

CAMBRIDGE NORTH

Ecological Design Strategy



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Prepared by:

RPS

Ben Draper

Suite D10, Josephs Well, Hanover Walk
Leeds, West Yorkshire LS3 1AB

T +44 1132 206 190
E ben.draper@rpsgroup.com

Prepared for:

BROOKGATE

Ivan Bennett
Construction Director

Two Station Place,
Cambridge, CB1 2FP

T 07786166038
E ivan.bennett@brookgate.eu

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Appendix 1

1 INTRODUCTION

1.1 Background

1.1.1 RPS was commissioned by Brookgate to produce an updated Ecological Design Strategy (EDS) to cover the whole of the Cambridge North area. This area brings together the Cambridge North station environs, the Phase 1 developments built out or under construction, the Phase 2 development application and also the remaining land north of the realigned Cowley Road. The Site boundary is outlined in the OMH Phasing Plan (Appendix 1, Figure 1).

1.1.2 This report builds on and refers back to the previous EDS for the Cambridge North Station Interchange, Planning reference. This previous EDS prepared in 2016 by Atkins covered the southern half of the site. In addition, we also draw on the RPS produced Landscape and Ecological Management Plans (LEMPs) in 2019 prepared for the Phase 1 office and hotel. It also draws on a wide range of ecological surveys undertaken by RPS and others for this site stretching back to at least 2012.

1.1.3 The original EDS (2016) was produced to discharge conditions 10 of permission S/3102/15/FL issued by South Cambridgeshire District Council and condition 8 of permission 15/2317/FUL issued by Cambridge City Council.

Conditions 10 (SCDC) & 9 (CCC) state: Ecological Design Strategy (EDS) - (protection, mitigation, compensation & enhancement)

No development shall commence until an ecological design strategy (EDS) addressing mitigation, compensation, enhancements and restoration for protected species (common reptiles, breeding birds), invertebrates, open mosaic habitat and other habitats (e.g. trees) and eradication of Schedule 9 species (e.g. Japanese Knotweed) has been submitted to and approved in writing by the Local Planning Authority.

The EDS shall include the following:

- a) Purpose and conservation objectives for the proposed works;*
- b) Review of site potential and constraints;*
- c) Detailed design(s) and/or working method(s) to achieve stated objectives. Key notable invertebrate species assemblages identified within the extended invertebrate surveys must be targeted for detailed habitat creation, making use of existing onsite materials as appropriate;*
- d) Extent and location/area of proposed works on appropriate scale plans;*
- e) Type and source of materials to be used, where appropriate, e.g., native species of local provenance;*
- f) Timetable for implementation demonstrating that works are aligned with the proposed phasing of development;*
- g) Persons responsible for implementing the works, such as ECoW;*
- h) Details of initial aftercare and long-term maintenance;*
- i) Details of monitoring and remedial measures; and*
- j) Details for disposal of any wastes arising from works.*

The EDS shall include off-site compensation measures. The EDS shall be implemented in accordance with the approved details and all features shall be retained in the manner thereafter.

1.1.4 This updated Ecological Design Strategy (EDS) is not a planning condition requirement, but its production has been agreed with SCDC/CCC as a requirement to support the Phase 2 application.

1.2 Proposed Development

- 1.2.1 The Cambridge North site is located in Chesterton off Cowley Road, approximately 1 km south of the A14 in the northern part of Cambridge. The site is located at approximate National Grid Reference 547500, 260900. The site is irregular in shape and covers an area of approximately 9.7 ha (OMH Phasing Plan, Appendix 1, Figure 1)
- 1.2.2 Cambridgeshire County Council (CCC) submitted a planning application for the new Chesterton Station Interchange (CSI) (now known as Cambridge North Station) in 2013 (Refs: S/1497/13/CM & C/05001/13/CC). Planning permission was granted for this application on the 23rd July 2014. Further planning applications were submitted in December 2015 for amendments to the proposed Station Development to provide a revised Station Square. These were accompanied by an Environmental Statement (ES). A range of baseline and species-specific surveys were undertaken on site in 2012 and 2013. These were updated in 2015.
- 1.2.3 The Cambridge North Site is located wholly within the original Chesterton Station Interchange (CSI) area. The CSI area was subject to a successful application for the Cambridge North Station which was approved in 2016 (permission S/3102/15/FL issued by South Cambridgeshire District Council and permission 15/2317/FUL issued by Cambridge City Council).
- 1.2.4 The Cambridge North Site is currently occupied by the now operational Cambridge North Station and its car park and an interchange facility, the newly constructed hotel at 2 Cambridge Square, and the office building under construction at One Cambridge Square (both in Phase 1 of the Brookgate development) and well as remaining areas of disused and operational railway sidings and a waste transfer site (for aggregates/building material for re-use) and the aggregates handling yard.
- 1.2.5 The majority of the site was in 2014/15 densely vegetated but areas have been disturbed or cleared and some of these areas have now been built on while other disturbed areas are regenerating naturally. This periodic clearance and regeneration is an ongoing feature of the site and informs much of the ecology present.
- 1.2.6 RPS has been commissioned by Brookgate to undertake ecology surveys of Cambridge North, to help inform the proposed redevelopment of the site, including Phase 2 and this report is a supporting document in that application.

2 BASELINE AND OBJECTIVES

2.1 Review of Site Potential and Constraints

- 2.1.1 The site has been heavily overgrown with vegetation, comprises dense scrub and secondary woodland (birch/willow) and large areas of open ground previously used to stockpile railway ballast. The Cambridge North area is bordered, with the exception of Bramblefields Local Nature Reserve (LNR) to the south west, by commercial/industrial and suburban residential areas.
- 2.1.2 No statutory or non-statutory nature conservation designations apply to the site. There are six statutory designated sites within 2 km of the site. There are no designated sites of international or national ecological importance within the Site or within 2 km of its boundary.
- 2.1.3 There are six Local Nature Reserves (LNRs) within 2 km, the closest of which is the Bramblefields LNR, which is located less than 100 m north-west of the Site and can be considered adjacent. This LNR is a mixture of grassland and scrub and also contains a pond. It is recorded as also being important for birds.
- 2.1.4 There are 16 non-statutory sites located within 2 km of the site. The closest of these is the River Cam CWS about 0.3 km to the east. The nearby LNR is, though, likely to act as a source of ecological resources such as its own invertebrate assemblage which will be available to re-colonise habitats provided as part of the Cambridge North developments.
- 2.1.5 The site is dominated by areas of scrub, woodland and ephemeral / short perennial vegetation. A large area of hardstanding is present within the centre of the site and small areas of semi-improved and amenity grassland, young broadleaf woodland, bare ground and scattered trees are also present. This constitutes a mosaic of habitats and is recognised as Open Mosaic Habitat (OMH) which is a UK Biodiversity Action Plan (BAP) habitat.
- 2.1.6 A number of rubble and debris piles and two disused railway buildings are located throughout the site. Four ponds were located within 500m of the site, two to the south-west of the site within Bramblefields Local Nature Reserve (LNR), one to east of the site and one to the north of the site within the railway sidings.
- 2.1.7 The combination of the habitats present means that the site is of some biodiversity value and of district importance, particularly by providing open mosaic habitat supporting rich assemblages of invertebrates and plants. These habitats provide some breeding and foraging opportunities for a range of species of more local ecological interest.

