definitely not present. Descriptions of plant species concentrate on the most obvious and abundant species as determinants of habitats present, however the species present have been listed where possible and any rare or notable, protected or invasive species were identified (if present).

## 4.0 Desk Study

### 4.1 *Designated nature conservation sites*

Note: Survey area here means the area surveyed on the ground by the ecologist. Search area is the wider radius for which data was obtained for the desk study.

#### 4.1.1 *Statutory sites*

There are five statutory nature conservation sites within 1km of the survey area boundary: The surveyed area includes part of four of these; the River Dee and Bala Lake Special Area of Conservation (SAC) and two Sites of Special Scientific Interest (SSSI); the River Dee, and Llyn Tegid, which together cover an area with essentially similar boundaries to the SAC, but covering the watercourse of the River Dee and Tryweryn, and Llyn Tegid respectively. The boundary between the two SSSI's is at the Dee outflow out of Llyn Tegid, approximately under the B4391 bridge. The protected sites do not include the riverbanks and upper lake shore areas. For clarity, the areas covered by the protected areas are shown in maps in section 4.5, below. Llyn Tegid is included in both SSSI and SAC areas up to the flood embankments, so the broad strip of inundation vegetation and scrub along the eastern lake shore is included in these designated sites (and the present survey area). Llyn Tegid, including the entire eastern shoreline up to the embankment is also designated as the Llyn Tegid RAMSAR site. Ramsar sites are wetland sites designated of international importance under the UNESCO Ramsar Convention 1971.

4.1.2 The other statutory site is further away; the Chwarel Gelli-Grin SSSI is just over 1km away to the south, an upland former quarry site. In addition most of the survey area, except the very easternmost part, is within the Snowdonia National Park.

#### 4.1.4 *Non Statutory Sites*

There are also two Local wildlife sites (LWS) (also known as Site of Interest for Nature Conservation) (SINCs) within 1km of the scheme. These are both areas of broadleaved woodland; Coed Pandy Isaf, around 500m to the east, and Ysgubor-isaf, a short distance north of the site over the A494 bridge.

### 4.2 *Protected and notable species; overview*

4.2.1 In total, records of 275 species are held within a 1km radius of the proposed scheme. Of these 50 are considered priority species (Legally protected, European protected species, UK BAP species), and 29 of significant conservation concern. Of the remainder 64 are considered locally important, and 132 “other” species. The following text highlights the most important species for the proposed works, in terms of the most important species (species with significant protection, rarity, and interest, and likelihood of being affected by the works (based on the location of the records and the habitat of the species in question).

#### 4.2.2 *Protected and notable fauna*

The majority of the faunal records are birds, including red kite (*Milvus milvus*), Barn Owl (*Tyto alba*) Peregrine (*Falco peregrinus*), Hen Harrier (*Circus cyaneus*), Osprey (*Pandion haliaetus*), Kingfisher (*Alcedo atthis*), Grasshopper warbler (*Locustella naevia*) and Crossbill (*Loxia curvirostra*). The birds are mostly recorded at the grid square scale (1-2km), and so while they may use the area, the exact locations of the sightings are not known. There are records of 11 priority mammal species, of which five are bats, with several records of roosts within the town of Bala. There are also several records of bats (mostly soprano pipistrelle *Pipistrellus pygmaeus*) along the lakeshore within the survey area.

4.2.3 Other priority species records include hedgehog (*Erinaceus europaeus*) recorded 26 times across Bala, including close to the survey areas in the south and west. There are nine records of badger (*Meles meles*) from the area surrounding the site from 2002 to 2014, most are over 200m away, including some sett records, but a latrine was recorded a short distance south of the Dee bridge, just outside the survey area. Brown Hare (*Lepus europaeus*) was recorded north of Bala in 2006 and 2008.

4.2.4 There are records of otter (*Lutra lutra*) from almost the entire survey area, including spraints and sightings in both rivers and the lake, as recently as 2017. In total there are 38 records of otter from 2002 to 2017, throughout the area. Spraints have been recorded along the Dee and Tryweryn throughout the entire area in this time.

4.2.5 There are no records of reptile or amphibian species, including no records of the great crested newt (*Triturus cristatus*) within the area. The records do include numerous aquatic



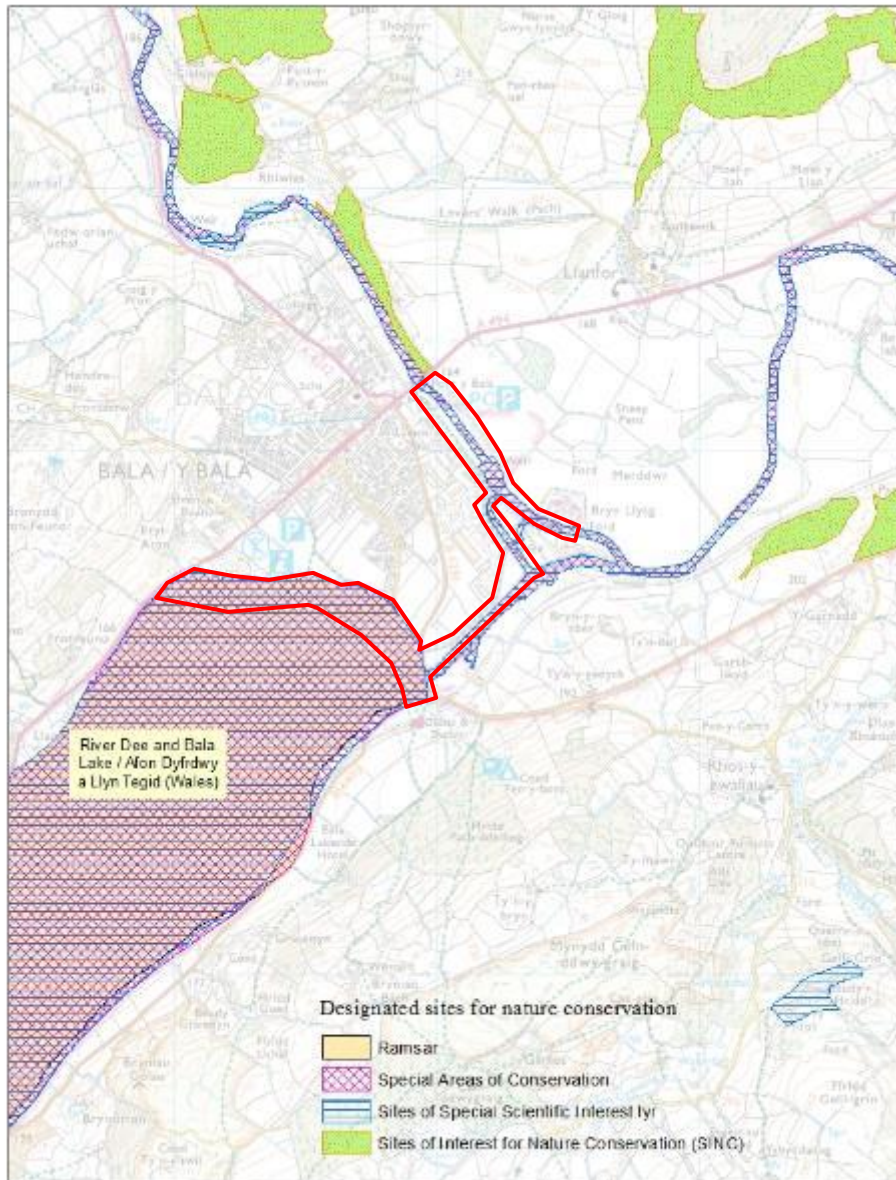
invertebrate species, some of which are of local and national conservation concern, and may be affected by changes to water levels or quality due to the proposed works. The rare snail (*Myxas glutinosa*) is known from numerous studies of Llyn Tegid (for example Hughes 2017, Willing, 2004, - see section 8.0), and must be presumed to be found in the vicinity of the eastern shore. Although no records of it were returned, Llyn Tegid is also known to contain a population of the endemic Gwyniad (*Coregonus pennantii*), a small whitefish found nowhere else.

#### 4.2.6 *Protected and notable or invasive flora*

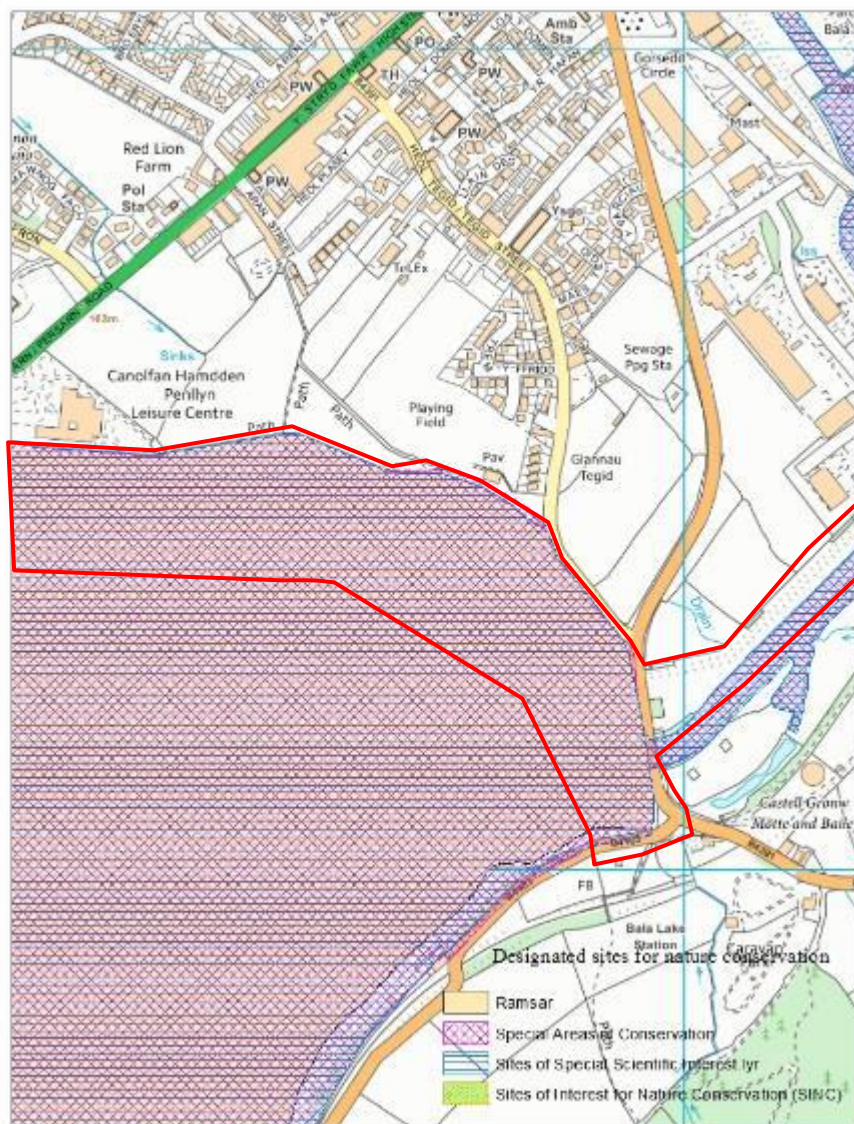
In total records of 43 plant species are held for a 1km radius of the area, (including flowering plants, ferns and bryophytes). Only one is of conservation concern: Small water pepper (*Persicaria minor*) was recorded in 2012 in the wet inundation grassland on the eastern shore of Llyn Tegid, within the present survey area.

4.4.2 There are records of three invasive non-native species; Japanese knotweed (*Falopia japonica*) was recorded in nine locations, two of which are in the survey area, along the embankment on the lakeshore, or in the hedgerow behind. These date from 1997-2013. A third record is just outside the survey area south of the Dee bridge. Himalayan Balsam (*Impatiens glandulifera*), has been recorded 26 times, all in 2013-14. All of these records are within the present survey area, covering both sides of the Dee and Tryweryn as they pass through this site. Rhododendron (*Rhododendron ponticum*) is the third species; this was recorded 15 times in 2009, all records are north of the survey area (though under 50m) in woodland beside the river Tryweryn above the A494 bridge.

4.5 *Protected Sites Maps.* The areas covered by the statutory sites affecting the site are shown in figures 3 and 4, below.



