

Phase 1 Ecological Survey Report

Lakeside North Harbour



Carmen Green
February 2021

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Executive Summary

Arcadian Ecology & Consulting Ltd (Arcadian Ecology) were appointed by Ian Cox, Estate Manager, of Lakeside North Harbour to undertake a Phase 1 ecological survey of the grounds at the Lakeside North Harbour site to assess the habitats and species present, as well as the potential for protected species. This was carried out in order to identify opportunities to enhance the habitats on site for wildlife while creating a peaceful and aesthetically pleasing environment.

Lakeside North Harbour is approximately 40 hectares in size and is located on the southern edge of the suburb of Cosham, Portsmouth, in Hampshire (SU 64591 05106), as shown on Map 1. The majority of the site consists of office buildings and car parks with a large fishing lake to the south.

The Phase 1 habitat survey, conducted on the 2nd February 2021, identified the key habitat on the site as buildings, hardstanding and a large lake with areas of semi-improved grassland, woodland, scrub, tree planting, hedgerow and a network of ditches.

An assessment of the site for protected and notable species concluded that the site has the potential for amphibians, badger, bats, breeding birds, widespread reptile species and invertebrates. The area also offers suitable habitat for common and widespread small mammals.

Lakeside North Harbour has the potential to support a range of both common and protected species. With appropriate management and enhancement, the site can be a valuable resource for supporting a range of wildlife, providing shelter, food and movement through the landscape. Recommendations on how habitats on site could be enhanced to benefit wildlife are provided.

The management recommendations have been developed from the findings of the Phase 1 habitat survey. The vision for the site is to enhance and create a variety of habitats which supports biodiversity, enabling it to move and thrive on site, whilst creating a peaceful and aesthetically pleasing environment. A number of recommendations have been provided which include enhancing existing habitat and features to benefit biodiversity, as well as creating new habitats for wildlife.

Key recommendations include managing and enhancing the ponds and ditches, as well as existing areas of grassland and hedgerows, to create both species and structurally diverse habitats with an abundance of flora to attract wildlife. In addition, there should be the creation of new habitats such as areas of wildflower meadow and the installation of log piles, bird and bat boxes, and insect hotels around the grounds. There is also potential for some additional tree and bulb planting on site.

Table of Contents

1.	INTRODUCTION.....	4
1.1.	Background.....	4
1.2.	Site Description.....	4
1.3.	Remit and Scope of the Report	4
2.	METHODOLOGY	5
2.1.	Phase 1 Habitat Survey	5
2.2.	Phase 1 Protected/ Notable Species Assessment	5
2.2.1.	<i>Amphibians</i>	5
2.2.2.	<i>Otter</i>	5
2.2.3.	<i>Water vole</i>	6
2.2.4.	<i>Reptiles</i>	6
2.2.5.	<i>Invertebrates</i>	6
3.	RESULTS	7
3.1.	Background Data Search.....	7
3.1.1.	<i>Protected and notable species</i>	7
3.1.2.	<i>Statutory and non-statutory designated sites</i>	7
3.2.	Phase 1 Habitat Assessment	8
3.2.1.	<i>General</i>	8
3.2.2.	<i>Semi-improved grassland</i>	9
3.2.3.	<i>Broad-leaved woodland</i>	9
3.2.4.	<i>Mixed woodland</i>	9
3.2.5.	<i>Scrub</i>	9
3.2.6.	<i>Hedgerow</i>	9
3.2.7.	<i>Scattered trees and shrubs</i>	10
3.2.8.	<i>Standing water</i>	10
3.2.9.	<i>Ditches</i>	10
3.2.10.	<i>Reedbed</i>	11
3.2.11.	<i>Tall ruderal</i>	11
3.2.12.	<i>Disturbed ground</i>	11
3.2.13.	<i>Ornamental planting</i>	11
3.2.14.	<i>Buildings and hardstanding</i>	11
3.3.	Phase 1 Protected/ Notable Species Assessment	11
3.3.1.	<i>General</i>	11
3.3.2.	<i>Amphibians</i>	11
3.3.3.	<i>Badger</i>	12
3.3.4.	<i>Bat</i>	12
3.3.5.	<i>Otter</i>	12
3.3.6.	<i>Water vole</i>	12
3.3.7.	<i>Birds</i>	12
3.3.8.	<i>Dormouse</i>	12
3.3.9.	<i>Reptiles</i>	13
3.3.10.	<i>Invertebrates</i>	13
3.3.11.	<i>Other Mammals</i>	13
4.	RECOMMENDATIONS	14

4.1.	Grassland	14
4.1.1.	<i>Enhance existing grassland</i>	14
4.1.2.	<i>Wildflower meadow creation</i>	14
4.2.	Hedgerows.....	15
4.2.1.	<i>Hedgerow enhancement</i>	15
4.2.2.	<i>Hedgerow management</i>	15
4.3.	Planting.....	16
4.4.	Ponds and ditches	16
4.4.1.	<i>Rohan pond</i>	16
4.4.2.	<i>Pond by the IBM building</i>	17
4.4.3.	<i>Ditches</i>	17
4.5.	Habitat creation.....	17
4.5.1.	<i>Compost heap</i>	17
4.5.2.	<i>Log piles</i>	17
4.5.3.	<i>Bird boxes</i>	18
4.5.4.	<i>Bat boxes</i>	18
4.5.5.	<i>Insect hotels</i>	18
4.6.	Ash tree monitoring.....	18
4.7.	Lighting	19
4.8.	Monitoring	19
5.	REFERENCES	27

MAPS

- Map 1: Site location
Map 2: Phase 1 habitat map

PHOTOGRAPHS

APPENDICES

- Appendix 1: Extent of background data search area
Appendix 2: Botanical species list compiled during Phase 1 habitat survey with a qualitative measure of abundance based on DAFOR scale
Appendix 3: Suitable plants for ponds
Appendix 4: Information on bird and bat boxes and insect hotels
Appendix 5: Annual work plan
Appendix 6: Long-term work plan

1. INTRODUCTION

1.1. Background

Arcadian Ecology & Consulting Ltd (Arcadian Ecology) were appointed by Ian Cox, Estate Manager, of Lakeside North Harbour to undertake a Phase 1 ecological survey of the grounds at the Lakeside North Harbour site to assess the habitats and species present, as well as the potential for protected species. This was carried out in order to identify opportunities to enhance the habitats on site for wildlife while creating a peaceful and aesthetically pleasing environment.

1.2. Site Description

Lakeside North Harbour is approximately 40 hectares in size and is located on the southern edge of the suburb of Cosham, Portsmouth, in Hampshire (SU 64591 05106), as shown on Map 1. The majority of the site consists of office buildings and car parking with a large fishing lake to the south, a network of ditches and areas of grassland, woodland, scrub and ruderal vegetation.

The site is bounded by the A27 road to the north and east, the M27 road to the south and the M275 road to the west. In the wider landscape, the suburb of Cosham extends to the north, east and west and the city of Portsmouth extends to the south. There are areas of farmland and large blocks of woodland further north, and Portsmouth Harbour is to the south.

1.3. Remit and Scope of the Report

This report details the findings of the Phase 1 ecological survey of Lakeside North Harbour, identifying the key habitats on site and the potential species it could support. It provides recommendations on how existing habitats could be managed and enhanced, and how new habitats can be created to benefit wildlife long-term. The vision for the site is to create a variety of habitats which support biodiversity, enabling it to move and thrive on site, whilst creating a peaceful and aesthetically pleasing environment for the site users.

2. METHODOLOGY

2.1. Phase 1 Habitat Survey

An extended Phase 1 habitat survey was conducted on 2nd February 2021 by Carmen Green (ACIEEM) of Arcadian Ecology & Consulting Ltd.

The Joint Nature Conservation Committee (JNCC) methodology for Phase 1 habitat survey was followed (Joint Nature Conservation Committee, 2010). A walkover survey of the site was undertaken, with areas classified and mapped using a standard set of colours on a Phase 1 habitat map to indicate the habitat types present. For each different habitat type, a species list was compiled, with particular reference to protected, notable or BAP species. This list will not give every species found on the site, but will give a representation of the diversity, significance, and dominance of plant species found within each habitat type. The location of descriptions relating to specific areas and features of interest or note were annotated on the Phase 1 habitat map using Target Notes.

Plant nomenclature in this report follows Rose (1989; 2006) for native and naturalised species of vascular plant. Plant names in the text are given with the common names first, followed by the scientific name in italics. Where there is a degree of doubt in the identification of a plant, 'cf.' precedes the specific epithet to signify the plant is very probably the species indicated, but it was not possible to distinguish it from similar members of the genus with certainty.

2.2. Phase 1 Protected/ Notable Species Assessment

An assessment of the habitats described in Section 3.2 for their potential to support protected and notable species was made for the following species/ groups: amphibians, badger *Meles meles*, bats, otter *Lutra lutra*, water vole *Arvicola amphibius*, breeding and Schedule 1 bird species, dormouse *Muscardinus avellanarius*, widespread reptile species and invertebrates. Details of the species-specific survey methods are given below.

2.2.1. Amphibians

An assessment of the site to support amphibians was based on the presence of waterbodies, the connectivity of the habitat, and presence of suitable features/ habitats for amphibians during their terrestrial phase, particularly features suitable for hibernation such as log and rubble piles.

2.3.1 Badger

An initial assessment was carried out to identify areas that might be used by badgers for foraging and sett digging. Specifically, areas of potential suitable habitat were investigated for the presence of setts, and attention was paid during the survey for the presence of incidental foraging signs, paths and latrines.

2.3.2 Bat

An assessment was made of the suitability of trees and features within or on the site boundary to support roosting bats. This involved consideration of the age and condition of the tree, and identifying features that roosting bats may favour (e.g. holes, cracks and cavities that might be used as entrance points or roost sites). Features with potential for roosting bats were noted, including woodpecker holes, roost cavities, splits, cracks, flaking bark and thick-stemmed or matted climbing plants.

An assessment was also made of the suitability of the site and the surrounding landscape to support foraging and/ or commuting bat species. All surveys conformed to current Bat Conservation Trust (BCT) guidelines (Collins 2016).

2.2.2. Otter

An assessment was made of the watercourses located within the site boundary for their potential to support otter, focusing on the bank structure and the bankside/ bank-top vegetation. Otter will excavate permanent shelters or holts in steep banks and beneath partially exposed tree root plates. Otters will also use areas of scrub and/ or tall vegetation as temporary resting sites or feeding areas.