2.2 Previous Surveys

- 2.2.1 A full review of the baseline conditions in relation to the Site is provided within the following habitat and species survey reports produced by Cambridge Ecology and submitted in support of the Cambridge North Station planning applications:
- Phase 1 Habitat Survey and Protected Species Scoping Survey 2012;
 - Report into findings of Species-specific Surveys 2012;
 - Supplementary Phase 1 Survey for Nuffield Road Access Land 2013;
 - Bat Activity Survey 2013;
 - Supplementary Invertebrate Survey 2013;
 - Phase 1 Habitat Survey and Protected Species Scoping Survey 2015;
 - Report into findings of Species-specific Surveys 2015.
- 2.2.2 And in subsequent surveys undertaken by RPS including:

- Desk study 2020
- Invasive Species Survey 2018
- Reptile Survey 2018
- Reptile Translocation 2019
- Breeding Bird Survey 2018
- Breeding Bird Scoping Survey 2019
- Bat Activity Survey 2018
- Preliminary Bat Roost Assessment 2019
- Bat Emergence Survey 2020
- Invertebrate Survey 2020 and 2021
- Detailed Botanical Survey 2020 and 2021
- Breeding Bird Survey 2022 (ongoing)

2.2.3 An updated Phase 1 survey walkover was undertaken in 2021 assessing the potential for protected habitats and species on site, as well as mapping the OMH and the condition of these plant communities in detail.

2.2.4 Details of these surveys can be found in the CB4 - Phase 2 Ecological Survey Report (RPS 2022).

2.2.5 The baseline conditions established within the surveys and the likely significant effects of the proposed development are summarised in the ES Chapter for Phase 2 in relation to ecology and nature conservation implications for that development in particular.

2.3 Baseline Conditions

2.3.1 A number of Phase 1 Habitat surveys have been undertaken across the whole Cambridge North site since April 2012. This includes update surveys undertaken in September 2013, April 2015, April 2017, October 2019 and July 2021.

2.3.2 Detailed botanical surveys were undertaken in August 2017, June 2018 and October 2019 and the OMH plant community conditions have been updated in 2020 and 2021.

2.3.3 The Phase 1 Habitat survey and botanical surveys identified that the site consisted of a good proportion of the bare ground remaining from the original railway sidings substrate and dense willow/birch scrub. The disturbed bare ground is able to regenerate quickly back to the early succession plant community that formed a habitat defined as 'open mosaic habitat' (OMH). These open areas support a very species-rich plant assemblage of annual, biennial and short-lived perennial species and qualifies as 'open mosaic habitat on previously developed land' which is a UKBAP habitat and habitat of principal importance under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006. The plant assemblage within the OMH is a key ecological receptor for this strategy.

2.3.4 These areas of OMH and areas of dense scrub and trees provided suitable habitat for a number of protected and notable species, including reptiles, breeding birds, foraging and commuting bats and invertebrates. A number of protected species surveys have been undertaken on site for these species since 2013.

2.3.5 An invasive species survey of the site was undertaken on the 2nd July 2018 following best practice as described by the Environment Agency (2006, amended 2013), Royal Institute of Chartered Surveyors (RICS, 2012) and the Property Care Association (PCA, 2013). No Schedule 9 species were found within the boundary of the site. A number of Non-Native Invasive Species of particular

concern listed under Schedule 9 Part 2 of the Wildlife and Countryside Act 1981 (as amended) was recorded, including Cotoneaster *Cotoneaster sp.*, Tree of Heaven *Ailanthus altissima*, and Buddleia *Buddleia sp.*

- 2.3.6 Common lizards *Zootoca vivipara* and Grass Snakes *Natrix natrix* have previously been translocated from the site between 2013 and 2015. A reptile survey following guidelines outlined by the Herpetofauna's Worker's Manual (Gent and Gibson, 2003) and Froglife Advice Sheet 10 (Froglife, 1999) was undertaken within suitable areas of habitat on site in September 2018. A juvenile Grass Snake and an adult Common Lizard was recorded during the surveys. A localised translocation completed in October 2018 did not observe or capture any reptiles on site. It is therefore considered that the reptiles found on site in 2018 are a remnant population that were missed in the previous translocation when reptiles were cleared from the whole of Cambridge North and removed to the Bramblefields LNR. It is possible that these reptiles could have moved back onto the site when the fencing was removed or damaged. It is likely that as habitats mature on-site reptiles will re-colonise from Bramblefields and the guided busway verge.
- 2.3.7 Breeding bird surveys were undertaken across the whole site in May and June 2018 based on standard territory mapping methodology as outlined in Gilbert et al. (1998) and Bibby et al. (2000). A total of 29 species were recorded, of which 12 were confirmed breeding and 1 possibly breeding within the survey area. There have also been breeding bird surveys undertaken in 2012, 2015 and in 2019. Three UK BAP species and species of principle importance have been recorded each time (Dunnock, Song Thrush and Starling). None of the species found breeding are considered rare. The baseline for breeding birds on the site is considered to be of district importance.
- 2.3.8 Bat activity surveys were undertaken on the site in June, July and August 2018 following Bat Conservation Trust Best Practice Survey Guidelines (Collins, 2016). The transect route included all the habitat types encountered within the site boundary to ensure an accurate representation of the bat species present on site. Automated bat detectors were also placed at various locations within the survey area to gain additional information on bat species utilising the site.
- 2.3.9 Three bat species; Common Pipistrelle *Pipistrellus pipistrellus*, Soprano Pipistrelle *Pipistrellus pygmaeus* and Noctule *Nyctalus noctule* were recorded during the activity surveys. Unknown pipistrelle and unknown bat species contacts were also recorded (where the call is too brief and/or faint to make any positive identification), which may have been additional bat species.
- 2.3.10 The areas of highest activity were along the western edge of the site, above the scrub and trees, although bats were also recorded on the eastern edge of the site. The low numbers of bats recorded suggest the site is not used by significant numbers of commuting and foraging bats.
- 2.3.11 Seven species were recorded during the automated surveys; Common Pipistrelle, Soprano Pipistrelle, Nathusius' Pipistrelle *Pipistrellus nathusii*, Noctule, Serotine *Eptesicus serotinus*, Brown Long-eared *Plecotus auratus* and an unknown Myotis.
- 2.3.12 A preliminary bat roost assessment was carried out on the trees on site by a bat licenced ecologist on the 7th of January 2020 following best practice as described by the Bat Conservation Trust (Collins, 2016), English Nature's Bat Mitigation Guidelines (Mitchell-Jones, 2004) and the Joint Nature Conservation Committee's Bat Worker's Manual (Mitchell-Jones & McLeish, 2004). Two trees were assessed as having high bat roost potential and needed emergence/re-entry surveys.
- 2.3.13 Several emergence/re-entry surveys were undertaken on those trees assessed as having potential to support roosting bats. The surveys were completed between August 2020 and September 2020 and included 3 dusk emergence surveys. No emergence or re-entry of bats were recorded.
- 2.3.14 Invertebrate surveys were undertaken twice per month between May and September 2013 across the whole of the Cambridge North. An initial update survey was undertaken in 2020 and a further detailed survey was undertaken in Summer 2021. The overall results of the survey indicated that the Cambridge North site as a whole contained a level of invertebrate interest that was considered

to be of County value in 2012 and the invertebrate assemblage is a key ecological receptor for this strategy.