**FIGURE 3. STATUTORY PROTECTED SITES IN THE BALA AREA. THE APPROXIMATE SURVEY AREA IS OUTLINED IN RED. –  
BASE PLAN PROVIDED BY NRW**



**FIGURE 4. DETAIL PLAN OF THE WESTERN END OF LLYN TEGID.**

**SURVEY AREA AGAIN OUTLINED IN RED**

**PLAN PROVIDED BY NRW**

### 4.6 Natural Resources Wales Consultation

4.6.1 NRW staff responsible for maintenance of the flood defences in Bala report that four scrapes (hollows in the ground intended to enhance the area for amphibians) were created in the eastern part of the flood defences, just outside the surveyed area. These are intended to hold water, but be separate to the river system (except in flood times) allowing amphibians to breed free from predation by river fish, and other potential disturbances. Additionally, two artificial otter holts were also created nearby, also in the eastern part of the flood defence scheme. Management of both holts and scrapes has varied and the present status of these features are unknown, as all are outside the area of the present

survey and so were not visited (not being known to the surveyor at the time). These features are not far from the survey area, - a few metres in most cases, and consideration of these features should be included in the overall assessment. The rough location of these features is shown in figure 5, below. It is not clear if the pond at target note 8 was originally also created as part of this habitat creation.



**FIGURE 5. DETAIL PLAN OF THE LOCATIONS OF SCRAPES AND HOLTS CREATED BY NRW AT BALA.**  
**HOLTS ARE SHOWN BY RED STARS, SCRAPES IN BLUE.**  
**THE SURVEY AREA AGAIN OUTLINED IN RED**  
**IMAGE ©GOOGLE 2017**

### 4.6.2 *Invasive species*

NRW and Snowdonia National Park Authority staff have logged the positions of invasive non-native species within the site and wider area over several years. Several examples of Japanese knotweed are recorded on the embankments. Himalayan balsam has been recorded over most of the works area, and has been cleared from several areas.

### 5.0 Habitat Survey

#### 5.1 Overview

##### 5.1.1 Habitat Types

Phase 1 habitat maps of the area are provided below. The map has been divided into three sections at larger scale for clarity, an overview of the whole area is also included, and a separate map showing the Target notes more clearly. A description of the habitats and details of target notes follows the maps. Photographs of the site are included with the text. Species common names are used in the text. A plant species list including Latin names can be found in Appendix A.

##### 5.1.2 The following standard phase 1 habitat and feature types were recorded within and adjacent to the sites, (with their alphanumeric codes):

- A1.1 Semi-natural Broadleaved Woodland
- A1.1.2 Plantation Broadleaved Woodland
- A1.2.2 Plantation Coniferous Woodland
- A2.1 Dense Scrub
- A2.2 Scattered Scrub
- A3.1 Scattered Broadleaved Trees/Parkland
- B4 Improved Grassland
- B6 Poor Semi-improved grassland
- C3.1 Tall Ruderal Vegetation
- F1 Swamp
- F2.1 Marginal Vegetation
- F2.2 Inundation Vegetation
- G1 Open Water
- G2 Running Water
- H3 Shingle
- H4 Boulders/rocks
- J1.1 Arable land
- J1.2 Amenity Grassland
- J3.6 Buildings
- J4 Bare Ground
- J2.1.2 Species Poor Intact Hedgerow
- J2.3.2 Species Poor Hedgerow With Trees
- J2.4 Fence
- J2.5 Wall
- J2.6 Dry Ditch
- J5 Other Habitat

##### 5.1.3 Here the habitat type; “J5 – other habitat” is used to map hardstanding (which has no official phase 1 habitat coding), including roads and also gravel and other pathways through the vegetation. In this survey none of these areas were vegetated. Habitat categories H3 and H4, shingle and rocks above the high tide mark respectively, technically refer to coastlands but

have been used here in relation to Llyn Tegid, as with this caveat they fit better than other categories. The areas of shingle are very small in any case.

### 5.1.4 Habitat Areas.

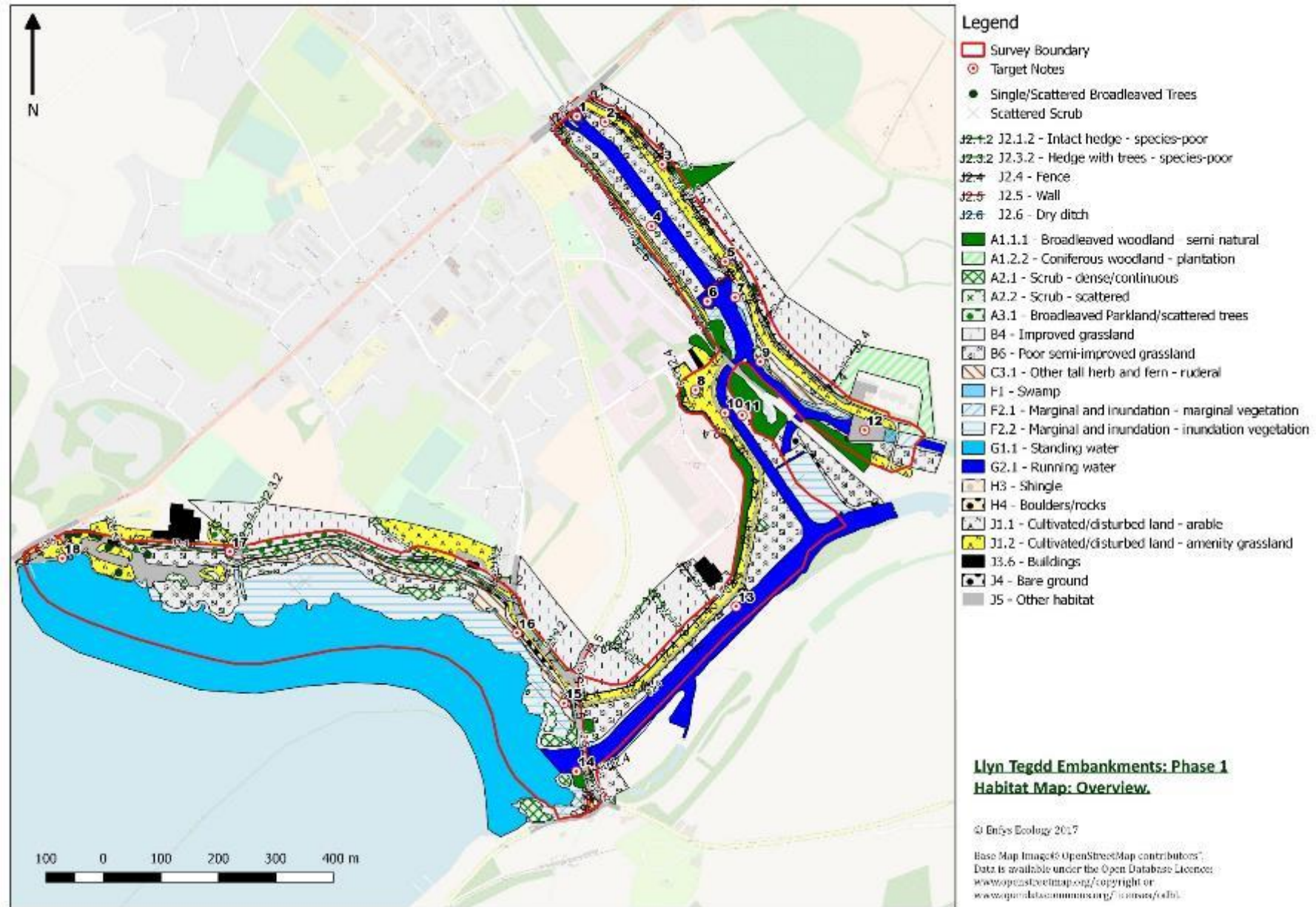
The table below contains the approximate areas of habitat types found during the survey, derived from the GIS mapping files. These should be considered approximate, as the areas are mapped boundaries between habitat types are not always absolute, and the mapped area is by nature arbitrary, in any case. Some of the habitat is also outside the red bordered survey area (see map).

**Table 1.** Approximate habitat areas as shown on the Habitat maps (Overleaf). The % of the total area column has been calculated *excluding* the open water area (the lake). Linear features are not included.

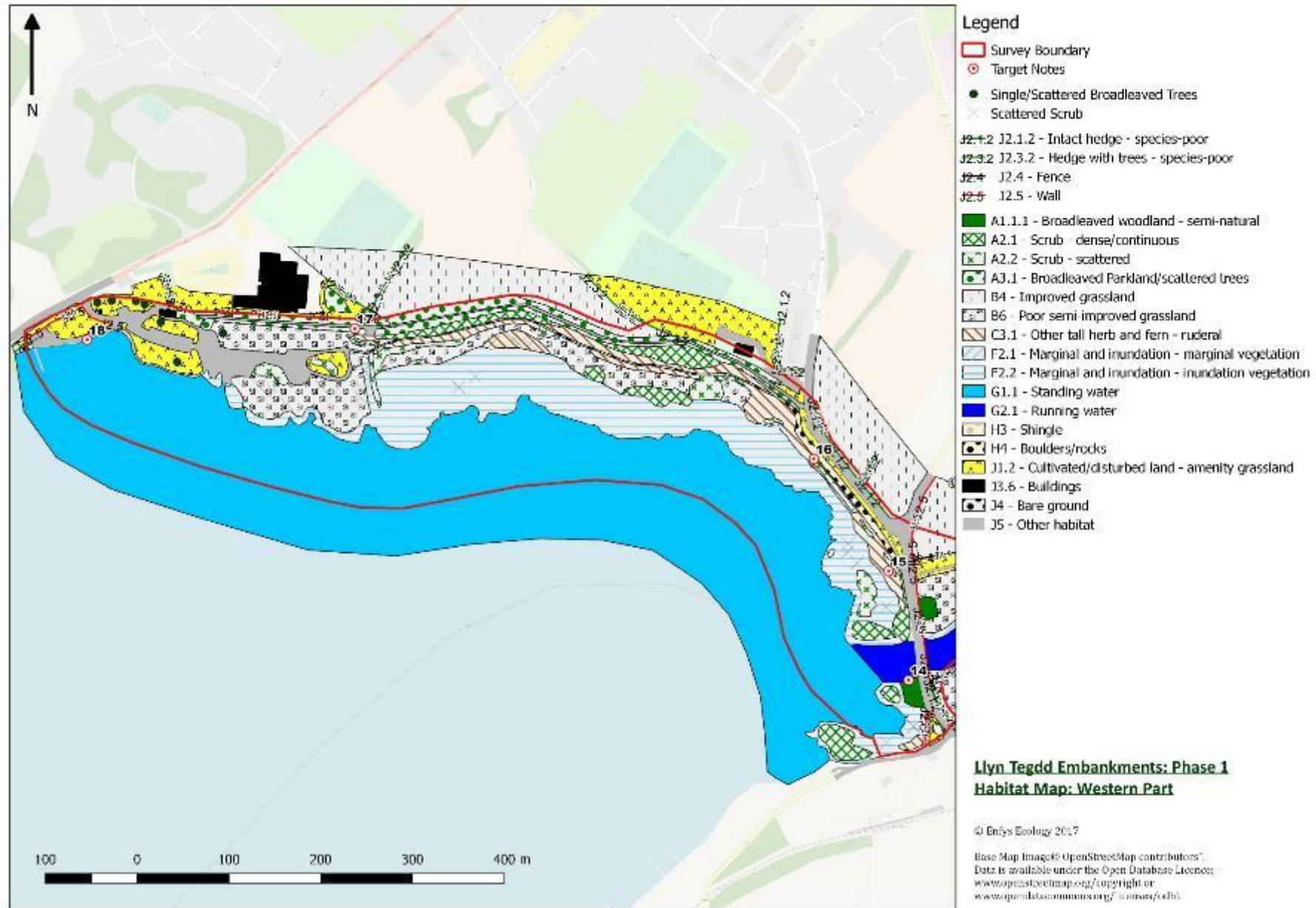
Habitat	Code	Area (M <sup>2</sup> )	Area (Ha)	% of Total
Semi-natural Broadleaved Woodland*	A1.1.1	19224	1.9224	4.6
Plantation Broadleaved Woodland*	A1.2.2	10501	1.0501	2.5
Dense Scrub	A2.1	8555	0.8555	2.0
Scattered Scrub	A2.2	4712	0.4712	1.1
Scattered Broadleaved Trees/Parkland	A3.1	12005	1.2005	2.9
Improved Grassland*	B4	68478	6.8478	16.3
Poor Semi-improved grassland	B6	69680	6.968	16.6
Tall Ruderal vegetation	C3.1	11107	1.1107	2.6
Swamp	F1	1085	0.1085	0.3
Marginal Vegetation	F2.1	2831	0.2831	0.7
Inundation Vegetation	F2.2	49809	4.9809	11.9
Open Water*	G1	141479	14.1479	-
Running Water*	G2	54815	5.4815	13.0
Shingle	H3	281	0.0281	0.1
Exposed Boulders/Rocks	H4	2532	0.2532	0.6
Arable*	J1.1	10357	1.0357	2.5
Amenity Grassland	J1.2	52148	5.2148	12.4
Buildings	J3.6	5231	0.5231	1.2
Bare Ground	J4	2611	0.2611	0.6
Hardstanding*	J5	34520	3.452	8.2

The Areas given are for the mapped area in total as shown on the Habitat maps overleaf, rather than within the red survey boundary. Areas for Habitats marked \* include some areas of habitat outside this boundary. The open water, for example, refers to Llyn Tegid, which has a total area of approximately 4.8km<sup>2</sup>.