2.2.3. Water vole

The watercourses located within the site boundary were assessed for their potential to support water vole. Water voles generally require sloping banks in which to burrow and well developed bankside vegetation to provide shelter and food (Ryland & Kemp, 2009).

2.3.3 Birds

The assessment of the potential of the site for breeding birds was based on the suitability of the habitats present, evidence of nesting such as old or currently active nests, and the presence of bird species that may potentially nest within the available habitat.

The site was also assessed for its potential to support important assemblages of notable wintering birds and/ or birds listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended).

2.3.4 Dormouse

The potential of the site to support dormice was based on an assessment of habitat features that may indicate that dormice are present in the area. This includes the presence of food sources such as hazel *Corylus avellana* and honeysuckle *Lonicera periclymenum*. Additionally, the species requires a continuum of food supply, therefore habitat structure, diversity and connectivity to adjacent areas of woodland/ scrub are important features for determining the potential presence of dormice.

2.2.4. Reptiles

The site was assessed for reptiles, with particular attention paid to those features that provide suitable basking areas (e.g. south-facing slopes), hibernation sites (e.g. banks, walls, piles of rotting vegetation) and opportunities for foraging (rough grassland and scrub).

The site was assessed for its suitability for each of the four widespread reptile species. Specific habitat requirements differ between species. Common lizards *Zootoca vivipara* use a variety of habitats from woodland glades to walls and pastures, although one of their favoured habitats is rough grassland. Slow-worms *Anguis fragilis* use similar habitats to common lizards, and are often found in rank grassland, gardens and derelict land. Grass snakes *Natrix helvetica* also have broadly similar requirements, with a greater reliance on ponds and wetlands where they prey on common frogs *Rana temporaria*. Adders *Vipera berus* use a range of fairly open habitats with some cover, but are most often found in dry heath (Beebee & Griffiths, 2000).

2.2.5. Invertebrates

An assessment was made of the site for its potential value to support diverse communities of terrestrial and/ or aquatic invertebrates, or any protected, notable or BAP species. The assessment was made based on the presence of suitable habitat features such as an abundance of deadwood, the presence of diverse plant communities, the presence of varied woodland structure and sunny woodland edges with a diverse flora, presence of ponds and water courses and the presence of free draining soil exposures. During the Phase 1 habitat survey, no attempt was made to comprehensively identify the range of species present, though where encountered, *ad hoc* sightings were noted.

3. RESULTS

3.1. Background Data Search

3.1.1. Protected and notable species

The background data search returned 11,914 records for 465 protected and/ or notable species within 2km of Lakeside North Harbour. A breakdown by group is given in Table 1.

Table 1. Background data search results

Group	Number of Species	Number of records
Reptiles	2	5
Birds	122	5686
Higher plants - Conifers	1	4
Higher plants - Flowering plants	82	372
Invertebrates - Blattaria	1	1
Invertebrates - Coleoptera	23	126
Invertebrates - Diptera	11	37
Invertebrates - Hemiptera	3	5
Invertebrates - Hymenoptera	25	232
Invertebrates - Lepidoptera	176	5282
Invertebrates - Odonata	1	3
Lower plants - Liverworts, Hornworts & Mosses	3	3
Mammals - Marine	2	2
Mammals - Terrestrial (bats)	9	133
Mammals - Terrestrial (non-bats)	4	23

3.1.2. Statutory and non-statutory designated sites

There are eight statutory designated sites within 2km of Lakeside North Harbour:

- Portsmouth Harbour Ramsar
- Chichester and Langstone Harbours Ramsar
- Portsmouth Harbour SPA
- Chichester and Langstone Harbours SPA
- Solent Maritime SAC
- Portsdown SSSI
- Portsmouth Harbour SSSI
- Langstone Harbours SSSI

There is one non-statutory designated sites within the site boundary. This is East of Lakeside SINC (Site of Importance for Nature Conservation), designated based on its semi-natural coastal and estuarine habitats, including saltmarsh, intertidal mudflats, sand dunes, shingle, brackish ponds, grazing marsh and maritime grasslands. In addition, there are 12 further SINC's within 2km of Lakeside North Harbour, as detailed in Table 2.

Table 2. SINCs within 2km of the site

SINC Reference	SINC Name	Grid Reference	SINC Criteria	Area (ha)
PO0001	Fort Southwick Ramparts	SU62940684	2A	0.22
PO0002	Fort Widley and Surrounds	SU65750662	2B/2D/6A	7.32
WC0498	Fort Southwick Ramparts	SU62800690	2A	3.12
WC0577	Motte & Bailey & Chalk Pit	SU63900730	1A	1.04
PO0021	James Callaghan Drive	SU63650672	2A/6A	0.91
PO0022	Paulsgrove Chalk Pit	SU63600660	2A/6A	7.17
PO0023	Tipner Ranges (part)	SU63500330	4A	0.37
FA0110	Portchester Paddock	SU62200495	4A	0.40
FA0091	Castle Shore Park	SU62200520	2B/4A/6A	1.91
FA0092	Urchins Copse	SU62350450	2B/6A	1.00
PO0003	Hilsea Lines	SU66750407	2B/4A/5A/6A/7A	19.20
PO0015	East of Lakeside	SU65050484	4A	3.98
PO0014	Horsea Island	SU64000420	2D/4A/6A	8.64

3.2. Phase 1 Habitat Assessment

3.2.1. General

The majority of the site consists of office buildings and car parking with a large fishing lake to the south, a network of ditches and areas of grassland, woodland, scrub and ruderal vegetation. The site is bounded by main roads and motorways on all boundaries. The habitat types classified are mapped on a Phase 1 habitat map (Map 2), with the location of descriptions relating to specific areas and features of interest or note annotated using 'Botanical' Target Notes.

The vegetation on the site is described here in general terms using Phase 1 habitat survey terminology and referring to dominant, characteristic and other noteworthy species in each vegetation type within the survey area. A complete list of the species identified during the Phase 1 habitat survey is provided in Appendix 2.

The main habitat types on site consist of:

- Semi-improved grassland;
- Broad-leaved woodland;
- Mixed woodland;
- Hedgerow;
- Scattered trees and shrubs;
- Standing water;
- Ditches;
- Reedbed;
- Tall ruderal;
- Disturbed ground;
- Ornamental planting; and
- Buildings and hardstanding.

More detailed descriptions of the ecological character of these habitat types are provided below.

3.2.2. Semi-improved grassland

One of the most widespread habitats on site is short-mown, species-poor semi-improved grassland that can be found around the buildings and car parks as well as around the lake (Target Note 1). The majority of the sward is dominated by perennial rye-grass *Lolium perenne* with a local abundance of creeping bent *Agrostis stolonifera* and red fescue *Festuca* c.f. *rubra*. Within the sward, there are lower levels of other grasses including annual meadow-grass *Poa annua*, cock's-foot *Dactylis glomerata*, meadow fescue *Festuca pratensis* and Yorkshire-fog *Holcus lanatus*. There is a mix of common herbs scattered throughout the sward including common field speedwell *Veronica persicaria*, creeping buttercup *Ranunculus repens*, daisy *Bellis perennis*, dandelion *Taraxacum* agg., musk stork's-bill *Erodium moschatum*, ribwort plantain *Plantago lanceolata*, selfheal *Prunella vulgaris*, spotted medick *Medicago arabica* and yarrow *Achillea millefolium*. There are occasional ruderal species, particularly at the edges of the field including bristly oxtongue *Picris echioides* and groundsel *Senecio vulgaris* as well as large patches of moss in damper areas.

3.2.3. Broad-leaved woodland

There is a small patch of broad-leaved woodland to the east of the buildings (Target Note 2). It consists of a mix of woody species including ash *Fraxinus excelsior*, eucalyptus *Eucalyptus* species, horse chestnut *Aesculus hippocastanum*, Norway maple *Acer platanoides*, Turkey oak *Quercus cerris* and whitebeam *Sorbus aria*. There is a mix of tall ruderal vegetation and grasses in the field-layer including creeping thistle *Cirsium arvense*, false oat-grass *Arrhenatherum elatius*, nettle *Urtica dioica* and wild carrot *Daucus carota* with smaller amounts of dock *Rumex* species as well as cleavers *Galium aparine* and hedge bedstraw *Galium mollugo*.

The south and western edges of the site consist of broad-leaved woodland (Target Note 3). The canopy is mostly alder *Alnus glutinosa* with a mix of other woody species including ash, aspen *Populus tremula*, hawthorn *Crataegus monogyna*, hazel, Norway maple, pine *Pinus* species, privet *Ligustrum* species, rose *Rosa* species and silver birch *Betula pendula*. There are also areas of bramble *Rubus fruticosus* agg. scrub throughout the understorey.

3.2.4. Mixed woodland

To the south of Building 1000, there are two small areas of mixed woodland on grassy mounds (Target Note 4). The canopy consists of a mix of bay laurel *Laurus nobilis*, Corsican pine *Pinus nigra*, hawthorn, Turkey oak and whitebeam. The field-layer comprises the grassland described in Target Note 1 with areas of leaf litter, bramble scrub and ivy *Hedera helix*. There is also some natural regeneration of holly *Ilex aquifolium*.

3.2.5. Scrub

There are several areas of scrub across the site. Along the north-eastern edge, there is dense scrub and tree saplings along the site boundary and ditch described in Target note 15 (Target Note 5). This comprises a mix of species including alder, ash, bramble, elder *Sambucus nigra* and privet. There is ivy in the field-layer that is also growing up into the trees and scrub.

There are patches of bramble scrub around the edges of the lake, particularly along the southern edge (Target Note 6). In addition to bramble, there is also some hawthorn, privet and red osier dogwood *Cornus sericea* amongst the scrub.

At the north-western edge of the lake there is a large patch of bramble scrub (Target Note 7). It is bordered by common reed *Phragmites australis* and pampas grass *Cortaderia selloana* at the edges of the lake with occasional gorse *Ulex europaeus*, ivy, red osier dogwood and silver birch.

3.2.6. Hedgerow

The northern boundary of the site is a species-poor hedgerow dominated by hawthorn with small amounts of bramble (Target Note 8). The hedge has multiple gaps and is quite leggy in places. The field-layer is dominated by ivy.