- 2.3.15 Information obtained from the surveys indicated that during construction and post-construction operation and management the development proposals have the potential to adversely affect the biodiversity value of the site. Adverse effects would include habitat loss, mainly the dense scrub and open mosaic habitat. There is also the potential, without mitigation for the development to have probable negative effects on the Bramblefields LNR, reptiles, breeding birds, invertebrates and a variety of flora present on site. In addition, construction activities could result in displacement, disturbance and direct mortality effects to the local ecology without mitigation. Section 3 details how these potential impacts will be mitigated and managed.

2.4 Purpose and Objectives

- 2.4.1 As the site includes various habitats, including open mosaic habitat (a UK BAP priority habitat) together with protected species (reptiles, breeding birds, invertebrates and flora), addressing mitigation, compensation, enhancements and restoration is paramount.
- 2.4.2 This document seeks to outline the ecological impacts likely to occur as the site is progressively developed and sets out a strategy and a design guide that provides suitable mitigation, compensation including enhancement and restoration within the Cambridge North site.
- 2.4.3 A number of different species that are afforded protection under European and UK national legislation have been identified as being present or may be encouraged to be present within and immediately adjacent to the site. Species that were found to be present during the surveys include reptiles, breeding birds, invertebrates and plants. Species which may be encouraged include amphibians, bats and water voles. Actions to be taken as a result of the surveys are described in section 3 Design Principles.
- 2.4.4 The conservation objectives for Cambridge North are as follows:
- Prevent harm and comply with all relevant legislation in relation to protected species on site during phases of clearance and construction. The detail of how this will be done will be captured in the development phase Landscape and Ecological Management Plan (LEMP) for each project as it comes forward through the planning process.
 - Minimise adverse effects on existing populations of protected and noteworthy species and seek to retain on site, including:
 - Reptiles including grass snakes and common lizards.
 - Nesting birds including species like black redstart, song thrush, starling and dunnock.
 - Invertebrates including the species of principal importance as identified in the invertebrate surveys.
 - The conservation objectives will also take into consideration the wider suite of key invertebrates and assemblages that are applicable to the site and pertaining to the noted and high value assemblages; namely the early successional mosaic, scrub fringe and deadwood communities.
 - Provide a long flowering period to provide nectar and pollen services across the site and over the principle invertebrate season from early March through to late autumn. In this way the scheme will limit any hunger gap for many of the species on the site that utilise nectar and/ or pollen to fuel either their adult reproductive stages or to provision nests for their larvae (primarily bees).
 - Retain and protect existing habitat on-site where possible and at least a reasonable proportion at ground-level;
 - Retain habitat connectivity across the site and provide linkages to the wider environment through the retention of corridors around the perimeter of the site;
 - Provide habitat enhancements that will provide conditions suitable for existing wildlife;

- Provide conditions suitable for Species of Principal Importance and Local BAP species and habitats;
- Restore existing habitat temporarily lost in working areas on completion of construction, with a preference for OMH where this is feasible and appropriate, or at least flower-rich planting that mimics OMH characteristics;
- Follow relevant British Standards and Codes of Practice; and; Select plants of known wildlife value within the planting scheme;
- Set out ongoing maintenance / management and monitoring requirements to ensure that the proposed mitigation and enhancement measures continue to provide biodiversity benefits after implementation.

3 DESIGN PRINCIPLES

3.1 Design principles and conservation objectives

- 3.1.1 The design and implementation of the landscape areas and planting; as well as all ecological mitigation and enhancement measures will make special provision for invertebrates and be wherever possible incorporate flower-rich and species rich plantings.
- 3.1.2 The conservation objectives have been developed to take account of the needs of the key invertebrate species and the wider assemblages; namely the early successional mosaic and dead wood communities.
- 3.1.3 Where possible the open mosaic habitat will be retained and enhanced. Elsewhere mitigation incorporating green and brown roof design, and native planting and wildlife habitats to continue and support the rich invertebrate and flora present, will be provided.
- 3.1.4 The EDS ambition is to deliver Biodiversity Net Gain (at +20%), whilst acknowledging that a proportion of the existing habitats will be lost. For net gain, the EDS will aim to deliver within the redline of each development as it comes forward, both at rooftop and at ground level.
- 3.1.5 Where existing OMH and deadwood habitats are to be avoidably affected by development of Cambridge North, the approach wherever feasible should be to re-use material and seedbank elsewhere on site both at ground level and also at roof level biodiverse brown and green roof design which should aim to mimic OMH style plant-richness.

3.2 Habitat based mitigation

- 3.2.1 The habitats within Cambridge North are characterised as built areas, dense willow/birch scrub and more open areas. These open disturbed areas are an early-successional plant community defined as 'open mosaic habitat'. These open areas support many annual, biennial and short-lived perennial flowering plants and therefore also support a rich invertebrate assemblage.
- 3.2.2 Construction activities, without mitigation, are considered to have the potential to give rise to certain negative effects on ecological resources based on loss of habitat, disturbance and direct mortality to species within site
- 3.2.3 Operational activities, following implementation of mitigation, are unlikely to give rise to negative effects based on fragmentation and direct mortality and have the potential to add beneficial value.
- 3.2.4 Mitigation measures for both construction and operation will be documented within the LEMP for each development as it comes forward within Cambridge North and will be implemented as pre-commencement and then during both the construction and post-construction phases.
- 3.2.5 The loss of vegetation and habitat will be offset through landscape planting and creation of new habitats. The species of plants, trees and shrubs considered for planting will be those that best represent the habitat and landscape character of the area as defined in the Landscape Assessment for the development and the Cambridgeshire Landscape Guidelines (1991). All landscape design will though be undertaken in close integration with the ecological requirements of the site as a whole. Such planting will aim to provide suitable feeding, breeding and hibernating opportunities for various wildlife. It would also provide biodiversity valuable and species-rich features providing ecological enhancement.
- 3.2.6 The proposed ecological mitigation measures will be detailed on the landscape and ecological mitigation plans for each development.
- 3.2.7 The landscaping principles will include:
 - Retention and enhancement of existing woodland and scrub along the south west boundary of the Station to form a buffer zone.

