NORTH WEST cambridge

Biodiversity Strategy

Condition 34

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North West Cambridge

Biodiversity Strategy

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Summary

This report has been prepared by Mike Dean of MD Ecology Limited, on behalf of the University of Cambridge. It provides a strategy for the protection and enhancement of the habitats and species present at the NW Cambridge development site, and the implementation of the required mitigation measures. This document has been prepared to discharge condition 34 of the outline planning consent for the development.

The development has been designed to retain and protect the most valuable ecological features, by incorporating them into the indicative layout and parameter plans, including areas of woodland, species-rich hedgerows and two small orchards. Ecological enhancement is a central theme in the design of the area of open land along the site's western boundary, known as 'the Western Edge'. This includes the Washpit Brook, areas of woodland and the more valuable hedgerows. In addition, new species-rich grassland, ponds and other wetland habitat, and areas of parkland will be created and managed to deliver ecological benefits. The brook itself will be enhanced through modifications to the banks in places, and new planting will off-set habitat losses.

Ponds adjacent to the site support great crested newts and large populations of common toads. The ponds will be protected, as will the terrestrial habitat used by these species. Measures to improve the conservation status of the local great crested newt population are a feature of the design of the Western Edge.

The development will deliver enhancements for a range of other species/groups, through the provision of bird nesting sites and bat roosting features in new buildings, bat boxes on retained trees, artificial otter holts, kingfisher nest sites, and amphibian and reptile hibernation sites.

This document sets-out the general approach to protecting the site's biodiversity assets during construction, including measures required to ensure legislative compliance for protected species, specifically great crested newts, badgers, bats, water voles and nesting birds. It also provides a schedule for ecological monitoring and management.

The overarching objectives for biodiversity are:

- To secure the long term nature conservation value of the site;
- To maintain and, where possible, enhance the conservation status of those species which are national or local priorities for conservation, thereby delivering local Biodiversity Action Plan objectives;
- To promote habitat connectivity within the site and with adjacent habitat;
- To provide a biodiversity resource which is valued and used by local residents;
- To assist in the delivery of nature-related education and encourage the voluntary participation of the local community in conservation activities.

1. Introduction

1.0.1 This report has been prepared by Mike Dean of MD Ecology Limited, on behalf of the University of Cambridge. It provides a strategy for the protection and enhancement of the habitats and species present at the NW Cambridge development site, the implementation of the required mitigation measures, and a strategy for monitoring. This document has been prepared to discharge condition 34 of the outline planning consent for the development:

'Prior to, or concurrently with, the submission of the first of the reserved matters applications for residential development for the site, a site wide Biodiversity Strategy shall be submitted to the local planning authority for approval. The plan shall set out how the development will improve the biodiversity of the site in accordance the principles proposed in the Environmental Statement and ancillary documents/strategies submitted with the application and include:

a) Full details of appropriate habitat and species surveys (pre, during and post-construction), and reviews where necessary.
b) Full details of measures to ensure protection and suitable mitigation to all legally protected species and those habitats and species identified as being of importance to biodiversity both during construction and post-development, including consideration and avoidance of sensitive stages of species life cycles, such as the bird breeding season, together with details of any protective fencing and/or phasing of works to ensure the provision of advanced habitat areas and minimise disturbance of existing features.
c) Identification of habitats and species worthy of management and enhancement together with the setting of appropriate conservation objectives for the site. Prescriptions shall be provided to detail how habitat and species management and enhancement shall be provided alongside measures to provide habitat restoration and creation to deliver targets in the Cambridgeshire and UK Biodiversity Action Plans such as: the provision of bat and bird boxes on buildings and on trees around the site; the provision of other nesting features for bird species such as kingfisher nest banks; reptile hibernacula; the creation of new aquatic habitats including specific measures for water vole and otter conservation; measures for badger conservation; measures for amphibian conservation; the management of grassland, orchards and veteran trees.
d) A summary work schedule table, confirming the relevant dates and/or periods that the prescriptions and protection measures shall be implemented or undertaken by within, and who will specifically over-see their delivery and compliance, such as an Ecological Clerk of Works.
e) Monitoring shall be carried out in accordance with the Biodiversity Strategy, part 7, with an annual report provided to the Local Planning Authorities.
f) Long-term maintenance, management and monitoring responsibilities for a period of 15 years to ensure an effective implementation of the Ecological Management Plan ensuring periodic review of the objectives and prescriptions.

No development shall commence until such time as the Biodiversity Strategy has been approved in writing by the Local Planning Authority. All species and habitat protection, enhancement, restoration and creation measures shall be carried out in accordance with the approved Strategy. Any variation to the prescriptions, measures, timing of delivery and/or personnel shall be agreed in writing and formally submitted as an approved variation to the Strategy.

***REASON** To ensure that the development of the site conserves and enhances ecology. North West Cambridge Area Action Plan Policy NW2.'*

1.0.2 This version of the Biodiversity Strategy builds on and supercedes the previous version of the Biodiversity Strategy submitted as part of the planning application as Appendix 7.4 of the Environmental Statement.

1.0.3 Detailed ecological surveys have been undertaken during the period 2004-2011 to inform the assessment of ecological effects set-out in the Environmental Statement. The results of these surveys, along with consultation with the local planning authorities and other relevant consultees, and update surveys carried out in 2012 have been used to guide the preparation of this Biodiversity Strategy.

1.0.4 This Biodiversity Strategy includes the following elements:

- A description of the current biodiversity resource, as set out in the Environmental Statement and updated by surveys in 2012.
- Biodiversity objectives and prescriptions for the management of valuable habitats and features within areas of Open Land.
- A description of the measures required to protect biodiversity resources and to deliver ecological enhancement.
- A strategy for monitoring the site's biodiversity resource and the success of mitigation and enhancement measures.

1.0.5 In some cases the specific mitigation measures required, and their timing, will be dictated by elements of detail that have not been finalised at this stage. This strategy provides a generic approach to be followed in such cases; it is intended that further details will be provided within the 'Biodiversity Survey and Assessment' report, which will be produced for each reserved matters application (as required by condition 35 of the Outline Planning Consent).

1.0.6 The implementation of the ecological protection and enhancement measures, as set-out in this strategy, will be overseen by the Project Ecologist, appointed by the University of Cambridge. Specialist ecologists will also be appointed, where necessary, to implement and/or oversee licensable works in relation to great crested newts, badgers and bats.

2. Summary of Ecological Surveys Undertaken

2.1 Pre-Application Ecology Surveys

2.1.1 The following ecological surveys have been undertaken during the period 2004-2011, as described in detail in Appendix 7.1 of the Environmental Statement (submitted as part of the planning application for the development):

- Multi-disciplinary walkover survey comprising Phase 1 habitat survey (JNCC, 2010), protected species walkover survey and Hedgerows Regulations assessment (2004/5, and updated in 2007, 2009 and 2011).
- Phase 2 botanical survey to identify arable weeds (July 2011).
- Aquatic invertebrate survey of the Washpit Brook using a standard kick-sampling approach (June 2011).
- Terrestrial invertebrate survey of the Application Site using a variety of standard techniques (as recommended in Drake *et al. (*2007) and targeted surveys for white-letter hairstreak (*Satyrium w-album*) and purple hairstreak butterflies (*Neozephyrus quercus*) (July 2011).
- Great crested newt (*Triturus cristatus*) surveys of six ponds and three ditches within/adjacent to the site following Natural England's guidelines (English Nature, 2001) (2004 and 2005, and updated in 2007, 2009 and 2011).
- Common toad (*Bufo bufo*) surveys of ponds within and adjacent to the site (March 2011).
- Reptile surveys of areas of suitable habitat using artificial refuges (initially in 2005 and an additional area surveyed in 2009).
- Breeding bird surveys following the British Trust for Ornithology's Common Bird Census methodology during 2004 (late-season surveys in June and July) and 2005 (early season surveys in April and May). These surveys were updated in 2009 and 2011 with four survey visits between April and June in both years of survey.
- Winter bird surveys of the site (March 2011).
- External inspections of all buildings and trees within the site to identify structures suitable for roosting bats. Where necessary, internal inspections of suitable buildings and tree climbing inspections of suitable trees (2005 and updated in 2009 and 2011) and emergence surveys of trees and buildings (2009 and 2011).
- Bat activity surveys along the stream corridor and boundary features suitable for foraging/commuting bats, carried out once per month in May, June and July 2009, following the Bat Conservation Trust's survey guidelines (BCT, 2007) and repeated in May and June 2011.

- Water vole (*Arvicola amphibius*) and otter (*Lutra lutra*) surveys of the Washpit Brook following standard survey techniques (Strachan and Moorhouse, 2006; Chanin, 2003) (2004 and repeated in 2005, 2007, 2009 and 2011).
- Brown hare (*Lepus europaeus*) survey (March 2011).
- A badger (*Meles meles*) survey of the site to map sett locations and determine their status following standard methods (2004, and updated in 2007, 2009 and 2010) and a bait marking study, to determine the status and 'ownership' of setts (2005 and 2007).
- A walkover of those parts of the site on which highways improvements and utility works are proposed to determine whether there are any ecological constraints to such works, as far as access allowed (August 2011), following the same approach as the multi-disciplinary walkover survey described above.
- A targeted bat survey of mature trees that would be affected by the construction of an access onto Madingley Road (January 2012).

2.2 Post-Application Ecology Surveys

2.2.1 A number of ecological surveys have been undertaken during 2012, since the planning application was submitted, to further inform the detailed approach to ecological mitigation, and as pre-construction surveys for the initial phase of the development. The methods and results are summarised below; further details of the survey results are provided in Sections 4.2, 4.13 and 4.15.

2.2.2 Buildings and mature trees likely to be affected during the initial phase of the development were inspected for evidence of bats. This included mature trees in the southern part of the site, which will need to be removed to construct the Madingley Road West junction and access road, the Agronomy centre buildings and farm buildings at Gravel Hill Farm. Further details are provided in Section 4.13.

2.2.3 The badger survey of the site was updated in September 2012; all setts and former setts were re-assessed to confirm their current status. All parts of the site were searched for evidence of new setts following standard survey methods. The status of a number of setts has changed since the previous survey in 2010 (see Section 4.15).

2.2.4 The water vole and otter surveys of the Washpit Brook were updated in September 2012, following the same survey techniques as used during the previous surveys in 2004, 2005, 2007, 2009 and 2011 (as described in Appendix 7.1 of the Environmental Statement). No evidence of water voles or otters was recorded during the survey, although suitable habitat for water voles is still present on the Washpit Brook (see Section 4.2).

3. Biodiversity Objectives

3.1 UK and local Biodiversity Action Plans

3.1.1 The UK Biodiversity Action Plan (BAP) provides a national strategy to conserve our threatened native species and habitats. A total of 1150 species and 65 habitats have been identified as priorities for conservation. The priority habitats and species, listed within the UK Biodiversity Action Plan, which are of particular relevance to the site are:

- Hedgerows
- Ponds
- Traditional orchards
- Lowland mixed deciduous woodland
- White-letter hairstreak butterfly
- Great crested newt
- Common toad
- Skylark
- Linnet
- Yellowhammer
- Yellow wagtail
- House sparrow
- Dunnock
- Starling
- Bullfinch
- Song thrush
- Water vole
- Brown hare
- Noctule
- Soprano pipistrelle bat
- Brown long-eared bat

3.1.2 The local BAP, produced by the Cambridgeshire and Peterborough Biodiversity Partnership, includes the following habitats and species of relevance:

- Hedgerows
- Managed greenspaces
- Ponds, lakes and standing water
- Neutral grassland
- Rivers and streams
- Traditional orchards
- Veteran trees and parkland
- Woodland
- Brown hare
- Great crested newt
- Pipistrelle bat
- Skylark
- Song thrush
- Water vole

3.2 Existing resources

3.2.1 The site currently comprises intensively managed farmland, of which approximately 90ha is in arable production and approximately 35ha comprises grazing pasture, the remainder is occupied by University buildings or existing road infrastructure.

3.2.2 A number of small woodlands are present as well as two small former orchards. The fields in the south-western part of the site are divided by hedgerows, some of which are species-rich. The majority of the field boundaries in the remainder of the site comprise fences, or no longer exist. Mature trees are associated with some of the field boundaries and a proportion of the trees on the site have been shown to support a valuable terrestrial invertebrate assemblage. A pit in the central part of the site is not farmed, and is in part designated as a geological Site of Special Scientific Interest (SSSI). A number of farm buildings are also present.

3.2.3 The Washpit Brook flows through the western part of the site. Surveys in 2004 and 2009 identified a small population of water voles on the Washpit Brook, although no evidence of water voles was recorded in 2011 or 2012. Occasional ponds are present which support breeding amphibians. Important populations of great crested newts are present associated with off-site ponds at the Bird Sanctuary and the Park and Ride to the south of the site (although no great crested newts were recorded in the Park and Ride pond in 2011). Common toads occur in the pond at the World Conservation Monitoring Centre immediately outside of the site (but located close to its centre), and the Park and Ride pond (off-site).

3.2.4 The farmland supports breeding birds, a population of brown hares, and is used by foraging bats and badgers. A brown long-eared bat (*Plecotus auritus*) roost and small pipistrelle (*Pipistrellus* sp.) bat roost is present in one of the farm buildings and numerous badger setts have been recorded across the site.

3.3 Proposed resources – a vision for biodiversity at North West Cambridge

3.3.1 The development has been designed to retain and protect the most valuable ecological features, by incorporating them into the indicative layout and parameter plans. Ecological enhancement is a central theme in the design of Area 5 on parameter Plan 03 known as 'the Western Edge', which includes the Washpit Brook, areas of woodland and the more valuable hedgerows. In addition, new species-rich grassland, ponds and other wetland habitat, and areas of parkland will be created.

3.3.2 The Western Edge will be managed to deliver a range of 'ecosystem services', including ecological, landscape and drainage functions, as well as providing a recreational resource which will be valued highly by future residents and visitors. In combination with the creation of other areas of Open Land this will provide green infrastructure, linking areas of farmland to the north and west of the site allowing the creation of an ecological network on the north-western edge of Cambridge.

3.3.3 The University of Cambridge will appoint an Estate Management Company to undertake management of new and retained habitats and ecological features, as set-out in this document.

3.3.4 The areas of Open Land will also provide an ideal opportunity to re-connect people to nature, by providing and encouraging access to the countryside; this would be supported by delivering nature-related education and encouraging voluntary participation in nature conservation activities.

3.3.5 Ponds supporting great crested newts and large populations of common toads will be protected, as will the terrestrial habitat used by these species. Measures to improve the conservation status of the local great crested newt population are a feature of the design of the Western Edge. Badger setts have also been retained as far as possible.

3.3.6 Where the development is likely to result in the loss of species, or assemblages of species (as is the case for brown hares and farmland birds), off-site mitigation has been secured following the general approach of biodiversity offsetting, as recommended in the UK Government's white paper '*The Natural Choice: securing the value of nature*'.

3.4 Overall objectives

3.4.1 The overarching objectives for biodiversity are:

- To secure the long term nature conservation value of the site;
- To maintain and, where possible, enhance the conservation status of those species which are national or local priorities for conservation, thereby delivering local Biodiversity Action Plan objectives;
- To promote habitat connectivity within the site and with adjacent habitat;
- To provide a biodiversity resource which is valued and used by local residents; and
- To assist in the delivery of nature-related education and encourage the voluntary participation of the local community in conservation activities.

4. Specific Measures to Protect and Enhance Biodiversity

4.1 General

4.1.1 The following measures will apply to all development activities on site to ensure that the measures for the protection of biodiversity, as set-out in this strategy, are implemented correctly:

- Prior to works commencing in any given part of the site, the Project Ecologist will brief the site team on the ecological constraints, including the location of protected species or sensitive habitats. These features will be demarcated with appropriate fencing until such time as the constraint has been removed, or works in proximity to it have been completed. The installation of the fence will be overseen by the Project Ecologist.
- An ecological permit system will operate on site during construction. Any works with the potential to affect protected species or ecologically sensitive habitats will be inspected by the Project Ecologist (or an otherwise appointed ecologist) to confirm the presence/absence of any potential ecological constraints. Once an area has been confirmed to be clear of any constraints, the permit will be signed by the Project Ecologist (or otherwise appointed ecologist) and work will then be permitted in those locations. Should a constraint be identified, the Project Ecologist or ECoW will provide details on appropriate measures and timings for a repeat inspection; works will not be permitted until the area has been certified clear of the constraint by the Project Ecologist (or otherwise appointed ecologist). An example Ecological Inspection Permit is provided in Appendix 6.
- The Project Ecologist will review forthcoming activities on a monthly basis and will communicate any requirements to the site team, to ensure that activities constrained in relation to protected species are undertaken in accordance with this strategy as well as current legislation and best practice guidance.
- During construction, the Project Ecologist will undertake at least quarterly site visits to review the implementation of this strategy, including the provision of enhancement measures and the implementation of both general and species protection measures. An annual report of the results will be produced and submitted to the Local Planning Authorities.
- During key periods the Project Ecologist will visit the site more frequently (weekly or monthly) as required to ensure effective compliance.

4.2 Washpit Brook, including water voles and otters

Current status

4.2.1 The Washpit Brook flows adjacent to the M11 on the western boundary of the site and through the centre of the north-western corner. A small number of common wetland plants are present within the Brook including Fool's Water-cress (*Apium nodiflorum*), Water-cress (*Rorippa nasturtium-aquaticum*), a water-starwort species (*Callitriche* sp.), and Common Duckweed (*Lemna minor*). The Washpit Brook supports an aquatic invertebrate fauna of low conservation value. The Brook can be divided into approximately three sections in terms of the habitat it supports:

- The northern section of the Brook is heavily shaded by an adjacent hedgerow, and supports little aquatic or emergent vegetation.
- The central section supports a significant amount of in-channel vegetation; the banks are dominated by Bramble and support few grasses.
- The southern section, located adjacent to the M11, dries out occasionally and therefore supports little wetland vegetation; the banks are generally grassy with occasional patches of Bramble scrub.