## Embankments at Llyn Tegid, Bala: Preliminary Ecological Appraisal

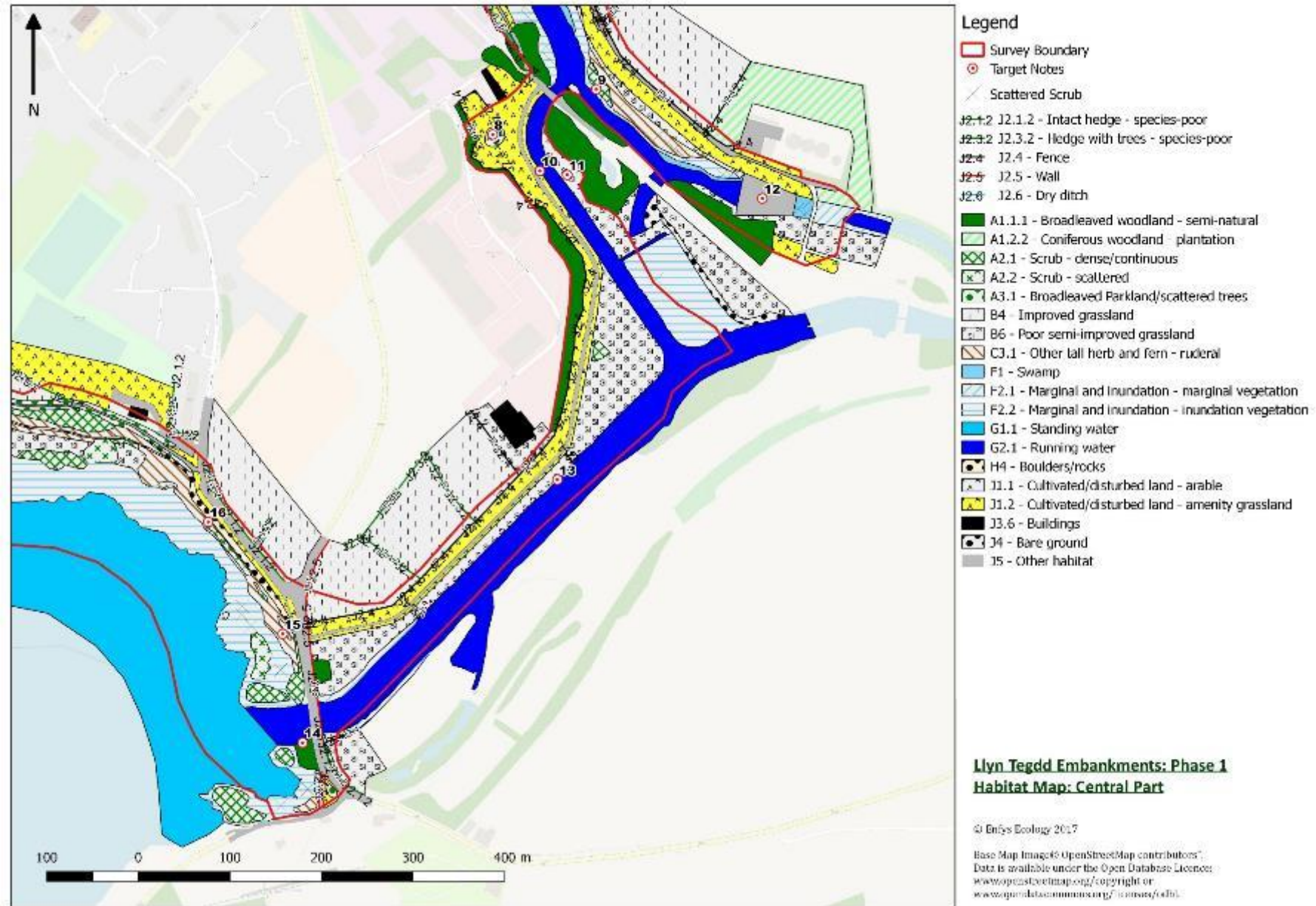


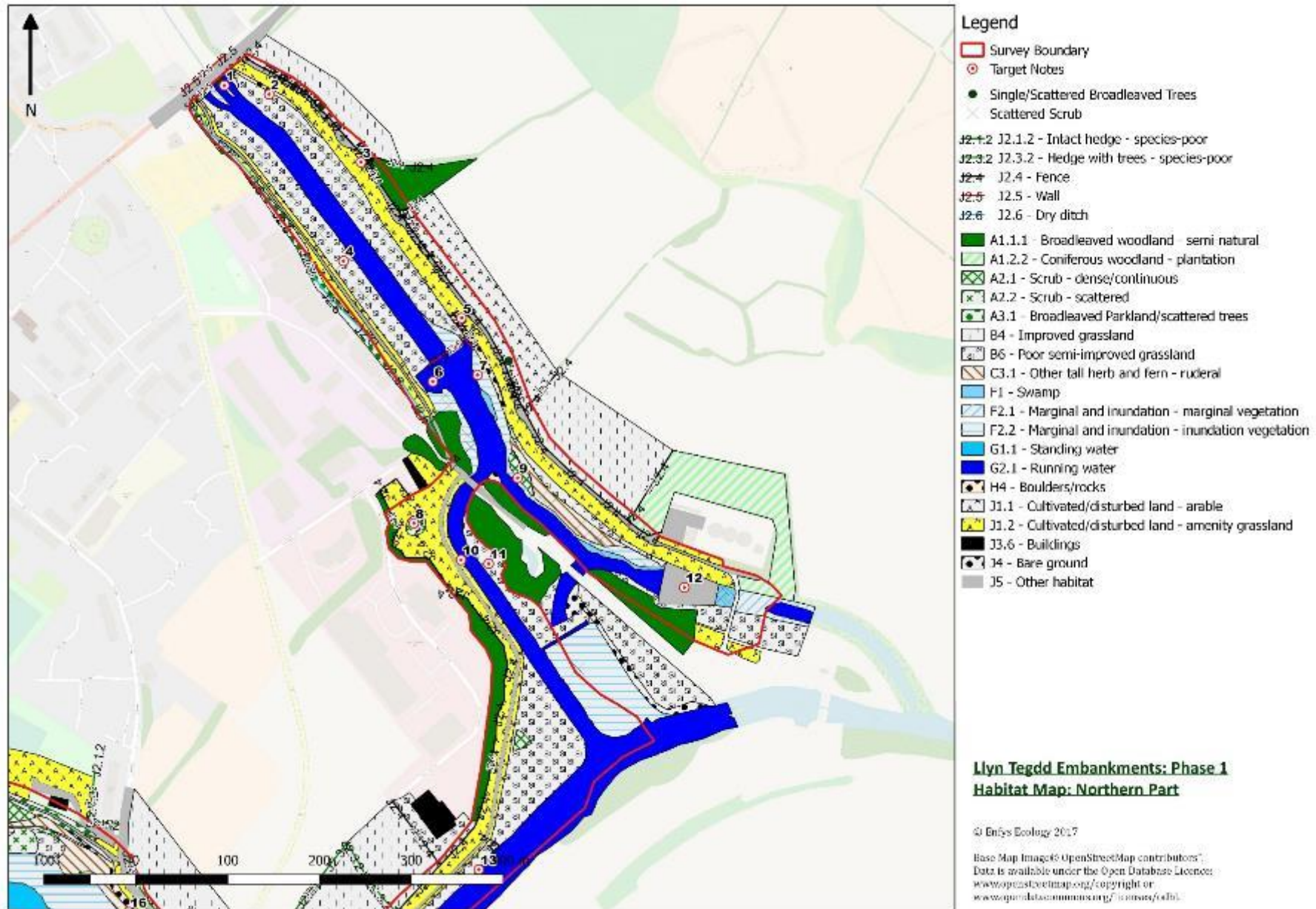
**Embankments at Llyn Tegid, Bala: Preliminary Ecological Appraisal**



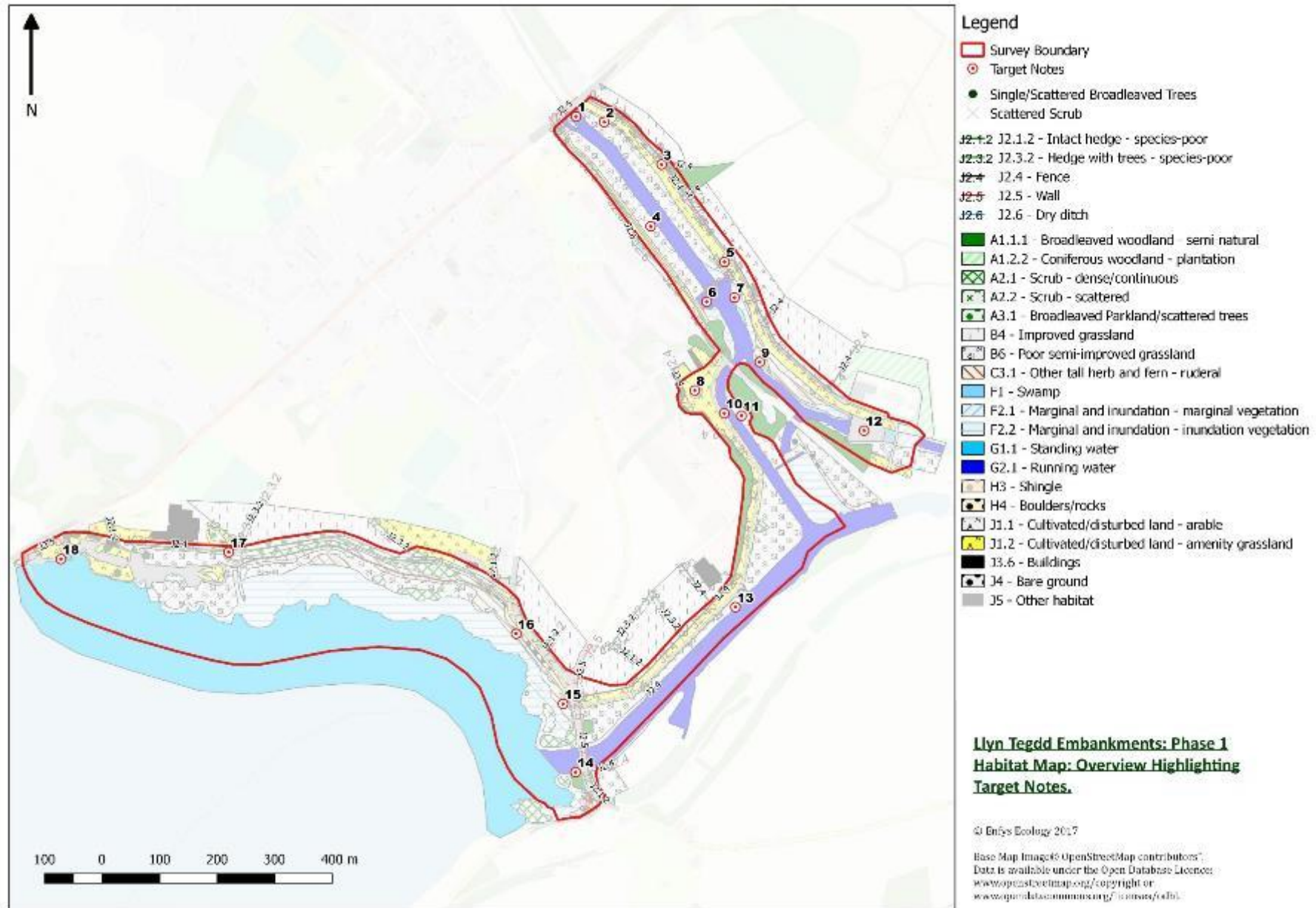


## Embankments at Llyn Tegid, Bala: Preliminary Ecological Appraisal





# Embankments at Llyn Tegid, Bala: Preliminary Ecological Appraisal



## Embankments at Llyn Tegid, Bala: Preliminary Ecological Appraisal

### 5.2 Target notes. (TN)

#### 5.2.1 Table 2. Target Notes from the Phase 1 Habitat Map.

Photographs are below the table (as indicated by the numbers in the pictures column.