- The existing screening will be enhanced and strengthened with additional native tree and understorey planting.
- Enhancements to include the introduction of productive species that are beneficial to invertebrates and birds including spring blossom and fruiting species of scrub. Species mix to include: blackthorn *Prunus spinosa*, hawthorn *Crataegus monogyna* and field maple *Acer campestre*.
- For the autumnal nectivorous invertebrates, ivy *Hedera helix* will be planted as is a primary source of pollen and nectar from September through to October, prior to invertebrates embarking on hibernation.
- Willows *Salix spp* and poplars *Populus spp* will also be planted, scarce invertebrates associated with these species include the weevils *Isochnus sequensi* (Red Data Book K), *Acalyptus carpini* (Nationally Scarce B) and *Temnocerus coeruleus* (Nationally Scarce B);
- Mature trees that are not in direct conflict with design realisation will be retained in addition existing vegetation will where possible be retained & enhanced on Western Boundary.
- Enhancements to the western boundary will include the introduction of a varied fringe of scrub (through diverse native woody species planting) to increase the structure, niche availability and interface variation along its length;
- Retaining wherever practicable, the small number of mature trees located within the site to provide habitat for invertebrates and birds;
- Boundary planting to assist habitat connectivity across the site and links to other habitats beyond the Site boundary to provide commuting routes for a range of wildlife including reptiles, birds, mobile invertebrates and bats. This includes, where possible retention of existing vegetation along the western and eastern boundaries.
- There will be additional planting to the eastern border where feasible and an edge of OMH or flower-rich planting will fringe this edge, where there is space.
- Tree planting will include oaks *Quercus spp*, rowan *Sorbus aucuparia*, wych elm *Ulmus glabra* and alder *Alnus glutinosa* and poplars *Populus spp*.
- Orchard tree species (plum (*Prunus domestica*) and apple (*Malus domestica*) will be planted in the southern planting area, orchard trees are beneficial to invertebrates including spring blossom and autumnal fruits, and in time deadwood.

Further details can be found in the Cambridge North – Landscape and Open Space Report, June 2022.

3.2.8 Introducing species such as plum trees speed up the natural provision of important deadwood situations for saproxylic beetles. Plum and apples age more rapidly than slower growing oaks and beech trees. This means that within 50-70 years these trees may begin to exhibit the highly valued heart rot decay that many high-fidelity beetles require. This will then bridge a gap until the other longer-lived tree species come on-line producing their own deadwood situations from 150-200 years onwards.

3.2.9 New habitat creation will include:

- flower-rich planting, with an abundance of nectar-rich flowering species;
- log piles/ deadwood habitats;
- scrub thinning and enhancement to restore ground level OMH areas and more scrub edge;
- urban tree and shrub planting;
- sandy “bee beaches” and vertical exposures;
- butterfly banks;

- biodiverse green and brown roofs to mimic open mosaic habitat habitats and re-create a flower-rich environment on tops of the buildings, bike shelters and other structures;
- a mix of bird and bat boxes, and
- small areas of permanent open water as naturalistic ponds, water features, swales and rain gardens.

3.2.10 These measures are aimed to provide habitat connectivity across the site. Specific details will be provided for each development as it comes forward on the Cambridge North site.

Bramblefields LNR

3.2.11 The design and implementation of mitigation and enhancement measures arising for the station application with respect to Bramblefields LNR have already been agreed with the LPA and have been undertaken by Cambridgeshire County Council. These are detailed below. Mitigation measures included:

- Retention and enhancement of existing buffer vegetation to maintain habitat value, reduce disturbance and provide screening from Station Area;
- Pedestrians have been encouraged elsewhere through provision of & focusing on other access means;
- Creation of grassy verges of varying sward heights and composition from short flowery swards cut on a regular basis to tall, tussocky grass managed on a longer two-year rotation;
- Beetle banks that will include material of varying grades to provide interstitial spaces for hiding and hunting beetles, and native-species hedgerow planting adjacent to the fencing alongside the allotments to provide screening and buffer zones to Bramblefields LNR. This land to be designated as part of the Bramblefields LNR;
- Provision of additional refugia ranging from piles of logs and timber to rubble, stones and gravels within the Bramblefields LNR and within Station buffer zone;
- Provision of south-east facing bird boxes along the western boundary and on rear of litter bin store. Boxes will have a range of 32mm & 26mm entrance hole to allow different species to utilise boxes provided;
- The protection of reptiles through translocation and installation of reptile fence & artificial refugia until the end of the train station project; and
- Watching brief during construction works in Bramblefields LNR.

3.2.12 Enhancement measures included:

- Increasing the overall biodiversity value through provision of additional under-storey planting and species rich/wildflower grassland, as appropriate, together with selective thinning of existing trees/scrub. The under-story planting will be commensurate to local shade and semi-shade loving plants. Species will include primroses (*Primula vulgaris*), red campion (*Silene dioica*) and along scrubby fringes raspberry (*Rubus idaeus*) and fruiting currants (*Ribes spp*)
- Establishment of new wetland habitat & enlargement of existing pond through realignment of existing path to provide additional habitat for reptiles and amphibians. The marginal planting will include, amongst others, the same species as for the rain gardens.
- Control of invasive weed swamp stonecrop (*Crassula helmsii*) in existing pond and provision of new aquatic planting to increase habitat value.
- Provision of new interpretation boards and litter bins. More bins for dog waste will be provided and bag dispensers at least one at each entrance to this site and to provide a sign requesting owners to clean up their dog's mess.

- Provide new, larger information boards at each entrance to the site, explaining its importance to wildlife and the reasons for the management carried out.
- Provide a new legal warning sign at each entrance to instruct no riding of motorcycles or horses and no dumping of rubbish.
- Contribution to an updated 10-year habitat Management Plan in collaboration with the City Council ecologist as with good management there is the potential to increase the value of the LNR for a greater diversity of species.
- Mitigation and enhancements of Bramblefields help to achieve the ideal management objectives by helping to maintain & enhance the diversity of the grassland, the scrub habitat and pond habitat.

3.2.13 The monitoring and management of Bramblefields LNR should be reviewed for each major application within Cambridge North to ensure the site is in good condition. Further enhancement and management could form part of future mitigation, although the capacity of the site for further enhancement is currently considered to be limited.

3.3 Protected Species Strategy

3.3.1 The Proposed Development, without mitigation, is likely to give rise to certain negative effects on ecological resources based on loss of habitat, disturbance and direct mortality to species within the site. Enhancement opportunities should be identified in the Landscape and Ecological Mitigation Plans prepared for each development as it comes forward.