4.2.2 The southern and central sections of the Washpit Brook provide suitable habitat for water voles (as shown on Figure 1), although the southern section is prone to dry out and supports little wetland vegetation, making it less suitable. Surveys between 2004 and 2009 identified a small population of water voles in this section of the Brook, although no evidence of the presence of water voles was recorded during surveys in 2011 and 2012. The site's water vole population has contracted in extent and size over the period during which surveys have been undertaken and is likely to have been lost altogether.

4.2.3 No evidence of otters has been recorded on the section of the Washpit Brook within the site, although they may use it occasionally to commute between larger watercourses. No potentially suitable resting sites have been identified.

Proposed works

4.2.4 The watercourse will be retained on its current alignment, with modifications to bank profile in places to allow the creation of a second stage channel to provide flood storage. The banks of the central section of the Brook, which provides the most valuable habitat for water voles, will be retained intact (as shown in the illustrative proposals produced by URS, cross-sections WSH-1961 and WSH-1998 (drawings D127313-SK-065 to 069 dated 17.04.12)).

4.2.5 A flow control structure will be constructed in the northern section of the Brook, which will also provide a crossing structure. Existing trees on the banks of the Brook will be retained as far as possible (although a small number of trees may need to be removed to construct the flow control structure). The pipe carrying the watercourse through the structure will be designed with a rough finish to its base to trap sediment and form a more natural stream bed.

4.2.6 The new drainage and attenuation features associated with the Washpit Brook will be designed to provide valuable habitat for water voles in particular. Linear habitat ponds will be created as part of new 'low flow channels', which will receive water from retention ponds and will be over-deepened to ensure that they hold water over as prolonged a period as possible. The new sections of channel and habitat ponds will have a steep (1:1 slope) earth bank on one side (at and immediately above water level), sown with a wildflower grass mix, and with a planting ledge below water level. Where bank re-enforcement is required this will be achieved through the use of coir fibre matting. Wetland vegetation will be planted at, and immediately below, water level.

4.2.7 There will be an overall increase in the availability of wetland habitat (by more than 50%) as new backwaters and linear ponds are created as low flow channels.

Objectives

4.2.8 Maintaining and improving riverine habitats is listed as a target on both the UKBAP and LBAP. In addition, water voles and otters are priority species on the UKBAP and the LBAP. Water voles are protected under the Wildlife and Countryside Act 1981 (as amended).

4.2.9 The key objectives for the Washpit Brook are as follows:

- Protect water quality during construction and operational phases of the Proposed Development;
- Enhance flow rates and bank structure through re-modelling works (required for flood risk reasons);
- Increase the amount of wetland habitat present;
- Protect any water vole population during construction and in the long-term;
- Enhance the conservation status of any water vole population by managing the watercourse appropriately, and by providing new habitat of value for this species;
- Encourage use of the Washpit Brook by kingfishers (*Alcedo atthis*) by providing artificial nest sites;
- Encourage use of the Washpit Brook by otters by providing artificial holt sites.

Protection measures

4.2.10 The modifications to the banks of the Washpit Brook, construction of the flow control structure, and excavation of the low flow channels, will be carried out during 2013/2014. This will allow time for the new habitat to develop and therefore deliver significant ecological benefits at an early stage of the project.

4.2.11 Appropriate pollution control measures will be implemented to avoid pollution or increased turbidity in the Washpit Brook during construction of the flow control structure and the bank modification works, to protect adjacent and downstream habitats.

4.2.12 It is considered likely that water voles are absent from the Brook within the site boundaries, although it is difficult to confirm absence of the species. Given that it has been recorded on site in the past, a precautionary approach to the works will be adopted in areas of suitable habitat:

- Prior to any construction works taking place within 5m of the Washpit Brook, the area will be inspected by the Project Ecologist to confirm the absence of water voles. This will apply to ongoing works beyond the initial modification works, such as outfall construction, for example.
- The modification works have been designed to allow retention of a 150m section of the Brook which supports the most valuable habitat for water voles (located at the northern extent of the suitable habitat for water voles shown on Figure 1).
- Prior to modification works taking place within the southern section of the Brook the banks will be strimmed to create a 'scorched earth' effect. Any water voles present would be expected to be displaced into the retained section (described above). The strimming will be undertaken during March or April 2013 and will be overseen by the Project Ecologist. The modification works will proceed after a period of at least 3 days, and will be overseen by the Project Ecologist. Strimming may need to be repeated if there is a delay of more than 2 weeks between strimming and the modification works taking place.
- Bank modification in the southern sections will be undertaken from the upstream limit of the works and will progress northwards, thereby pushing any remaining animals into the retained central section.

4.2.13 It is considered unlikely that other aspects of the development would directly affect the Washpit Brook. Nevertheless, the Brook will be protected within a buffer zone throughout the remaining construction phases of the development. The buffer zone will be fenced off using netlon-type fencing to prevent accidental damage, and to restrict access during the works. Appropriate pollution control measures will be implemented to avoid pollution or increased turbidity in the Washpit Brook.

Enhancement measures

4.2.14 The modifications to the banks of the Washpit Brook have been designed to provide enhanced habitat for water voles and a range of other species:

- There will be overall increase in the availability of wetland habitat (by more than 50%).
- The new sections of channel will have a steep bank (1:1) on one side at and immediately above water level, and a planting shelf where marginal vegetation will be established, to provide valuable habitat for water voles.
- The low flow channels will be excavated to form linear ponds, with a deepened section at the in-flows from attenuation ponds; flow rates will be controlled to maximise the amount of water held in these 'ponds', and thereby provide valuable habitat for water voles and breeding amphibians (including great crested newts).

4.2.15 Two artificial otter holts will be provided at suitable locations along the Washpit Brook, constructed from recycled plastic, sized 1.2m x 830mm x 380mm high (kits available to purchase from http://www.filcris.co.uk/products/product-details/otterholt). The artificial holts will be constructed on top of the bank of the Washpit Brook, and buried to allow turves to be relaid over the top. A ventilation tube will be installed. Blackthorn and hawthorn shrubs will be planted around the holts to limit likely disturbance. The holts will be located in areas likely to experience least public disturbance, selected by the Project Ecologist.

4.2.16 Four artificial kingfisher (*Alcedo atthis*) nest sites will be provided at suitable locations along the Washpit Brook, constructed from woodcrete, comprising a tunnel, outer nesting chamber and inner nesting chamber. The artificial nest sites will be installed on top of the bank of the Washpit Brook, and buried to allow turves to be relaid over the top. Blackthorn and hawthorn shrubs will be planted above the nest sites to limit likely disturbance. The nest sites will be located in areas likely to experience least public disturbance, but within as steep a slope as possible to encourage use by kingfishers. The sites will be selected by the Project Ecologist. The nest sites will be installed in pairs, located at least 70cm apart, as kingfishers tend to use different nest sites for first and second broods. The bank height shall ideally be 1.5m above water level with nest holes 0.5m below top of bank.

4.2.17 The first pair of kingfisher nest sites will be provided prior to occupation of the 800th residential unit; the second pair of kingfisher nest sites will be provided prior to occupation of the 2200th residential unit.

4.2.18 The first otter will be provided prior to occupation of the 1600th residential unit; the second holt will be provided prior to occupation of the 3000th residential unit.

4.2.19 The Washpit Brook will be further enhanced through the implementation of appropriate management (described below).

Management responsibility

4.2.20 The Washpit Brook watercourse will continue to be managed by South Cambridgeshire District Council. Landscaped areas to either side of the Washpit Brook will be maintained and managed by the University of Cambridge, through an Estate Management Company.

Management principles

a) Maintain water flow within the Washpit Brook

4.2.21 It will be necessary to remove silt and dense in-channel vegetation to maintain flows. The frequency of removal of silt and in-channel vegetation will be dependent on South Cambridgeshire District Council's operational needs. Ideally, it will be done on at 5 to 10 year intervals and on a rotational basis so that only 20% of the length of the brook is de-silted in any one year.

b) Maintain water quality within the Washpit Brook

4.2.22 Any spillages, litter or other pollutants within, or in the vicinity of, the Washpit Brook will need to be removed as soon as possible to prevent long-term effects on water quality.

c) Maintain bankside and in-channel vegetation

4.2.23 The timing and frequency of cutting of bankside and in-channel vegetation will also be dependent on South Cambridgeshire District Council's operational needs. Ideally, it will be cut every two years on a rotational basis, so that vegetation is retained intact on one bank of the brook. Vegetation cutting should take place in October to minimise the effect on water voles and avoid the nesting bird period.

4.3 Woodland and scrub

Current status

4.3.1 There are four blocks of woodland within the site, as shown on Figure 1.

4.3.2 W1 is a triangular block of woodland supporting mature multi-stemmed trees including Ash (*Fraxinus excelsior*), Hornbeam (*Carpinus betulus*), Field Maple (*Acer campestre*), English Elm (*Ulmus procera*) and Sycamore (*Acer pseudoplatanus*). The understorey comprises dense Elder (*Sambucus nigra*), Hawthorn (*Crataegus monogyna*) and Blackthorn (*Prunus spinosa*). The ground flora comprises plants associated with secondary woodland and scrub, including Hedge Garlic (*Alliaria petiolata*), Rough Chervil (*Chaerophyllum temulum*) and False Brome (*Brachypodium sylvaticum*), Lesser Celandine (*Ranunculus ficaria*) and Common Nettle (*Urtica dioica*). The presence of large tree stumps indicates that this woodland may be of some antiquity.

4.3.3 W2 is a small copse supporting several large mature Pedunculate Oak (*Quercus robur*) trees. The dense understorey comprises Hawthorn, Elder and English Elm. The ground flora is dominated by Ivy (*Hedera helix*).

4.3.4 W3 is a small block of woodland comprising mature Ash trees with a patchy understorey of Hawthorn and Elder. It also contains a small number of mature Pedunculate Oak trees. Part of this woodland has been replanted with Sweet Chestnut (*Castanea sativa*) trees. The ground flora largely comprises Cow Parsley (*Anthriscus sylvestris*), Ivy and Common Nettle.

4.3.5 W4 is a small woodland block, the western end of which comprises mature Hybrid Black-poplar (*Populus nigra x deltoides*), Pedunculate Oak, Hornbeam and Beech (*Fagus sylvatica*) trees with immature Holm Oak (*Quercus ilex*) trees and an understorey of Hazel (*Corylus avellana*), Blackthorn, Hawthorn, Spindle (*Euonymus europaeus*), Goat Willow (*Salix caprea*), Wild Cherry (*Prunus avium*), Elder and Bramble (*Rubus fruticosus* agg.). The groundflora is dominated by Ivy and Common Nettle. The remainder of the woodland block appears to have been felled in recent years and comprises dense Bramble with scattered understorey shrubs. A row of mature trees and shrubs is present on the edge of the woodland largely comprising Sycamore, Hornbeam, Pedunculate Oak, Hawthorn, Hazel, Elder, Spindle and Bramble.

4.3.6 In addition, patches of scrub will be planted through the Western Edge, comprising a mixture of Hawthorn, Blackthorn, English Elm, Hazel and Pedunculate Oak trees.

Proposed works

4.3.7 Woodlands W1, W3 and W4 will be retained as part of the Proposed Development; works within and adjacent to these woodlands should be avoided wherever possible to minimise any losses of woodland habitat. The small copse (W2) will need to be removed to allow construction of the access road linking the site with the Madingley Road West junction. A narrow strip of woodland is also present along the northern side of Madingley Road, located adjacent to the Park and Ride site. A small area of this woodland will need to be removed to allow construction of the Madingley Road West junction. Any large sections of hard wood to be felled should be retained on site wherever possible, as re-used timber or in the form of dead wood habitat features.

4.3.8 It is proposed to construct an artificial badger sett in W1, which will require only minor scrub clearance.

Objectives

4.3.9 Maintaining woodland habitat and achieving appropriate management of woodland are local BAP targets. The key objectives for woodland and scrub are as follows:

- Protect retained areas of woodland from damage during construction;
- Protect areas of woodland and scrub from damage during the operational phase;
- Increase the overall area of woodland present on site through planting of appropriate species (see 4.3.11) to replace any losses (area of new woodland planting should be greater than areas of woodland lost);
- Implement appropriate nature conservation management, through thinning (particularly removal of Sycamore trees);
- Control Bramble as necessary to promote ground flora species;
- Provide valuable habitat for invertebrates, particularly white-letter hairstreak and purple hairstreak;
- Provide valuable terrestrial habitat for amphibians, particularly great crested newts;
- Provide suitable habitat for reptiles;
- Provide valuable habitat for nesting and foraging birds;
- Provide valuable foraging and roosting habitat for bats;
- Provide suitable foraging habitat for badgers.

Protection measures

4.3.10 All retained areas of woodland within close proximity to construction works will be fenced off using netlon-type fencing to protect them from being accidentally damaged, or accessed during the works. The fence will be installed at a distance of 10m from the woodland edge. No works will take place within 10m of any woodland unless otherwise agreed by the Project Ecologist; the Project Ecologist will oversee any such works.

Enhancement measures

4.3.11 New areas of woodland will be planted as part of the landscape design for the Western Edge. These will comprise a mix of native species, including Pedunculate Oak, Hornbeam, Field Maple, Hawthorn, Blackthorn, Hazel, Spindle, Holly (*Ilex aquifolium*) and Buckthorn (*Rhamnus catharticus*). Consideration will be given to planting disease-resistant varieties of elm. Where appropriate, a variety of different fruit trees will also be incorporated in the planting mixes (including Apple (*Malus domestica* agg.), Wild Pear (*Pyrus communis*), Wild Cherry and Wild Plum (*Prunus domestica*). Areas of wet woodland will also be created in appropriate locations, planted with species such as Alder, Downy Birch (*Betula pubescens*) and various willow species (such as Crack Willow (*Salix fragilis*), White Willow (*Salix alba*), Goat Willow (*Salix caprea*) and Grey Willow (*Salix cinerea*).

4.3.12 The woodlands will be further enhanced through the implementation of appropriate management (see 'Management principles', below).

Management responsibility

4.3.13 Woodland management will be undertaken by the University of Cambridge, through an Estate Management Company.

Management principles

a) Undertake thinning

4.3.14 Selectively fell over-mature trees within the woodlands to reduce shading of ground flora. Prioritise the removal of non-native tree species, such as Sycamore. Tree felling should take place once every 10 years. No more than 5% of tree canopy should be removed.

4.3.15 All felling work should take place outside the nesting bird period. Felled material will be used to create log piles and brash piles within the woodland in locations that do not destroy valuable ground flora. Larger pieces of felled material will be partially-buried to provide a permanent habitat feature for invertebrates and a hibernation site for amphibians and reptiles.

b) Control Bramble

4.3.16 Areas of dense Bramble scrub should be removed through mechanical cutting. Bramble removal should take place once every 5 years, with 50-70% of dense Bramble removed; it will be appropriate to retain at least 30% of the dense Bramble vegetation in any given woodland and in any given year of management.

4.3.17 Areas of Dense Bramble scrub that threaten the establishment phase of new areas of woodland planting should also be controlled through mechanical cutting as required.

4.3.18 Bramble removal should take place outside the nesting bird period.

c) Control public access

4.3.19 All of the woodland areas are too small to be able to accommodate public access with the exception of W4. An appropriate path should be constructed through the parts of W4 where limited vegetation clearance will be required. This will formalise woodland access. Woodlands W1, W2 and W3 should be fenced off to prevent public access.

d) Removal of litter

4.3.20 Litter removal should take place regularly. The appropriate frequency of litter removal will need to be determined during the operational phase, but is likely to be annually in some cases.

e) Scrub control

4.3.21 The areas of newly planted scrub should be reviewed on a 10 year basis to determine whether control measures are required (in late-January / early-February).

4.4 Hedgerows

Current status

4.4.1 The majority of the hedgerows on the site are species-poor, both in terms of the woody species present and their ground flora. However, seven hedgerows are species-rich (comprising five or more woody species), as shown on Figure 1; two of these would be classified as 'important' under the Hedgerows Regulations (1997), using the Wildlife and Landscape criteria. The shrub species most commonly recorded in the hedgerows include Hawthorn, Blackthorn, Elder, Field-rose and Dog-rose. A number of the hedgerows also support English Elm trees, a large number of which are dead and are of value for terrestrial invertebrates.

Proposed works

4.4.2 The majority of the species-rich hedgerows will be retained intact, although a short section of one will need to be removed to allow construction of the access road linking the site with the Madingley Road West junction, and there will also be minor effects on one other to allow the construction of the second stage channel for flood storage.

4.4.3 There will be some loss of species-poor hedgerows (likely to be approximately 700m, although the overall length of hedgerow lost will need to be determined during detailed design). New species-rich hedgerow will be planted to mitigate the loss using an appropriate mix of native species, including Pedunculate Oak, Field Maple, Hawthorn, Blackthorn, Hazel, Spindle, Holly, Buckthorn and Field Rose (*Rosa arvensis*). Consideration will be given to planting disease-resistant varieties of elm. Where appropriate, a variety of different fruit trees will also be incorporated in the planting mixes.

Objectives

4.4.4 Hedgerows are a national and local priority for conservation, and maintenance and favourable management of the hedgerows is therefore a priority. The key objectives for hedgerows are therefore as follows:

- Protect retained hedgerows during construction;Increase the overall length of hedgerow present on site through planting of appropriate species to replace any losses (length of new hedgerow planting should be greater than length of hedgerow lost);
- Implement appropriate nature conservation management.