The map column indicates which of the subset maps the target note is on; N – Northern, C - Central, W – Western. (All are shown on the overview and Target Note maps).

Target Number	Description	Picture No's:	Map:
1	<i>Invasive Species</i> Small islands have formed in the river here due to the bridge arches. They are covered in inundation vegetation similar to the river margins, including scrub and ruderal vegetation, and clearly flood occasionally. Both contain numerous well established Himalayan balsam ( <i>Impatiens glandulifera</i> ) an invasive non-native plant. Balsam is also found scattered at the river's edge on both banks in this area, particularly in scrub on the east bank.	1	N
2	<i>Invasive Species</i> A small but dense (and tall) stand of Japanese knotweed ( <i>Fallopia Japonica</i> ) has sprouted from the western face of the flood defence embankment at this point, above the rock facing	2	N
3	<i>Habitat Feature, Protected Species</i> A small copse of sycamore ( <i>Acer pseudoplatanus</i> ), ash ( <i>Fraxinus excelsior</i> ), oak ( <i>Quercus petraea</i> ) and other trees outside the main woodland. All trees were mature and reasonable large, the ground flora was mostly nettles and grasses, similar to the surrounding but un-cut. There was some evidence of peeling bark, though no specific gaps or knot holes could be seen. Due to time it was not possible to thoroughly examine every tree, and so it is possible potential roosting features (PRF's) are present. If the trees are to be removed (not thought to be the case) then a bat survey is recommended.	3	N
4	<i>Habitat Feature, Protected Species</i> A Kingfisher ( <i>Alcedo atthis</i> ) was seen flying from a small alder at the river's edge at this point during the survey. The bird flew south down the river. The river corridor included numerous small areas of scrub and small trees, including alder ( <i>Alnus sp</i> ) and Willows ( <i>Salix sp</i> ). There was also a large pile of wood and brash here that could possibly be used by small animals.	4	N
5	<i>Protected Species.</i> A small stone building which had some features suitable for bats, with small gaps at the top of the gable walls and between the soffits and walls. The building could not be accessed. It is possible bats may roost in the building/birds nesting, especially if the building is warmed (perhaps by machinery) or infrequently accessed. If it was to be affected by the works then further surveys are recommended.	5	N
6	<i>Invasive Species</i> There were dense stands of Himalayan balsam throughout this area, including on numerous small river islands either side of a weir. There were dense stands of just this plant on the right (west) bank, and scattered plants throughout, including inland at the top of the flood bank and individual plants in the dry ditch to the east behind it.	6	N

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	Effectively balsam is spread throughout the entire riverbank, concentrated points are target noted in this report, but the plant should be considered present throughout the riverside vegetation, often just as scattered small individual plants. Mapping these is impossible at this scale, as it would cover most of the map.		
7	<i>Invasive Species</i> A dense stand of Himalayan balsam was also present here. As at TN6, the entire riverbank had scattered examples. The lowest land close to the river forms an inundation/swamp, with reeds and other water loving species, and significant amounts of willow regeneration and other scrub.	7	N
8	<i>Habitat Feature –Pond</i> A small pond, or possibly series of small ponds depending on water level and vegetation. There were small areas of open water with duckweed ( <i>Lemna</i> sp), but less than 2m <sup>2</sup> at the time of survey. The pond(s) were thickly vegetated with reeds ( <i>Phragmites australis</i> ) and reedmace ( <i>Typha</i> ), to the exclusion of other aquatic vegetation (some possible watercress/fools watercress may be present in the centre but was hard to access/see). The water was dark and silty, and appeared deep. The remainder of the area was mostly bramble ( <i>Rubus fruticosus</i> ) nettles ( <i>Urtica dioica</i> ) and Umbellifers, and very dense and hard to access. This pond may have been created as part of enhancement works by NRW – see section 4.6.	8,9	N, C
9	<i>Invasive Species</i> Another large stand of Himalayan balsam. The plant was scattered throughout.  This area had dense willow and bramble scrub, the riverside flood plain was increasingly wet with dense beds of reed and reedmace being increasingly common. Sweetgrass ( <i>Glyceria</i> sp) is present.	-	N, C
10	<i>Marginal Vegetation</i> This bank also had a narrow band of marginal vegetation, as at target note 13 (see TN13), but is much steeper, and the banks were armoured with small rocks. The channel is very artificial and maintained with steep banks. There may be hiding places for small animals in the bank, but larger holes suitable for otter holts were not present.	10	N, C
11	<i>Invasive Species/Habitats</i> This area could not be accessed, however it was viewed from the far bank. The vegetation was similar to the banks of the Tryweryn to the north, with reeds and tall ruderal vegetation (see habitat descriptions), behind which was a woodland with mature trees. It is not known if the threes had features suitable for bats. South of this was a large area of marginal vegetation below a weir, flooded at times of high water. This was inaccessible but dominated by reeds.  Throughout the area were numerous scattered Himalayan balsam plants, - essentially everywhere at low density. The plant was found along this entire bank including the large swathe of inundation vegetation to the south.	10	N, C

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12	<p><i>Habitats</i> A broad concrete spillway at the end of a flood relief channel. The concrete was vegetating with grasses, rushes, reeds, mosses, lichens and liverworts, Below this was a swampy area of reeds, rushes, meadowsweet (<i>Filipendula ulmaria</i>). The water had dense stands of watercress (<i>Nasturtium officinale</i>) and pondweed (<i>Potamogeton</i>) (which could not be reached). The deep water appeared to contain abundant growth of green algae on the surface.</p> <p>This area was notable for being free of Himalayan balsam (and other invasives) around the spillway, possibly due to control. The odd balsam plant may be present.</p>	11,12	N, C
13	<p><i>Habitat Feature, Marginal Vegetation, Invasive species.</i> The river flows through a controlled channel of maintained earth banks, sometimes with the rocks within coming to the surface. The banks were vegetated with a narrow band of marginal vegetation dominated by common reed. The upper banks had scattered scrub including most abundantly bramble, willow, meadowsweet and common nettle and docks (<i>Rumex</i>), similar to other areas of ruderal vegetation described in this report. There may have been hiding places for small animals in the bank, but larger holes suitable for otter holts were not as likely. None were seen.</p> <p>Himalayan balsam was present all along this area as widely scattered individual plants.</p>	13	C
14	<p><i>Invasive species</i> A very dense stand of Himalayan balsam was present here on the south bank of the Dee as it flows out of the lake. The plant was also scattered amongst the lakeside vegetation south of the bridge, but appeared much more rarely on the north bank here.</p>	-	C, W
15	<p><i>Invasive Species</i> There were dense stands of Himalayan balsam within the scrub and nettles in the southern lakeshore. The balsam was concentrated inland near the flood defence bank, with only scattered individuals closer to the lake</p>	-	C, W
16	<p><i>Flood Defence Bank</i> A stone faced bank topped with managed amenity grassland runs along the lake shore, behind the broad marginal vegetation. The bank had some mosses, and vegetation coming up between cracks.</p>	14	C, W
17	<p><i>Protected Species</i> The embankment was lined with numerous large mature trees, over almost its entire length of over 700m. The trees include oak, ash, sycamore, birch (<i>Betula pendula</i>) and Horse chestnut (<i>Aesculus hippocastanum</i>). There were many trees (too many to assess during this survey) with potential roosting features for bats (PRFs), including knot holes, bark damage, hollows, etc. Many, especially around this point, were covered in dense ivy (<i>Hedera helix</i>) which may conceal bat features.</p>	15,16	W

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	Any works to these trees must be carried out following a suitable bat survey, which may include further roost assessment, and emergence surveys if needed.		
18	<i>Lakeshore Marginal Vegetation</i> Too narrow to map, but there was a narrow band of marginal vegetation, common reed, rushes and grasses, between the hardstanding, and in places shingle, at the lakes edge. The water was shallow and clear, with a gravel bottom. The lakeshore throughout had no notable aquatic vegetation <i>actually in</i> the water, just a few emergents around the edges, mostly reed, with some soft rush ( <i>Juncus effusus</i> ) Water Mint ( <i>Mentha aquatica</i> ) only present near the water's edge.	17,18	W

5.2.1 Target note (TN) pictures.



**PICTURE 1. ISLANDS WITH BALSAM. TN1.**



**PICTURE 2. JAPANESE KNOTWEED TN2.**



**PICTURE 3. SYCAMORE TREES, TN 3.**



**PICTURE 4. KINGFISHER HABITAT AT TN4.**



**PICTURE 5. BUILDING AT TN5.**



**PICTURE 6. HIMALAYAN BALSAM, TN6.**



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PICTURE 7. RIVERSIDE VEGETATION WITH HIMALAYAN BALSAM. PICTURE 8. SMALL POND WITH 'TYPHA' TN 8.



PICTURE 9. SCRUB AROUND THE PONDS, TN8. PICTURE 10. TARGET NOTES 10 (NEAR BANK) AND 11 (FAR SIDE).



PICTURE 11. SPILLWAY AND SOUTHERN END OF THE SITE. TN12.

PICTURE 12. BELOW SPILLWAY. TN12.

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**PICTURE 13. MARGINAL BANK VEGETATION. TN13.**



**PICTURE 14. STONE FACED FLOOD BANK. TN16.**



**PICTURE 15. MATURE TREES ON EMBANKMENT. TN16.**



**PICTURE 16. IVY COVERS THE TREES. TN16.**



**PICTURE 17. LAKESHORE, TN18.**



**PICTURE 18. WATER'S EDGE, SOUTH OF TN18.**

### 5.3 *Habitat descriptions*

Species common names are used in the text. A plant species list including Latin names can be found in Appendix A.

#### Western section – Lakeshore.

5.3.1 The lake shore was dominated by a broad area of mixed, often tall vegetation including grasses, stands of ruderals and bramble, and also willow scrub and small trees, which gets increasingly wet towards the lake. Most of the lakeside vegetation was low-lying and clearly subject to occasional flooding, featuring many species typical of marshland and also grassland, though species ‘preferring’ very wet conditions such as water mint appeared only within a few metres of the lake. It was therefore best described as inundation vegetation, with some of the rear, drier areas dominated by grass have been mapped as grassland. The map also attempts to define some areas which were dominated by tall ruderals (usually nettles or willowherbs) or scrub, though this should be regarded as approximate, and is probably changeable. Near a large car park at the west of the site the vegetation was short and grass dominated, and in the far west around the car park was an entirely separate area of managed improved grassland. Behind the whole area was a large earth flood defence bank, faced with stone in places and topped with trees (see target note 16), behind (north of) this are pasture fields.



**PICTURES 19 AND 20. BROAD INUNDATION AREA ALONG THE LAKE SHORE.**



**PICTURE 21. PATHWAY THROUGH THE LAKESHORE VEGETATION.**

**PICTURE 22. SHORT GRASSLAND NEAR THE CAR PARK IN THE WEST.**

- 5.3.2 The western end of the site was a car park and recreation area composed of short, mown amenity grassland, with some managed ornamental and native scrub. The grassland was managed, and species poor, with common grasses including perennial rye, and cock's foot, and other grasses which were difficult to identify at this time of year with no flowers. Dandelion, daisy, meadow buttercup, red clover, and ribwort plantain were common. Southeast of the car parks the grassland was more patchy and interspersed with small bare ground areas, but still managed, probably as an overflow car park, with curled dock, the remains of umbellifers and thistles. A small building was present, used for storage and public toilets, this had a few potential bat roosting features, principally small gaps around the eaves and roof. The grassland margins included some unmanaged areas with willowherbs, teasel, nettles, and willow and ash scrub.
- 5.3.3 The wide belt of 'inundation grassland' stretched along the lakeshore from south of the car parks, across to the southern shore beyond the Dee outflow. The composition was uniform, as a whole, but it contained numerous smaller areas dominated by different types of vegetation. The majority was grass dominated, with Cock's foot, Yorkshire fog, red fescue, glyceria and other grasses. Other plants included soft rush, meadow buttercup, meadowsweet, hogweed, common sorrel, common knapweed, common valerian, silverweed, common birds' foot trefoil (though appearing to be the introduced variety *Lotus corniculatus v. sativus*), tufted vetch and bush vetch. Occasional species in the grassy areas included angelica, creeping cinquefoil, goldenrod, sharp flowered rush, imperforate St. Johns wort, hedge bindweed, hairy bittercress, red dead nettle, water mint (near the lake), and greater stitchwort. Large areas were dominated by common reed, or common nettle, willowherbs, goldenrod, the remains of docks and umbellifers, bramble and docks, while the margins near the embankment had common mouse ear, lesser celandine and harebell (rarely). Himalayan balsam was common in the southern part of the area, but not noted north of the approximate location of target note 16.