3.3.2 These will reflect the habitat-based approach and include OMH, habitat mounds, Flower-rich planting, hedgerows and scrub, planting of native specimen trees, biodiverse green and brown roofs that mimic OMH but where appropriate will also include species-specific measure in addition, where this is deemed necessary or desirable.

Reptiles & Amphibians

3.3.3 Reptiles are still in the main largely absent within the main Cambridge North site currently, given the translocation efforts for the previous developments and also the changes to the site. There is the population of both grass snake and common lizard within Bramblefields LNR. It is therefore anticipated that these populations will extend to the busway verge and into the site with time. The proposed treatments for the guided busway verge will support and encourage this re-colonisation. Where appropriate, certain measures will be implemented to ensure legal compliance. Best practice measures will be implemented to ensure animal welfare issues are addressed to minimise the risk that reptiles are harmed prior to and during any site inspection and construction works, particularly along this south western fringe.

3.3.4 The design and implementation of mitigation and enhancement measures for reptiles should where appropriate be included in each development LEMP and agreed and then implemented.

3.3.5 The existing vegetation of along the Cambridge North and Bramblefields LNR boundary will be retained and enhanced to act as a buffer zone. This buffer zone will be used as a receptor site for reptiles caught within the Site. This area will be managed for the benefit of reptiles, birds and other wildlife and act as a feeding, breeding, resting and commuting area linking with other habitats nearby.

3.3.6 Any works requiring clearing of vegetation will happen outside of nesting season if this is not possible adequate precautions will be undertaken. This when necessary will include inspections and searches for reptiles prior to commencement of works. The western boundary will also be retained & enhanced through bird boxes and invertebrate habitats.

Breeding Birds

- 3.3.7 The presence of nesting birds and UKBAP species is of material consideration for the Cambridge North site. The design and implementation of mitigation and enhancement measures for nesting birds are set out below:
- Compliance with legislation with the timings of construction activities e.g. vegetation clearance and removal of bird breeding habitat, undertaken outside the breeding season (March to September inclusive). If this is not possible all vegetation and buildings that are cleared during the breeding season checked for nesting birds by an experienced ornithologist acting as an Ecological Clerk of Works.
 - Retention and enhancement of the area of broad-leaved woodland and scattered scrub along the south western boundary, existing vegetation to be enhanced with poplar, willow and alder planting.
 - Creation of new habitat in the Station Area, to include shrub, hedgerow and urban tree planting. These areas have been designed to meet the breeding and foraging needs of birds and other wildlife. Species should include berry producing shrubs, including hawthorn and blackthorn.
- 3.3.8 Enhancement measures will include:
- The incorporation of bird nestboxes. There will be a range of box types included in the individual project LEMPs to support a wide range of species (sparrows, starlings, swifts, redstarts and other species). The higher building should also consider other more specialist boxes where appropriate (kestrel/peregrine etc).

Invertebrates

- 3.3.9 The site contains high valuable habitat suitable for invertebrates of national and local importance and overall is of high value for invertebrate conservation. The 2021 survey found 482 invertebrate species across the entire Cambridge North site. Of these 68 species (14.1%) are considered to be species of conservation concern, which is an exceptionally high proportion of scarce and rare species. This is comparable with some of the UK's highest quality reserves, rich southern heathlands or ancient woodlands. Two of these species are new to the UK: the ichneumon *Temelucha decorata* and the chrysididae *Hedychridium captaureum*. This is why the focus of all planting and habitats is to make sure the widest possible range of micro-habitats, niches and features are provided with the landscaping and ecological designs. It is feasible to deliver development and to maintain this invertebrate interest if the solutions are carefully designed and then implemented.
- 3.3.10 It is encouraging that even after the first phases of development there is no evidence for any loss or even reduction in the quality of the invertebrate communities present at Cambridge North. In fact, the intermittent disturbance events are broadly beneficial.
- 3.3.11 As part of the design and implementation of mitigation and enhancement measures for invertebrates, specific mitigation will be employed for species indicative of the site's former quality and assemblage bias, namely early successional mosaics (including rich flower resources), scrub fringe and deadwood features of varying state of decay as highlighted by the 2021 invertebrate report.
- 3.3.12 The following recommendations were provided in the 2021 report:
- Further clearance of habitats at the site should not proceed until mitigation for the Phase 2 development is in place.
 - The value of the birch/sallow scrub woodland, as well as developing poplar scrub, is most valuable along the edges where it transitions into the OMH. Isolated bushes and trees can also be very important.

- The dense, shaded internal parts of birch/sallow thicket is less important and can be opened out by driving rides through, creating glades and “scalping” the margins to increase the extent of the transition zones.
- Within the boundary of the site, some areas of dense thicket that are not lost to development, can be sacrificed to increase the area of OMH.
- The loss of open mosaic habitat is also occurring through scrub encroachment so an ongoing programme of management is needed to ensure the greatest range of habitats is maintained, particularly those that are important for the rarest species found on this survey.
- Grassy verge needs to be managed by an annual late cut to prevent scrub encroachment. The scrub bordering the grassy areas along the busway verge should be pushed back in places to provide an opportunity for the development of a transition zone.
- To maintain the population of the rare moth *Nemophora fasciella*, the amount of Black Horehound *Ballota nigra* should be increased. Only a few plants were noticed during the most recent surveys.
- Tree planting should be minimised or avoided in all ecological mitigation areas, natural regeneration should be sufficient to maintain the woody flora component of the habitat.
- Onsite ecological mitigation areas should ideally be contiguous, or if not then a corridor of habitat included to join them.
- Green roofs can be a good compliment to ground level mitigation but cannot substitute for it completely. The scrub and birch-sallow thicket components cannot be replicated on green roofs, and tall perennial herbage is also unlikely to thrive in the soil depths that are possible on green roofs. Design elements to re-create the mosaic element of OMH on the roofs needs to be considered in design. Some non-plant shelter features could provide the same function.
- Ideally a green roof should have some variability in soil depth, providing areas very prone to drought and areas more resistant to drought. This also provides small slopes where fossorial aculeates (such as mining bees and burrowing solitary wasps) can nest (eg bee beaches/banks).
- Planting should include species present on site, especially those known to harbour scarce invertebrates particularly Wild Mignonette *Reseda lutea*, Viper's-bugloss *Echium vulgare*, Common Toadflax *Linaria vulgaris* and Poppies *Papaver*.
- All planting on site should also provide a flower-rich, nectar-rich environment generally. Also important plants for pollen and nectar sources such as Common Bird's-foot-trefoil *Lotus corniculatus*, Kidney Vetch *Anthyllis vulneraria* and species of yellow *Asteraceae* such as *Crepis*, *Hypochaeris* and *Leontodon*.
- While green roofs cannot accommodate scrub, small patches of very drought-prone *Rubus* agg (Bramble) can provide nesting opportunities for many small aculeate *Hymenoptera*. This can also be provided for by carefully designed ‘bug/bee hotels’.
- Ongoing monitoring of both green roofs and ground-level mitigation areas will be highly desirable to ensure that the important invertebrate assemblages are persisting and monitoring requirements for invertebrates should be incorporated into each LEMP for developments as they come forward.