Protection measures

4.4.5 All retained hedgerows within close proximity to construction works will be fenced off using netlon-type fencing to protect them from being accidentally damaged, or accessed during the works. The fence will be installed at a distance of 5m from the woodland edge. No works will take place within 5m of any hedgerow unless otherwise agreed by the Project Ecologist; the Project Ecologist will oversee any such works.

Enhancement measures

4.4.6 At least an equivalent length of new species-rich hedgerow will be planted to replace the length lost (likely to be approximately 700m). This will represent an enhancement as the majority of losses will be from species-poor hedgerows. The retained hedgerows will be further enhanced through the implementation of appropriate management (see 'Management principles', below).

Management responsibility

4.4.7 The management of hedgerows (other than those within private ownership) will be undertaken by the Estate Management Company.

Management principles

a) Hedgerow trimming

4.4.8 Hedgerows will be trimmed annually in late-January or early-February each year. Hedgerows in the areas of Open Land along the Western Edge of the site will be trimmed every other year in late-January or early-February, where a less frequent management regime is considered acceptable.

4.4.9 Consideration will also be given to laying hedgerows rather than trimming, where this management technique would be appropriate.

4.5 Veteran and mature trees

Current status

4.5.1 There is one veteran Pedunculate Oak tree on site, which will be retained (Tree T196 in the Arboricultural Report, as shown on Figure 1), although a number of other mature trees are relatively old and contain dead wood, making them also of ecological value. Tree T196 is of considerable age, supports a valuable assemblage of terrestrial invertebrates and is located on the boundary between South Cambridgeshire District and the City of Cambridge; although assessed as being 'near veteran' in Lockhart Garratt's Arboricultural Assessment (Appendix 7.3 of the Environmental Statement) it is considered to represent a 'veteran' tree for the purposes of the ecological assessment.

Proposed works

4.5.2 Tree T196 will be retained within an area of Open Land. Mature and semi-mature trees alongside the Washpit Brook and in the hedgerows in the south-western parts of the site will be largely retained. The scheme layout has been developed to allow retention of the avenue of mature Horse-chestnut (*Aesculus hippocastanum*) trees in the eastern part of the site, although there may be a need to remove individual diseased specimens and to replant these with replacement trees.

4.5.3 A small number of mature oak trees in the southern part of the site will need to be felled to allow construction of the Madingley Road West junction and the associated access road, including trees adjacent to Madingley Road (within G151, 152 and 156 in the Arboricultural Report) and three trees adjacent to the north-east corner of the Park and Ride site (T191, T192 and T193 in the Arboricultural Report), which are located in woodland W2.

Objectives

4.5.4 Veteran trees are listed as a nature conservation priority in the local BAP. Mature Pedunculate Oak and English Elm trees provide valuable habitat for butterflies (see Section 4.9, below). The veteran and other mature trees within the Application Site also support an important assemblage of terrestrial invertebrates, including several species of wood-decay beetle and a nationally scarce species of tree ant.

4.5.5 The key objectives for veteran and mature trees are as follows:

- Protect retained trees during construction;
- Manage mature and veteran trees to prolong their life and promote heartwood decay in living trees (which is of particular importance for the valuable terrestrial invertebrate assemblage present) through crown reduction;

- Remove diseased individual trees from the avenue of Horse-chestnuts and replant with appropriate species;
- Increase the number of veteran trees in the long-term.

Protection measures

4.5.6 A number of planning conditions (conditions 12-15 inclusive) relate to the protection of mature trees during construction, including the veteran oak tree and the avenue of Horse-chestnut trees.

4.5.7 All retained mature trees will be fenced off to protect them from being accidentally damaged, or accessed during the works following appropriate British Standards for tree protection. Standing dead wood should be retained wherever possible.

4.5.8 All felling work / tree surgery should take place outside the nesting bird period and following a survey to confirm the absence of roosting bats (see sections 4.12 and 4.13, below).

Enhancement measures

4.5.9 Standard trees will be planted as part of the landscaping proposals for the site, including the Western Edge and associated parkland, and within the built area.

4.5.10 Felled material removed to allow construction of the access road linking the site to the Madingley Road West junction will be used to create log piles and brash piles. Larger pieces of felled material will be partially-buried to provide a permanent habitat feature for invertebrates (potentially including stag beetles, *Lucanus cervus*) and a hibernation site for amphibians and reptiles.

Management responsibility

4.5.11 The management of trees (other than those within private ownership) will be undertaken by the Estate Management Company.

Management principles

4.5.12 Tree surgery, through crown reduction, should be undertaken as required to ensure long-term health and survival of veteran and mature trees, promoting heartwood decay wherever possible, to increase the numbers of veteran trees present in the long-term.

4.5.13 A specific strategy for the avenue of Horse-chestnuts will need to be agreed with the Local Planning Authority to remove diseased specimens and initiate successional replanting with appropriate species.

4.6 Orchards

Current status

4.6.1 There are two orchards present within the site, as shown on Figure 1.

4.6.2 O1 is an abandoned orchard with scattered mature fruit trees and Hawthorn bushes. Dense Bramble covers the majority of the area with small patches of species-poor rabbit-grazed semi-improved neutral grassland dominated by mosses and grasses.

4.6.3 O2 is a small 'orchard' comprising four semi-mature Apple trees and several dwarf trees within an area of species-poor semi-improved grassland. This area is mown and also supports Yarrow (*Achillea millefolium*), Field Bindweed (*Convolvulus arvensis*), Ground Ivy (*Glechoma hederacea*), Dandelion (*Taraxacum officinale* agg.), Upright Hedge-parsley, Ribwort Plantain (*Plantago lanceolata*) and Common Knapweed (*Centaurea nigra*).

Proposed works

4.6.4 Orchard O1 will be retained. Orchard O2 will be retained as far as possible, although works are required in close proximity.

Objectives

4.6.5 Old orchards are a local conservation priority. The key objectives for orchards are as follows:

- Protect retained orchards during construction;
- Replace any lost fruit trees on at least a 2 for 1 basis;
- Increase the number of fruit trees within the site through incorporation into new woodland and hedgerow planting (see sections 4.3 and 4.4);
- Implement appropriate nature conservation management.

Protection measures

4.6.6 Retained orchard areas will be fenced off using netlon-type fencing to protect them from being accidentally damaged, or accessed during the construction works. The fence will be installed at a distance of 10m from the orchards (except along the southern edge of O2, where it will be installed alongside the adjacent access track, and the northern edge of O2, where it will be installed along the edge of construction works). No works will take place within the buffer zones around the orchards unless otherwise agreed by the Project Ecologist; the Project Ecologist will oversee any such works.

Enhancement measures

4.6.7 Fruit trees will be incorporated into the planting scheme, including Apple, Crab Apple (*Malus sylvestris*), Wild Cherry, Wild Pear and Wild Plum. Consideration will be given to the fruiting periods when determining the appropriate species to plant in each location; for example, late-flowering Apple trees and Wild Pear trees will be more appropriate within the school grounds to minimise the amount of fruit fall during the school term.

4.6.8 Orchard O1 will be enhanced through the control of encroaching Bramble scrub and planting of new fruit trees.

4.6.9 Orchard O2 will be enhanced through additional planting of a variety of fruit tree species.

Management responsibility

4.6.10 Orchard management will be undertaken by the Estate Management Company.

Management principles

a) Bramble control

4.6.11 Areas of dense Bramble scrub that threaten the integrity of the orchard trees should be removed through mechanical cutting (following on site guidance by the Project Ecologist). Bramble control should then take place once every 5 years in order to conserve the integrity of the fruit trees. It is not necessary to removal all Bramble from the site. Bramble removal should take place outside the nesting bird period.

b) Tree surgery

4.6.12 Restorative pruning of existing retained fruit trees should be undertaken as required to ensure their long-term health and survival. Formative pruning of new fruit trees will also be required during the first 5 years following planting; the pruning requirements will be dependent on species, rootstock and variety.

4.7 Grassland

Current status

4.7.1 There is one small area of species-rich semi-improved neutral grassland adjacent to the site, as shown on Figure 1. The grassland was seeded with a wildflower seed mix and a single specimen of Snakeshead Fritillary (*Fritillaria meleagris*) has been recorded (in 2004). This grassland is outside of the site and associated with the World Conservation Monitoring Centre. All other areas of grassland comprise agriculturally-improved grassland or amenity grassland, including the 'ridge and furrow' fields in the southern part of the site.

Proposed works

4.7.2 Several areas of amenity and agriculturally-improved grassland will be lost, although the 'ridge and furrow' fields will be retained unaffected.

4.7.3 New areas of amenity grassland and wildflower meadow will be created within areas of Open Land. In particular, extensive areas of new species-rich wildflower meadow will be created along the Western Edge, with areas of parkland created closer to the areas of built development.

Objectives

4.7.4 Species-rich meadow grassland is a local priority for nature conservation. The key objectives for grassland are as follows:

- Increase the availability of dry species-rich grassland and wet grassland habitat through the creation of new areas within the Western Edge;
- Increase the species diversity within retained grassland habitat in the ridge and furrow fields;
- Provide a floristically diverse habitat, using native species of local provenance as far as possible, particularly within the more 'natural' areas of Open Land along the Western Edge;
- Provide a valuable habitat for terrestrial invertebrates within the Western Edge, including the creation of areas of bare ground that will provide suitable habitat for the nationally scarce lace hopper bug *Reptalus panzeri*.
- Provide valuable foraging habitat for amphibians, particularly great crested newts, reptiles and badgers.

Protection measures

4.7.5 None required.

Enhancement measures

4.7.6 New areas of dry species-rich meadow and wet grassland habitat will be created as part of the landscape design for the Western Edge through seeding with an appropriate mix of native species. Remodelling of the landform within the Western Edge will allow the creation of dry grassland habitat in areas outside of the floodplain. Species-rich meadows will be sown in these areas, with an appropriate mix of native grasses and wildflowers, ideally of local provenance. Particular attention will need to be given to the subsoil and topsoil type, pH and depth to maximise the likelihood that the target grassland community develops.

4.7.7 Areas of land adjacent to the Washpit Brook will be lowered to create a second stage channel to provide flood storage. These areas will flood regularly, but can be expected to dry out in summer, and will be seeded and managed as floodplain grassland. Areas of bare ground will be created and maintained to provide suitable habitat for the nationally scarce species of lace hopper bug (*Reptalus panzeri*).

4.7.8 The ridge and furrow fields (to the south-west of Woodland W3) will be retained, but are currently species-poor due to repeated application of chemical fertilisers. The species diversity of the sward within these fields will be increased as an enhancement measure through, for example, herbicide treatment to remove the dominant Perennial Rye-grass (*Lolium perenne*), followed by re-seeding with a species-rich wildflower meadow mix, and subsequent meadow management (as described below).

Management responsibility

4.7.9 The management of grassland within areas of Open Land will be undertaken by the Estate Management Company.

Management principles

a) Cutting

4.7.10 The majority of the dry species-rich grassland and wet grassland areas should be mown once annually in late-summer. Hay should be left on site to dry for 3-5 days before being removed, to encourage spread of seeds. Grass cuttings will be used to create a number of compost heaps (up to 20) at the edge of the meadow, in different areas of the Western Edge and the ridge and furrow fields.

4.7.11 Mowing of meadow areas should be undertaken with an initial cut to a height of 150mm, followed by a second cut to complete the mowing. Ideally, mowing should only be undertaken in warm and sunny conditions when reptiles are more active, and able to move away from machinery.

4.7.12 Species-rich grassland sown in new areas of 'parkland' will be cut more frequently to maintain a short sward.

b) Grazing

4.7.13 Ideally, the hay meadows will be lightly grazed over autumn and winter to maintain a short sward (3cm). This can also help to disturb the ground and encourage areas for the establishment of new growth from seed. Stock should be removed by the end of February. Small patches of bare ground created during winter grazing should not be allowed to re-seed.

4.7.14 Consideration will need to be given to the breeds to be used, stocking rates, and the use of stock-proof fencing to ensure that sensitive habitats are not affected (such as the woodlands, areas of new planting, and the watercourse and ponds).

c) Fertiliser

4.7.15 Chemical fertilisers should not be used. A light application of manure can be introduced if needed.

4.8 Ponds

Current status

4.8.1 There are only two ponds within the site, identified as ponds 3 and 5 on Figure 1. Both are small features, prone to drying out during the summer months, and do not support valuable invertebrate or amphibian species.

4.8.2 A number of ponds are located adjacent to the site:

- Pond 1 – at the Park and Ride site, which supports breeding amphibians, including great crested newts
- Pond 2 – an attenuation / drainage pond associated with the M11
- Pond 4 – located within the grounds of the World Conservation Monitoring Centre, which supports a breeding population of common toads
- Pond 6 – the Bird Sanctuary ponds, which support breeding amphibians, including great crested newts

Proposed works

4.8.3 Ponds 3 and 5 will be removed/in-filled. The off-site ponds will not be affected.

4.8.4 New ponds will be created along the Western Edge in the form of linear habitat ponds (as described in Section 4.2, above) and additional small ponds, scattered throughout the Western Edge as part of the scheme's Sustainable Drainage Strategy (SuDS). Each pond will be located within 200m of another pond or wetland feature, and clusters of ponds will be created in some locations. Ponds will be designed to maximise their value for breeding great crested newts, and will therefore have the following characteristics wherever possible:

- Surface area between 100m^2 and 300m^2;
- Depth of at least 1m and ideally deeper in some areas to ensure open water maintained;
- Substantial cover of native submerged and marginal vegetation (but avoiding plant species like *Typha* that will dominate at the expense of other species).

Objectives

4.8.5 Ponds are a national and local priority for nature conservation. The key objectives for ponds are as follows:

- Provide new breeding habitat for amphibians within the Western Edge, particularly great crested newts.

Protection measures

4.8.6 None required.

Enhancement measures

4.8.7 New ponds will be created within the Western Edge which will provide valuable habitat for breeding amphibians, including great crested newts, as well as other species including water voles.

Management responsibility

4.8.8 The management of new ponds within areas of Open Land (including the linear ponds which form the low flow channels of the Washpit Brook) will be undertaken by the Estate Management Company.

Management principles (other ponds)

a) Removal of litter

Litter removal should take place regularly. The appropriate frequency of litter removal will need to be determined during the operational phase, but is likely to be annually in some cases.

b) Control of emergent wetland vegetation and encroaching scrub

Emergent vegetation will be removed by hand annually if necessary to retain at least 80% of each pond as open water. Scrub control measures will be implemented if required to prevent shading of the ponds. Works to the ponds will be undertaken during the winter months (November to January inclusive) to avoid the nesting bird season and the period when amphibians are most likely to be present.

Bankside vegetation will not be cut.

4.9 Invertebrates

Current status

4.9.1 The site is of importance for an assemblage of wood-decay (saproxylic) invertebrates associated with the mature and 'veteran' trees present. These trees are concentrated in three areas: the main group of older hedgerows in the south-western part of the site, with mainly mature Pedunculate Oaks; a line of mature willow trees along the Washpit Brook; and the avenue of Horse-chestnut trees. The invertebrate fauna includes several scarce and/or declining species of wood-decay beetles and a nationally scarce species of tree-nesting ant.

4.9.2 In addition, the uncommon white-letter hairstreak butterfly is also present, which is associated with Elm trees. There are also desk study records of purple hairstreak butterflies in the area, from the Park and Ride site, which could also be present, associated with oak trees, although none were recorded during targeted surveys.

4.9.3 The majority of fields are ploughed to the field margins and farm tracks, reducing their likely value for invertebrates. However, a small number of other uncommon species of invertebrate have also been found along the hedgerows and in the fields, including one further nationally scarce species (a lace hopper bug, *Reptalus panzeri*) which was found to be widely present around the arable fields on clayey soils. The ecology of this species is poorly known, although it is thought to require soil cracking caused by summer droughts on land prone to winter flooding.

4.9.4 The aquatic macro-invertebrate communities at both locations sampled on the Washpit Brook in 2011 were found to comprise a low diversity of common species, representative of such small ditches, with intermittent flow. The sample site at the northern end of the site was significantly more diverse than that within the section of the brook adjacent to the M11. However, its diversity was still low and the communities at both sites were assessed as being of 'low' conservation interest.

Proposed works

4.9.5 The more valuable hedgerows and the majority of the mature trees will be retained. There will be some loss of species-poor hedgerows (approximately 700m – see Section 4.4, above). New species-rich hedgerow will be planted to mitigate this loss. Mature trees and scrub adjacent to the Park and Ride site will be removed to allow construction of the Madingley Road West junction and associated access road. This will be mitigated through the planting of new trees and areas of scrub (see Section 4.3, above).

4.9.6 Species-rich grassland will be created in the Western Edge, part of which will be prone to winter flooding as a result of the creation of a second stage channel (see Section 4.7, above).

4.9.7 New ponds and other wetland features will be created as low flow channels along the Washpit Brook; additional ponds will be created in the Western Edge (see Sections 4.2 and 4.8, above).

Objectives

4.9.8 White-letter hairstreak is a national priority species for conservation. The key objectives for invertebrates are as follows:

- Protect and improve water quality within the Washpit Brook;
- Increase the diversity of wetland habitat available for invertebrates through enhancement of the Washpit Brook and provision of new wetland features;
- Increase the availability of valuable habitat for terrestrial invertebrates, particularly white-letter hairstreak, purple hairstreak and the lace hopper bug *Reptalus panzeri*;
- Protect and enhance the dead wood habitat available, by protecting veteran and mature trees (see Section 4.5 above) and creating piles of dead wood within retained woodlands (see Section 4.3 above).

Protection measures

4.9.9 The protection measures set out in relation to protection of habitat features (above) will serve to protect invertebrates. No additional protection measures are required.