**PICTURE 23. DENSE VEGETATION ON THE LAKE SHORE.**



**PICTURE 24. SCRUB AND LAKESHORE SOUTH OF THE DEE OUTFLOW**

- 5.3.4 The area was also dotted with scrub, formed of small trees, mostly willow, including crack willow and goat willow. Open areas had similar ground flora to the surroundings, but some

denser areas had limited ground flora, mostly leaf litter. Other woody species included roses, gorse, bramble, and hawthorn, and some ash and oak regeneration on the east.

5.3.5 The lake itself had no specifically aquatic vegetation (visible from the land, at least), and is shallow close to the shore (except at the Dee outflow) with a gravel bed.

### 5.3.6 *Embankments*

Behind the mixed scrub, grassland and tall ruderal was an earth embankment, which was faced with stone in places, and topped with short, mown amenity grassland. This was species poor and managed to be very short with a similar composition to the car park area, with frequent common daisy. There were some longer grassy areas forming the ground flora beneath the trees (seen in picture 25 below), dominated by ivy, but with thistles, docks, groundsel, common ragwort, herb Robert, red campion, clovers, nettles, greater stitchwort mullein and nettles. The banks were topped with many large mature trees (TN16), including oak, ash, horse chestnut, birch, and cherry. Behind the embankment was a loosely managed (and tall) hedgerow including hawthorn (dominant), rowan, hazel and ash. The trees were often covered in dense ivy.



**PICTURE 25. TREE TOPPED EMBANKMENT**



**PICTURE 26. TREELESS EMBANKMENT IN THE SOUTH.**

5.3.7 In the south near the Dee the embankment opens out, with only short mown amenity grassland between the bank and the road (Picture 26). Behind the embankment hedgerows were pasture fields, which were not accessed, but appeared species poor improved grassland.

### Central area -River Dee and lower Tryweryn.

5.3.8 The survey area included the north bank of part of the river Dee as it flows out of the lake, to the confluence with the Tryweryn. Flood defences are built into the riverbank here, which is a high earth bank, with rock reinforcement in places covered in tall vegetation, mostly scrub and ruderal, but there were occasional emergent vegetation stands, mostly reed. The bank was topped with a broad area of rough, semi improved grassland, and above this, a smaller raised bank with a walkway, and covered in very short mown managed amenity grassland. The grassland featured similar grasses and forbs to other parts of the area (in

particular see section 5.3.11 below, but evidently floods, with abundant rushes, common birds foot trefoil, hogweed, yarrow, meadow buttercup and thistles. The banks themselves featured tall grasses, meadowsweet, willowherbs, herb Robert, red campion, common valerian, dock, thistles, sow thistles, common knapweed, birds foot trefoil, common reed, common sorrel, hairy bittercress, tufted vetch, soft rush, brambles and nettles. There was also occasional small birch and willow trees. The short amenity grassland curved around to the north alongside the lower Tryweryn, where there was a small pond hidden within dense scrub (see target note 8). The water level here was low, with little open water, but this probably fluctuates.



**PICTURE 27. GRASSLAND ON THE NORTH BANK OF THE DEE. PICTURE 28. SMALL WOODED AREA NEXT TO THE DEE.**

### 5.3.9 *Trees and woodland*

The north bank of the Dee had two small woodland/scrub areas within the grassland. To the west by the road was a small woodland, made up of semi mature oak, ash and sycamore with a ground flora dominated by ivy, bramble, nettles and willowherbs, and male fern. In the centre of the grassland there was a small triangular area of scrub, mostly hazel, willow, silver birch, hawthorn and alder, with a dense understory of bramble, with red campion, cow parsley, thistles and hogweed. It appeared possible a pond is or was present in here, but the vegetation was very dense and no water could be seen. There is no pond here on OS maps.

5.3.10 The north and west side of the survey area here backed onto an industrial estate in Bala, and was lined by a dense but narrow band of broadleaved woodland, possibly originally a hedgerow. This was dominated by oak and ash, with birch, sycamore and hazel, above a ground flora which was dominated by bramble, nettles, and introduced shrubs, dogwood, and roses.

### Northern section – River Tryweryn

#### 5.3.11 *Embankments*

In the northernmost part of the survey area the river Tryweryn flows south in a broad channel between two large raised embankments, topped with short mown amenity grassland. Between these was a broad area of less intensively managed grassland forming a flood containment channel, and then a narrow strip of marginal vegetation (wider to the

south) and reed swamp adjacent to the river. The amenity grassland embankments were cut very short, dominated by cocksfoot, perennial rye, Yorkshire fog, curled dock, and meadow buttercup, with abundant ribwort plantain, dandelion, hawkweeds, common mouse ear, and soft rush. Common ragwort, hogweed, cleavers, field buttercup, common sorrel and common knapweed (in the south) were occasional. The rough grassland below this was very similar, but longer, and wetter, with more common soft rush. This grassland was also dotted with scattered willow and alder scrub. The narrow band of marginal vegetation along the riverside included reeds, meadowsweet, cleavers, umbelifer remains, common sorrel, greater stitchwort, a cranesbill, herb Robert, birdsfoot trefoil, tufted vetch, common valerian, and meadow buttercup.



**PICTURES 29 AND 30. THE RIVER TRYWERYN CORRIDOR LOOKING SOUTH.**

5.3.12 Further down the river the marginal/inundation vegetation areas became much broader, and also incorporated significant areas of tall ruderal and scrub. The species composition is similar to the river margins described above, with more willowherbs and bramble scrub. Himalayan balsam was common throughout. The riverside grades between effectively reed swamp and areas of dense willow, bramble, nettles and willowherbs. *Glyceria* and *Iris* were occasionally found. The river has several weirs, around which were some small islands of long vegetation including Himalayan balsam.

5.3.13 The western bank was topped with a line of mature trees in front of a broad dry ditch. The trees included oak, including an ornamental oak, ash, birch, cherry, sycamore, and occasional beech and maple, clearly planted along the embankment. Some of the trees had ivy on the trunks. A dense woodland area near the southern bridge was also mostly oak and ash, with a limited ground flora around an access road. A conifer woodland in the east appeared to be a monoculture spruce plantation.



**PICTURES 31 AND 32. DENSE SCRUB AND RUDERAL VEGETATION ALONG THE TRYWERYN CORRIDOR.**

5.3.14 Behind the eastern embankment to the east were arable and improved grassland fields, and a small oak and ash woodland, with an open ground flora.

### 5.5 *Fauna*

#### 5.5.1 Amphibians

There was potential breeding habitat for amphibians in the two (or more) small ponds at target note 8, (which may be the same pond, as access and visibility was difficult in the dense scrub), but no other breeding habitat in the area. The only other pond known from the surrounding area (within 500m) is a field pond 400m south of the Dee shown on OS maps of the area. The pond(s) within the survey area was suitable, though small, for amphibians including great crested newts, with open water and vegetation for egg laying. The scrapes created outside the area (see figure 5) will also provide potential habitat if they are holding water.

The areas have good potential for foraging habitat for amphibian species; all of the tall grassland on the lake shore and riverbanks, and woodlands are good foraging habitat. The area has good connectivity to surrounding areas along the Dee and Tryweryn corridors, and around the lake, though fish are a threat to amphibians moving through these areas, and will prevent breeding in the lake area. It is very likely common amphibians are present in the survey area.

#### 5.5.2 Badger

No evidence of badger was found during the survey. The entire area is suitable for foraging by badgers. The area contains very limited areas suitable for sett building though, - as much of the area is subject to periodic flooding or is very wet. Remaining areas are largely open and so any sett would be easily seen. The only possible places are the woodlands on the north bank of the Dee, east of the Tryweryn or behind the embankment along the lake, but no signs of a sett were seen.



### 5.5.3 Bats

All of the large mature trees on the site should be considered potential bat roosts, as it was not possible to search them all. The trees atop the embankments along the lake and the Tryweryn have suitable features for bats, with knot holes and cracks seen, and may have more features behind the dense ivy on some of the trees. The ivy itself is in many cases dense enough to count as a potential roosting feature.

5.5.4 The tree lines form part of a larger network of tree lines and hedgerows forming potential bat flight paths and commuting pathways along the Dee and Tryweryn corridors. The lake shore may also be used, and bats are likely to forage on small insects emerging from the water across the site. Overall the site is likely to be used by bats and may support significant activity, both foraging and commuting, with the river corridors being used for long distance navigation.

### 5.5.5 Nesting birds

The trees and woodland were all very suitable for nesting bird species, including several large oaks with knot holes and other gaps. All the trees and scrub across the site should be considered potential bird nesting habitat. The reedbeds and long vegetation by the lake may also be used by waterfowl for nesting.

### 5.5.6 Reptiles

The survey areas contains some areas of good reptile habitat, but these are tending to be small, as most of the vegetation is either uniformly tall or very short, with few areas with both open areas for basking, and tall vegetation for cover. Reptiles may use the areas of the lakeside and river embankments where there are exposed rocks, which will be good for basking, and with good cover close by. The rocks making up the embankments may also provide overnight shelter or even hibernation spots, but except on the embankment along the Dee these areas are small and relatively isolated, so it is not known if reptiles are present.

The area however does provide good habitat for grass snakes (*Natrix natrix*), with wet tall grassland in which to hunt, watercourses, and stones and probable deep gaps within the embankments to shelter, it is likely this species is present, as there is good connectivity to other similar areas via the river corridors.

### 5.5.7 Otter

The large rivers and lake provide very good habitat and connectivity for otters and it is very likely that they use the survey area for both foraging and passing through. Whether any holts or lying up places are present is more difficult to determine. No evidence was seen, however they could be present within dense understory areas, such as the scrub by the rivers, and very likely the inundation vegetation and scrub along the Tryweryn.

The lake shore is suitable for spraint marking in the exposed shingle areas by the shore, but probably not for holts as the area is nearly flat a good way inland, and there may not be suitable burrows, though the scrub may provide some opportunities. The river channels on

the other hand are managed to control flooding, and so are either low to the water, or steep and faced with rock, except in the east of the area on the lower Tryweryn. No suitable spots or cracks within the rocks could be seen, and are less likely to be present in a maintained and monitored structure such as this. There are also no prominent shoreline rocks for spraint marking due to this. Despite this it is certainly possible that otters do have residence in the area. The extreme east of the survey area near the spillway is probably best for this, and the most likely area with the most cover. At least two holts were created by NRW close to this area, which may well be occupied, although it is noted that these need repairs.

### 5.5.8 Water Vole

The embankments and marshy areas are suitable for water vole, though many of the same caveats apply as for otter, in that these are managed channels. There were limited opportunities for burrowing in the very low banks of the lake or Tryweryn, with limited cover inland due to the short cut grassland, while the Dee and Lower Tryweryn banks are rocky and difficult to burrow in. The lower Tryweryn is the best area, with steeper banks and lots of grass forage and cover in the swamp and scrub, and it is possible water vole are present here. No evidence was seen, but the area is well connected to other habitats and part are suitable.

### 5.5.9 Other Protected Species.

No evidence of other protected species (for example brown hare (*Lepus europaeus*) hazel dormouse (*Muscardinus avellanarius*) and red squirrel (*Sciurus vulgaris*)) was found. A kingfisher (*Alcedo Atthis*) was seen flying over the Tryweryn.

5.5.10 The area contains suitable habitat for water shrew (*Neomys fodiens*). While the desk study returned no records of this species, the habitat is suitable and the species is found in the wider North Wales area. On this basis, it is likely that water shrews are found in the area, though population levels are unknown.

### 5.5.10 Invertebrates

The rivers and marginal habitat are suitable habitat for many aquatic invertebrate species. Habitat heterogeneity is important for invertebrate diversity, and the weirs create areas of both fast flowing and slower water, and there are still backwaters among the many small islands in the Tryweryn, and the spillway approaches. The snail *Myxas glutinosa* is known from the lake. This species requires clear water and low levels of pollution. The clear water along the eastern end of the lake appears suitable for this species. While the habitats can be noted, it should be noted that no specific invertebrate survey was carried out during this survey.

### 6.0 Discussion and Evaluation

#### 6.1 *Nature Conservation Sites*

The scheme is located within the River Dee and Bala Lake Special Area of Conservation (SAC) and the River Dee Site of Special Scientific Interest (SSSI), and so obviously has the potential to affect both these areas. The two Local Wildlife Sites (LWS) nearby are broadleaved woodland some distance from the site (and not downstream) and so are unlikely to be affected.