4 DESIGN ELEMENTS FOR INVERTEBRATES

4.1 Introduction

- 4.1.1 The following features and treatments will benefit the broad invertebrate assemblage types identified and also the specific features of value that many of the higher fidelity species, including Red Data Book, Nationally Scarce, localised and NERC Act species depend upon for some or all of their lifecycles.
- 4.1.2 Overall, the principal behind the mitigation measures is to reinstate a high degree of variation, structure and juxtaposition between habitats and features creating extensive interfaces at which diversity is often raised and rich in species. Mitigation measures to be included within LEMPs prepared for future developments, including Phase 2 should include some or all of the following measures.

4.2 Flower-rich planting/ flower-rich grassland

- 4.2.1 Enhancement of the species poor areas and the proposed new planting should all aim to be both species-rich and provide a flower-rich, nectar-rich environment.
- 4.2.2 The species rich planting specification will include native flowering plants that are of high value to pollinators. The species will represent a range of flower types from flat daisy-type white and yellow composites that benefit species and groups with short tongues to trefoils and labiates that are favoured by certain solitary bee species and long-tongued bumblebees. This planting style is often referred to as ‘Labiates and Legumes’.
- 4.2.3 Where grassland is specified and where appropriate it should also aim to be flower-rich, even if managed as a short sward lawn. Where longer grassland is planted Emorsgate EM4 – meadow mixture for clay soils or similar will be used as a reference to inform seed specification.
- 4.2.4 Off the shelf seed mixes should be supplemented to include key plants required to support as many of the invertebrate species of importance identified as being present on the site. Yellow rattle (*Rhinanthus minor*) should be included in grassland seed mixes, where this is appropriate. This is a key strategic species to help maintain the longevity of the flower-rich dominance of the sward. Since yellow rattle is a hemi-parasite on grasses it will suppress their dominance and promote broad-leaved flowers.
- 4.2.5 The grassland species mix could include:
- Short hawkbits *Leontodon spp*
 - Rough hawkbit *Leontodon hispidus*
 - Tall hawkweeds *Hieracium spp*
 - Common cat’s-ear *Hypochoeris radicata*
 - Ox-eye daisy *Leucanthemum vulgare*
 - Red clover *Trifolium pretense*
 - Meadow vetchling *Lathyrus pratensis*
 - Common bird’s-foot trefoil *Lotus corniculatus*
 - Wild carrot *Daucus carota*
 - Tufted vetch *Vicia cracca*
 - Common fleabane *Pulicaria dysenterica*
 - Hemp-agrimony *Eupatorium cannabinum*

- St. John's-wort *Hypericum spp*
- Yellow rattle *Rhinanthus minor*

4.2.6 The grasslands will be sown by specialist commercial operators and lightly rolled to garner seed to soil contact. This will then be left and allowed to establish. At this stage it is not known how long it will take to establish but monitoring will be undertaken to assess the establishment of the sward and spot spraying may be included to inhibit pernicious weed species. Once established the grassland will be managed to sympathetically culture strong populations of invertebrates and not to diminish the flowering potential of the grassland resource. This will be done by not cutting the entire grassland resource in a single event (such as with traditional hay meadow management) but will seek to manage the resource to allow the plants to flower into late summer and it is proposed to only cut half of the resource each September. An ecological management plan will detail the cutting regime, including variations depending upon grassland establishment success rate and growth.

4.3 Flower-rich open habitat mosaics

4.3.1 Open mosaic habitat will be retained and restored wherever feasible on site. The open mosaic in the 'wild park' north of the Cowley Road will restore OMH areas from encroaching scrub. Where possible other areas will be restored using on-site materials and seedbank wherever possible. The newly created open mosaics will include features such as south-facing bunds and banks to increase the microclimate for thermophilic invertebrates. There will be depressions included that, on windy days, will provide sheltering warm spots for basking invertebrates, which will be useful for species in early spring.

4.3.2 These depressions may partially fill with rainwater, which will provide a temporary feature that may benefit aquatic species, such as diving beetles and aquatic heteroptera (water boatmen and allies), two key aquatic and semi-aquatic groups on "brownfield" habitat. The open mosaic will be left to regenerate naturally when possible as there is likely to be a viable seedbank within retained materials. Where possible, the newly developing early successional vegetation will be situated close to scrub fringe and flowering grassland.

4.3.3 The majority of the scarce species recorded fall into the category of early successional species or those that utilise its features or plants for some or all of their lifecycles. The reinstatement of open mosaic swards and planting that mimics these features will benefit these species. Some of the typical pant species of the site such as common toadflax *Linaria vulgaris* for the leaf beetle *Chrysolina sanguinolenta* (Nationally Scarce A), mulleins (*Verbascum spp*) that supports a range of key species including *Cionus longicollis* (Nationally Scarce A) and *Longitarsus tabidus* (Nationally Scarce A) should be encouraged or planted.

4.3.4 Monitoring of the restored bare ground colonisation will be undertaken to ensure the direction of botanical colonisation is a positive contribution to the overall invertebrate mitigation. Where it does not meet the priorities of invertebrate mitigation, namely flower-rich and diverse patchy swards, further work will be undertaken to steer the mosaics towards this through processes that may include turf stripping or disturbance.

4.4 Log piles/ dead wood habitat

4.4.1 Where there are trunks or tree limbs left from any scrub clearance from the construction work, these will be retained to provide nesting locations for stem-nesting bees and wasps. A range of timber sizes will be used to benefit specialised saproxylic species such as *Dasytes plumbeus* (Nationally Scarce B) which prefers small diameter material to material that is greater than 30cm diameter to benefit dead wood nesting bees and wasps such as mason bees (*Osmia spp*) which are the hosts for the Red Data Book 2 parasitic bee *Stelis phaeoptera*. Where possible, stumps

will also be left in situ and not cut flush or ground out so that they rot in situ, again benefiting invertebrates associated with deadwood.