Enhancement measures

4.9.10 The measures set out in Section 4.2 above, in relation to enhancement of the Washpit Brook, will deliver increased habitat diversity for aquatic invertebrates. The provision of new wetland features as part of the landscape design for the Western Edge will also provide increased habitat availability (see Section 4.2 above).

4.9.11 The creation of dry species-rich meadows and wet grassland with patches of scrub and areas of bare ground as part of the landscape design for the Western Edge will provide improved habitat diversity for terrestrial invertebrates. Areas of bare ground will be created through appropriate management (see Section 4.7, above), which will provide suitable conditions for the lace hopper bug *Reptalus panzeri*.

4.9.12 Oak trees will be planted to specifically favour purple hairstreak butterflies. Consideration will be given to planting disease-resistant varieties of elm to favour white-letter hairstreak butterflies.

4.9.13 The creation of piles of dead wood from felled material in woodlands will increase the availability of habitat for dead-wood beetles.

Management responsibility and management principles

4.9.14 No specific management activities in addition to those described in the preceding sections are required.

4.10 Amphibians

Current status

4.10.1 None of the ponds within the site support breeding great crested newts (*Triturus cristatus*), although a medium-sized population of this species does breed in ponds immediately to the south of the site (at the Park and Ride and the Bird Sanctuary (Ponds 1 and 6 respectively)). Great crested newts are therefore likely to use the southern parts of the site during the terrestrial phase of their lifecycle.

4.10.2 In general, the land within 50m of the pond is the most valuable (the 'immediate' terrestrial habitat), the land at a distance of 50-250m from the pond is considered the next most valuable (the 'intermediate' terrestrial habitat), and the land at a distance of 250-500m from the pond is of lower value (the 'distant' terrestrial habitat). However, this assumes that all areas of land surrounding a pond support terrestrial habitat of equivalent value, which is clearly not the case in relation to the Park and Ride and Bird Sanctuary ponds. It can generally be assumed that great crested newts are unlikely to be encountered at distances of more than 250m from a pond, and are very unlikely to be encountered at distances of more than 500m from a pond.

4.10.3 The areas of affected habitat within 500m of the ponds have been assessed in terms of the likely risk of great crested newts being encountered during the works, to enable a risk-based approach to site clearance to be adopted. The areas have been classified as set-out in the table below, and as shown on Figures 2 and 3. Photographs showing the various areas listed are provided in Appendix 3.

4.10.4 Common toads (*Bufo bufo*) are present in large numbers in the pond at the World Conservation Monitoring Centre (Pond 4) and the off-site pond at the Park and Ride (Pond 1). Toads are likely to use the habitats present on site during the terrestrial phase of their lifecycle.

4.10.5 Smooth newts (*Lissotriton vulgaris*) and common frogs (*Rana temporaria*) also use these ponds as well as other ponds on the site.

Risk level	Areas included	Distance from ponds	Description
High	Area of scrubby woodland at the north-eastern corner of the Park and Ride – W2 on Figure 1 (Photo A3.2)	50-100m	Numerous log-piles, brash piles and rabbit burrows are present, which provide suitable refuges for great crested newts and other amphibians. Located on the banks of a ditch which may be used by newts moving between the ponds. A brief search of refuges in this area by Cambridge City Council's Ecologist recorded more than 30 smooth newts, and 3 common frogs.
Medium	Northern part of the reserve strip which has been cleared (Photo A3.3)	50-150m	Area previously planted with young trees which have been felled at a height of 30-50cm; limited potential refuges for newts, except within the base of the hedgerow which forms the eastern boundary of the area, but will be retained, and within soil cracks in areas of open grassland.
Medium	Pasture land to the west of the Park and Ride (Photo A3.4)	50-250m	Grazed pasture with rabbit burrows present, particularly along its eastern boundary and the field edges.
Medium	Hedgerow to the north of the Park and Ride pond	75-150m	Section of hedgerow containing small number of rabbit burrows at its base, which could be used by newts as a refuge.
Medium	Woodland W3	220-235m	North-west corner of woodland, mainly comprising nettles, with some trees and shrubs; occasional rabbit burrow.
Low	Hedgerows to the north of the Park and Ride pond	150-500m	Sections of hedgerow containing small number of rabbit burrows at their bases, which could be used by newts as a refuge.
Low	Pasture land to the west of the Park and Ride pond (Photo A3.4)	100-250m	Central areas of grazed pasture with relatively few suitable refuges present.
Low	Southern part of the reserve strip, which has been partially cleared (Photos 6.5 and A3.6)	150-250m	Area previously planted with young trees which have been felled at a height of 30-50cm; limited potential refuges for newts, except within the base of the hedgerow which forms the eastern boundary of the area, but will be retained. Area of existing woodland alongside Madingley Road, with limited understorey, but which contains some suitable refuges for newts (albeit at a distance of c.250m from the ponds).
Negligible	Arable fields (Photo A3.7)	50-500m	Arable fields are regularly ploughed and comprise compacted ground with limited potential refuges
Negligible	Improved pasture located more than 250m from the ponds	50-500m	Areas of pasture with no visible refuges at more than 250m from the ponds are of negligible risk.

Proposed works

4.10.6 No ponds used by breeding great crested newts, or significant populations of other amphibians, will be affected. However, site clearance operations within areas of high, medium or low risk areas (as identified in the table above and shown on Figures 2 and 3) may result in the destruction of, or damage to, resting sites used by great crested newts, and/or the incidental mortality of individual animals. Similarly, site clearance operations elsewhere on site may result in the incidental mortality of common toads or other amphibians.

4.10.7 New habitat for amphibians (including both breeding habitat and terrestrial habitat) will be created along the site's Western Edge.

4.10.8 New roads associated with the development will pose an additional mortality risk to amphibians, as they attempt to move between new and retained habitats.

Objectives

4.10.9 Great crested newts are a national priority species for conservation and receive legal protection under the Conservation of Habitats and Species Regulations 2010 and the Wildlife and Countryside Act 1981 (as amended). Common toads are also a national priority for conservation. The key objectives for amphibians are as follows:

- Protect individual animals during site clearance and construction;
- Protect features used by breeding amphibians during construction;
- Ensure that any works undertaken are in accordance with current legislation and licensing procedures;
- Increase the availability of breeding habitat for amphibians by creating new features within the Western Edge;
- Provide enhanced foraging habitat for amphibians within the Western Edge;
- Promote safe movement of amphibians between retained and new habitat.

Protection measures

4.10.10 Netlon-type fencing will be installed during construction, where necessary, to prevent access to, or accidental damage of, the ponds at the Park and Ride and World Conservation Monitoring Centre.

4.10.11 Site clearance operations within areas of high, medium or low risk areas (as identified in the table above and shown on Figures 2 and 3) will take place under licence to Natural England in relation to great crested newts. Newts (and other amphibians) will be relocated from these areas during spring 2013, using a combination of methods (pitfall trapping, drift fencing, and artificial refuges) and released at a suitable receptor site. Temporary one-way amphibian-proof fencing

will be used to aid captures and to prevent animals from returning. Further details of the proposed approach are provided in Appendix 3, although the precise mitigation measures will need to be agreed with Natural England as part of the licence application process, and will be dependent on certain elements of the detailed design.

4.10.12 Prior to the newt relocation commencing, and prior to a licence being granted, all areas of vegetation within the footprint of the works will be cut to approximately 30-50cm above ground level using chainsaws, during winter 2012/2013 (to prevent birds from nesting in it during spring 2013). The works will be overseen by the Project Ecologist to ensure that log-piles or other suitable amphibian refuges are not affected. The Project Ecologist will advise on the appropriate safe locations for vehicles and chippers. Cut vegetation is to be chipped onto a truck and taken off site for disposal or stored in a suitable location for use in creating artificial hibernation sites at a later date; no chippings or cut material are to be left on site.

4.10.13 Site clearance operations outside of the risk areas for great crested newts, and which could affect suitable refuge sites for toads (including scrubby vegetation, hedgerows and species-rich grassland), will be overseen by the Project Ecologist. Any toads encountered will be moved to new refuge sites in retained areas around ponds 1 and 4 that are located within the planning application boundary. Given the low likelihood of great crested newts being present in these areas it is proposed that these works will not need to take place under licence to Natural England. These fields are likely to be used by ground-nesting birds and, ideally, they will therefore be topsoil stripped during the winter months.

4.10.14 All amphibians will be relocated from on-site ponds that will be lost as a result of the works. These animals will be captured using appropriate methods and relocated into new or retained ponds within the site. Where necessary, vegetation and invertebrates will be relocated with the amphibians to ensure that suitable habitat exists within the new and retained ponds.

4.10.15 Safe crossings for amphibians will be provided in at least three locations to link the populations:

- Under/across the access road linking the site to the Madingley Road West junction, between the Park and Ride pond and the Bird Sanctuary ponds;
- Under/across the site access road to the north of Woodland W3 (see Figure 1); and
- Under/across the site access road to the north of the World Conservation Monitoring Centre.

4.10.16 Safe crossings will comprise either tunnels, with appropriate amphibian-proof fencing to guide the animals into them, or sections of road with lowered kerbs and recessed sections around drainage structures, such as gully pots. It is considered most appropriate to install a tunnel under the access road linking the site to the Madingley Road West junction, as there is an obvious feature (a drainage ditch) linking two ponds used by great crested newts. The crossings in the other locations are likely to be used by toads rather than great crested newts, although there are no obvious features that the animals are likely to use; lowered kerbs with recessed sections around drainage structures are more appropriate in these locations.

4.10.17 Tunnels will be designed to lie flush with the surface of the road and comprise a specification similar to the ACO AT500 tunnel (see http://www.aco.co.uk/product_detail.php?id=62 for further details). Short sections of permanent newt-resistant fencing will be installed to guide amphibians to the tunnel entrance.

4.10.18 Custom-made recessed sections of kerbs around drainage structures are available (see http://www.aco.co.uk/product_detail.php?id=52 for further details).

4.10.19 Safe crossings for amphibians will be installed in parallel with construction of the relevant sections of site infrastructure.

Enhancement measures

4.10.20 The landscape design for the Western Edge includes a mosaic of habitats of value for amphibians, including small ponds (to provide breeding habitat) and grassland/scrub to provide foraging habitat and hibernation sites. Artificial hibernation sites will also be constructed on the Western Edge and close to the pond adjacent to the World Conservation Monitoring Centre.

Management responsibility and management principles

4.10.21 No specific management activities in addition to those described in the preceding sections are required.

4.11 Reptiles

Current status

4.11.1 The site may support small numbers of common reptile species, although none have been recorded and the habitat currently present is sub-optimal. The landscaping for the Western Edge would be expected to enhance the value of this part of the site for reptiles.

Proposed works

4.11.2 The removal of hedgerows and the modification works to the Washpit Brook could result in the loss of habitat for reptiles, as well as the risk of mortality of individual animals (if any are present). The creation of species-rich grassland and patches of scrub in the Western Edge will provide additional areas of valuable habitat for reptiles.

Objectives

4.11.3 Common species of reptiles are protected under the Wildlife and Countryside Act 1981 (as amended) against killing or injury. The key objectives for reptiles are as follows:

- Protect individual animals during site clearance and construction;
- Provide enhanced habitat for reptiles within the Western Edge;

Protection measures

4.11.4 The protection measures described above for amphibians, during site clearance operations, will also serve to protect reptiles. The grubbing out of hedgerows and the modification works to the Washpit Brook will be overseen by the Project Ecologist. Any reptiles present during these works will be relocated to suitable retained habitat within the site.

Enhancement measures

4.11.5 The landscape design for the Western Edge includes a mosaic of habitats of value for reptiles, including small ponds (to provide foraging sites for grass snakes) and grassland/scrub (to provide foraging habitat and hibernation sites for all species). Features of value for reptiles will be created as part of routine management activities.

Management responsibility and management principles

4.11.6 No specific management activities in addition to those described in the preceding sections are required.

4.12 Birds

Current status

4.12.1 The site currently supports a farmland breeding bird assemblage, which includes a number of species of nature conservation concern. Skylark (*Alauda arvensis*), yellow wagtail (*Motacilla flava*), song thrush (*Turdus philomelos*), starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), linnet (*Carduelis cannabina*), dunnock (*Prunella modularis*), bullfinch (*Pyrrhula pyrrhula*), yellowhammer (*Emberiza citrinella*) and reed bunting (*Emberiza schoeniclus*) are all listed as priority species for conservation on the UKBAP or LBAP, and/or are listed on the RSPB's 'Red' list of bird species of conservation concern (RSPB, 2009). In addition, whitethroat (*Sylvia communis*) and willow warbler (*Phylloscopus trochilus*) are listed on the RSPB's 'Amber' list as species of conservation concern (RSPB, 2009) and have also been recorded breeding within the site. The site also provides foraging habitat for birds breeding in the adjacent residential areas (such as starling, house sparrow, dunnock and blackbird (*Turdus merula*)). The site may also be used by foraging barn owls (*Tyto alba*) although they have not been recorded breeding on site.

4.12.2 The farmland is also used by wintering birds. The following species of particular conservation concern have been recorded using the site during the winter months: herring gull (*Larus argentatus*); skylark; fieldfare (*Turdus pilaris*); song thrush; starling; linnet; yellowhammer; and golden plover (*Pluvialis apricaria*).

4.12.3 Barn owls (*Tyto alba*) are known to use the site although no evidence of barn owls nesting on site has been recorded.

Proposed works

4.12.4 The development of the site is likely to change the species composition of the assemblage of breeding birds. Farmland specialist species, such as skylark, yellow wagtail and linnet, are likely to be lost as the development progresses. Off-site mitigation to off-set this loss will be delivered through the provision of enhanced habitat for these species on areas of farmland in the surrounding area. The off-site mitigation will be secured as part of the S106 agreement and is not covered by this Biodiversity Strategy.

4.12.5 Other species of birds are likely to increase in number, as the buildings and associated gardens, and landscaping along the Western Edge, provide increased nesting and foraging habitat.

4.12.6 All site clearance operations could result in the damage or destruction of bird nests, including tree/hedgerow removal, topsoil stripping, and modifications to the Washpit Brook.

Objectives

4.12.7 A number of species of conservation concern are present on the site (see above). All nesting birds are protected under the Wildlife and Countryside Act 1981 (as amended). The key objectives for birds are as follows:

- Protect nesting birds during site clearance and construction;
- Maximise the availability of nesting and foraging habitat within the site.

Protection measures

4.12.8 Each phase of vegetation clearance and topsoil stripping will be undertaken outside the bird breeding season (that is, not between end-February and mid-August) wherever possible.

4.12.9 Where works during the nesting period are unavoidable, the relevant area of the site will be cleared during the preceding winter if at all possible, or surveyed prior to works to confirm the absence of nesting birds.

4.12.10 Site clearance or topsoil stripping may create suitable nesting habitat for other ground-nesting species such as lapwing (*Vanellus vanellus*) and little ringed plover (*Charadrius dubius*), which have not previously been recorded using the site but are present in the local area. Ongoing bird surveys will therefore be undertaken by the Project Ecologist during construction.

4.12.11 Similarly, buildings will be demolished outside the bird breeding season wherever possible. Surveys will be carried out to confirm the absence of nesting birds from any buildings which may be demolished during the bird breeding season.

4.12.12 Should active bird nests be identified, a suitably adequate buffer zone would be put in place between any active nests and construction works in order to avoid disturbance to nesting birds until the chicks have fledged. Netlon-type fencing will be used to denote retained features where nesting birds are present to avoid accidental damage.

4.12.13 In areas considered to be 'high risk', 'medium risk' or 'low risk' for great crested newts (see Section 4.10, above), a two-stage approach to vegetation removal will be followed. Trees / shrubs / hedgerows will be cut to c.30-50cm above ground level outside the bird breeding season; topsoil stripping, stump removal and grubbing out of hedgerows will be undertaken after a newt relocation exercise has been completed (see Section 4.10, above).

4.12.14 A detailed description of measures to be employed during site clearance operations to protect nesting birds is provided in Appendix 4.

Enhancement measures

4.12.15 The landscape design for the Western Edge includes a mosaic of habitats of value for breeding and foraging birds, including small ponds and grassland/scrub.

4.12.16 Artificial nest sites for kingfisher, swifts (*Apus apus*), starlings and house sparrows will also be provided, following the guidelines set-out in the South Cambridgeshire Biodiversity Strategy.

4.12.17 Four kingfisher nest sites will be constructed in the banks of the Washpit Brook. These will be located as two sets of two closely associated nest sites, within locally steepened sections of bank, ideally 1.5m above water level and 0.5m below top of bank (see Section 4.2, above). Two nest sites will be provided prior to occupation of the 800th residential unit. A further two nest sites will be provided prior to occupation of the 2200th residential unit.

4.12.18 At the end of each phase, as identified in the site-wide phasing strategy, at least 25% of all buildings will incorporate a bird nesting feature. Bird nesting features are to include nest sites for one of the following species: swifts; starlings; house sparrows. The new nest sites for swifts will include internal boxes in communal buildings, with calls played to help establish a new colony. Starling boxes and house sparrow 'terraces' will be scattered throughout the new development.

4.12.19 New nest sites are to be constructed from high quality materials (such as woodcrete type boxes) and will be installed in appropriate locations, to be determined in conjunction with the Project Ecologist. Suitable designs are widely available (for example from http://www.wildcareshop.com/Products_Results.php?Search=1&ProductCategoryID[]=6).

Management responsibility and management principles

4.12.20 No specific management activities in addition to those described in the preceding sections are required.

4.13 Bats

Current status

4.13.1 The site currently supports a maternity roost of brown long-eared bats in the loft space of Gravel Hill Farmhouse (see Figure 1). A further roost is present in the porch of the same building, which is considered likely to be used as a day roost by only a small number of common pipistrelle bats (*Pipistrellus pipistrellus*). No other bat roosts have been confirmed, although surveys in 2011 may have identified a soprano pipistrelle (*P. pygmaeus*) roost in a crack in the wall of the Cambridge Arctic Shelf Programme offices; this was not identified as a roost during any other surveys. There are a number of other buildings on site, the majority of which have only limited suitability for use by roosting bats. A number of mature trees provide suitable roost sites for bats, although no evidence of use of any such trees by bats has been recorded.