Around the car parks there are also several small sections of well-managed hedgerow that are dominated by box *Buxus sempervirens* and hawthorn (Target Note 9).

3.2.7. Scattered trees and shrubs

There are areas of tree planting around the site, particularly in and around the car parks (Target Note 10). It contains a mix of alder, black poplar *Populus nigra*, field maple *Acer campestre*, hawthorn, hazel, pedunculate oak *Quercus robur*, silver birch, white poplar *Populus alba* and willow *Salix* trees. At the base, there is some natural regeneration of holm oak *Quercus ilex* and yew *Taxus baccata*. The field-layer is similar to that described in Target Note 1 but with ivy, areas of bare ground and leaf litter.

In the north-west corner of the site, there is a small group of black poplar trees with some bramble scrub and ruderal vegetation beneath (Target Note 11). There are also piles of brush, debris and litter beneath the trees which is smothering the field-layer (Photograph 14).

3.2.8. Standing water

There is a large fishing lake to the south of the site with fishing platforms around its margin (Target Note 12). There are large areas of reedbed around the edges dominated by *Phragmites australis* with patches of great reed mace *Typha latifolia* and sharp-flowered rush *Juncus acutiflorus*. There are also large patches of bramble scrub at the edges of the lake.

At the western end of the site, there is a small pond, Rohan pond (Target Note 13). There are concrete slabs around the margins and no aquatic vegetation within the pond or along the margins. It contains shallow water and a lot of leaf litter and is heavily shaded by willow *Salix* scrub.

At the centre of the site, just south of the IBM building there is a pond surrounded by a gravel path and improved grassland (Target Note 14). The water is quite deep (more than 30cm). There is no aquatic vegetation in the pond and only small amounts of common club-rush *Schoenoplectus lacustris*, figwort *Scrophularia* species, great willowherb *Epilobium hirsutum* and pampas grass at the edges of the pond.

3.2.9. Ditches

There is a network of ditches across the site with varying levels of water. At the eastern end of the site, there is a ditch to the north of the main road leading into Lakeside North Harbour (Target Note 15). The water is quite shallow (approximately 10cm deep) and the banks have been reinforced with wooden planks. There is some submerged vegetation in the ditch including curly waterweed *Lagarosiphon major* and fool's watercress *Apium nodiflorum* as well as dense patches of emergent vegetation such as common club-rush and great reed mace *Typha latifolia*. Further west of the ditch, the water's surface becomes dominated by duckweed *Lemna* species.

To the south of the main road leading into the site is another small ditch (Target Note 16). It contains shallow water with banks similar to the grassland described in Target Note 1 as well as areas of disturbed ground and mud. There is little aquatic vegetation within the ditch with the exception of a patch of common club-rush towards the centre. The ditch feeds into a wider channel at the eastern edge of the site that flows south. Here the banks are mostly mud with ruderal vegetation and ivy at the northern end and there is a patch of great reed mace.

Towards the north and at the centre of the site, there is a short stretch of ditch (Target Note 17). The water is deeper here than in the other ditches and the banks are dominated by bramble scrub with tall ruderal species including creeping thistle, nettle and teasel *Dispacus fullonum*. In the water there are occasional stands of great reed mace with great willowherb at the edges. At the top of the bank there are alder and willow trees overhanging the ditch.

To the south-west of the ditch described in Target Note 17 there is another ditch (Target Note 18). The water is fairly deep and there is some great reed mace in the water. Its banks are dominated by ivy with some gorse scrub and a small amount of winter heliotrope *Petasites fragrans*. At the top of the banks there is a mix of alder, ash and aspen. This ditch extends round the car park and flows to the west. Here the area covered by great reed mace becomes more extensive.

Along the southern edge of the site, at the base of the woodland described in Target Note 3, there is a shallow ditch with low water levels (Target Note 19). It mostly consists of improved grassland, as described in Target Note 1 but with leaf litter and patches of common fleabane *Pulicaria dysenterica* and sharp-flowered rush in the wetter areas.

3.2.10. Reedbed

Around the edges of the lake, there are several areas of reedbed that are dominated by common reed (Target Note 20).

3.2.11. Tall ruderal

At the eastern end of the site, there is a large area of tall ruderal vegetation (Target Note 21). This is dominated by false oat-grass, teasel and wild carrot with smaller amounts of dock species.

To the west of the lake, there is a small mound of rubble covered by tall ruderal vegetation (Target Note 22). Teasel is dominant with smaller amounts of other ruderal species including Canadian fleabane *Conyza canadensis*, common evening primrose *Oenothera biennis*, common knapweed *Centaurea nigra*, mullein *Verbascum* species, nettle and spear thistle *Cirsium vulgare*.

3.2.12. Disturbed ground

There are areas of disturbed and bare ground to the east of the site that is quite wet in places (Target Note 23). The vegetation mostly comprises low-growing ruderal species characteristic of disturbed ground such as bristly oxtongue, prickly sowthistle *Sonchus asper* and spear thistle. There are also a number of common herbs from the adjacent grassland such as creeping buttercup, crane's-bill *Geranium* species, forget-me-not *Myosotis* species and ribwort plantain.

3.2.13. Ornamental planting

Around the buildings, car parks and at the tops of the ditches along the main road into the site there are areas of ornamental planting (Target Note 24). These include a mix of ornamental species such as cypress *Cupressus* species, palms *Arecaceae* species, pampas grass and *Viburnum* species as well as some bramble and privet growing amongst the ornamental planting.

3.2.14. Buildings and hardstanding

The majority of Lakeside North Harbour comprises a series of office buildings at the centre of the site with associated car parks, roads and paths to the north of the buildings. There is also a mud and gravel track to the south of the site between the woodland and lake.

3.3. Phase 1 Protected/ Notable Species Assessment

3.3.1. General

Based on the Phase 1 habitat survey, the site is considered to contain habitat potentially suitable for the following species:

- Amphibians;
- Badger;
- Bats;
- Otter;
- Water vole;
- Breeding birds;
- Dormouse;
- Reptiles (widespread species);
- Invertebrates; and
- Other mammals.

3.3.2. Amphibians

The lake, ponds and ditches provide suitable breeding habitat for amphibians on the site. In addition, the woodland and scrub provide suitable hibernation habitat as well as habitat to allow amphibians to shelter and movement around the landscape. There are brush piles to the north-west of the site that provide additional refugia for amphibians (Photograph 17). However, there are no records of amphibians within 2km of Lakeside North Harbour.

3.3.3. Badger

No evidence of badger was found within the survey area. Although, the habitats offer suitable foraging habitat for badgers and the banks and mounds may offer potential sett building habitat, the site is bounded by main roads and urban areas which may limit the movement of badgers on to the site.

There are eight records of badger within 2km of the site. These are mostly over 1km to the north of the site, however, there is one record within 150m to the west of the site, on the other side of the M27 motorway.

3.3.4. Bat

No evidence of the presence of bats was recorded during the Phase 1 habitat survey. A detailed assessment of the trees on site was not carried out and the majority of trees were small and immature and have not developed features suitable for roosting bats.

The woodland, lines of trees, scrub and aquatic habitats provide good commuting and foraging habitat for bats on site. The woodland and lines of trees connect to a network of other lines of trees and hedgerows in the wider landscape, enabling the movement of bats to and from the site. There are 133 records of at least nine species of bat within 2km of the site.

3.3.5. Otter

No evidence of the presence of otter was recorded along any of the ditches during the Phase 1 habitat survey.

The ditches on site are of limited suitability for otters with shallow water and no potential permanent shelter opportunities for otter holts. While the woodland and scrub on site may provide suitable temporary resting places for otter and may offer opportunities for movement around the landscape, there are no records of otter within 2km of the site boundary.

3.3.6. Water vole

No evidence of the presence of water vole was recorded along any of the ditches during the Phase 1 habitat survey.

The ditches on site are of limited suitability for water vole. They have very shallow water and little aquatic vegetation in the water or on the banks for water vole to feed upon. In addition, there are no records of water vole within 2km of the site boundary.

3.3.7. Birds

Several bird nests were observed within the trees on site during the Phase 1 habitat survey (Photograph 16). The habitats on site including trees, scrub and reedbed provide suitable nesting opportunities and foraging habitat for a number of common species of bird. Winter bird surveys are currently being conducted at Lakeside North Harbour to gain an understanding of the numbers and species of bird using the site during the winter.

The HBIC background data search returned a total of 5686 records from at least 122 species of bird. This included a mix of woodland and wetland species that are likely to use the habitats on site for breeding such as cetti's warbler *Cettia cetti*, firecrest *Regulus ignicapilla*, kingfisher *Alcedo atthis*, mistle thrush *Turdus viscivorus*, reed warbler *Acrocephalus scirpaceus* and song thrush *Turdus philomelos*.

3.3.8. Dormouse

No evidence of the presence of dormice was recorded during the survey. Although the woodland, hedgerow and scrub may provide some suitable habitat for dormouse and contains a range of food sources including ash, bramble, hawthorn, hazel and oak, the site is bounded by main roads and urban areas. Therefore, it is unlikely that dormice are present as it quite isolated with few good links to other large blocks of woodland and hedgerows within the wider landscape. In addition, there are no records of dormice within 2km of the site.

3.3.9. Reptiles

No evidence of the presence of reptiles was recorded during the Phase 1 habitat survey.

The tall ruderal vegetation and scrub provide some suitable foraging and sheltering opportunities for widespread species of reptile such as slow-worm. The woodland areas also provide suitable hibernation habitat for reptiles. There are log and brash piles to the north-west of the site that could provide additional refugia for reptiles (Photograph 17).

There are records of common lizard and slow-worm within the background data search area, to the north-west, south-east and south-west of the site. The nearest record to the site is of a slow-worm approximately 560m to the south-east.

3.3.10. Invertebrates

The site offers suitable foraging habitat and shelter for common and widespread invertebrate species and assemblages such as moths, butterflies, bumblebees, grasshoppers, crickets and beetles.

3.3.11. Other Mammals

The woodland and scrub provide suitable foraging and sheltering opportunities for small mammals. There is evidence of rabbit *Oryctolagus cuniculus* on the site including multiple burrows along the eastern boundary as well as in the grassland to the north-west of the site (Photograph 18). In addition, there are records of harvest mouse *Micromys minutus* and hedgehog *Erinaceus europaeus* within 2km of the site. The reedbed provides suitable habitat for harvest mice on site, however, this is quite isolated from other areas of suitable habitat in the wider area.