- 4.4.2 The deadwood material should be large (greater than 30 cm diameter) and will not have bark on at least some of its surface. The material should be dry and ideally starting to desiccate though this is not essential as newly felled timbers will start to desiccate within approximately 6 months when positioned in a sunny location.
- 4.4.3 Where there are no existing beetle holes in the wood being used for the bees and wasps, some holes could be drilled of varying sizes from 2-8 mm in diameter and of at least 10 cm in depth. Where this is done, a minimum of 70 holes of varying sizes will be drilled per 2 m length of timber. The timber should be positioned across the site including the eastern and western boundaries where there is more shelter and locations with a westerly aspect and exposed to the warmer afternoon sun. Most should be exposed to full sun for most of the day and will be situated in the retained areas of habitats and near to other key invertebrate features such as flower-rich foraging, scrub and bunds. The timbers used at the site will be lying down or stacked to replicate standing deadwood, which is the desired positioning to prevent the material becoming damp and rotting. Clusters of deadwood will be favoured over individual pieces of material scattered of the site.
- 4.4.4 Deadwood to favour beetles is most readily used when covered in bark and, in the main part, of large volume. The larger the material the better and some may require sourcing from off site and brought in to fulfil this requirement, particularly for later developments as the existing resources are exhausted.
- 4.4.5 Large volume will be greater than 50 cm diameter and 3 m in length sourced from broad-leaved trees, preferably oak, beech or sweet chestnut *Castanea sativa*, although a wider range of tree species could be included. Some smaller volume material (less than 30 cm diameter) will also be provided for species such as *Dasytes plumbeus* (Nationally Scarce B). Some material will be situated in semi-shaded situations to retain moisture in the deadwood.
- 4.4.6 Where tree or scrub clearance is being undertaken as part of restoration of OMH, efforts will be made to retain some as standing deadwood though ring barking, regardless of tree or scrub species. These will be allowed to rot in situ and provide a resource for beetles that prefer dying trees with fungal rot features rather than “dead” wood. Where standing deadwood is being retained, clean cuts will not be made where possible that neatens up the feature, but a jagged and shattered appearance will be created. This replicates natural snapping and breakage of limbs and trunks. The purpose of this is to enable water to penetrate the timber and allow access points for fungi and the formation of rot, unlike a clean cut that can scar over and inhibit the rate of decay.
- 4.4.7 Existing log piles & hibernacula will not be disturbed unless necessary to enhance the diversity of invertebrates identified.

4.5 Scrub retention and tree and shrub planting

- 4.5.1 Scrub along the western boundary will be retained and enhanced as far as is possible, in order to preserve a significant scrub edge habitat on site for many of the invertebrates recorded. Enhancements will include potential supplementary planting to add variety to the scrub fringe woody species diversity and management to increase variation along the boundary, including remodelling of the fringe to include scalloped edges and deadwood (through ring barking).
- 4.5.2 Where there is still a dominance of scrub, some of this will be cleared to re-establish OMH and expose the underlying nutrient-poor soils and kick-start the successional processes that previously made the site of value for invertebrates. Any clearance of scrub will be designed to provide a significant edge and therefore be in sinuous “finger” like fringes that maximise a southerly exposed aspect.
- 4.5.3 If soils are thought to have developed a humus and become too rich for flower-rich perennial vegetation to establish after the scrub is cleared, a soil test will be undertaken and analysed for the

key components of soil chemistry including the phosphorous and nitrogen levels. Where the results come back indicating it is too rich, the surface layers will be stripped and removed to expose the original materials.

- 4.5.4 High density flowering “super abundances’ will complement shrub planting within the site. These swards will range in type to complement other flowering features across the site and provide high value pollinator services. These are high value plant species and families for many common and local pollinators including most hoverflies, other fly groups, common bumblebees and beetles. The purpose of these features is to bolster populations of the local pollinator species.

4.6 Bee beaches

- 4.6.1 Many of the bees and wasps recorded including the five-banded digger wasp and it’s probable parasite *Hedychrum niemelai* (a Red Data Book 3 rubytail wasp) are associated with horizontal or near level sandy planes. The creation of a series of “bee beaches” will be included in the overall matrix of the invertebrate habitat, including on the rooftop biodiverse green roofs. The matrix refers to the retained areas of the site and also other planted areas. The bee beaches will be made from partially compacted builders sand or another appropriate relatively fine sand. The material will be at least 60cm in depth and each beach will be a minimum of 5m x 5m in area (of varying shapes). The northern side of each beach will be produced into a clifflet of 50cm in height across the extent of the northern edge of the beach therefore creating a south-facing sandy exposure. The appearance of these features will not be dissimilar to a golf bunker but less uniform in surface appearance. Over working of the material will be avoided to retain microtopography.
- 4.6.2 These bee beaches should be monitored alongside other components of the site to ensure they are developing in a way that will produce favourable results. Once a bunker has lost its optimal state and succeeded to a vegetation dominant state (that being greater than 80% vegetation cover), half of the feature will be scraped off to initiate succession again. The remaining half will be scraped off in the following year during May-July.
- 4.6.3 Further details on their design, in terms of form and shape should be included in the LEMP for each future development as it comes forward, including Phase 2. Reference back to the design used for the Station development should also be made (detail design drawing: 5134906-RLS-CIS-LND-00023).

4.7 Butterfly and beetle banks

- 4.7.1 Butterfly banks are in essence beetle banks but also benefit other species, in this instance butterflies. Butterfly banks are bunded materials sown, or planted, with key butterfly larvae foodplants. The material used in the construction of the bunds can vary dependent upon the targeted species or geographical location. At this site the material will bias calcareous deposits as this will produce the richest flora and benefit the widest range of butterfly species indicative of brownfield sites and calcareous grasslands of the surrounding area. The bunds will comprise of chalky or limestone deposits. A mix of material from fine grade to coarse deposits will be included.
- 4.7.2 Large flat slabs of chalks (greater than 30cm in diameter) or if these cannot be sourced bricks and other rock surfaces will also be positioned on the surface of the bunds. These are important as they suppress plants and therefore help retain open ground. This bare ground, over the long term, is important for basking butterflies (and other invertebrates) and also provides important oviposition microsites for butterflies. It has been shown that where key plant species grow prostrate over bare ground such as bricks, slabs and other warm surfaces, the oviposition and reproductive rates of brownfield butterflies increases. Species such as dingy skipper *Erynnis tages* and grizzled skipper *Pyrgus malvae* have been shown through applied research by Butterfly Conservation in Warwickshire to benefit from this bespoke feature manipulation.

- 4.7.3 The butterfly banks will be positioned in sheltered places in full sun. To increase their value they will be constructed in a sinuous shape to help impede wind across the features and can be situated as two parallel banks. These parallel arrangements are optimal as they can produce their own microclimate. This principal of parallel butterfly banks has been used with success at the Butterfly Conservation Broadcroft Quarry reserve on the Isle of Portland. The feature will be optimised further through the creation of some vertical, southerly-facing exposures cut into the bunds to promote their use to nesting bees and wasps.
- 4.7.4 Beetle banks will be created using varied grade material. The material, where possible will be sourced from on site as this material is likely to contain invertebrate species of some value. The material will also possess an existing seedbank. The banks will be situated in sunny situations and also in semi-shaded situations to provide homes and shelter for species from different assemblage types with specific ecological requirements, such as those that prefer dry, arid conditions typical of calcareous parched grasslands and brownfields to those that prefer damp, humid and/or cooler shaded situations such as wood edge species.
- 4.7.5 Further details on their design, in terms of form and shape can be found by reference back to the Station development (detail design drawing: 5134906-RLS-CIS-LND-00023).