4.13.2 Up to five species of bats have been recorded commuting and foraging across the site, including noctule (*Nyctalus noctula*), common pipistrelle, soprano pipistrelle, Daubenton's bat (*Myotis daubentonii*) and serotine (*Eptesicus serotinus*). The overall level of bat activity is low, probably due to low insect biomass associated with the farmland. The greatest level of bat activity is at the southern end of the site, in fields adjacent to houses and woodland. Noctule and pipistrelle bats have been recorded foraging and commuting over open fields, but the majority of bats commute along linear features, primarily hedgerows and woodland edges. In addition, common pipistrelle bats have been observed commuting along the avenue of Horse Chestnut trees.

Proposed works

4.13.3 The buildings, including Gravel Hill Farmhouse, will be demolished. The majority of the mature trees on site will be retained, although a small number of oak trees adjacent to Madingley Road will need to be removed. The features of greatest value for foraging bats will be retained.

Objectives

4.13.4 Noctule, brown long-eared and soprano pipistrelle bats are listed as priority species on the UKBAP. All bats are protected under the Conservation of Habitats and Species Regulations 2010 and the Wildlife and Countryside Act 1981 (as amended). The key objectives for bats are as follows:

- Provide new roost sites in communal buildings to replace the roost lost at Gravel Hill Farmhouse;
- Protect individual bats during site clearance/demolition;

- Ensure that any works undertaken are in accordance with current legislation and licensing procedures;
- Increase the availability of roost sites by constructing artificial roost features in a proportion of new buildings, and providing bat boxes on retained trees;
- Provide enhanced foraging habitat for bats within the Western Edge.

Protection measures

4.13.5 The demolition of Gravel Hill Farmhouse will need to take place under licence to Natural England and will be carried out during a period when bats are seasonally absent (ideally during the winter months (November to February), but potentially also during early-spring (March) and autumn (September or October). Works will need to take place in accordance with a detailed method statement, to be agreed with Natural England as part of the licence application process.

4.13.6 Bat lofts (roofspaces containing suitable roosting features for bats and to which human access is restricted) will be created within six new buildings on site as an enhancement measure (see 4.13.11, below). At least one of these should be located in the area of the Farmhouse to enable the roosts to continue to be present in this part of the site and to off-set the loss of the Farmhouse roost specifically. The creation of new roost sites for bats will follow the guidelines set-out in the South Cambridgeshire Biodiversity Strategy and Natural England's 'Bat Mitigation Guidelines' (Natural England, 2004).

4.13.7 Any lighting required within 100m of retained or new bat roosts or habitat features that are likely to be used by foraging bats (within open land or the green fingers) will be located and designed in consultation with the Project Ecologist, and in accordance with guidance provided in the Bat Conservation Trust's 'Bats and Lighting in the UK' (BCT, 2008). The following general principles will be followed:

- No part of the roof of a bat loft, including the soffits, will be directly illuminated;
- Hoods, cowls or similar will be used to direct the lighting to where it is needed and minimise light spillage;
- Lighting will only be provided where needed;
- Light levels will be minimised within appropriate best practice guidelines;
- Timers and / or movement triggers will be incorporated into the design of the lighting where feasible, to minimise the time period when lights are on.

4.13.8 All other buildings and mature trees will be re-surveyed prior to demolition / felling to confirm the absence of bat roosts. The surveys will be undertaken by the Project Ecologist and are described in Section 6, below.

4.13.9 In the unlikely event that a bat roost is identified during the works (other than at Gravel Hill Farmhouse), those works that could affect the roost or bats using it must cease immediately. The feature will be retained until a licence can be obtained from Natural England for the works that could affect the roost. During the intervening period the feature and, if necessary, a buffer zone around it, will be identified using marker tape. No works will take place within the buffer zone and there will be no access to this area for site personnel other than the Project Ecologist or other licensed ecologist. The size of the buffer zone will be determined by the Project Ecologist or other licensed ecologist.

4.13.10 Lighting will be minimised within the Western Edge. No lighting will be provided within the new meadows and scrub areas to the west of the Washpit Brook. Lighting at the sports fields close to the Park and Ride site, and to the east of the Washpit Brook will be designed to prevent light spillage onto the brook, woodlands, hedgerows and mature trees.

Enhancement measures

4.13.11 Bat lofts will be created in six new buildingsby allowing bats access into the roofspace (such as through raised tiles or cavities at roof apexes, and provision of bat bricks). Two bat lofts are to be provided prior to occupation of the 800th residential unit; a further two bat lofts are to be provided prior to occupation of the 2,200th unit; and a further two bat lofts are to be provided prior to occupation of the 3,000th residential unit.

4.13.12 A variety of roosting features will be provided within each roofspace, including:

- Bat bricks,
- Internal 'false' cavities between gable wall and a secondary wall
- Timber cladding mounted on 20-30mm counter battens with bat access at the bottom
- A timber ridge board for species such as brown long-eared.

4.13.13 The roof void should have a height (floor to ridge board at apex) of at least 1.5m (ideally 2m) and an apex length of at least 4m; it should be unobstructed by construction timbers. The lofts should be boarded out, as fibres from modern breathable roofing membranes have been found to entangle bats. Any chemicals used to treat timbers should be certified as 'bat-safe' products.

4.13.14 Ideally, non-residential buildings, such as the community building and the sports pavilions, will be used for the creation of bat lofts. A pill box is present on the eastern site boundary. If possible, this structure will also be used to provide bat roosting features as one of the six bat lofts.

4.13.15 The bat lofts will be distributed across the site, with (ideally) one loft in each of the following character areas: Storey's Field, Neighbourhood Village, Local Centre, Western Edge, North-west Corner and Madingley Rise. Where there are few (or no) suitable buildings within a given character area, it may be appropriate to provide an additional loft in an adjacent character area instead.

4.13.16 In circumstances where it is not possible to provide bat lofts, 50 individual roost sites (internal or external) can be provided as an alternative for each loft. Ideally, these would comprise bat tubes, incorporated into the external wall of the building. Alternatively, purpose built external bat boxes can be provided.

4.13.17 Any new roost features are to be constructed from high quality materials (such as woodcrete type boxes) and will be installed in appropriate locations, to be determined in conjunction with the Project Ecologist.

4.13.18 A total of 50 bat boxes will be provided on retained mature trees to further increase the availability of roost sites. The 50 boxes are to include 3 Schwegler 1FW 'hibernation' boxes; the remainder to be a mix of Schwegler boxes (2F, 2F-DFP, 1FD and 2FN). The boxes are to be installed in the following locations (with approximate numbers and types indicated, although these can be varied slightly, dependent on availability):

- Woodland W1: 22 boxes, including 2 x 1FW, 8 x 2F, 6 x 2FN, 3 x 2F-DFP and 3 x 1FD
- Woodlands W3 and W4: 16 boxes combined, including 1 x 1FW, 6 x 2F, 3 x 2FN, 3 x 2F-DFP and 3 x 1FD
- Retained mature trees in hedgerows in the south-western part of the Application Site: 12 x 2F boxes

4.13.19 The bat boxes will be installed prior to occupation of the 400th residential unit.

Management responsibility and management principles

4.13.20 Bat boxes and bat lofts will be inspected as part of the monitoring programme (see Section 7, below). Boxes will be cleaned out as part of this inspection, and any faults/damage will be rectified where possible, or otherwise reported to the Estate Management Company. No other specific management activities in addition to those described in the preceding sections are required.

4.14 Brown hares

Current status

4.14.1 The site currently supports a population of brown hares (*Lepus europaeus*), with a peak count of 35 hares recorded during surveys in 2011.

Proposed works

4.14.2 The development will result in the loss of farmland habitat, and therefore the loss of brown hares from the site. As for farmland birds, off-site mitigation will be delivered to off-set habitat loss for hares; this will be secured as part of the S106 agreement and is not covered by this Biodiversity Strategy.

Objectives

4.14.3 Brown hares are a national and local priority for conservation. Given that mitigation for hares will be delivered off-site, this strategy does not include objectives for brown hares.

Protection measures

4.14.4 None required. Brown hares will be displaced from the site during site clearance. There is likely to be a 'managed reduction' in the population, with hares being displaced onto surrounding farmland over a period of several years; individual animals are able to leave the site via the M11 underpass.

Enhancement measures

4.14.5 None proposed.

Management responsibility and management principles

4.14.6 None required.

4.15 Badgers

Current status

4.15.1 There are a number of badger setts present within the site; the status of these setts has varied slightly over the period during which surveys have been undertaken (2004-2012). The most recent survey (September 2012) identified three large, active badger setts (as shown on Figure 4):

- Sett C – considered to be functioning as the 'main' sett, comprising 10 well-used entrance holes, located in the side slopes of the Travellers Rest Pit.
- Sett D – considered likely to be functioning as a 'subsidiary' sett, comprising at least 9 well-used and 2 partially-used entrance holes; this sett is largely located off-site and in areas of dense vegetation, although a number of entrances are located on-site. It includes Sett G (previously identified as a separate sett).
- Sett E – considered likely to be functioning as a 'subsidiary' sett, comprising 10 well-used and 8 partially-used entrance holes; the entrances are located either side of a hedgerow, and are also occasionally recorded in the adjacent arable field.

4.15.2 A number of other setts are also present on site (as shown on Figure 4):

- Sett A – previously considered to be in use as the 'main' sett, this structure has shown decreasing levels of use over recent years, and no evidence of use by badgers was recorded in 2012; it may become re-occupied by badgers.
- Sett I – outlying sett comprising 1 well-used entrance hole, with evidence of current or recent use by badgers in September 2012. This structure was closed on 31st October 2012 after monitoring showed a prolonged period of disuse.
- Sett K – outlying sett comprising 1 well-used, 1 partially-used and 3 disused entrance holes, with evidence of current or recent use by badgers; located in the base of the hedgerow on the banks of the Washpit Brook.
- Sett M – outlying sett comprising at least 1 well-used entrance hole, with evidence of current or recent use by badgers; located in an overgrown garden, where other entrances may also be present.

4.15.3 Other former outlying setts (B, F, H, J, L) showed no evidence of use by badgers in 2012 and were considered not to represent setts for licensing purposes, although these structures may be re-occupied by badgers in the future.

4.15.4 A bait-marking study was undertaken in 2005 and 2007. This showed that the site supports a single social group of badgers, which uses all of the above setts. However, given the changes in activity levels recorded over recent years, it will be necessary to update this study (in spring 2013) to confirm the status of setts A, C, D, E and G in particular (see Section 6, below).

4.15.5 There are a small number of areas of dense scrub located within the site and immediately adjacent to it, which it has not been possible to search exhaustively for badger setts (see Figure 4). It is considered unlikely that large or active setts would have remained undetected, although it is possible that additional small outlying setts are present in these locations.

Proposed works

4.15.6 The main sett (Sett C) will be retained unaffected within an area of Open Land.

4.15.7 Sett D (including Sett G) will be largely retained, although some of the entrance holes located on-site may need to be closed. In any case, works are likely to be required within 30m of the sett, and may therefore damage below-ground tunnels or chambers.

4.15.8 Sett E will be retained within an area of Open Land, although works are likely to be required within 30m of the sett, and may therefore damage below-ground tunnels or chambers.

4.15.9 Sett A will also be largely retained within an area of Open Land, although works will be required within 30m of it.

4.15.10 Setts I and M will be lost to the development.

4.15.11 Sett K will be retained, although works may be required within 30m of it as part of the modifications to the Washpit Brook (a culvert within 10-15m is proposed for removal).

4.15.12 The resident social group of badgers is likely to lose approximately 90ha of arable land, which is of low value as a foraging habitat. The areas of Open Land, including the Western Edge, will provide approximately 40ha of grassland habitat of high value for foraging badgers.

Objectives

4.15.13 Badgers are protected under the Protection of Badgers Act 1992. The key objectives for badgers are as follows:

- Protect badgers and their setts during site clearance and construction;
- Ensure that any works undertaken are in accordance with current legislation and licensing procedures;
- Maximise the value of areas of Open Land for foraging badgers;
- Provide an alternative artificial sett for badgers in an undisturbed part of the site.

Protection measures

4.15.14 Any works within 30m of an occupied sett may need to take place under licence to Natural England. The status and location of setts within the site will be monitored by the Project Ecologist through update surveys (see Section 6, below).

4.15.15 The works required in close proximity to Setts A, E and D (including G) will be reviewed by the Project Ecologist and detailed surveys undertaken to determine the extent and status of these setts prior to works commencing. Any works within 30m of an occupied sett entrance may need to take place under licence to Natural England and during the period July to November inclusive. Dependent on the extent of the works it may be considered appropriate to temporarily exclude badgers from these setts during the works under licence to Natural England. It will be important to confirm the status of these setts through a bait-marking study (as identified in Section 6, below) to inform the need for alternative shelter to be provided during any temporary exclusion.

4.15.16 Badgers will be excluded from Sett M prior to works commencing within 30m, and, ideally, during the period July to November inclusive. The sett will be subsequently destroyed. These works will need to take place under licence to Natural England unless there is a change in the status of this sett, and following the approach set-out in Appendix 5.

4.15.17 Should it be necessary to remove the culvert located within 10-15m of Sett K, this will be undertaken under licence to Natural England and will be carefully supervised by the licence holder to ensure that the sett is not damaged. Dependent on the extent of the works it may be considered appropriate to temporarily exclude badgers from the sett until the works have been completed. These works will take place during the period July to November 2013.

4.15.18 An artificial sett will be constructed prior to occupation of the 400th residential unit. This sett will be located within the area of open land along the site's western boundary, as shown on Figure 4. This location has been chosen on the basis that:

- It is located within a part of the site that will experience a relatively low level of disturbance by the public (as it is located within an existing woodland, which is fenced).
- It is located in close proximity to the most extensive area of Open Land (along the site's Western Edge) where the majority of suitable foraging habitat will be present in the long-term.
- It is located outside of any areas that will be subject to construction activities.
- It is located on land controlled by the University of Cambridge, is within the current territory of the social group, and is to the east of the M11 (the resident social group may hold a small amount of territory to the west of the M11, accessed via the M11 underpass to the north of the proposed artificial sett location).

4.15.19 A number of alternative locations have been considered, although none of these meet all of the criteria identified above. It is noted that the selected location is within 150m of the M11 motorway. However, an increased risk of badger mortality on the M11 would not be expected to occur, as the resident social group of badgers already forage within this part of the site and in close proximity to the M11 (sett K is located a similar distance from the M11 and badger dung pits have been recorded close to the proposed location of the artificial sett). The resident social group of badgers have a number of other setts that they can continue to use, including the current main sett. The artificial sett is proposed as an alternative to the main sett should badgers wish to use it; it is not proposed to exclude badgers from the main sett. The construction methods for the artificial sett are described in Appendix 5.

4.15.20 Vegetation clearance within the areas of dense scrub identified on Figure 4 will be overseen by the Project Ecologist. Vegetation will be cleared carefully to allow any setts in these areas to be located. If a sett is identified no works will take place within 30m of it, until a licence is obtained from Natural England. The Project Ecologist will advise on the most appropriate course of action to protect badgers; this is likely to involve exclusion of badgers from the sett following the methods described in Appendix 5.

Enhancement measures

4.15.21 The grassland habitat within the various areas of Open Land will be managed to maximise their value for foraging badgers, by keeping areas of amenity grassland mown short. The planting of fruit trees as part of the landscape design for the areas of Open Land will also deliver benefits for foraging badgers.

Management responsibility and management principles

4.15.22 No specific management activities in addition to those described in the preceding sections are required.

5. Education and Community Involvement

5.1.1 A strategy for monitoring the site's biodiversity resource has been set-out in Section 7, below. This provides an opportunity to involve the local residents in conservation activities, educate local residents about biodiversity, and educate local residents about the work undertaken to mitigate the impacts of the development. Local residents will therefore be encouraged to participate in monitoring wherever possible (this will not always be possible for health and safety reasons, or due to some monitoring surveys needing to be undertaken by a licensed ecologist). The results of the monitoring will be made available to the local residents.

5.1.2 Local community involvement in management activities will also be encouraged. This is likely to be particularly appropriate in relation to management activities for woodland and scrub, orchards, and amphibians. At least one 'work day' will be organised annually, where local residents will be encouraged to participate in management activities. The University of Cambridge will organise work days through an appropriate organisation, such as the local Wildlife Trust.

5.1.3 Other opportunities to use the site's biodiversity resource for education will be sought, such as class field trips for the local school.

6. Additional Surveys Required

6.1.1 Each reserved matters application will be informed by up-to-date ecology surveys, as described below. The surveys will be undertaken by the Project Ecologist or other suitably experienced and licensed (in the case of bat surveys) ecologist.

6.1.2 Any mature trees to be felled, or requiring surgery, and any buildings to be demolished or otherwise affected, will be surveyed for evidence of roosting bats. The survey will comprise an internal and external inspection of buildings for bats or evidence of bats, followed by dusk emergence and/or dawn re-entry surveys if required. Trees will be the subject of a ground inspection for features suitable for use by bats, followed by a ladder-top or climbing inspection of any such features, using a fibrescope, to search for evidence of bats. Dusk emergence and/or dawn re-entry surveys of trees may also be required if suitable features cannot be surveyed adequately using other methods. The bat surveys will follow current best practice guidelines (Hundt, 2012) and will have been undertaken no more than 12 months prior to the date of the application.