4. RECOMMENDATIONS

The habitat types and species present at Lakeside North Harbour are common and widespread in the national and local context, and as such, are considered to be of low ecological value, with the exception of the strip of woodland along the southern and western boundaries. The site has the potential to be of significantly greater value to wildlife through habitat enhancement and management measures. Suitable objectives and actions have been developed that will enhance the biodiversity interest of Lakeside North Harbour. The management recommendations are aimed at maintaining and increasing the biodiversity of the site in the future.

A management plan outlining the biodiversity actions for Lakeside North Harbour is detailed in Table 3. The table is divided into 5 main columns; Objective, Action, Outcome, Targets and Monitoring Action. Objectives are the overall aim of undertaking the action, actions are the key activities that need to be undertaken, outcomes are the benefits to biodiversity that will be achieved, the targets are the steps that need to be fulfilled by the end of the stated years, and the monitoring action identifies how progress towards the final objective is going to be assessed. Some targets also include management suggestions on how best to achieve the target, these should be incorporated into the management plan for the site. These are summarised in annual and long-term work plans in appendices 5 and 6.

4.1. Grassland

4.1.1. Enhance existing grassland

Areas of grassland around the site could be developed into flower-rich meadow habitats that provide shelter and a food resource for a wider range of invertebrates and other wildlife.

It is important to create structure and diversity creating a mosaic of microhabitats for wildlife. Therefore, it is recommended that the grassland is cut in the spring with a second cut in early autumn, once the wildflowers have set seed. All cuttings should be removed so that any wildflowers present are not smothered and to prevent the grasses from seeding. This will encourage wildflower growth. Cuttings will be added to a compost heap to provide additional wildlife habitat.

There should be repeated cutting of nettled and ruderal vegetation to prevent these from dominating the grassland and outcompeting the grasses and wildflowers. However, mowing or cutting large areas of grassland can create habitats that are too uniform and it is important to create a mosaic of habitats. Therefore, the mowing regime should be carried out on a rotational basis with some areas left uncut so that any animals that are disturbed during the mowing have a safe refuge to retreat to. The grassland should not be cut to a height of less than 5cm.

4.1.2. Wildflower meadow creation

Areas of wildflower meadow could be created around the grounds at Lakeside North Harbour using a seed mix (for example Emorsgate seed mix EM3 – Special General Purpose Meadow Mixture - <https://wildseed.co.uk/mixtures/category/meadow-and-grassland>). This could be carried out in the areas of grassland around the site as well as on the areas of disturbed ground and tall ruderal vegetation to the east. Native species that could be planted within the meadow include common agrimony *Agrimonia eupatoria*, common bird's-foot trefoil *Lotus corniculatus*, common knapweed *Centaurea nigra*, greater knapweed *Centaurea scabiosa*, oxeye daisy *Leucanthemum vulgare*, selfheal, viper's bugloss *Echium vulgare*, wild carrot and wild marjoram *Origanum vulgare*.

Wildflowers grow best on unproductive soil and most soils will generally be too rich and fertile, so it will be necessary to reduce soil fertility first. It should be noted that seed mixes sown into an existing lawn sward may not establish well as they will be outcompeted by the more vigorous amenity grass species. Therefore, it is recommended that the top three to six inches of topsoil are removed before any seeds are planted to increase the chances of them germinating. Further details on how to create a wildflower meadow can be found here: <https://www.rspb.org.uk/get-involved/activities/give-nature-a-home-in-your-garden/garden-activities/startawildflowermeadow/>

Mowing should be undertaken annually; late summer/ autumn and again in spring, if needed (for example if it becomes dominated by coarse grasses or ruderals). The frequency will vary depending on flower source (seed, plug-plant or turf) and time following establishment but generally should not be

done until flower seeds have set. Varying the time of year will ensure some species do not become dominant. All cuttings should be removed from the meadow so that any wildflowers present are not smothered and to prevent the grasses from seeding. This will encourage wildflower growth. Cuttings could be added to a compost heap to provide additional wildlife habitat.

There should be repeated cutting of nettlebed and ruderal vegetation to prevent these from dominating the grassland and outcompeting the grasses and wildflowers. However, mowing or cutting large areas of grassland can create habitats that are too uniform and it is important to create a mosaic of habitats. Therefore, the mowing regime should be carried out on a rotational basis with some areas left uncut so that any animals that are disturbed during the mowing have a safe refuge to retreat to. The meadow should not be cut to a height of less than 5cm.

The creation of wildflower meadow areas would not only increase botanical diversity but also attract a range of invertebrates including insect pollinators such as butterflies and bees as well as providing shelter and foraging habitat for small mammals and reptiles.

No chemicals such as pesticides, herbicides or insecticides should be used.

4.2. Hedgerows

Hedgerows are important habitat for a range of wildlife, providing opportunities for foraging and shelter, as well as providing connectivity with other hedges and woodland, allowing wildlife to safely move across the wider landscape. Bats, for example, rely on hedges to navigate throughout the landscape and commute to foraging grounds.

4.2.1. Hedgerow enhancement

There should be enhancements to the existing hedgerow along the northern boundary through infilling any gaps using a mix of native species, of local provenance, similar to those already found on the site and in the surrounding area such as field maple, hawthorn, hazel and rose. This will improve and enhance the site for wildlife and improve connectivity with other hedges and woodland on site and in the wider landscape.

4.2.2. Hedgerow management

The hedgerow is currently quite leggy. Regular management of the hedgerow should be undertaken and will benefit a range of species including breeding birds, and should include maintaining a thick base to the hedge. Hedgerows should be trimmed on a two to three-year rotation to ensure a dense, species-rich hedge.

To address any legginess and provide the hedges on site with a strong base for future growth, hedge-laying could be considered. Hedge-laying is a traditional way of prolonging the life of a hedge and creating a stock-proof barrier. Left unmanaged, a hedgerow will continue to grow upwards and outwards and will eventually become a thin line of trees. This may result in a lack of bird nesting areas and fewer berries. The newly laid hedge will become thick and bushy and develop good nesting areas for birds, an excellent corridor for small mammals and more berries and flowers for pollinators.

Cut stems are bent over at an angle, secured with stakes and, in some styles, binders along the top, so creating a living, stock-proof barrier. Hedge-laying is the most effective maintenance method which encourages regrowth from ground level and ensures the health and longevity of the hedgerow. Once a hedge has been layed, regular trimming will keep it in good order for up to 50 years when it may be appropriate to lay the hedge again.

All hedge works must be undertaken outside of the bird nesting season, which is February to August inclusive, but hedgerows should be checked prior to works as birds will nest outside of these times if the weather is suitable. If birds are nesting, work must be postponed until the young have fledged. It is also advisable to avoid trimming in the autumn as this allows overwintering birds to feed on the berry crop. Hedge trimming in December and January is ideal.

4.3. Planting

There are several areas of tree planting already on the site, particularly around the buildings and car parks. However, if desired, additional tree planting could be carried out. Trees and shrubs planted should include a mixture of native broad-leaved species similar to those already found on the site such as elder, field maple, hawthorn, hazel and oak. This will enhance the value of the site for wildlife by providing greater foraging resources and shelter as well as improving connectivity with other lines of trees, scrub and woodland in the wider landscape.

Placing tree guards around any new trees will protect them from grazing animals such as rabbits and deer while they are establishing. Any plastic tubing should be collected and removed once the trees are established to reduce the build-up of degrading plastic in the environment. Pruning and coppicing can be carried out in future years to control and promote growth.

Creating a mosaic habitat by allowing the grass beneath the planted trees to grow long will support yet more species. Ideally, having areas of long grass as well as areas of short grass, and a staggered mowing regime will accommodate different flower seed set times. A selection of plug plants could be planted below the trees to provide instant variety to the sward, in combination with waiting to see what grows naturally from the existing seed bank.

Species that could be planted include a mix of herbs and wildflowers such as common knapweed, cowslip *Primula veris*, ground-ivy *Glechoma hederacea*, ox-eye daisy, ragged robin *Lychnis flos-cuculi*, red campion *Silene dioica* and selfheal. A range of herbs such as marjoram *Origanum majorana*, mint *Mentha* species and thyme *Thymus vulgaris* could also be considered. Plug plants are recommended over seeds if there is already vegetation in these areas as seed mixes sown into an established sward may not establish well.

In the shaded areas beneath trees and scrub, such as along the north, south and west boundaries, shade-tolerant perennial bulbs could be planted to bring colour to the site throughout the year and attract wildlife. Species could include bluebell *Hyacinthoides non-scripta*, daffodil *Narcissus* species or snowdrops *Galanthus* species. Snowdrops in particular can provide a late winter nectar and pollen source for early-emerging pollinators.

4.4. Ponds and ditches

Both the ponds and the ditches on site are of low ecological value in their current state. This is mainly due to the limited aquatic vegetation both in the water and at the edges. This results in little suitable foraging, shelter or egg-laying habitat for wildlife.

Although there are fish in the lake and in some of the ditches, no fish were observed within the ponds and it is thought that they are currently absent. The ponds should be maintained so that it is free of fish as they can be detrimental to wildlife ponds. They can reduce the water quality and make the pond turbid, reducing its suitability for aquatic vegetation and consequently wildlife. In addition, fish will also feed on amphibian eggs and larvae.

It should be noted that water levels in ponds naturally rise and fall over the course of a year and many aquatic and amphibious species are adapted to this occurrence (<https://freshwaterhabitats.org.uk/wp-content/uploads/2013/09/What-to-do-if-your-pond-is-drying-out1-1.pdf>). However, if levels remain unusually low for a long period of time, then it may be necessary to top the pond up using harvested rainwater. Improving the vegetation structure of the pond will also enable more species to survive periods of drought.

Continued monitoring and clearance of undesirable species such as weeds and excessive vegetation growth should be carried out regularly around the ponds. It is recommended that vegetation is monitored, and any dead vegetation removed to prevent the build-up of nutrients and dead plant material, or the drying up of the area. All cleared vegetation should be removed and can be added to a compost heap.

4.4.1. Rohan pond

Rohan pond is currently of low suitability to wildlife due to the lack of aquatic vegetation in and around the pond. It is also very shaded by willow trees. While this is creating a cooler environment as little

sunlight is able to reach the water and therefore warm the pond, it is also contributing to a build-up of leaf litter that can lead to increased levels of silt within the pond. This reduces the ecological value of the pond, while also making it less visually attractive. Allowing more sunlight to reach the pond will also encourage the growth and establishment of a range of aquatic plant species.