#### 6.2 *Habitats*

6.2.1 The site is mostly made up of water bodies and their riparian and lacustrine vegetation communities, with areas of scrub and broadleaved woodland. Ponds and Rivers, and open freshwater lakes are considered to be Habitats of Principal Biological Importance on Section 41 of the NERC Act 2006, and Priority Habitats on Section 7 of the Environment (Wales) Act 2016.

6.2.2 The most valuable habitats present are the watercourses, and so action is required to prevent the works causing damage or disturbance to these. This is most likely to occur through discharge of pollutants, from chemicals, to spoil and silt laden runoff, which are significant concerns with earthworks next to water. A comprehensive runoff containment and drainage plan will be required, which will include the siting of chemical/fuel storage, spillage procedures, and methods of working to reduce runoff, including working upwards away from the water if possible, and covering all exposed soil with tarpaulins or similar to prevent rainwater washing soil into the watercourses.

6.2.3 The mature trees should be protected as much as possible. It is recommended that an arboricultural survey (to BS5837 standard) is carried out of the affected area, which is used to design a comprehensive plan to protect the trees within the work area. This will identify root protect in zones for all trees to be retained, which will be fenced off from site workers using Heras fencing.

6.2.4 The riverside and lakeside ruderal and inundation communities should be protected by being fenced off from the working areas, and should be off limits to site staff unless works are carried out in these areas. If areas are to be destroyed/removed by the works (not recommended) then reinstatement is needed, even if only restoring the site to a state where the riparian vegetation may quickly recolonize.

#### 6.3 *Species*

##### 6.3.1 *Flora*

Floral diversity of the site was reasonable but not high in pure species richness terms. Levels were not exceptional but this is probably partly due to the time of the survey. All of the species recorded are common in the region, and none of the species recorded during the

survey are protected by the Wildlife and Countryside Act 1981 (as amended) or considered rare nationally or locally. Two invasive species were recorded within the survey area, Japanese Knotweed and Himalayan Balsam, both of which will require treatment to remove them as part of the proposed works (invasive species are discussed in section 6.4, below).

As the majority of the proposed work involves raising the embankments, this is likely to take place on the relatively low diversity amenity grassland of the embankments, so the impact of the work on habitat diversity is likely to be low. However the embankments do feature several large mature trees which will require further mitigation if removal is required. The most diverse habitats within the site are the inundation vegetation and river margins (which are within protected areas (the aforementioned SAC, SSSI and RAMSAR sites), and so it is recommended that as little as possible of the works are planned for these areas.

### 6.3.2 *Fauna*

#### 6.3.3 Amphibians

The area is suitable for foraging amphibians, and common amphibians are expected to be present throughout. The presence of the specially protected great crested newt (GCN) is unknown, but there are no records in the wider area. While there are no records of this (or any amphibian) species from the data search and the pond is relatively isolated by the river (containing predatory fish), the presence of GCN is unlikely in this area.

For common amphibians, some specific working measures to reduce the likelihood of killing or injuring amphibians should be put in place during any works as a precaution. If these animals are found during works, they should be carefully moved to adjacent habitat away from the construction zone. Works would be stopped in the (unlikely) situation of finding a great crested newt.

#### 6.3.4 Badger

There is no evidence of badger within the area, either setts or evidence of activity, but the habitat is suitable. There are numerous records of the species within 1km, including a latrine just south of the Dee Bridge in the south of this area and so it is extremely likely that badgers visit the site. As the species is not thought to be resident (in terms of setts – the site is likely in the territory of at least one clan) no specific mitigation is required. However as badgers are known from the area, it is recommended that surveys are carried out of all areas within 30m of the works area, once proposals have been determined. If the proposed works will result in working within 30m of an active sett, then a licence for the works is likely to be required (depending on the exact works), or the works redesigned to avoid this.

If at any point during the works a previously unknown badger sett is found work will have to stop in the area, and an ecologist be called.

### 6.3.5 Bats

Many trees within the site had potential to support bats, including those indicated at target notes 6 and 16. As many of these trees are on the embankments, it is not known the extent that the works will affect them, but if it is necessary to fell or cut any of the mature trees here then the tree(s) must be subject to a bat inspection by a suitably qualified bat ecologist, possibly including tree climbing surveys. If bat roosting cannot be discounted the tree must be subject to specific emergence surveys using bat detectors during the bat survey season. Following this if bats are using the tree a bat licence will be required. If bats are not found to be using the tree, further advice regarding if supervision will be required and best practice, will be provided.

No works to the trees may be carried out until surveys are complete.

There are records of bats from the surrounding area, including many records of pipistrelle on the lake shore area of the site, and this may form an important foraging or commuting route. Were large scale removal of trees or scrub to be proposed this may require compensatory habitat works, and an ecologist must be consulted. Bat activity surveys (transects) are also required if habitat connectivity is to be affected, in order to determine levels of commuting/foraging activity and necessary mitigation.

### 6.3.7 Nesting Birds

A variety of bird species are likely to breed within the vegetation on site. From the nature of the habitats present it is considered possible that some are subject to special protection; A kingfisher was seen, but Kingfisher nests are located in sandy or other soil of exposed, vegetation free riverbanks, and no habitat matching this description is present in the area to be affected by the works. (If evidence of kingfisher nesting is seen during the works then works must stop in the vicinity and an ecologist be called). There are records of protected species including osprey, barn owl, peregrine, red kite, and others from the area. Only the large mature trees are likely to provide suitable nesting sites. There are also records of smaller species, for example ducks including merganser which may breed in the lakeside vegetation, more likely in the south away from the car park and areas used regularly by people and dogs.

As the site provides nesting habitat for birds, any tree or shrub removal required should ideally take place outside the bird breeding season, (March to September inclusive), if this is not possible, a thorough search for nesting birds should be conducted prior to any clearance (including tree climbing if required) and if any nests are found or the area cannot be adequately searched all activity must stop until the birds have fledged or outside the nesting period.

### 6.3.8 Reptiles

The survey area overall has limited potential habitat for reptiles, and it is likely that few are present due to the relative isolation and size of the suitable areas of habitat. There were no records of reptiles in the data search. The site is more suitable for grass snake due to the

connectivity of the watercourses and it is possible that these may be present in the water and margins. Suitable reasonable avoidance measures (RAMs) to minimise harm to amphibians are recommended for the works, and should be implemented where applicable to protect reptiles as well. These are specified in section 7, below. Provided this is implemented then no further surveys are required.

### 6.3.10 Otter

Otter are certain to visit the area given the suitable habitat and the sheer number of records, including recent sightings (Taylor 2018). The absence of evidence during this survey is not a concern as while evidence was searched for where possible, the survey is a PEA requiring covering a large area, and no specific otter survey was carried out. There relatively few obvious shoreline rocks, etc. where spraints are most easily seen. How likely otters are to be resident (i.e. actually in a holt) in the specific area of the works is harder to determine. The embankments are artificial and maintained, forming steep banks without significant holes or crevices, but the willow and other scrub in the southeast of the area may contain suitable spots. The holts created by NRW may be in use, and should certainly be investigated prior to the works.

The works have the potential to disturb otters using the site, but it is unlikely that this will cause significant habitat loss or direct harm. On this basis disturbance will be largely mitigated for by the implementation of suitable RAMs already in place for other small animals, (to which we have added provision for this species) but it is recommended that a search of any affected riverbanks is carried out by a suitably experienced ecologist prior to the works being carried out, once exact plans are known. If any holts are discovered these should be monitored, and if possible the works timed to avoid disturbance. If a holt is found than a suitable mitigation plan will be required, and a licence may also be needed, depending on the nature of the proposed work.

### 6.3.11 Water vole

A search for evidence of water vole can be carried out at the same time as otter survey. The presence of this species is unlikely as there are no records, and the artificial channels and embankments have limited potential. In the event that water vole are found then action can be taken to mitigate for potential harm, including possibly discouraging them from small areas, e.g. by strimming the vegetation, or wire mesh. A licence may be required depending on the action proposed in the event this species is found.

### 6.3.12 Water Shrew

Water shrew are likely to be present in the area. Suitable reasonable avoidance measures (RAMs) to minimise harm to amphibians and reptiles are recommended for the works, and should be implemented, where applicable, to protect shrews as well. These are specified in section 7, below. Survey for this species is intensive, requiring the siting of bait tubes which must be regularly checked, or trapping which requires even more frequent checks due to the rapid metabolism of the animals, carried out under a licence. As the presence of the species is assumed, appropriate mitigation will be put in place through RAMS as for other species

with equivalent protection. Provided these measures are followed then the potential to harm shrews will be minimised.

### 6.3.13 Protected Riverine/Lacustrine Species

The glutinous snail is assumed to be found in the lake shallows adjacent to the works area. As the population is known and monitored (see references listed in section 8.0) it is not considered that a survey for this species would be a mandatory prerequisite of the development; the snail is assumed to be present along the lake shore. The species is aquatic and should not be directly impacted by the works providing that the works in this area are confined to the land, and a suitable plan is put in place to prevent runoff or other pollutants reaching the water, prevent works access to the water, etc. All of which is compatible with the proposed plans as we understand them. The above also applies to the gwyniad and other lake wildlife.

If the works were to include provisions which would directly affect the lake, including the lake bed substrate, then there are potential impacts to this species, and in this case it is recommended that a survey of affected areas is carried out prior to works, with affected animals relocated to adjacent parts of the lake. As the glutinous snail is listed on species listed on schedule 5 of the Wildlife and Countryside Act 1981 (as amended) for England and Wales then a licence may be required for this work.

Freshwater Pearl Mussels (*Margaritifera margaritifera*) are also known to be found in the rivers at the site. This species is listed as critically endangered by the IUCN, and protected under UK and European law (schedule 5 of the Wildlife and Countryside Act 1981, Conservation of Habitats and Species Regulations as amended (2010)). Steep population declines in this species have been attributed to pollution including acidification, organic enrichment, siltation, and river engineering, among other causes (JNCC 2018), and therefore populations of this species may be affected by the proposed works, if runoff or other pollutants are allowed to enter the channel, or works take place within the waterbodies. Overall changes in water levels may potentially also affect this species. In the absence of specific surveys Freshwater Pearl Mussels should be assumed to be present in the rivers adjacent to the working area.

Similar to the glutinous snail, above, survey for this species is not recommended unless works directly within the watercourse are proposed. It is preferable not to disturb a known population of a rare species, and presence should be assumed. As the works may affect this species indirectly it is vital, as with the other species, to control for releases of runoff or pollutants into the water, and a suitable plan for runoff mitigation should be implemented. The most likely impact is probably silt discharge directly from the works, or soil erosion from exposed spoil, as work is likely to be proposed immediately on the embankments close to the river, which must be controlled through careful working. Likely impacts of the works, while severe if not controlled, would generally be short term in nature, one off discharges of material, of greater threat is long term changes to the watercourse due to changes in water or catchment management, for example introducing a greater level of organic nutrients or

silt to the water through more frequent flooding of marginal areas, and consideration should be given to any long term changes that might result from the works. This is outside the scope of this report, however we understand that lake and river levels are proposed to remain the same following the works, which will reduce the potential for such changes.

### 6.4 *Invasive non-native species.*

6.4.1 Japanese Knotweed is found at one point on the site. Himalayan balsam is found throughout the entire area, which is consistent with the records from 2013-14 which indicate this species has been established for a while. Both are listed on Schedule 9 of the Wildlife and Countryside Act 1981 in Wales, and it is an offence to plant or otherwise allow it to grow in the wild. These plants will require removal as part of the works. The records of Knotweed by the lake may have been dealt with by now, or refer to plants within the hedgerow and fields behind the embankment, as no other plants were seen.

6.4.2 It is recommended that appropriately qualified and experienced specialist consultants (or NRW staff if appropriate personnel are available) are engaged to remove the knotweed on the embankment. Various methods are possible:

Digging out is sometimes used but rhizomes can be deep, and regrowth usually occurs. Also bear in mind Japanese knotweed is classed as 'controlled waste' under the Environmental Protection Act 1990. And must be disposed of at licensed landfill sites. Glyphosate can also be used, it usually takes three to four seasons to eradicate Japanese knotweed with glyphosate. Use of Glyphosate near watercourses must be sensitively handled. Stem injection and covering with matting can also be used.

6.4.3 Removal of Himalayan balsam is easier in terms of the individual plant, however the issue here is the sheer number of the plants in the catchment. The seeds are spread by the watercourse and so any course of eradication which only takes place on this site without considering the wider catchment is likely to fail in the long term, as the plant will reintroduce from upstream. Therefore ideally, the balsam will be removed as part of a comprehensive project over the whole catchment, - but this is probably unlikely to be feasible.