6.1.3 Up-to-date badger survey data will be submitted with each reserved matters application, identifying the presence or absence of setts from the footprint of the works, and the status and extent of any setts present. Badger surveys will have been undertaken no more than 12 months prior to the date of the application, and will follow standard survey methods for classifying and describing badger setts.

6.1.4 An updated badger bait-marking study will be updated in spring 2013 to re-confirm the status of Setts A, C, D, E and G. Further updates to the bait-marking study may be required for reserved matters applications affecting these setts if their status is unclear following the survey described in 6.1.3, above.

6.1.5 Any reserved matters application which requires works to be undertaken to the banks of the Washpit Brook will require an update water vole survey to be carried out no more than 12 months prior to the date of the application. The survey will follow standard survey methods (Strachan *et al*., 2011). Water vole surveys can only be undertaken during the period mid-April to end-September inclusive.

6.1.6 Any reserved matters application which requires works within 500m of the Park and Ride pond or Bird Sanctuary ponds will require an assessment to be undertaken of the suitability of the habitats present for use by great crested newts (specifically the presence / absence of suitable breeding sites, refuges and foraging habitat).

6.1.7 The results of the surveys, and any mitigation measures required, will be included in the 'Biodiversity Survey and Assessment' report for each application, as required under condition 35 of the Outline Planning Consent for the development.

7. Monitoring Strategy

7.1 General

7.1.1 The Project Ecologist will undertake the monitoring set out in this section. Opportunities will be sought to include local interest groups, where these include suitably experienced members and where health and safety considerations allow, although overall responsibility will be assigned to the Project Ecologist. Wherever possible, local residents will be encouraged to participate in undertaking monitoring surveys. Any monitoring surveys requiring protected species licences (bats, great crested newts) will need to be undertaken by a suitably licensed ecologist.

7.1.2 The results of all monitoring undertaken in any year will be provided in a written report on an annual basis. The report will be submitted to South Cambridgeshire District Council and Cambridge City Council. The report will be made available to local residents.

7.1.3 Monitoring will take place over a 15 year period. A summary schedule for the monitoring is provided in Appendix 2. In some cases it may be appropriate to cease monitoring earlier than currently shown, such as where the success of the mitigation has been adequately established, and further surveys could result in unnecessary disturbance; the proposal to cease monitoring in relation to a given habitat or species will be determined in consultation with the Local Planning Authorities.

7.2 Washpit Brook

7.2.1 Botanical surveys of the Washpit Brook will be undertaken to determine whether there has been an increase in species diversity.

7.2.2 The survey will be undertaken on a single visit in June/July every two years, commencing in 2015.

7.3 Woodland and scrub

7.3.1 Botanical surveys of the woodland areas (W1, W2, W3 and W4) will be undertaken every three years to record ground flora species using the DAFOR scale. Woodland ground flora will be sampled using an appropriate number of quadrats. The survey will also identify non-native tree species and map areas of dense Bramble scrub to inform future management.

7.3.2 The survey will be undertaken on a single visit in April every three years, commencing in 2016.

7.4 Hedgerows

7.4.1 No hedgerow monitoring is proposed beyond any monitoring of new hedgerows to inform aftercare.

7.5 Veteran and mature trees

7.5.1 All veteran and mature trees will be inspected to determine whether valuable features such as rot holes or torn limbs have developed, and retention of these features discussed with a tree surgeon, where required.

7.5.2 The survey will be undertaken on a single visit every five years during winter or early spring, commencing in 2015.

7.6 Grassland

7.6.1 Botanical surveys of the grassland areas will be undertaken every two years to record species using the DAFOR scale. An appropriate number of quadrats will be sampled in each field.

7.6.2 The survey will be undertaken on a single visit in June or July every two years, commencing in 2015.

7.7 Invertebrates

7.7.1 Aquatic invertebrate surveys of the Washpit Brook will be undertaken every two years following a standard kick-sampling methodology, with 'scores' given following the BMWP approach. Aquatic invertebrate surveys will be undertaken on a single visit in June or July every two years, commencing in 2014.

7.7.2 Butterfly and dragonfly transect surveys will be undertaken on three visits during June/July every two years, timed appropriately to coincide with optimal times for surveying for white-letter and purple hairstreak butterflies. Targeted surveys for the lace hopper bug *Reptalus panzer* will also be undertaken every two years. Surveys for wood-decay beetles and other species associated with veteran and mature trees will be undertaken on a single visit in June/July every five years. The surveys will focus on areas of suitable habitat within the site and will commence in 2015.

7.8 Amphibians

7.8.1 Torchlight surveys will be undertaken to assess the status of great crested newts and common toads on the site. This will include surveys at all new and retained ponds, as well as two off-site ponds (the Park and Ride pond (Pond 1) and the Bird Sanctuary ponds (Pond 6). Great crested newt surveys will need to be undertaken by a licensed ecologist.

7.8.2 Surveys will commence in 2014 and be undertaken annually for the first three years, and every three years thereafter for the remainder of the monitoring period. The surveys will be undertaken over eight visits in each year of survey:

- Three visits in March, spread out at approximately weekly intervals to record the maximum count of toads. One of the visits should take place in late-March and be used to record great crested newts.
- Three visits between mid-April and mid-May to record great crested newts within the Park and Ride pond and the Bird Sanctuary ponds (two visits during the same period for all other ponds).
- Two visits between mid-May and mid-June to record adult great crested newts and any evidence of breeding within the Park and Ride pond and the Bird Sanctuary ponds (one visit during the same period for all other ponds).

7.9 Reptiles

7.9.1 Any reptiles identified during other monitoring visits will be recorded (species, life stage, sex and location). Targeted reptile surveys will not be undertaken.

7.10 Birds

7.10.1 Monitoring of artificial nest sites will be undertaken to determine level of use. This will be undertaken by a suitably experienced surveyor watching for evidence of breeding activity from a suitable distance to avoid disturbance of the birds. Any birds identified during other monitoring visits will be recorded (species, life stage, sex and location). Monitoring will be undertaken on a single visit in May/June, commencing in 2016. Surveys will be undertaken every two years.

7.11 Bats

7.11.1 The bat lofts will be surveyed every two years on a single visit in June/July, for evidence of use by bats. Bat boxes on trees will be checked every two years during spring. Internal inspections of bat lofts and bat box checks will need to be undertaken by a licensed ecologist. Inspections of other artificial roost sites (such as bat tubes) will be undertaken to determine level of use; this will comprise a search for evidence of use, such as droppings, and / or 'emergence' surveys at dusk. Surveys will commence in 2016.

7.11.2 Where bat lofts are provided as mitigation for the removal of a roost, it may be necessary to undertake additional monitoring visits in accordance with the requirements of a Natural England licence.

7.12 Water voles

7.12.1 Field sign surveys will be undertaken along the Washpit Brook and any other wetland features, to determine the extent and (relative) size of the water vole population. Survey methods will follow Strachan and Moorhouse (2006). Latrine counts will be used to determine relative population size.

7.12.2 The survey will be undertaken every two years on a single visit in May/June. Surveys will commence in 2015.

7.13 Brown hares

7.13.1 Incidental observations of brown hares during other surveys will be recorded. Targeted surveys for brown hares are not proposed.

7.14 Badgers

7.14.1 The status of the main and subsidiary setts on site (Setts A, C, D/G and E), as well as the artificial sett, will be re-assessed annually. This will comprise mapping and assessment of the level of use of each entrance hole to determine the status and level of use of the sett.

7.14.2 In addition, badger activity within the Travellers Rest Pit SSSI (Sett C) will be monitored by mapping entrance holes and estimation of the volume of spoil outside each entrance to determine whether badger activity is increasing.

7.14.3 The monitoring visit will be undertaken by the Project Ecologist, ideally accompanied by a Quaternary geologist to determine what level of damage to the observatory gravels is occurring. Consideration will be given to monitoring by LIDAR surveys, should sufficiently conclusive results not be gained through the approach described above. The results of the monitoring will be discussed with Natural England annually, to determine whether it is necessary to close any setts within the SSSI, in accordance with the Geological Site Management Plan.

7.14.4 The survey will be undertaken annually on a single visit during the period March to June inclusive, commencing in 2014.

7.15 Otters

7.15.1 Monitoring of artificial holts will be undertaken to determine level of use. This will be undertaken by a suitably experienced surveyor searching for field signs of otters or other evidence of use. Internal inspections of the structures will not routinely be undertaken. If such a survey (using a fibrescope, for example) is considered necessary, this would need to be undertaken under licence to Natural England. The survey will be undertaken every two years on a single visit in May/June, commencing in 2017.

8. References

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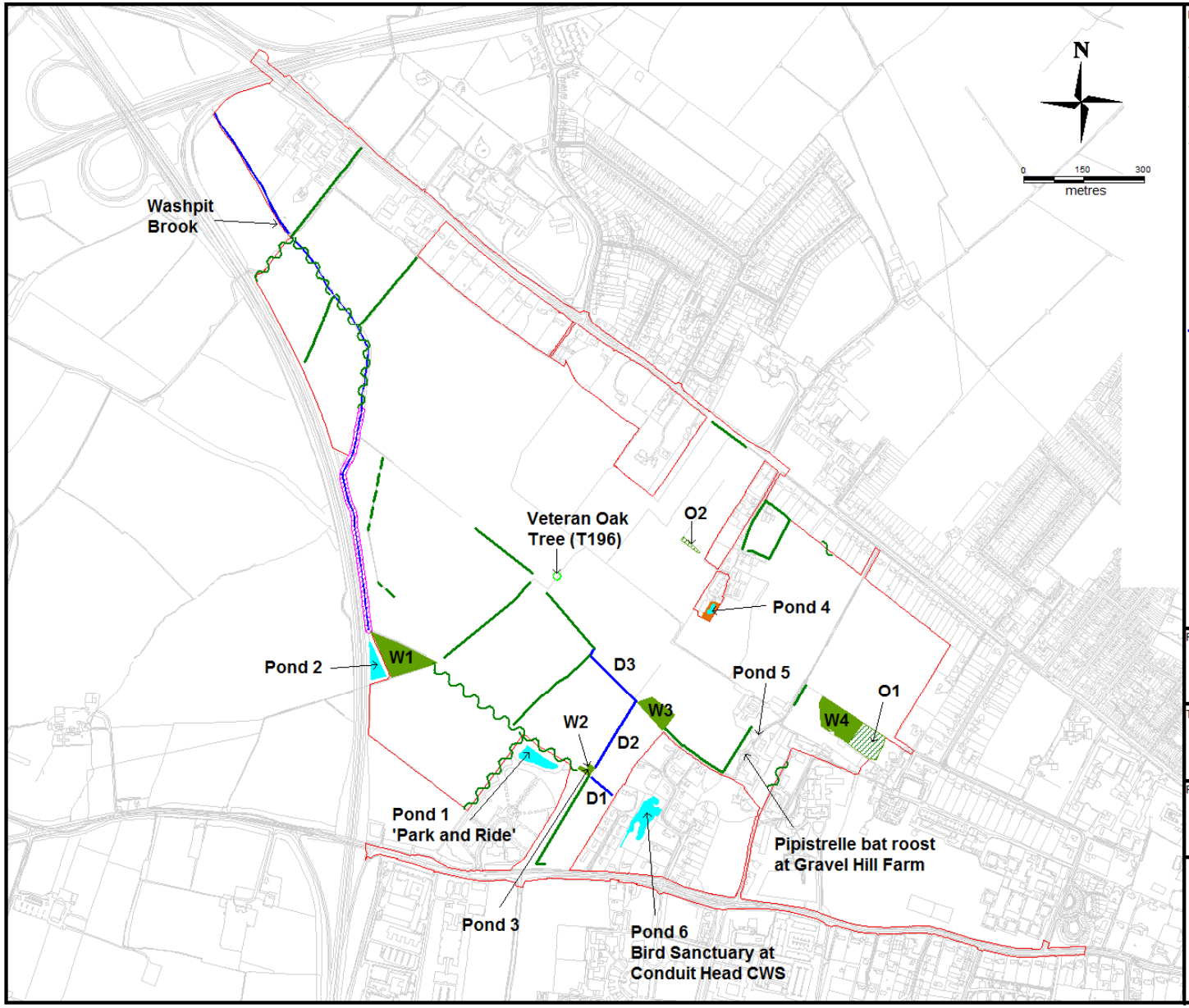


Key

- Site boundary
- Species-rich hedgerow
- Species-poor hedgerow
- Defunct species-poor hedgerow
- Veteran tree
- Woodland
- Orchard
- Species-rich grassland
- Pond
- Running water
- Section of Washpit Brook providing suitable habitat for water voles

Project

NW Cambridge Biodiversity Strategy

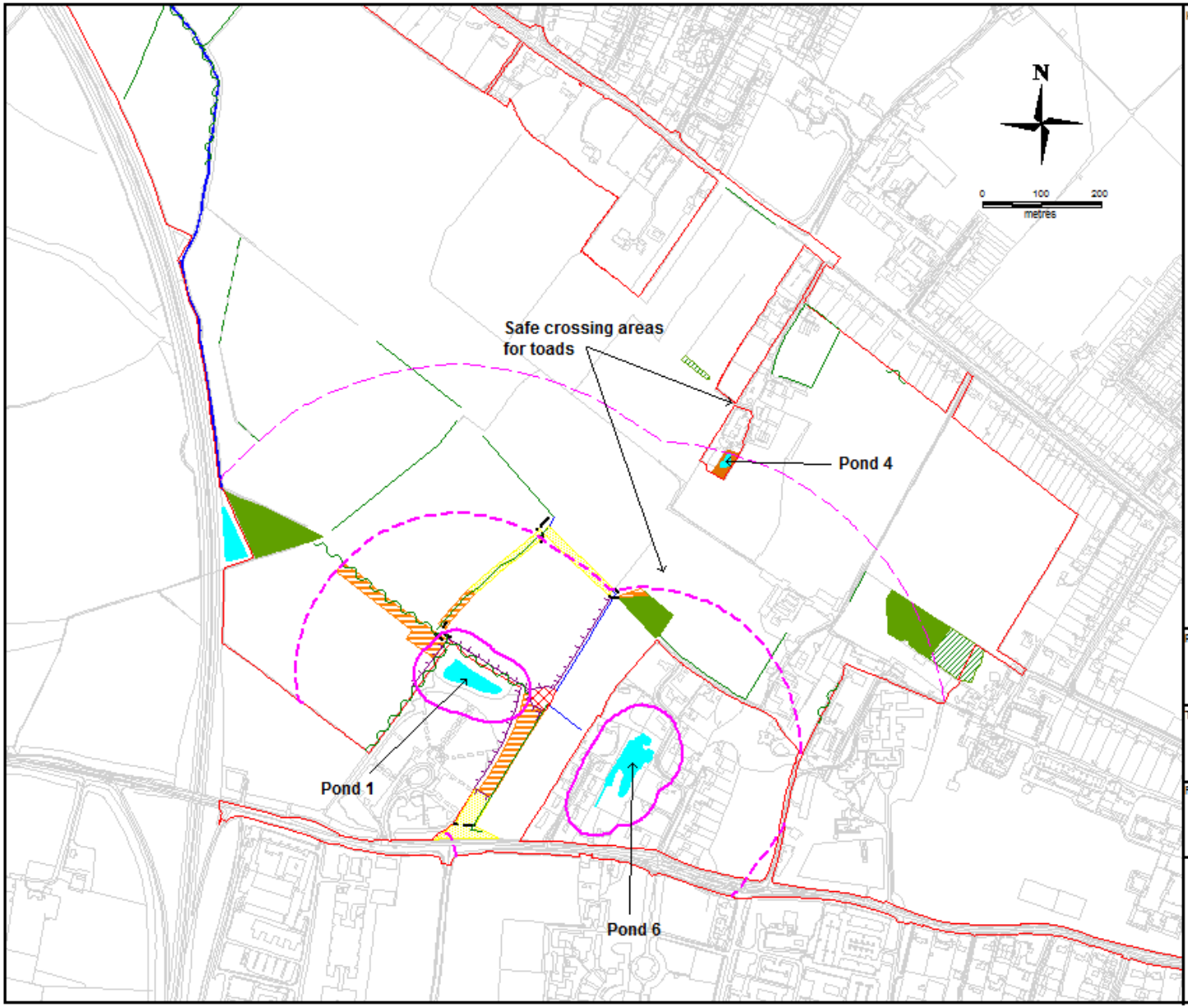
Title

Existing Valuable Features

Figure

Figure 1

MD Ecology Limited



Key

- Site boundary
- 50m pond buffer
- 250m pond buffer
- 500m pond buffer
- 'High risk' areas of terrestrial habitat
- 'Medium risk' areas of terrestrial habitat
- 'Low risk' areas of terrestrial habitat
- Exclusion fencing
- Drift fencing
- Species-rich hedgerow
- Species-poor hedgerow
- Defunct species-poor hedgerow
- Woodland
- Orchard
- Species-rich grassland
- Pond
- Running water