Therefore, it is recommended that pruning of some of the willow is carried out to open up the pond. There should be no more than about 60% shade to the pond. Removal of excessive leaf litter using a handheld net could be carried out when necessary. When doing so, check the net for any animals that may have been collected. Leaves should be added to a nearby compost heap, allowing any animals that have been missed to escape and move back to the pond.

To further enhance this pond for wildlife, there should be planting of native vegetation. This should include a mixture of bankside vegetation, marginal plants, tall emergents, floating and submerged plants, as detailed in Appendix 3. This would provide foraging, sheltering and egg-laying opportunities for a number of aquatic invertebrate species, as well as amphibians.

4.4.2. Pond by the IBM building

This pond is also currently of low suitability to wildlife due to the lack of aquatic vegetation in and around the pond. Planting of native vegetation should be carried out to enhance the pond for wildlife. This could include a mixture of bankside vegetation, marginal plants, tall emergents, floating and submerged plants, as detailed in Appendix 3. This would provide foraging, sheltering and egg-laying opportunities for a number of aquatic invertebrate species, as well as amphibians.

4.4.3. Ditches

The majority of the ditches on site are of low suitability to wildlife due to the low levels of aquatic vegetation. In addition, there is a large amount of litter within the ditches. Therefore, it is recommended that all litter is removed from the ditches. Some of the ditches are also quite shaded due to overhanging trees which is contributing to a build-up of leaf litter that can lead to increased levels of silt in the water. Removal of excessive leaf litter using a handheld net could be carried out when necessary. When doing so, check the net for any animals that may have been collected. Leaves should be added to a nearby compost heap, allowing animals that have been missed to escape and move back to the pond.

Following that, there should be planting of native aquatic vegetation. This should include a mixture of bankside vegetation, marginal plants, tall emergents, floating and submerged plants, as detailed in Appendix 3.

Continued monitoring and clearance of undesirable species and dead material should be carried out regularly along the ditches. It is recommended that cutting and removing areas of reeds is carried out on a 4 to 7 year rotation to prevent the build-up of nutrients and dead plant material, or the drying up of the area. All cuttings should be removed and can be added to a compost heap.

4.5. Habitat creation

4.5.1. Compost heap

A compost heap could be established on the site and this will continue to provide a habitat for foraging, nesting and hibernating amphibians, reptiles, small mammals and invertebrates. It is recommended that slatted compost bins are installed in a sheltered location, such as beneath the trees and shrubs at the edges of the site, for example along the northern or southern boundaries. This slatted design allows wildlife easy access in and out of the heap. All cuttings taken from the grassland and aquatic habitats could then be added to the heap.

4.5.2. Log piles

Log piles attract a number of invertebrates, small mammals and fungi as well as providing hibernation habitat for amphibians and reptiles. Logs from broad-leaved trees of varying sizes could be used to create a log pile. Logs should be partially buried in the ground in a semi-shaded area (i.e. somewhere warm enough for insects but not exposed to prolonged sunlight which can dry out the wood).

Some logs should be positioned vertically as this is suitable for stag beetles which lay their eggs into deadwood and the rotten wood provides a food source for stag beetle larvae (Figure 1). The logs should be from broad-leaved trees at least 10cm in diameter and can be of varying lengths to create a

varied height structure, providing different microclimates and rates of decay. They should be partially buried (about 50cm deep) in partial shade to prevent drying out. Further information can be found at <https://ptes.org/wp-content/uploads/2016/11/Build-a-log-pile-for-stag-beetles.pdf>

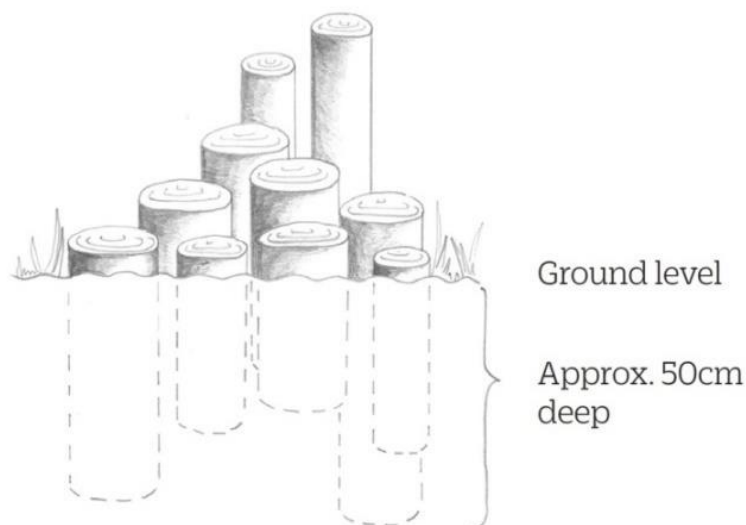


Figure 1. Example of a stag beetle loggery (Taken from 'Build a Log Pile for Stag Beetles' by People's Trust for Endangered Species, 2016).

4.5.3. Bird boxes

Boxes for a range of common species of bird could be installed on site and should include a mix of box types to attract different species including standard boxes for blue tits and great tits, open fronted boxes for robins and wrens, starling boxes for starlings, woodpeckers and nuthatches, and sparrow terraces. Further information on installation is detailed in Appendix 4.

4.5.4. Bat boxes

To enhance the site for bats, additional roosting habitats could be installed in the form of bat boxes. These should be installed on mature trees and face south-east to south-west, as detailed in Appendix 4.

4.5.5. Insect hotels

Additional sheltering resources could be provided for invertebrates through the installation of insect hotels. Insect hotels vary in shape and size and provide opportunities for a wide range of species. The majority incorporate several different sections that provide sheltering or refuge opportunities, particularly during winter, for many types of insects. Insect hotels should be positioned in a sunny location on a fence or wall near to bee-friendly vegetation. The front should be accessible with no vegetation blocking the entrance. Further details can be found in Appendix 4.

When building or buying an insect hotel, ensure it is easy to maintain, is not treated with chemicals, does not contain non-breathable materials like plastic, and does not concentrate one species type in one place that could lead to large numbers of individuals lost to parasites. Helpful advice can be found on The Pollinator Garden website: <https://www.foxleas.com/make-a-bee-hotel.asp>.

4.6. Ash tree monitoring

There are a number of ash trees around the grounds at Lakeside North Harbour. These should be continually monitored for signs of ash dieback disease and pruned or felled if they become dangerous. Prior to any works, the trees should be checked for bat roosting features (e.g. cavities, split limbs and lifted bark). Where possible, the trees should be retained as monoliths, retaining potential bat roosting features. Deadwood provides suitable habitat for a number of species including bats, birds, invertebrates and fungi. Therefore, any standing deadwood should remain in-situ to decay slowly and attract wildlife (provided it is not a health and safety risk). If any dead or decaying branches must be removed, these could be added to the log piles.

It is recommended that any tree works should avoid the bird nesting season (February to August inclusive). If this is not feasible, a suitably experienced ecologist should be employed immediately preceding the works to carefully check for the presence of breeding birds and/ or their nests at the proposed site, and works may commence if none are found. If birds' nests are found prior to or during the works, then these will need to be protected by establishing a 5 metre buffer zone around the nest that will remain in place until either the end of the breeding bird season or after the young have fledged.

4.7. Lighting

Any security lighting around the site should result in no negative impacts to foraging and commuting bats and other nocturnal wildlife such as badger and hedgehogs, maintaining connectivity across the site and into the adjacent habitat. To avoid causing disturbance by light to nocturnal animals, any lighting should be directed downwards away from any features of wildlife interest (hedgerows, trees and wildlife planting). This could be achieved by using cowls or hoods. In addition, lights could be set on timers or motion sensors to ensure dark periods. Further information on bats and artificial lighting can be found at: <https://theilp.org.uk/publication/guidance-note-8-bats-and-artificial-lighting/>.

4.8. Monitoring

Following the management, enhancement and creation of the habitats at Lakeside North Harbour, it is recommended that further ecological surveys are conducted to evaluate the success of the habitat management and enhancement measures and monitor changes in species diversity. This could help inform future management recommendations.

Table 3. Biodiversity actions for Lakeside North Harbour

OBJECTIVE	ACTION	OUTCOME	TARGET (YEARS)			MONITORING ACTION	PRIORITY
			1- 2	3 – 5	6 – 10		
Maintain and enhance existing habitats for wildlife	Enhance areas of species-poor semi-improved grassland	Habitat for invertebrates, such as bees and butterflies as well as reptiles and small mammals Area for site users to enjoy nature	<p>Areas of long grass and wildflowers with no large ruderal species such as nettle, docks and thistles.</p> <p>Management: Year 1: Cut grass in March then leave to grow over the summer. In autumn remove any weeds & cut. If not very species diverse, seed with a wildflower mix. Do not leave cut grass in-situ.</p> <p>Year 2: Cut when height between 10 - 15cm, then every 6 to 8 weeks, always removing the grass. Do not cut below 5cm. Avoid cutting during main flowering period (mid-May to July).</p>	<p>Grassland with a mixture of grass and native wildflowers with no dominant species.</p> <p>Management: Year 3: Cut twice – once in late March/ early April, & once in late August/ early September. From Year 4: Adopt an annual mowing regime – cutting once in late August/ early September. Vary the time of the cut each year to allow late-flowering plants to set seeds in some years. Remove any large weeds. Remove grass cuttings from area.</p>	<p>Grassland with a mixture of grass and native wildflowers with no dominant species.</p> <p>Management: Continue annual mowing regime, mowing alternate strips on a rotational basis, removing the cut grass from the area and not cutting below 5cm.</p>	<p>Carry out botanical survey at 5 year intervals</p> <p>Carry out surveys for invertebrates such as butterflies, bumblebees, grasshoppers and crickets</p>	High
	Manage and enhance existing hedgerows	The hedgerows will provide sheltering habitat and a food resource for a range of species while allowing safe movement across the site and wider area	<p>Improved floral diversity and good nesting areas for birds, an excellent corridor for commuting bats, small mammals and more berries and flowers for pollinators.</p> <p>Management: Infill any gaps using a mix of native species, of local provenance, similar to those already found on the site and in the surrounding area such</p>			<p>Targeted species surveys – breeding bird, butterfly, bumblebee and Orthoptera surveys annually</p> <p>Botanical survey at 5 year intervals</p>	