The North Wales Wildlife Trust currently run the Dee Invasive species project (DINNS), focussed on community based projects to control invasive species on the Dee, and may be able to help with control of this species at this site.

6.4.4 Balsam control is usually required to be carried out before August of any particular year, as the plants should be removed before they set seeds. Some recommendations on treatment of Himalayan balsam are included in the recommendations section, in section 7, below.

### 6.5 *Summary of the Main Potential Ecological Issues*



- The major feature of ecological value in the area are the watercourses and lake, and above all action is required to prevent damage or disturbance to these waterbodies, especially release of chemicals or spoil, silt laden runoff water or any other pollutants into the water, even on a small scale. The mature trees and riparian vegetation are also valuable. Impacts on water quality are the main potential impact on rare and endemic species including the Gwyniad, Freshwater pearl mussel and the snail *Myxas glutinosa*.
- The area has significant amounts of the invasive non-native Himalayan Balsam, and Japanese Knotweed which will require removal.
- Otters are almost certainly found throughout the area.

### 6.6 Conclusions.

- 6.6.1 The proposed embankment works have the potential to affect statutory protected sites, and both habitats and species of conservation and legal importance if handled insensitively, but with appropriate mitigation the impacts should be minimal. The principal concern is effects on the water quality or water level downstream of the project, and a suitable plan is required to prevent pollutants entering the watercourses, including silt and soil in surface runoff. The project will also have to consider the potential for changes to water levels and the effect this may have on aquatic communities. The effect of runoff on the lake would also be potentially serious.
- 6.6.2 Otherwise, the area is used by otter, and almost certainly by bat species, for whom the lakeside may be an important foraging or commuting zone. The requirement of the project to remove or maintain any of the large mature trees on the embankments is not known, but any tree removal should be minimised, as the trees may support bat roosts, but are arguably more important as a foraging or commuting flight line. The actual habitats which will be most affected by embankment raising works are relatively species poor; short mown amenity grassland and semi-improved grassland, and it is recommended that as much of the work as possible is confined to these grassland areas.
- 6.6.3 The most diverse plant communities are on the lakeshore and river margin inundation. Wherever possible it is highly desirable to maintain the size of these habitats (or increase this as long as it is at the expense of relatively species poor grassland, not the watercourses), but recognising that this site needs to function foremost as a managed waterway for flood defence and river management then this may not be possible. Any works that are proposed on the lake shore should ideally be as close to the landward side (the embankment) as possible, and towards the western end (car park area), as these areas were less diverse. The area is likely to form an important connecting habitat between the lake and two river catchments, for animals such as otter and plant communities and project should aim to leave the area with the same or greater connectivity in habitats. Ideally if any of this habitat was to be lost this should be mitigated for by the creation of additional areas, but as creating

more shoreline may entail partly filling in the lake (which should not be done) this is not a simple matter, habitat loss here should be avoided.

(Compensatory habitat works would in this instance be better on other areas of the Dee or Tryweryn away from this site where, for instance the banks are species poor farmland, though identifying these areas is outside the scope of this report).

- 6.6.4 The lakeshore inundation vegetation forms part of a wetland RAMSAR site, SPA and SAC, and it is desirable to minimise any detrimental effect on this area. The proposed extension to the Bala Lake Railway appears to run along the bridges and roadway over this area, and then onto the embankment. Ideally the embankment works will also be confined to this area, but also be carried out without the loss of any large trees. The lake is known to be the site of the last British population of the glutinous snail. This aquatic species should be considered present in the waters of the lake adjacent to the work area. This, and other aquatic species such as the freshwater pearl mussel shouldn't be affected by works on dry land (as is proposed along the lake shore), provided that measures are in place to control possible runoff into the water, over both short (during the work) and long term (changes to local hydrology).
- 6.6.5 Finally there is a need to remove Himalayan balsam from much of the area, ideally this should be done without clearing the rest of the vegetation (essentially so on the lakeshore) and disturbing otters or other protected species. Therefore pulling this up is the recommended control method.
- 6.6.6 In the long run the scheme has the potential to be low impact in terms of biodiversity, as the result will be broadly similar habitats and conditions, providing the important features are retained, and there is a potential for minor enhancements.

## 7.0 Recommendations

### 7.1 *Protected Species*

#### 7.1.1 *Bats and Nesting Birds.*

Any tree or shrub removal should be timed to avoid the bird breeding season which runs from March to September (inclusive) to avoid damaging/disturbing any nests present.

If it proves necessary to work during this season then a survey must be carried out immediately prior to works starting to ensure that no active nests will be affected. If active nests are found then work must be delayed until all chicks had fledged. Any of the mature trees highlighted in this report as potentially suitable for bats must be subject to a suitable bat survey by experienced ecologists during May-August. (These include any of the large mature trees at target note 17, but also along *all* embankments, plus wooded areas at target note 3).

An exploratory survey of trees to be felled is initially recommended in 2018, once initial plans are formed. This will establish if the trees are in use by bats. If bats are found removal of the tree may only proceed under a licence from Natural Resources Wales (NRW). It may be possible that further surveys are required prior to felling if suitable features are found, but this is speculative prior to initial survey. Substantial tree felling will also affect the flight lines or foraging habitat for bats, and so transect activity surveys would be needed to assess this and design suitable mitigation. As this remains a possibility (the final scope of the plans is unknown), a series of activity transects are recommended. At minimum, one transect should be carried out per month during the period April- September. These will be carried out according to Bat Conservation Trust (BCT) best practice guidelines (Collins, J. 2016), and cover at minimum the lines of trees along the embankments on the Dee, Tryweryn, and Llyn Tegid.

No further bat work is required if the plans do not require the felling of mature trees, or on any trees not proposed for felling (but transects must be carried out as long as this remains under consideration as a possible option).

### 7.1.2 *Otter and Water Vole.*

Once the final plans are known, it is recommended that a survey of the water's edge within 30m of any proposed works is carried out for evidence of otter holts prior to works taking place. If evidence is found that the works will cause the destruction or disturbance of a holt or resting place then further mitigation work may be required, ranging from a licence to an inspection of the sites each morning to ensure that otters have left the area prior to works. Checks for Water vole will also be carried out at this time, - but specific survey is not required.

The existing known holts should also be checked prior to the works to establish occupancy, and if these are to be affected then mitigation designed as above. This may be best carried out through the positioning of suitable camera traps, which could be done by the ecologist or NRW staff.

Otter are certainly present in the area and will move through the area during the works period, therefore the measures in section 7.4.1 must be implemented during the works.

### 7.1.3 *Great crested newt.*

Due to the lack of records of this species and fragmentary habitat on site, it is considered very unlikely that GCN are present on site. This view was supported following initial consultation with NRW staff and National Park Planning Authorities; great crested newts are not known from the Bala area. Therefore, no further works are proposed to survey for this species.

The pond will in any case be difficult to survey by conventional means (as access is difficult for torch surveys and traps, and open water is limited). If a GCN are found at any point during the works, then works must stop in the vicinity and a licence may be required for the works, along with other mitigation measures.

### 7.1.4 *Riverine and Lacustrine Species*

In order to protect sensitive aquatic species, a suitable drainage and runoff management plan should be produced once the works locations are known. This will include measures to prevent pollutants, silting or runoff discharge into any watercourses, and will include such measures as restricting refuelling and any work with pollutants to areas away from the water, covering of exposed substrate, directional working and the use of cofferdams.

### 7.2 *Invasive species.*

7.2.1 The Japanese Knotweed on site should be removed by a suitably qualified consultant or NRW staff, if available. Various treatment methods are available, including stem injection, weedkillers and digging, but this requires specialist advice.

7.2.2 Action is required to remove Himalayan balsam from the site. As it is now autumn the plants on site will have set seed, so the plant will reappear in the growing season next year if removed now. Control measures should be implemented in spring and early summer 2018 and if at all possible all balsam on site should be removed prior to any works taking place, however in order to avoid spreading this species it is essential that all balsam in works areas is controlled prior to works commencing.

### 7.2.3 Balsam control:

Himalayan balsam is removed by pulling it out at the root and breaking the plants stem, or strimming, ensuring that the stem is broken below the first node in both cases. The plants are then left on site to dry out and die. This should be carried out before the plant sets seed, usually in July-August. It is an offence (under the Wildlife and Countryside Act 1981, Section 9 schedule 14) to cause this plant to grow in the wild, therefore waste which may contain seeds must be carefully handled. Biosecurity measures must be implemented to prevent spreading, see section 6.2.4, above.

7.2.4 As removal of the plants prior to seeding is not possible at this site in 2017, it is recommended that contractors remove any balsam that is still present when the works begin. However, ideally control work will also be carried out in 2018 (depending on the timing of the works, still to be determined at this early stage).

7.2.5 Control in 2018 should take place well before July, when plants begin to set seed, and be either through controlled pulling of the plants, breaking them before the first node, or strimming. Plants should then be left on site to die off. The most effective method would be a large working party going over the site and pulling up any balsam found and crushing it. This is because the species is not only present in large discrete stands, but throughout the site in small amounts and scattered plants, therefore a large group will be required to cover the whole area. Alternatively it is possible to control by strimming the plants below the first node. This will require strimming the vegetation of essentially the whole working area in order to ensure that all plants are controlled. It was not possible to map each individual

plant at present this would require strimming the entire works area to ground level – feasible, but not good for protected species, so this is not recommended, hence pulling is favoured, and is the only appropriate measure in the SAC and RAMSAR site areas. Experienced staff who can recognise Balsam should be used wherever possible.

- 7.2.6 Other methods may work, and may be used provided a properly considered plan can be produced. Ideally the entire catchment should be treated or the plant will return, and ultimately this has to be the recommended approach. As that is a large undertaking (!) and may not be possible it would be wise to expect the balsam to return, and schedule regular control, if possible over multiple years. If controlled in 2018, there is no reason why Balsam cannot be removed from the works area prior to the works commencing.
- 7.2.6 Himalayan balsam is target noted on the maps where present in large stands, but it is now scattered throughout the vegetation below the embankments and should be regarded as present in any of the inundation vegetation, semi-improved grassland, scrub and ruderal vegetation of the entire survey area, except the lake shore northwest of Target Note 16.

### 7.3 Site General

- 7.3.1 Suitable Reasonable Avoidance Measures (RAMS) will be implemented to reduce the potential to impact to otters, reptiles, amphibians, nesting birds or other species that may be found on site. Example such measures are set out in section 7.1.5. As the precise nature of the works is not known, all the measures in this section should be implemented as appropriate.
- 7.3.2 A biosecurity risk assessment must be carried out and the recommendations implemented for the duration of the works.
- 7.3.3 It is recommended that action is taken to protect the large mature trees on site during the works. If any works involving breaking ground are proposed within 10m of the wooded areas, then suitable root protection zones should be identified by an arboriculturalist (if this has not already been done) and Heras fencing should be used to create a tree protection zone around the trees, as far as possible during the works. This area should be out of bounds for site workers, and especially machinery. Any works within SSSI will require consent from NRW. A tree survey to BS5837 should be carried out if works are taking place in close proximity to trees.
- 7.3.4 *Reasonable avoidance measures,*  
The following measures should be implemented at all times during the works:
- Working areas should be kept to the minimum required.

- If works are taking place in close proximity to trees a BS5837 survey may be required to ensure the trees, and the development is protected. Root zones may require fencing off to ensure the roots are not damaged.
- Should it be necessary to have any excavation left open these excavations should ideally be covered with plywood boards (or similar). The boards are to be bedded on sand to prevent small animals from taking shelter under exposed edges. If this is not possible, then these trenches must be thoroughly checked prior to back filling, or if leaving pits or trenches open is unavoidable, a suitable ramp (such as a plank or branch) must be provided to allow badgers, otters and other animals to escape the pit. Ramps could be created by grading the slope at the edges or using scaffold boards.
- Trenches must be checked each morning (by site operatives) prior to works commencing to ensure that amphibians/reptiles etc. are not present.
- Any exposed soil or substrate adjacent or above a water body must be covered with a suitable waterproof sheeting material at all times when not being worked on, in order to prevent rain and surface runoff washing material into the water.
- Storage of fuel must be properly bunded, and machinery provided with drip trays especially when refuelling. Refuelling and storage of potential pollutants should be restricted to site compounds and hardstanding areas well away from the water where runoff can be prevented from entering the watercourse. Given the nature of the site it is recommended that refuelling and storage takes place off site, perhaps at the NRW Bala compound.
- At the end of works each day, the site should be inspected by a responsible individual to ensure that the above protocols are being complied with.
- Works should ideally be avoided within 1 hour of dawn and dusk where possible, but if works outside this time are needed then all lighting should be directional and be directed away from the woodland areas or the water corridor (as this may affect otters), i.e. lights should be directed on to the site from the perimeter.