Project

NW Cambridge Biodiversity Strategy

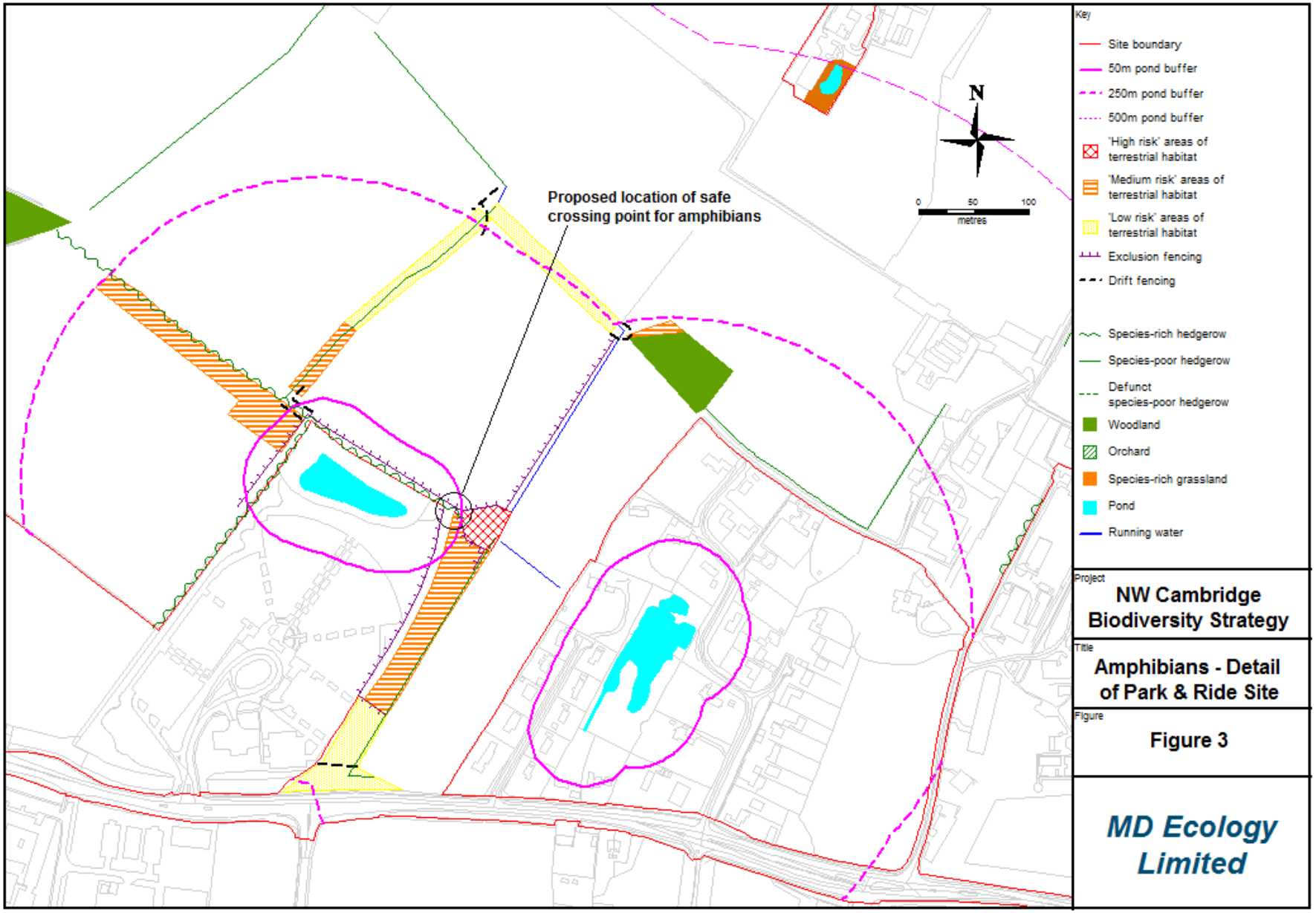
Title

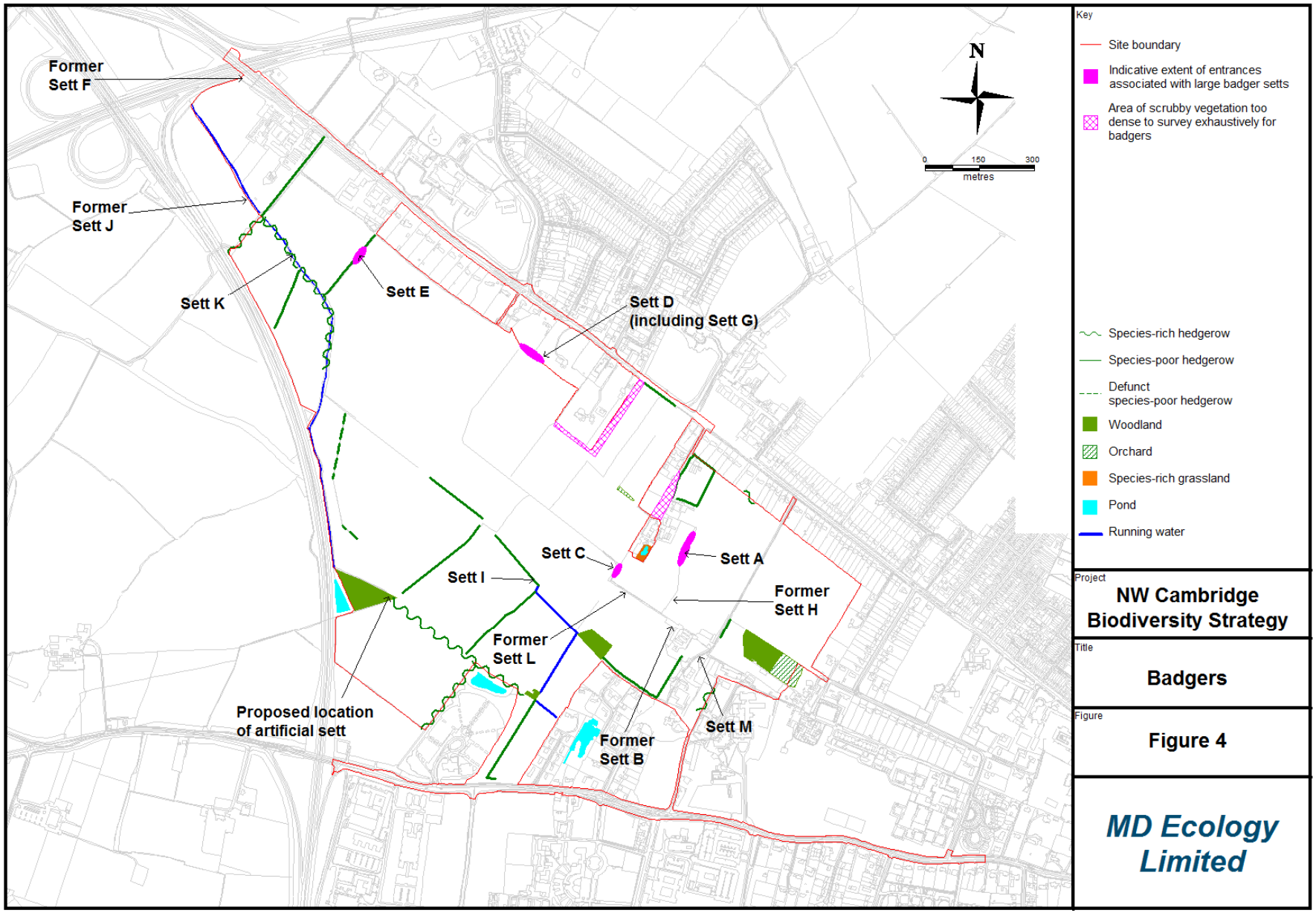
Amphibians - General

Figure

Figure 2

MD Ecology Limited





Appendix 1: Summary work schedule

Work item	Frequency	Month	Year														
			2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Site-wide																		
Litter removal	Quarterly	n/a	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Washpit Brook																		
De-silting	20% every 5 years	October	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mowing bankside / in-channel vegetation	50% every 2 years	October	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Woodlands																		
Thinning (<5% of canopy)	Every 10 years	Oct-Feb	✓										✓					
Bramble control	50-70% every 2 years	Oct-Feb		✓		✓		✓		✓		✓		✓		✓		✓
Cutting new areas of scrub	Every 10 years	Late-Jan or early-Feb										✓						
Hedgerows																		
Trimming	Annually (or every 2 years)	Late-Jan or early-Feb	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Veteran and mature trees																		
Tree surgery to allow retention	As required	Oct-Feb	As required															
Orchards																		
Bramble control	Every 5 years	Oct-Feb	✓					✓					✓					✓

Work item	Frequency	Month	Year															
			2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Grassland (meadows)																		
Mowing	One cut annually	Late-July or August	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Grazing	Annually	Sep-Feb	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Grassland (parkland)																		
Mowing	Three cuts annually	April, July, September	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ponds																		
Control of emergent/bankside vegetation	Annually	Nov-Jan	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Appendix 2: Summary monitoring schedule

Survey	Month	Year															
		2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Botanical survey of Washpit Brook and new areas of grassland in the Western Edge	June/ July		✓		✓		✓		✓		✓		✓		✓		✓
Botanical survey of woodlands W1, W2, W3 and W4	April			✓			✓			✓			✓			✓	
Veteran and mature trees	Nov-March		✓					✓					✓				
Aquatic invertebrate survey of Washpit Brook	June/ July	✓		✓		✓		✓		✓		✓		✓		✓	
Terrestrial invertebrate surveys	June/ July		✓		✓		✓		✓		✓		✓		✓		✓
Amphibian surveys	March-June	✓	✓	✓			✓			✓			✓			✓	
Bird surveys (on-site)	May/ June			✓		✓		✓		✓		✓		✓		✓	
Bat surveys – bat boxes on trees	Spring			✓		✓		✓		✓		✓		✓		✓	
Bat surveys – bat lofts and other artificial roost sites on buildings	June/ July			✓		✓		✓		✓		✓		✓		✓	
Water vole survey of Washpit Brook	May/June		✓		✓		✓		✓		✓		✓		✓		✓
Inspection of artificial sett and Setts A, C, D/G and E	March-June	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Inspection of artificial otter holts	May/June				✓		✓		✓		✓		✓		✓		✓

Appendix 3: Detailed measures to protect great crested newts during site clearance

Photographs showing 'risk' areas

Photo A3.1: Park and Ride pond (photo taken in May 2012)

Photo A3.2: Log-piles within standing vegetation to the north-east of the Park and Ride (photo taken in May 2012)

Photo A3.3: Vegetation in the northern part of the 'reserve strip' which has been coppiced to a height of 30-50cm (photo taken in May 2012)

Photo A3.4: Archaeological Area VII, with Park and Ride site to the left of the photo (photo taken in May 2012)

Photo A3.5: Vegetation in the southern part of the 'reserve strip' which has been coppiced to a height of 30-50cm (photo taken in June 2012)

Photo A3.6: Existing woodland in the southern part of the 'reserve strip' (photo taken in June 2012)

Photo A3.7: Arable field within Archaeological Area II (photo taken in February 2012)

Proposed approach to newt relocation

All mitigation work relating to the capture and relocation of great crested newts must be undertaken by individuals named as 'Accredited Agents' on the licence. Any site personnel carrying out works affecting great crested newts must be overseen by an individual named as an Accredited Agent on the licence.

Lengths of newt-resistant fencing will be installed as part of the newt mitigation works, to aid the capture of any newts remaining in terrestrial habitat and to minimise the likelihood of newts returning to the construction site. The fence layout will need to be agreed with Natural England as part of the licence application process; an indicative fence layout is shown on Figures 2 and 3, although this will need to be reviewed dependent on detailed design for the access road linking the site to the Madingley Road West junction. The proposed layout is based on the following:

1) A continuous length of fence to be installed along the western and northern sides of the Park and Ride, extending north along the edge of the works, to act as exclusion fencing (sections of this fence to be installed as 'one-way' fence to allow animals to escape from the area of the works

2) Area of 'high risk' terrestrial habitat at the north-eastern corner of the Park and Ride to be fenced to aid capture of newts using terrestrial habitat

3) Lengths of drift fencing within the reserve strip, along the eastern side of the Park and Ride, to aid newt captures in this area

4) Short sections of drift fencing around the ends of hedgerows within 250m of the ponds, making use of existing gateways in the hedgerows, to aid newt captures from these features

Pitfall traps will be installed on both sides of fencing. Artificial refuges, comprising sheets of carpet and other suitable materials, will be used to capture any newts from these areas, in parallel with the pitfall trapping operation.

Specialist contractors will be used to install the fencing, during March/April 2013. Fence installation will be overseen by the Project Ecologist or other suitably experienced ecologist. Detailed specifications for newt-resistant fencing are provided below. The newt-resistant fence will be located within areas of land that do not contain suitable refuges for great crested newts, as specified on the ground by the Project Ecologist. The fence layout shown on Figures 2 and 3 makes use of existing gateways to minimise the likelihood of newt refuges being affected by installation of the fence. The exact fence alignment in these (and other) locations will be selected by the Project Ecologist; any suitable refuges within the working width will be searched by hand to ensure that the fence can be installed without any impact on resting sites.

The Project Ecologist will undertake weekly inspections of the newt-resistant fencing to ensure its continued effectiveness and organise repairs where needed.

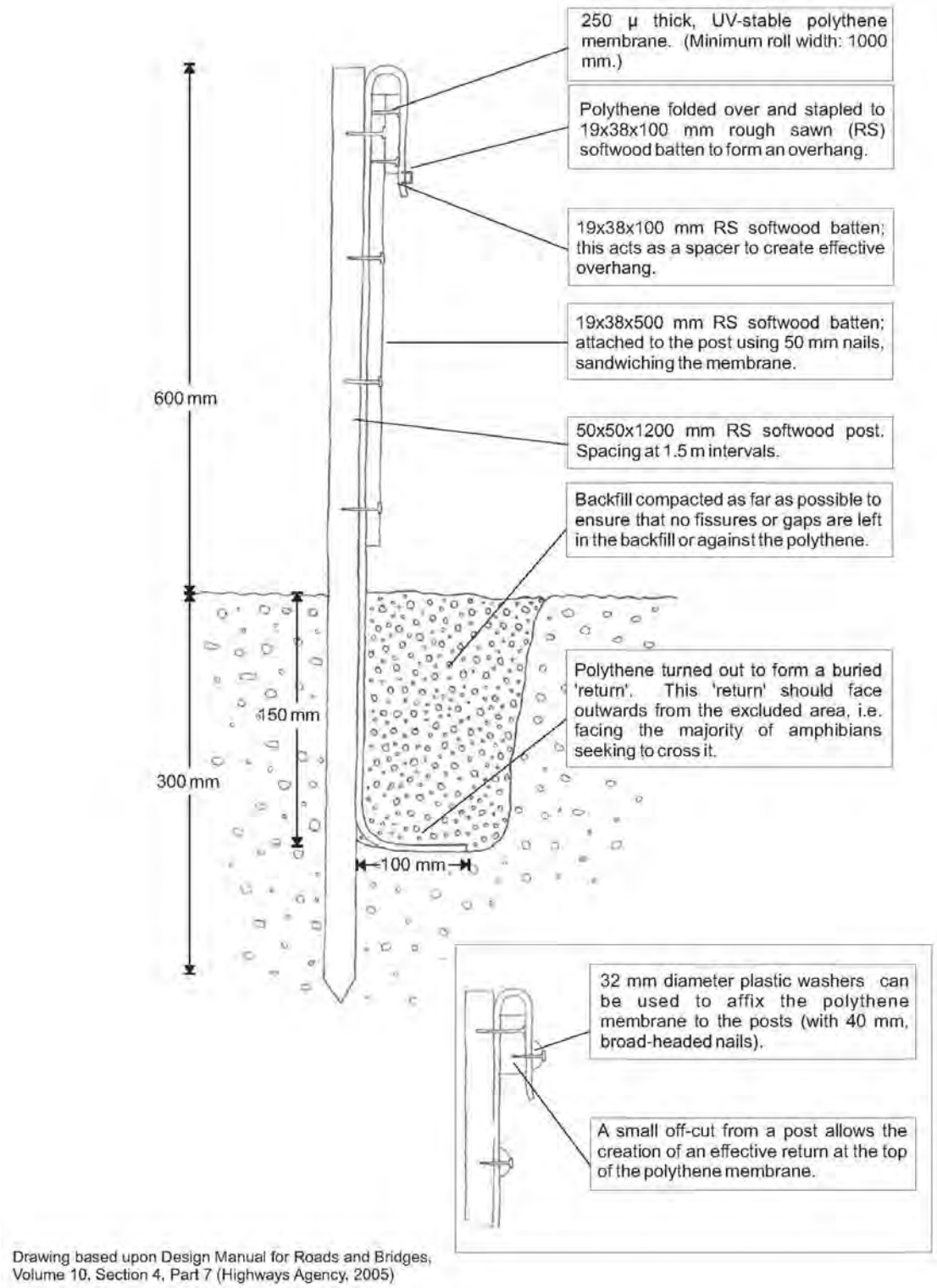
The relocation of newts will follow best practice guidelines, as described in Natural England's 'Great Crested Newt Mitigation Guidelines' (English Nature, 2001). The level of capture effort will need to be agreed with Natural England as part of the licence application process. At this stage is it proposed that at least 30 nights of pitfall trapping (and refuge checking) be undertaken during suitable weather conditions (night-time air temperatures >5^{o}C, and overnight rain or damp ground); this may need to be increased if newts need to be relocated from the 'high risk' area. Any newts captured will be released into terrestrial habitat adjacent to the Park and Ride pond. Topsoil stripping and removal of tree roots, following completion of the newt relocation described above, will be overseen by the Project Ecologist or other licensed ecologist.

Ideally, newt-resistant fencing will be removed following completion of the topsoil stripping, although it may be appropriate to maintain the exclusion fencing for longer periods; this process will be overseen by the Project Ecologist or other licensed ecologist. In addition, it will be important to ensure safe passage for newts across the new access road located between the Park and Ride pond and the Bird Sanctuary ponds. Dependent on the timing of construction works in this location, newt-resistant fencing may need to be retained until a permanent safe-crossing is installed with associated permanent fencing (see below).

Two artificial newt hibernation sites will be constructed adjacent to the Park and Ride pond, following the designs provided below, during April 2013.