OBJECTIVE	ACTION	OUTCOME	TARGET (YEARS)			MONITORING ACTION	PRIORITY
			1- 2	3 – 5	6 – 10		
			<p>as field maple, hawthorn, hazel and rose.</p> <p>Hedgerows should be trimmed on a two to three-year rotation to ensure a dense, species-rich hedge.</p> <p>Undertake hedge works outside of the bird nesting season (February to August inclusive) and avoid depleting the autumn berry crop. Hedge trimming in December and January is ideal.</p>				
	Manage and enhance ponds	Improved water quality and floral diversity suitable for wildlife	<p>A pond with clear, clean water suitable for a range of wildlife including aquatic invertebrates such as odonatan (dragonflies and damselflies), and amphibians.</p> <p>Management: Light pruning of overhanging trees and shrubs to reduce leaf litter entering the pond and causing a build-up of silt.</p> <p>Planting of native, locally sourced aquatic species in and around the pond. This should include a mix of bankside vegetation, marginal plants, tall emergents, floating and submerged plants. A list of suitable aquatic plant species can be found in Appendix 3.</p>			<p>Targeted species surveys – amphibians, Odonata</p> <p>Carry out vegetation survey at 3-5 year intervals</p>	High

OBJECTIVE	ACTION	OUTCOME	TARGET (YEARS)			MONITORING ACTION	PRIORITY
			1- 2	3 – 5	6 – 10		
			<p>Removal of excessive leaf litter using a handheld net when necessary. When doing so, check the net for any animals that may have been collected. Leaves to be added to a nearby compost heap. Any animals missed can then escape and move back to the pond.</p> <p>Regular maintenance of the aquatic vegetation including removing any dead plants or excessive weeds/ vegetation growth to allow a mix of species to flourish without any becoming dominant. Add dead/ removed vegetation to a compost heap</p>				
	Maintain and enhance ditches on site	Improved water quality and floral diversity suitable for wildlife	<p>Ditches with clear, clean water suitable for a range of wildlife including aquatic invertebrates such as dragonflies and damselflies, and amphibians.</p> <p>Management: Light pruning of overhanging trees and shrubs to reduce leaf litter entering the ditches and causing a build-up of silt.</p> <p>Regular removal of litter from the ditches.</p> <p>Planting of native, locally sourced aquatic species in the ditches. This should include a mix of bankside vegetation, marginal plants,</p>			<p>Targeted species surveys – amphibians, Odonata</p> <p>Carry out vegetation survey at 3-5 year intervals</p>	High

OBJECTIVE	ACTION	OUTCOME	TARGET (YEARS)			MONITORING ACTION	PRIORITY
			1- 2	3 – 5	6 – 10		
			<p>tall emergents, floating and submerged plants. A list of suitable aquatic plant species can be found in Appendix 3.</p> <p>Regular maintenance of the aquatic vegetation including removing any dead plants or excessive weeds/ vegetation growth to allow a mix of species to flourish without any becoming dominant.</p> <p>Cutting and removing areas of reeds on a 4 to 7 year rotation.</p> <p>Add dead/ removed vegetation to a compost heap.</p>				
Creating space for wildlife	Creation of wildflower areas	To enhance floristic diversity of site and provide pollen and nectar sources for invertebrates	<p>Sow wildflower meadow and maintain with appropriate cutting regime to create areas of long grass and wildflowers with no large ruderal species such as nettle, docks and thistles.</p> <p>Plant native wildflower species such as common knapweed, oxeye daisy, red campion and selfheal. This could be created using a seed mixture such those by Emorsgate (https://wildseed.co.uk/home).</p> <p>Management: Year 1: Late summer cut to no less than 5cm, then removal of cut material to</p>	<p>Grassland with a mixture of grass and native wildflowers with no dominant species.</p> <p>Management: Year 3: Cut twice – once in late March/ early April, & once in late August/ early September. From Year 4: Adopt an annual mowing regime – cutting once in late August/ early September. Vary the time of the cut each year to allow late-flowering plants to set seeds in some years.</p>	<p>Grassland with a mixture of grass and native wildflowers with no dominant species.</p> <p>Management: Continue annual mowing regime, mowing alternate strips on a rotational basis, removing the cut grass from the area and not cutting below 5cm.</p>	<p>Carry out baseline survey to check establishment of meadow plant species</p> <p>Carry out butterfly, bumblebee, grasshopper and cricket surveys annually</p>	High

OBJECTIVE	ACTION	OUTCOME	TARGET (YEARS)			MONITORING ACTION	PRIORITY
			1- 2	3 – 5	6 – 10		
			<p>keep nutrient levels low and encourage wildflower growth and seed germination. In autumn remove any weeds & cut.</p> <p>Year 2: Cut when height between 10 - 15cm, then every 6 to 8 weeks, always removing the grass.</p> <p>Repeated cutting of nettlebed and ruderal vegetation to prevent these from dominating and out-competing the grasses and wildflowers</p>	<p>Repeated cutting of nettlebed and ruderal vegetation</p> <p>Remove grass cuttings from area.</p> <p>Mow alternate strips on a rotational basis with some areas left uncut so that any animals that are disturbed during the mowing have a safe refuge to retreat to.</p>			
	Additional tree and shrub planting	<p>Create a varied structure suitable for a range of species and enhance floristic diversity of site, providing a variety of food sources for invertebrates, birds and small mammals.</p> <p>Improving connectivity with other lines of trees, scrub and woodland in the wider landscape.</p>	<p>Additional planting could be carried out to supplement the woodland and scrub.</p> <p>Trees and shrubs planted should include a mix of native broad-leaved species similar to those found on site such as elder, field maple, hawthorn, hazel and oak.</p> <p>Placing tree guards around these new trees will protect them from grazing animals while they are establishing.</p> <p>Management: Pruning and coppicing can be carried out in future years to control and promote growth.</p> <p>Coppicing of hazel should be carried out to increase fruiting and provide additional food resource.</p>	Rotational coppice			Low

OBJECTIVE	ACTION	OUTCOME	TARGET (YEARS)			MONITORING ACTION	PRIORITY
			1- 2	3 – 5	6 – 10		
	Planting of perennial bulbs	Provisioning of additional habitat and a food resource for a range of invertebrate and bird species.	<p>Bulb planting could be carried out in shaded areas beneath trees and scrub.</p> <p>Species could include bluebell, daffodil and snowdrops.</p> <p>Management: Regular management of grass and weeds around bulb planting.</p>				Low
	Erection of bird boxes for a range of species	To provide additional nesting opportunities on the site for breeding birds	<p>A range of bird boxes should be installed and include a mix of standard, open-fronted bird boxes, starling boxes and a sparrow terrace.</p> <p>Boxes should not be positioned too close together and attract a range of species.</p> <p>The boxes should be checked once a year during the late autumn/ winter to remove old bedding. Any damaged boxes should be replaced.</p> <p>Further information on bird boxes can be found in Appendix 4.</p>	Any damaged boxes should be replaced	As previous	Carry out annual bird box checks and woodland breeding bird survey. Data submitted to BTO nest Record Scheme, and Wildlife Trust.	Low
	Erection of bat boxes on mature trees	To enhance the site for bats by creating additional roosting habitat	<p>Install boxes on mature trees.</p> <p>Further information on bat boxes can be found in Appendix 4.</p>	<p>Ensure vegetation does not grow over boxes as this will deter bats from using them.</p> <p>Any damaged boxes should be replaced</p>	As previous		Low

Phase 1 Ecological Survey Report: Lakeside North Harbour

OBJECTIVE	ACTION	OUTCOME	TARGET (YEARS)			MONITORING ACTION	PRIORITY
			1- 2	3 – 5	6 – 10		
	Provision of log piles	Increased habitat for invertebrates and small mammals as well as providing hibernation habitat for amphibians and reptiles	<p>Creation of at least one log pile in a suitable area within the woodland.</p> <p>Use logs from broad-leaved trees of varying sizes. These should be partially buried in the ground in a semi-shaded area (i.e. somewhere warm enough for insects but not exposed to prolonged sunlight which can dry out the wood).</p> <p>Some logs should be positioned upright as this is suitable for stag beetles which lay their eggs into deadwood.</p>				Low
	Provision of compost heaps	Increased habitat for invertebrates, reptiles and small mammals	Can be created using cuttings from the grassland and cleared aquatic vegetation piled up into a heap.				Low
	Provision of invertebrate houses	Increased habitat for invertebrates	<p>Install invertebrate house "bug hotel" near wildflower areas.</p> <p>Further information can be found in Appendix 4</p>				Low

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MAPS

Location within county:



Map 1. Site Location

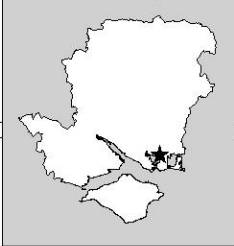
Lakeside North Harbour

Scale 1:35000



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 For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hwwt.org.uk, tel: 01489 774455.