### Sightings.

While preliminary surveys will be designed and undertaken to establish the presence of protected species, precautions should be in place in the event any are encountered:

- If at any point in the works a reptile or amphibian is found all works in the vicinity of the sighting must immediately cease, and the animal moved from the site into by hand (wearing gloves). If this is not possible then an ecologist must be called. The ecologist will review the situation and advise on further action.

- If at any point during the works an otter, water vole, badger or water shrew is seen works must immediately stop in the vicinity of the sighting and an ecologist should be notified, and the sighting recorded. The ecologist will assess the situation and determine if further action is needed. The animal must be allowed to leave on its own, undisturbed. If this is not possible e.g. the animal is injured or trapped then the ecologist will determine the best course of action. It is possible that works will be delayed while licenses or other approval is obtained.
- Any other animals, for example squirrels, hares, seen must be allowed to leave the area on their own. If this is not possible e.g. the animal is injured or trapped then an ecologist must be called.

### 7.4 *Enhancements*

7.4.1 Without specific plans of the proposed works and other information it is difficult to determine the scope for enhancement of the area. The area also must function as a flood defence in the first instance. Any habitat works are also likely futile in the long run without control of Himalayan balsam, so that should be a priority.

7.4.2 It is difficult to specify habitat enhancements in the absence of plans. The first principle in sensitive sites such as this should be non-intervention, but there is scope for improvement through scrub clearance in places (mostly bramble) which may be required anyway in order to get to the balsam. Works to the lakeshore should be limited, but the creation of additional temporary pools and more marshy conditions over more of the area presently occupied by bramble would be of benefit. Planting of black poplar (*Populus nigra*) in suitable locations on the embankments should also be considered.

7.4.2 The previously created otter holts and amphibian scrapes should be identified, assessed and repaired where necessary, including improving two scrapes which are believed not to be holding water.

7.4.3 It is recommended that the works include a suitable raised earth bank for kingfisher nesting, near the River Dee or Tryweryn. While the area is subject to flooding the natural habitat in the area is as also, and a suitable bank could be incorporated into a corner of the embankment, with a timber frame filled with partially rammed earth.

7.5.4 Bat and bird boxes should also be erected on the trees, especially if any are to be lost. The banks should where possible be maintained as wildflower hay meadows, with mowed areas where necessary for public access.

### 7.4 *Summary of Further Survey Recommendations*

Table 3 (overleaf) contains a summary of the recommended surveys and conditions in which they would be required, along with information on timing.

### Required works:

#### Bats

- If any trees are to be felled as part of the works then these should be inspected by a suitable bat ecologist prior to felling. If there are suitable features for bats then tree climbing survey or/and an emergence survey will need to be carried out immediately prior to felling.
- Activity Transect surveys are required if tree works are proposed which may affect or cause gaps to appear in the habitat connectivity formed by the large tree lines and woodland areas.

#### Badgers

- Surveys should be carried out to determine if any active setts are present within 30m of any proposed works. Working with machinery within 30m of an active sett will usually require a licence. If any setts are found and can be shown to be inactive these will require monitoring in case badgers return to the area.
- Depending on the proposed works, if disturbance to a sett is likely then a licence will be required for the works. This will be assessed by the ecologist following survey, taking into account the proposed plans. Works which require disturbing a sett, closing or temporarily excluding badgers from a sett can only be licenced between 1 July and 30 November.

#### Birds

- Nesting bird surveys should be conducted by a suitably experienced ecologist in the event that vegetation clearance must take place in the bird breeding season (March-September inclusive).

- Otters

Before works begin checks should be carried out on the existing holts identified by and/or installed by NRW, along with a check for spraints and any other evidence. The results of this survey will inform the design and potential mitigation for the scheme, as if any Holts are occupied and will be affected for the works, the ecologist will be able to advise on potential mitigation, licencing, etc.

- In addition; Otter Surveys are required of the waterline anywhere within 30m of the works to determine if Otter holts will be affected. This should be carried out a short time prior to works commencing. The ecologist will advise on further action if otters are found. This survey should also check for water voles and water shrews.



- Amphibians  
Due to the relatively low likelihood of this species' presence further survey is not required. Common amphibians may be present, and so specific Reasonable Avoidance Measures (RAMS) will be implemented during the works.
- Other  
In the event that works will *directly* affect the lake substrate then surveys for the glutinous snail are required. This should be preceded by a mitigation plan which will assess the works and detail recommendations including relocating the animals, exclusion from the works area, as appropriate, and details of required licencing.

Table 3. Summary of recommended further work, with timings and the conditions under which surveys are required. N.B "Pre-construction" means prior to the works phase beginning on site, whereas "Immediately prior to works"" means during the works, but prior (ideally within 24 hrs) to that particular operation (e.g. tree felling) beginning.

## Embankments at Llyn Tegid, Bala: Preliminary Ecological Appraisal

Condition	Work Stage	Species	Surveys	Location	When possible
For all works	Pre-construction	Otter	Holt checks, Bank survey	NRW created Holts and surroundings	All year
For all works	Immediately prior to works	Otter	Otter Survey	Riverbank areas, particularly scrub, banks.	All year
For all works	Pre-construction	Badger	Survey for Setts	Within 30m of any proposed working areas.	All year (licenced works only possible between 1 July and 30 November)
If mature trees are to be felled/cut	Pre-construction	Bats	Tree Inspections	Any mature trees which are to be felled	All year
If suitable bat features are found	Pre-construction	Bats	Bat Emergence Surveys	Any trees above where suitable features are found.	May-August
If works will affect tree lines, including creating gaps by tree felling	Pre-construction	Bats	Transect Activity Surveys	Whole site – areas where felling proposed. Embankments.	April-September (Monthly surveys throughout season)
If vegetation clearance in March – September	Prior to clearance, whenever this occurs	Nesting Birds	Nesting Bird Surveys	Any scrub, tree, or tall vegetation clearance	March - September

### 8.0 References and useful Information Sources

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9.0 Appendices

**Appendix A. Plant Species List, including Latin names. (This list is Not Exhaustive).**

Invasive non-native species are shown in red. No protected or notably rare species were found.

Habitat	English Name	Scientific Name
Grasslands	Perennial Rye-grass	<i>Lolium perenne</i>
	Cock's-foot	<i>Dactylis glomerata</i>
	Meadow grass	<i>Poa Sp. (Prob P. trivialis)</i>
	Meadow foxtail	<i>Alopecurus pratensis</i>
	Crested dog's tail	<i>Cynosurus cristatus</i>
	Broad-leaved Dock	<i>Rumex obtusifolius</i>
	Curled Dock	<i>Rumex crispus</i>
	Creeping thistle	<i>Cirsium arvense</i>
	Red clover	<i>Trifolium pratense</i>
	Red campion	<i>Silene dioica</i>
	Common sorrel	<i>Rumex acetosa</i>
	Bird's foot trefoil	<i>Lotus corniculatus ssp Sativa</i>
	Yarrow	<i>Achillea millefolium</i>
	Common/black knapweed	<i>Centaurea nigra</i>
	Common vetch	<i>Vicia sativa</i>
	Tufted vetch	<i>Vicia cracca</i>
	Hairy bittercress	<i>Cardamine hirsuta</i>
	Meadow buttercup	<i>Ranunculus acris</i>
	Ribwort Plantain	<i>Plantago lanceolata</i>
	Soft rush	<i>Juncus effusus</i>
	Creeping Thistle	<i>Cirsium arvense</i>
	Common daisy	<i>Bellis perennis</i>
	Hogweed	<i>Heracleum sphondylium</i>
	Scarlet pimpernel	<i>Anagallis arvensis</i>
Yellow pimpernel	<i>Lysimachia nemorum</i>	
Japanese Knotweed	<i>Fallopia Japonica</i>	
Meadow cranesbill	<i>Geranium pratense</i>	
Inundation/ Ruderal	All above species including all grasses with:	
	Himalayan balsam	<i>Impatiens glandulifera</i>
	Soft rush	<i>Juncus effusus</i>
	Sharp flowered rush	<i>Juncus acutiflorus</i>
	Common/black knapweed	<i>Centaurea nigra</i>
	Common valerian	<i>Valerian officinalis</i>
	Silverweed	<i>Argentina anserina</i>
	Bird's foot trefoil	<i>Lotus corniculatus ssp Sativa</i>
	Tufted vetch	<i>Vicia cracca</i>
Bush vetch	<i>Vicia sepium</i>	

	Creeping cinquefoil	<i>Potentilla reptans</i>
	Goldenrod	<i>Solidago</i>
	Hairy bittercress	<i>Cardamine hirsuta</i>
	Angelica	<i>Angelica archangelica</i>
	Imperforate St. Johns wort	<i>Hypericum maculatum</i>
	Ground ivy	<i>Glechoma hederacea</i>
	Mullein	<i>Verbascum thapsus</i>
	Common dog violet	<i>Viola riviniana</i>
	Ivy	<i>Hedera helix</i>
	Foxglove	<i>Digitalis purpurea</i>
	Cleavers/goosegrass	<i>Galium aparine</i>
	Herb Robert	<i>Geum Robertium</i>
	Greater Stitchwort	<i>Stellaria holostea</i>
	Harebell	<i>Campanula rotundifolia</i>
	Lesser celandine	<i>Ficaria verna</i>
	Common mouse ear	<i>Cerastium fontanum</i>
	Red dead nettle	<i>Lamium purpureum</i>
	Reedmace	<i>Typha latifolia</i>
	Common reed	<i>Phragmites australis</i>
	Brooklime	<i>Veronica beccabunga</i>
	Sweet grass	<i>Glyceria sp (almost cert. G. fluitans)</i>
	Meadowsweet	<i>Filipendula ulmaria</i>
	Water Mint	<i>Mentha aquatica</i>
	Goosegrass	<i>Galium aparine</i>
	Rosebay willowherb	<i>Chamerion angustifolium</i>
	Greater willowherb	<i>Epilobium hirsutum</i>
	Hedge bindweed	<i>Calystegia sepium</i>
	Common nettle	<i>Urtica dioica</i>
	Bramble	<i>Rubus fruticosus</i>
	Hogweed	<i>Heracleum sphondylium</i>
	Umbellifers –remains of.	<i>Umbelliferae</i>
Woodland, Trees, and Scrub	Oak	<i>Quercus petrea</i>
	Ash	<i>Fraxinus excelsior</i>
	Wych elm	<i>Quercus petraea</i>
	Beech	<i>Fagus Sylvatica</i>
	Sycamore	<i>Acer pseudoplatanus</i>
	Sitka spruce	<i>Picea stitchensis</i>
	Hawthorn	<i>Crataegus monogyna</i>
	Hazel	<i>Corylus avellana</i>
	Holly	<i>Ilex aquifolium</i>
	Silver birch	<i>Betula pendula</i>
	Rowan	<i>Sorbus acuparia</i>

## Embankments at Llyn Tegid, Bala: Preliminary Ecological Appraisal

	Horse Chestnut	<i>Aesculus hippocastanum</i>
	Alder	<i>Alnus glutinosa</i>
	Field Maple	<i>Acer campestre</i>
	Bramble	<i>Rubus fruticosus</i>
	Dogwood	<i>Cornus sanguinea</i>
	Fushia species	<i>Fuschia sp</i>
	Cherry species	<i>Prunus sp.</i>
	Cotoneaster	<i>Cotoneaster sp.</i>
	Goat willow	<i>Salix cinerea</i>
	Crack willow	<i>Salix fragilis</i>
	Willows	<i>Salix sp</i>
	Gorse	<i>Ulex europaeus</i>
	Roses	<i>Rosa Sp (garden variety)</i>
	Hart's tongue fern	<i>Asplenium scolopendrium</i>
	Male fern	<i>Dryopteris filix-mas</i>
	Bracken	<i>Pteridium aquilinum</i>
Aquatic/Other Habitats	Ivy leaved toadflax	<i>Cymbalaria muralis</i>
	Reedmace	<i>Typha latifolia</i>
	Common reed	<i>Phragmites australis</i>
	Brooklime	<i>Veronica beccabunga</i>
	Sweet grass	<i>Glyceria sp (almost cert. G. fluitans)</i>
	Meadowsweet	<i>Filipendula ulmaria</i>
	Watercress	<i>Nasturtium officinale</i>
	Pondweed	<i>Potamogeton sp</i>
	Duckweed	<i>Lemna sp</i>
	Iris	<i>Iris pseudocoris</i>
	Ivy	<i>Hedera helix</i>