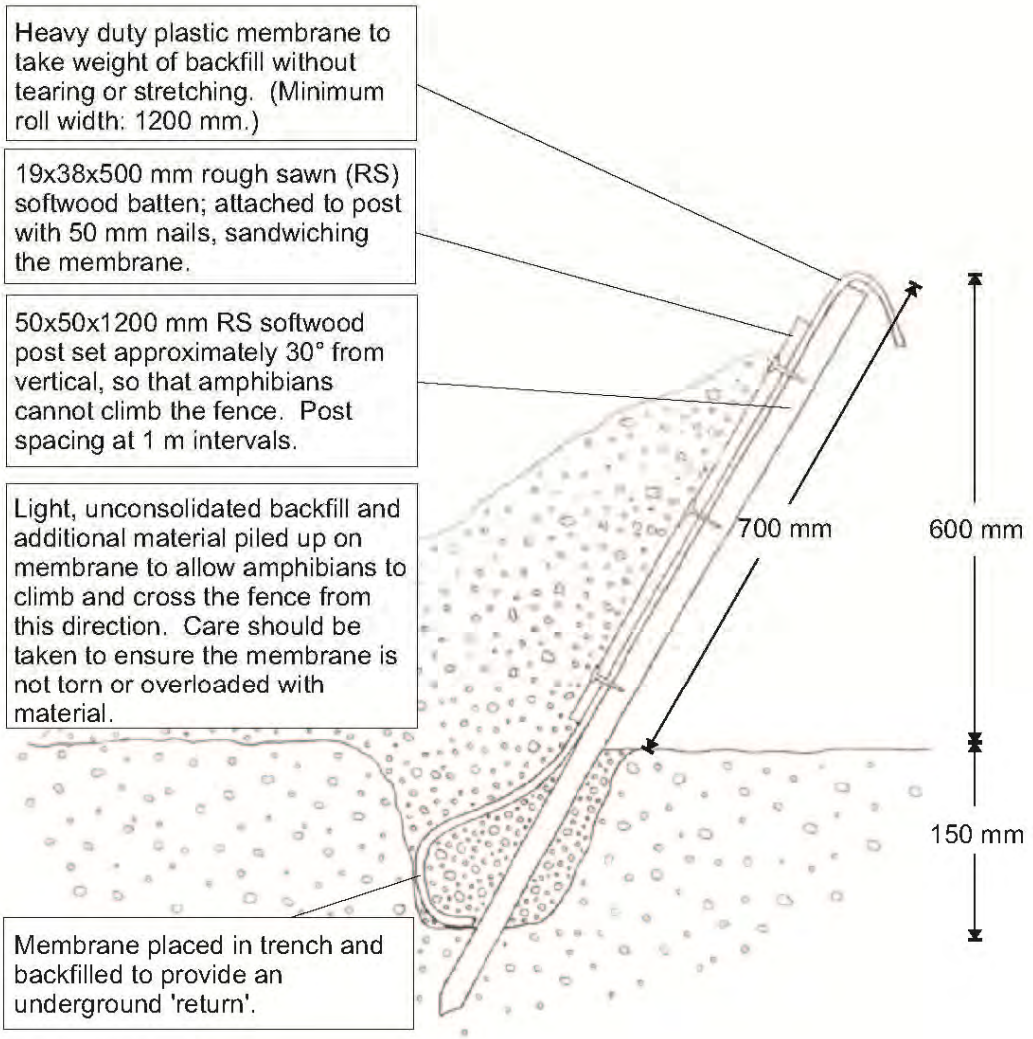
The Park and Ride pond is within the ownership of Cambridgeshire County Council; permission from the Council will therefore be required to allow the release of captured newts on land adjacent to it, and to construct artificial newt hibernation sites. Alternatively, the hibernation sites will be constructed on land within the site boundary, as close as possible to the Park and Ride pond, and will be fenced to prevent accidental damage.

Detailed specification for standard temporary newt-resistant fencing



Drawing based upon Design Manual for Roads and Bridges, Volume 10, Section 4, Part 7 (Highways Agency, 2005)

Detailed specification for temporary one-way newt-resistant fencing – option 1



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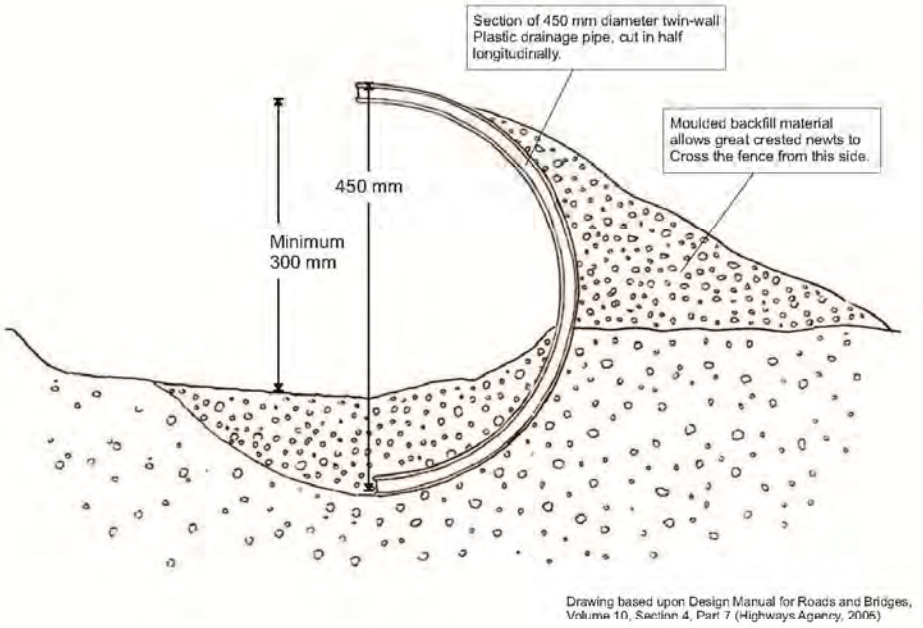
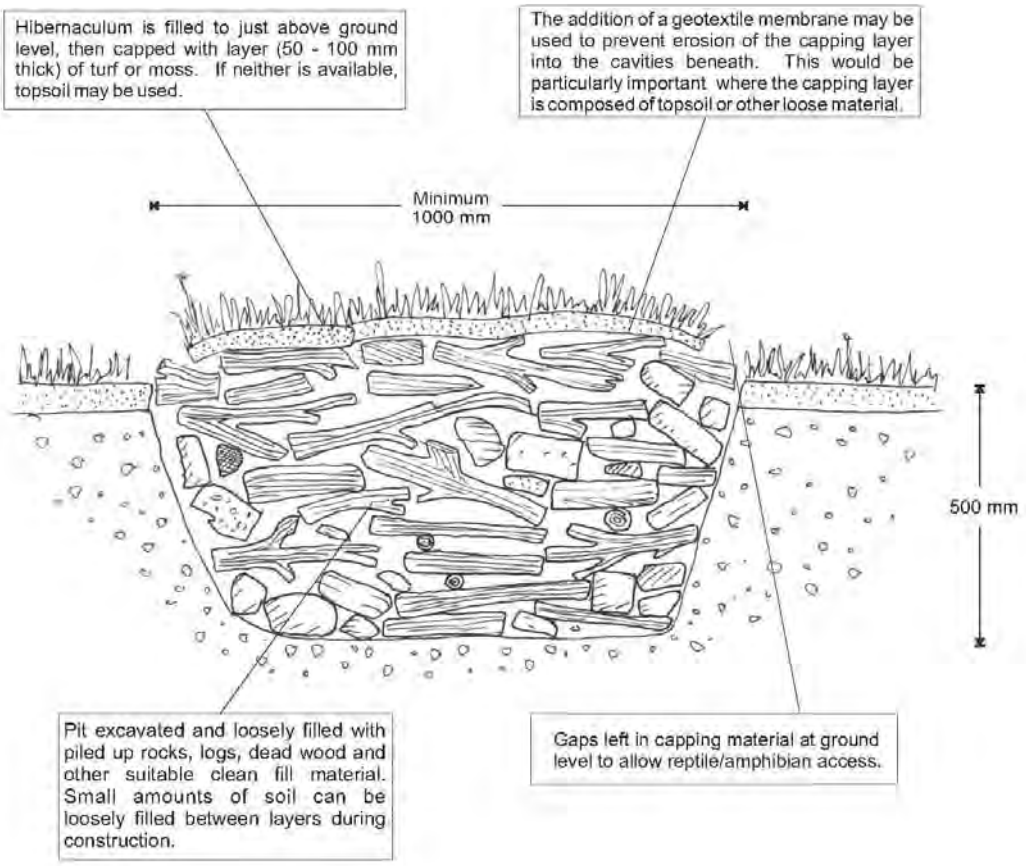
Detailed specification for temporary one-way newt-resistant fencing – option 2

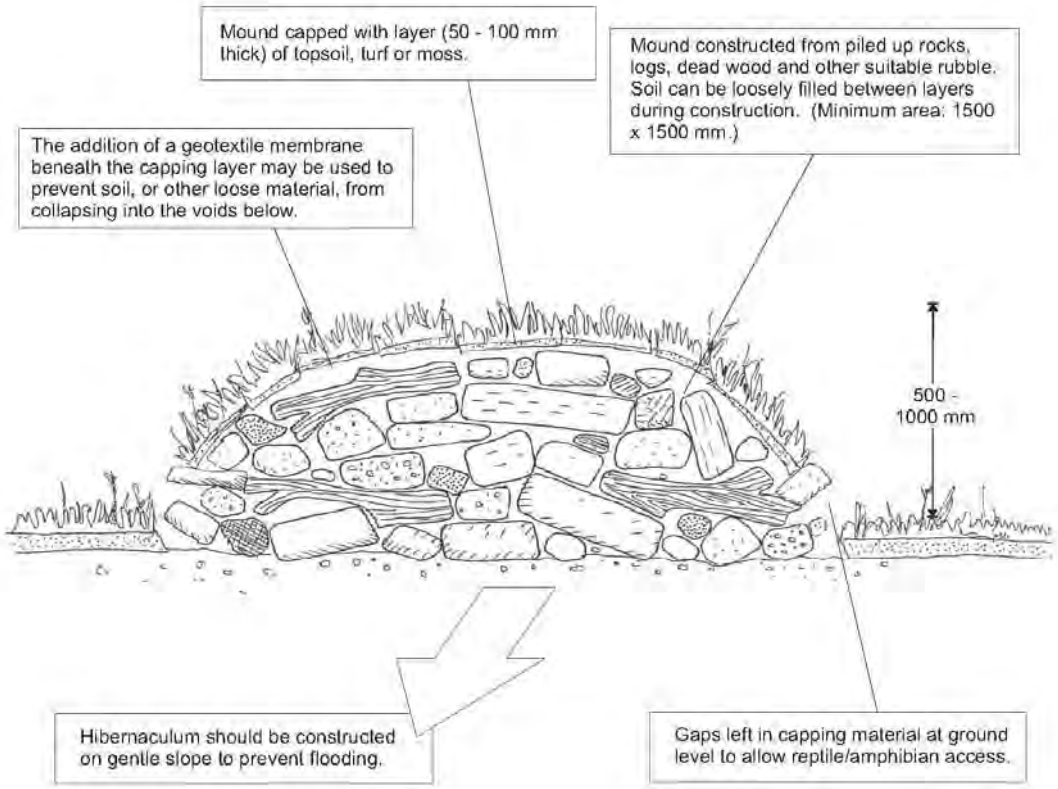


Design for artificial newt hibernation site – option 1



Drawing based upon Design Manual for Roads and Bridges, Volume 10, Section 4, Part 7 (Highways Agency, 2005)

Design for artificial newt hibernation site – option 2



Drawing based upon Design Manual for Roads and Bridges, Volume 10, Section 4, Part 7 (Highways Agency, 2005)

Appendix 4: Detailed measures to protect nesting birds during site clearance

Nesting bird inspections

A nesting bird inspection will be undertaken by the Project Ecologist (or other suitably experienced ecologist) prior to all site clearance operations commencing, in all parts of the site and at all times of year. This inspection will comprise a walkover survey to determine whether or not the works will affect areas of habitat suitable for use by nesting birds, and will include a targeted survey of suitable features to confirm the absence of nesting barn owls. Where nesting habitat will be affected and the absence of nesting birds cannot be determined during a walkover survey, an early morning bird survey will be undertaken. Any walkover inspection or early morning survey which has confirmed the absence of nesting birds will only be valid for 48 hours following the survey.

Watching brief

The Project Ecologist will maintain a watching brief throughout construction of the scheme. During the main bird breeding season (late-February/March to August/ September inclusive) the Project Ecologist will undertake regular monitoring of areas of suitable nesting bird habitat which may be affected by ongoing works, such as topsoil mounds.

Protocol to follow if nesting birds are present

Should nesting birds be present in an area to be affected by the works, the location of the nest will be identified and the stage of breeding determined (i.e. eggs, hatchlings, fledglings, etc) to give an indication of the likely end date for breeding activity. The nest and a buffer zone around it will be retained until the end of breeding activity, and this area identified using marker tape (it will be important not to mark the location of the nest itself, as this will increase the risk of predation and may cause the nest to be abandoned). No works will take place within the buffer zone and there will be no access to this area for site personnel other than the Project Ecologist. The size of the buffer zone will be determined by the Project Ecologist, and will be dependent upon the species present, the location of the nest and the nature of the vegetation or other structure supporting it. The end of breeding will be determined by the Project Ecologist prior to the nest and buffer zone being removed and following an appropriate period of monitoring.

Dealing with arisings from site clearance

Arisings from vegetation clearance provide suitable nesting bird habitat and will be removed from site or chipped within 48 hours of felling/removal or stock-piled in areas which will not be affected by the works. Any such features which have been left in situ for more than 48 hours will be inspected for evidence of nesting birds by the Project Ecologist before being removed or chipped.

Appendix 5: Detailed description of mitigation measures for badgers

Sett Exclusion methodology

Where closures of sett entrances are required, badger activity at the sett entrances will be monitored using a combination of 'sticks' and 'sand pads' in order to determine exact levels of use by badgers. Once a licence has been obtained from Natural England, any entrances which show evidence of use by badgers would be excluded by installing a combination of 'one way gates' and buried fencing materials securely over each entrance. Licences are generally only issued for excluding badgers from setts during the period July to November inclusive. 'One way gates' would initially be tied open for a period of at least three days before being set to 'one way' operation in order to effect an exclusion. Any entrances which do not show any evidence of use by badgers, would be securely blocked using buried fencing materials. Badger activity would be monitored throughout the exclusion process, and no works likely to interfere with or cause damage to the sett would proceed until an absence of badger activity was confirmed at the excluded entrances for a period of at least 21 days. At this stage the entrance holes will be permanently closed using buried fencing material, or the sett excavated and destroyed. This approach would also be followed if badgers need to be excluded from any other occupied setts.

Where setts need to be closed, and they show no evidence of current or recent use by badgers, the structures will be carefully excavated and subsequently in-filled. In some cases it will be appropriate to securely block the entrances in advance of the structure being excavated; this will be achieved using buried fencing materials. All works will be overseen by the Project Ecologist or other suitably experienced ecologist.

Provision of Alternative Shelter

The artificial sett will be constructed such that it mimics a 'natural' sett, and will be incorporated into a raised bund to reduce the likelihood of it being flooded. The sett will comprise 10 timber chambers connected using 300mm diameter twin-wall plastic drainage pipe. Chambers will be approximately 900mm diameter, and will be constructed using 100-150mm half round by 500mm long rustic timber posts, and 1200 x 1200 x 25mm marine ply lids. The sett will be constructed such that there are four entrance tunnels, leading to two 'entrance chambers', each of which will lead to a further four chambers.

The sett will be constructed in an existing small clearing in the wood to ensure it is as sheltered from disturbance as much as possible; a few small Elder and Hawthorn shrubs will need to be cleared to allow plant access to construct the sett. Once the chambers and tunnels have been constructed, the sett will be capped with a bund of imported material to ensure a minimum of 1500mm cover on top of the chambers to ensure thermal insulation, and to reduce the likelihood of interference. The immediate surroundings of the 'artificial sett' will be planted up with scrub to provide additional cover.

Appendix 6: Example Ecological Inspection Permit

Inspection Permit No: _____

This Ecological Inspection Permit is to be completed by the Project Ecologist following environmental inspections prior to site clearance or construction works.

These Inspection Permits (and where appropriate accompanying site sketches) are to ensure site clearance is undertaken in a sensitive manner where there are protected species issues, particularly in the bird nesting season (late-February to late-August) and where there is habitat suitable for great crested newts.

Location Inspected:		
Inspected by:	**Date:**	
Site Description:		
Valid from:	**Valid to:**	
Signed (Contractor):		
Plan Reference No. (Including Revision)	**See attached**	**(Attach Copy)**
Site Sketch Reference (If different to above)		**(Attach Copy)**

COMPLETE EITHER SECTION 1 OR SECTION 2

Section 1	Complete if **NO** protected species and/or habitats identified

I / We certify that reasonable professional skill and care has been exercised in inspecting the area(s) marked on the attached Site Plan/Sketch and that there was no evidence of species or habitats protected by law or identified protected areas at the time of the inspection.

Work may be undertaken in this area within the next _____ days/weeks/months without the need for any subsequent ecological inspections, other than routine ongoing ecological surveys.

Section 2	Complete if protected species and/or habitats **ARE** identified

I / We certify that reasonable professional skill and care has been exercised in inspecting the area(s) marked on the attached Site Plan/Sketch and that there WAS evidence of species or habitats protected by law or identified protected areas at the time of the inspection.

NO Work may be undertaken in this area without the presence of an Ecologist to monitor the said work. (Provide details below)

Item Ref (see fig.)	Affected species/habitat and necessary mitigation / control measures	Supervision by Ecologist [Y/N]	Proposed timing of further works and brief details	Mitigation checked by Ecologist? (signature + date)
Signature:		**Date:**		