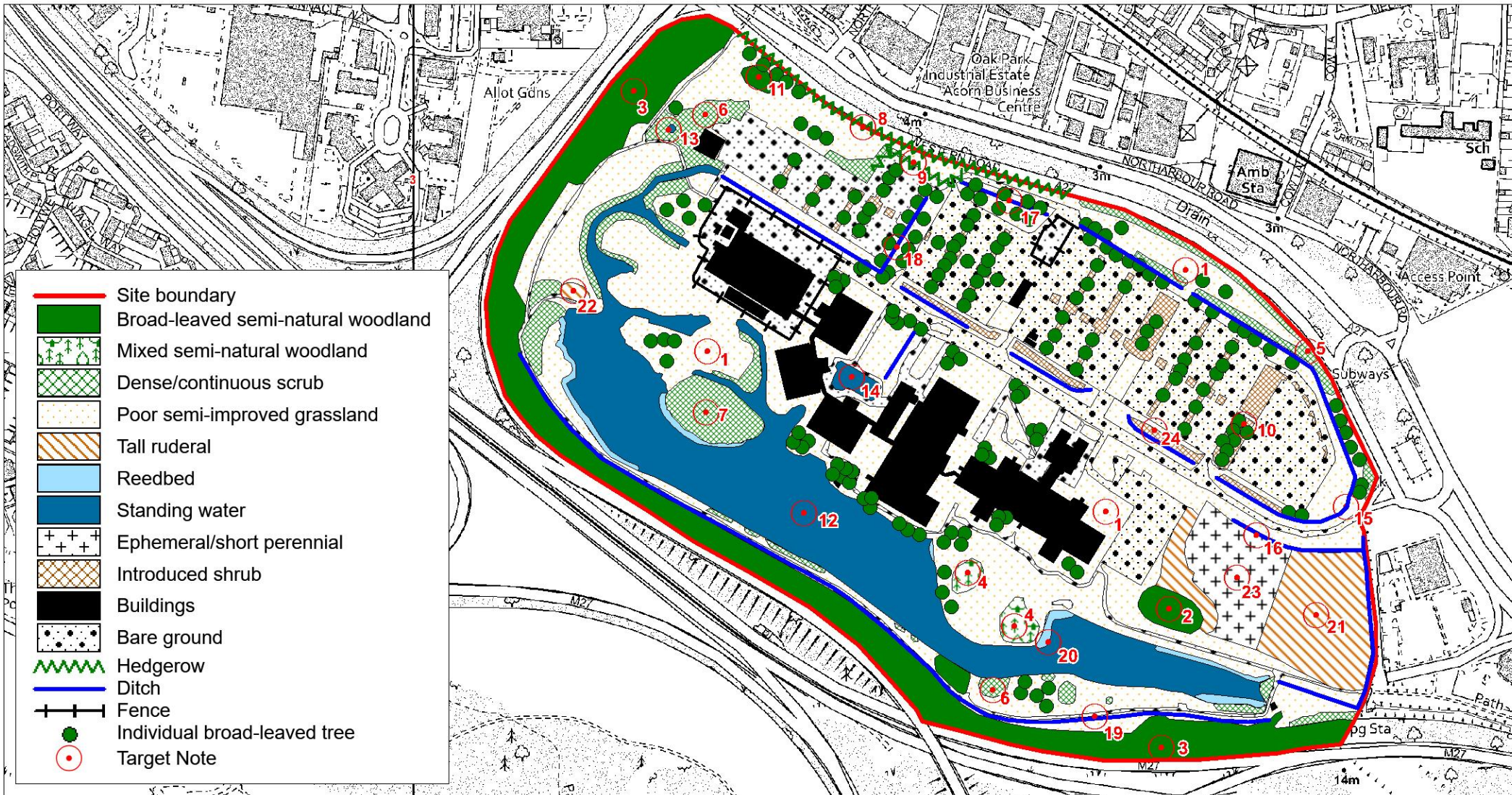
Location within county:



Map 2. Phase 1 Habitat Survey Map

Lakeside North Harbour

Scale 1:6000



PHOTOGRAPHS



Photograph 1: Building 1000 at Lakeside North Harbour facing south-west



Photograph 2: Lake to the south of the site, facing west



Photograph 3: Areas of species-poor semi-improved grassland around the car parks



Photograph 4: Scrub, tree line and species-poor semi-improved grassland to the north of the site



Photograph 5: Ditch and tree line to the north-east of the site (Target Note 15)



Photograph 6: Shaded ditch with scrub on the banks to the north of the site (Target Note 17)



Photograph 7: Ditch dominated by great reed mace to the north of the IBM building (Target Note 18)



Photograph 8: Pond to the south-west of the IBM building



Photograph 9: Rohan pond to the west of the site



Photograph 10: Hedgerow along the northern site boundary



Photograph 11: Woodland and scrub to the south of the site



Photograph 12: Ruderal vegetation to the east of the site



Photograph 13: Scrub and reedbed around the lake



Photograph 14: Patch of trees with large piles of brash and litter to the north-west of the site



Photograph 15: Disturbed and bare ground to the east of the site



Photograph 16: Disused bird nests in the trees on site



Photograph 17: Log and brush piles, suitable for amphibians and reptiles



Photograph 18: Rabbit holes in the north-west corner of the site

APPENDICES

Appendix 1:
Map showing extent of background data search area

Location within county:



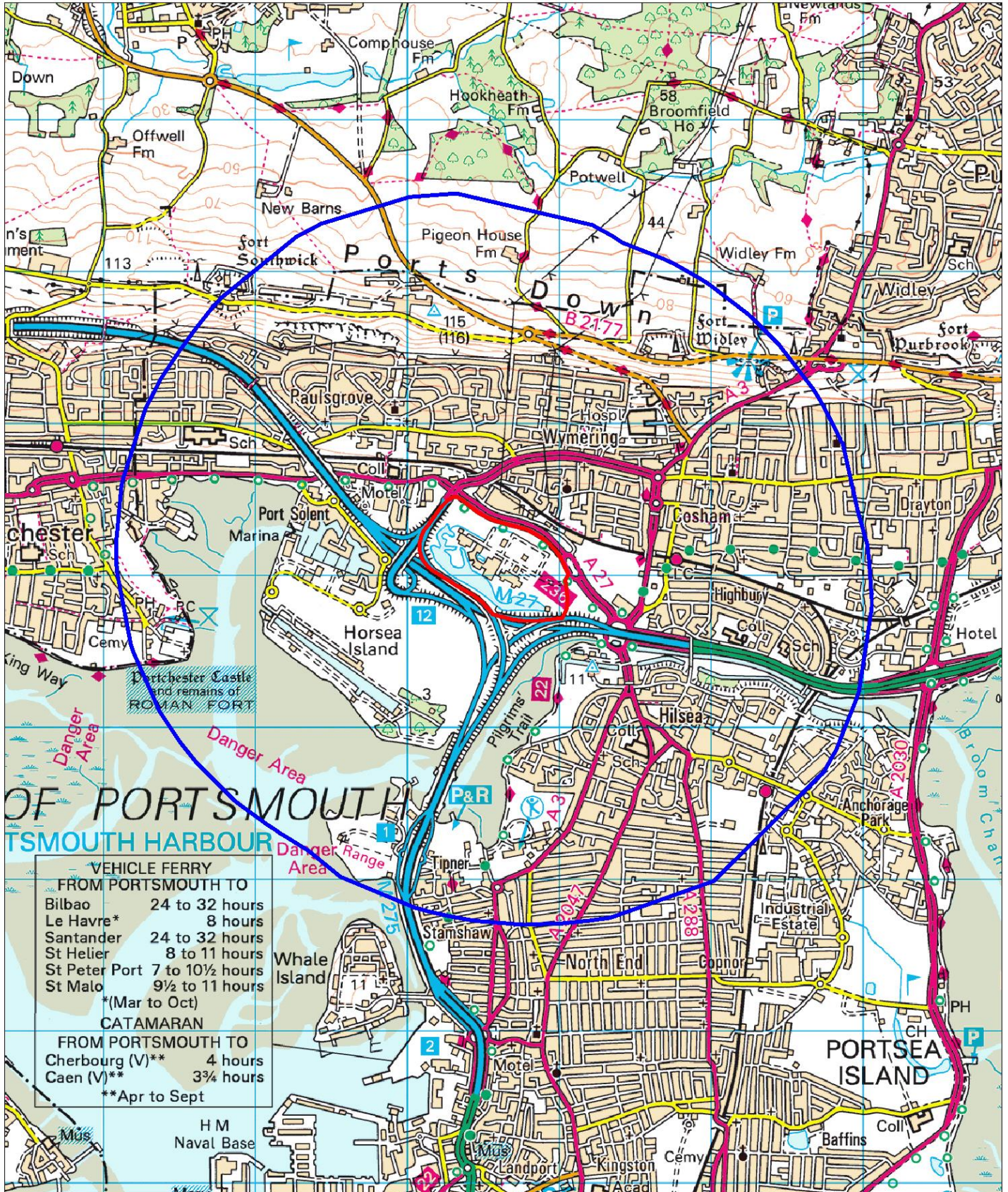
Appendix 1. Extent of Background Data Search Area

Lakeside North Harbour

Scale 1:35000



- Site boundary
- 2km buffer



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 Aerial photography courtesy of GetMapping plc. Produced on 12 February 2021 by Carmen Green
 For enquiries relating to GIS data contact Catherine McGuire, email Catherine.McGuire@hiwvt.org.uk, tel: 01489 774455.

Appendix 2:

Botanical species list compiled during Phase 1 habitat survey with a qualitative measure of abundance based on DAFOR scale

Appendix 2. Botanical species list compiled during Phase 1 habitat survey with a qualitative measure of abundance based on DAFOR scale

The DAFOR scale provides an assessment of the abundance of particular species.

D = Dominant, A = Abundant, F = Frequent, O = Occasional, R = Rare. Species can also be Locally Dominant (LD) or Locally Abundant (LA) meaning there is a particularly dense patch but it does not extend to an entire area, for example a nettle bed.

Scientific name	Common name	Grassland	Woodland, scrub and planting	Hedge	Ruderal and disturbed ground	Aquatic habitats
Grasses, sedges and rushes						
<i>Poa annua</i>	annual meadow-grass	O				
<i>Dactylis glomerata</i>	cock's-foot	R				
<i>Schoenoplectus lacustris</i>	common club-rush					LA
<i>Phragmites australis</i>	common reed					LA
<i>Agrostis stolonifera</i>	creeping bent	LA				
<i>Brachypodium sylvaticum</i>	false brome				R	
<i>Arrhenatherum elatius</i>	false oat-grass		O		F	
<i>Typha latifolia</i>	great reed mace					F
<i>Juncus inflexus</i>	hard rush					R
<i>Festuca pratensis</i>	meadow fescue	F				
<i>Cortaderia selloana</i>	pampas grass		O			R
<i>Carex pendula</i>	pendulous sedge					R
<i>Lolium perenne</i>	perennial rye-grass	LA				
<i>Festuca c.f. rubra</i>	red fescue	F				
<i>Juncus acutiflorus</i>	sharp-flowered rush					O
<i>Holcus lanatus</i>	Yorkshire-fog	R				
Herbs						
<i>Melissa officinalis</i>	balm	R				
<i>Picris echioides</i>	bristly oxtongue				F	
<i>Conyza canadensis</i>	Canadian fleabane				R	
<i>Melianthus major</i>	cape honey flower		R			
<i>Hypochaeris radicata</i>	cat's-ear	R				
<i>Allium schoenoprasum</i>	chives	O				
<i>Galium aparine</i>	cleavers		R			

Scientific name	Common name	Grassland	Woodland, scrub and planting	Hedge	Ruderal and disturbed ground	Aquatic habitats
<i>Oenothera biennis</i>	common evening primrose				R	
<i>Veronica persicaria</i>	common field speedwell	O				
<i>Pulicaria dysenterica</i>	common fleabane	LF				
<i>Centaurea nigra</i>	common knapweed	R			O	
<i>Malva sylvestris</i>	common mallow	R				
<i>Senecio jacobaea</i>	common ragwort	O				
<i>Anthriscus sylvestris</i>	cow parsley	R	O			
<i>Ranunculus repens</i>	creeping buttercup	O				
<i>Potentilla reptans</i>	creeping cinquefoil	O				
<i>Cirsium arvense</i>	creeping thistle	R			O	
<i>Lagarosiphon major</i>	curly waterweed					R
<i>Narcissus</i> sp.	daffodil	O				
<i>Bellis perennis</i>	daisy	O				
<i>Taraxacum</i> sp.	dandelion species	O			O	
<i>Mercurialis perennis</i>	dog's mercury		R			
<i>Geranium molle</i>	dove's-foot crane's-bill	R				
<i>Lemna</i> sp.	duckweed					LA
<i>Apium nodiflorum</i>	fool's watercress					F
<i>Myosotis</i> sp.	forget-me-not	R				
<i>Veronica chamaedrys</i>	germander speedwell	R				
<i>Epilobium hirsutum</i>	great willowherb					LF
<i>Glechoma hederacea</i>	ground-ivy	R				
<i>Senecio vulgaris</i>	groundsel	R			R	
<i>Galium mollugo</i>	hedge bedstraw	R				
<i>Oenanthe crocata</i>	hemlock water-dropwort					R
<i>Ficaria verna</i>	lesser celandine	O				
<i>Lathyrus pratensis</i>	meadow vetchling	R				
<i>Erodium moschatum</i>	musk stork's-bill	O			O	
<i>Urtica dioica</i>	nettle (common)		O		O	O
Orchidaceae sp.	orchid species	R				

Scientific name	Common name	Grassland	Woodland, scrub and planting	Hedge	Ruderal and disturbed ground	Aquatic habitats
<i>Leucanthemum vulgare</i>	ox-eye daisy	O				
<i>Euphorbia peplus</i>	petty spurge				R	
<i>Sonchus asper</i>	prickly sowthistle	R				
<i>Lamium purpurea</i>	red dead-nettle	R				
<i>Plantago lanceolata</i>	ribwort plantain	O			O	
<i>Anagallis arvensis</i>	scarlet pimpernel	R				
<i>Prunella vulgaris</i>	selfheal	O				
<i>Capsella bursa-pastoris</i>	shepherd's-purse	R				
<i>Sonchus oleraceus</i>	smooth sowthistle	R			R	
<i>Medicago arabica</i>	spotted medick	F				
<i>Lepidium</i> sp.	swine-cress	R				
<i>Dipsacus fullonum</i>	teasel				LF	
<i>Trifolium repens</i>	white clover	O				
<i>Daucus carota</i>	wild carrot				F	
<i>Petasites fragrans</i>	winter heliotrope		R			R
<i>Geum urbanum</i>	wood avens					
<i>Achillea millefolium</i>	yarrow	O				
Woody species						
<i>Alnus glutinosa</i>	alder		F			
<i>Fraxinus excelsior</i>	ash		O			
<i>Populus tremula</i>	aspen		F			
<i>Cedrus atlantica</i>	atlas cedar		R			
<i>Laurus nobilis</i>	bay laurel		R			
<i>Berberis</i> sp.	barberry		R			
<i>Populus nigra</i>	black poplar		F			
<i>Rubus fruticosus</i> agg.	bramble		F	O		
<i>Cytisus scoparius</i>	broom		R			
<i>Buddleja</i> sp.	butterfly bush		R			
<i>Buxus sempervirens</i>	common box			LD		
<i>Pinus nigra</i>	Corsican pine		O			

Scientific name	Common name	Grassland	Woodland, scrub and planting	Hedge	Ruderal and disturbed ground	Aquatic habitats
<i>Sambucus nigra</i>	elder		O			
<i>Eucalyptus</i>	eucalyptus		R			
<i>Acer campestre</i>	field maple		O			
<i>Pyracantha</i> sp.	firethorn		R			
<i>Ulex europaeus</i>	gorse		R			
<i>Crataegus monogyna</i>	hawthorn		O	LD		
<i>Corylus avellana</i>	hazel		O			
<i>Ilex aquifolium</i>	holly		R			
<i>Aesculus hippocastanum</i>	horse chestnut		R			
<i>Hedera helix</i>	ivy	R	O	F	O	
Arecaceae sp.	palm		R			
<i>Quercus robur</i>	pedunculate oak		O			
<i>Ligustrum</i> sp.	privet		O	O		
<i>Quercus rubra</i>	red oak		R			
<i>Cornus sericea</i>	red osier dogwood		O			
<i>Rosa</i> sp.	rose species		O			
<i>Betula pendula</i>	silver birch		F			
<i>Acer pseudoplatanus</i>	sycamore		O			
<i>Quercus cerris</i>	Turkey oak		O			
<i>Viburnum</i> sp.	viburnum		R			
<i>Populus alba</i>	white poplar		O			
<i>Sorbus aria</i>	whitebeam		O			
<i>Salix</i> sp.	willow species		O			
<i>Taxus baccata</i>	yew		R			
Non-flowering plants						
	Moss species	LA				







Appendix 3:
Suitable Plants for Ponds

Appendix 3: Suitable Plants for Ponds (Taken from 'Creating garden ponds for wildlife' by Pond Conservation & World of Water, 2011)

Type of Plant	Species	Comments
Plants next to the pond (for use in wildflower areas adjacent to pond)	<ul style="list-style-type: none"> • Cow parsley • Devil's-bit scabious • Hemp agrimony • Teasel • Purple loosestrife • Red valerian • Yarrow 	Provision of food and cover next to the pond Links to other habitats e.g. hedgerows
Low-growing wetland grasses (planted on dry ground or in a few cm of water)	<ul style="list-style-type: none"> • Creeping bent • Small sweet-grasses 	
Marginal herbs & rushes (2-10cm depth of water)	<ul style="list-style-type: none"> • Lesser spearwort • Marsh pennywort • Water forget-me-not • Water mint • watercress 	
Marginal plants with attractive flowers & architecture (2-10cm depth of water)	<ul style="list-style-type: none"> • Marsh cinquefoil • Marsh woundwort • Marsh-marigold • Pendulous sedge • Purple loosestrife • Ragged-robin • Water dock • Yellow iris 	
Tall emergents (2-10cm depth of water)	<ul style="list-style-type: none"> • Branched bur-reed • Bulrush • Greater pond-sedge • Hard rush • Lesser reedmace • Reed sweet-grass • Soft rush 	Can become dominant in small ponds so regular cutting back necessary
Floating-leaved plants (15-30cm of water)	<ul style="list-style-type: none"> • Amphibious bistort • Broad-leaved pondweed • Fringed water-lily • Yellow water-lily 	
Submerged plants (Float in deep water)	<ul style="list-style-type: none"> • Common water-starwort • Curled pondweed • Rigid hornwort • Spike water-milfoil • Water-crowfoot 	

Appendix 4:
Information on bird and bat boxes and insect hotels

Appendix 4. Information on bird and bat boxes and insect hotels

Type	Typical species	Height	Additional information
Standard bird box e.g. Schwegler 1B 	Blue tits, great tits	2-4m	<ul style="list-style-type: none"> Position on a building or tree, angled north and east (away from prevailing winds) and tilt forward slightly. Chances of occupation can be increased by positioning boxes near vegetation.
Starling box e.g. Schwegler 3S 	Starlings, woodpeckers and nuthatches	≥ 2m	<ul style="list-style-type: none"> Position on a tree, angled north and east (away from prevailing winds) and tilt forward slightly. Chances of occupation can be increased by positioning boxes near vegetation.
Open-fronted bird box e.g. Schwegler 2H 	Robins, wrens	≤ 2m	<ul style="list-style-type: none"> Mount on a tree or shrub Conceal amongst foliage to keep well hidden from predators.
Sparrow terrace E.g. Schwegler 1SP 	House sparrows	≥ 2m	<ul style="list-style-type: none"> Should be fixed onto a sturdy building, not onto fences or garden sheds due to its weight.
Bat box e.g. 2F Schwegler 	Bats	2.5-5m	<ul style="list-style-type: none"> Site on mature trees with 1 or 2 boxes per tree South-east to south-west facing Away from lighting Near to vegetation without it obscuring entrance
Insect hotel 	Invertebrates	≥ 1m	<ul style="list-style-type: none"> Position in sunny location on a tree, fence or wall near to bee-friendly vegetation Ensure it is accessible with no vegetation blocking the entrance

All boxes should be positioned to avoid facing the prevailing wind.

Appendix 5:
Annual Work Plan

Appendix 5. Annual Work Plan

Operational Objective	Activity	Month											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maintain and enhance existing habitats for wildlife	Mowing of grassland areas. Remove all cuttings				X					X			
	Infilling of hedgerows with a mix of native species	X	X	X								X	X
	Trim hedgerows on a two to three-year rotation	X											
	Cutting back of vegetation overhanging ponds and ditches	X										X	X
	Planting of a mix of aquatic vegetation			X	X	X							
	Removal of excessive leaf litter											X	X
	Clear any dead aquatic plants/ excessive weeds or vegetation growth from water bodies	X	X										X
Creating space for wildlife	Create wildflower areas through scattering seeds				X	X	X						
	Additional tree and shrub planting	X	X	X								X	X
	Planting of perennial bulbs									X	X	X	X
	Put up a range of bird and bat boxes	X	X										
	Install insect hotels		X										
	Create log piles and compost heaps in sheltered locations	X	X									X	X
Monitoring biodiversity and effects of management activities	Botanical survey							X					
	Breeding bird survey				X	X	X						
	Winter bird survey	X	X	X							X	X	X
	Invertebrate survey (butterfly, bumblebee, Orthoptera and Odonata)				X	X	X	X	X	X			

Operational Objective	Activity	Month												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
	Amphibian survey			X	X	X	X							
Comply with health and safety requirements	Dangerous tree survey	X										X	X	X

Appendix 6:
Long-term Work Plan