4.8 Brown and green roofs mimicking OMH

- 4.8.1 The open mosaic habitat roofs will be designed to be a mix of flower-rich swards comprising 'bee-friendly' native plants; log piles/ deadwood habitats, sandy "bee beaches" and vertical exposures / micro-habitat banks. The roofs will have some micro-variation in levels with some occasional south-facing sloped areas. These areas will also have nest boxes and chick shelters (half-pipe or similar for ground-nesting bird chicks to hide to avoid crow, gull and raptor predation); and medium sized shallow water bowls/dishes to provide ephemeral open water habitats.
- 4.8.2 The planting should supplemented include species across a range of flower types from flat daisy-type white and yellow composites that benefit species and groups with short tongues to trefoils and labiates that are favoured by certain solitary bee species and long-tongued bumblebees.
- 4.8.3 The roof design will also look to incorporate material from the remaining open mosaic habitats, re-using the substrate and therefore the existing seedbank in patches on the roofs. The roof areas will as well as having plug planting also naturally regenerate from the remaining viable seedbank of species from the original OMH priority habitat re-used from the site. The aim of this is to allow some of the typical plant species of the site to re-establish. A small amount (approximately 150kg+ per 10m²) of OMH substrate from the site should be salvaged from the site, to be used from 'top-dressing'.
- 4.8.4 A selection of mulleins and other characteristic plants from the OMH habitat will, where feasible also be temporarily transplanted and be used as additional planting within these roof areas. The salvaged OMH substrate may need to be salvaged and stored on-site prior to construction, although avoiding double-handling and storage is preferable.
- 4.8.5 The design and implementation of the green and brown roofs will make special provision for invertebrates. The conservation objectives have been developed to consider the key invertebrate species and the wider assemblages; namely the early successional mosaic and dead wood communities. For most developments, this should be incorporated into the roof habitat design.
- 4.8.6 The design objectives for these roofs are therefore:
- re-use of salvaged material from existing on-site OMH habitats as a top dressing and associated seedbank on the brown roof areas;
 - provision of bare ground, seeded areas and selected plugs of a range of flowering plant species for both open sun and shaded areas in the biodiverse brown roof design to meet a target plant species-richness of 85 species;

- provision of micro-habitat for invertebrates, including a variety of deadwood material, open water, varied micro-topography;
- Provide habitat enhancements that will provide conditions suitable for existing wildlife, including biodiverse green roof areas to meet a target plant species-richness of 102 species;
- Provide conditions suitable for Species of Principal Importance and Local BAP species and habitats;
- Restore existing habitat temporarily lost in working areas after practical completion of the office;
- Follow relevant British Standards and Codes of Practice;

4.8.7 Each LEMP should set out ongoing maintenance / management and monitoring requirements to ensure that the proposed mitigation and enhancement measures continue to provide biodiversity benefits after implementation. The brown and green roof plan design should reference the Office and Hotel developments in Phase 1 (**Cambridge North – Landscape and Open Space Report, June 2022**) illustrating the variety of habitats provided.

4.9 Nest and bat boxes

4.9.1 The LEMPs will incorporate bird nest boxes and bat boxes. There will be a range of box types included in the individual project LEMPs to support a wide range of species (sparrows, starlings, swifts and other hole-nesting species). The higher building should also consider other more specialist boxes where appropriate (kestrel/peregrine etc).

4.9.2 Provision of bird nest boxes will be positioned in alignment with the landscaping plans for the development and close to habitat areas retained or created. Bird boxes will be attached to suitable retained trees or other structures/buildings. The bird boxes will be placed at least 2 metres above ground level, out of direct sunlight & ideally southeast facing. Bird boxes will include a range of open and hole-fronted boxes. This mixture of 32mm & 26mm for access will cater to different species found in area. The Schwegler 'woodcrete' boxes models or similar are most appropriate: 1B hole-fronted, 26mm entrance hole and 32mm entrance hole, and 2H open-fronted 120mm opening; plus other more specialist boxes and also bat boxes of various sizes/types.

4.10 Open water, swales and rain gardens

4.10.1 Swales, open water and rain gardens will be incorporated into the landscape design and will provide valuable habitats for wildlife on site. The rain gardens and other wetland areas will be planted with suitable native marginal and wet ground loving plants that will benefit invertebrates. Plants will include purple loosestrife *Lythrum salicaria*, marsh woundwort *Stachys palustris*, greater bird's-foot trefoil *Lotus pedunculatus*, hemp-agrimony *Eupatorium cannabinum*, common fleabane *Pulicaria dysenterica*, water figwort *Scrophularia auriculata* and marsh marigold *Caltha palustris*.

4.10.2 Marsh woundwort in particular is a noted pollen source for the previously recorded (2013) NERC Act Section 41 and Nationally Scarce large garden bumblebee *Bombus ruderatus*. Other plant species are themselves important pollen and nectar sources for a wide range of invertebrates and the list has been produced to provide flowers from early spring (marsh marigold) through to late summer (common fleabane).

4.10.3 For rain gardens, refer to the Cambridge North – Landscape and Open Space Report, June 2022.

4.11 Flora

4.11.1 Two hundred and fourteen (214) species of plant were found during the 2012/13 Phase 1 Habitat Survey. This number of plants is considered to be a low to average number of plants for an area of this size but was considered to be of local importance although no plant species were considered

very rare. Flora of county significance included Hoary Mullein, Wood Sage, Echinace Bramble, Long-stalked Crane's Bill and Heath Speedwell. Since then a number of detailed botanical surveys have been completed. The majority of the plant species recorded were common and widespread species and no legally protected or BAP species were recorded. The design and implementation of mitigation and enhancement measures for flora should be detailed on the Landscape and Ecological Mitigation Plan for the developments as they come forward, if specific plant mitigation, is appropriate. The strategy though is habitat rather than species led on the whole.

4.11.2 Specific plant mitigation measures will include:

- Limiting vegetation clearance to that which is essential for the safe construction of the Development in order to maintain plant biodiversity on site.
- All vegetation clearance will be set out in relation to the current design to ensure vegetation will be retained where possible.
- Creation of new habitat areas will be species rich and flower-rich.
- A survey should be undertaken prior to site clearance and construction to locate any plants of county significance e.g. Hoary Mullein, Wood Sage, and Long-stalked Crane's bill. Where plants are identified, where feasible they will be translocated elsewhere on site.

4.12 General Enhancements

Amphibians

4.12.1 The implementation of reptile mitigation measures and enhancements to Bramblefields LNR, e.g. creation of new wetland area and enlargement of pond and provision of aquatic planting, will benefit amphibians. The use of standard construction practices outlined in the CEMP and LEMP. Biodiversity will minimise any short-term disturbance and certain measures will be necessary e.g. installation of one-way fencing, to ensure legal compliance is maintained during site preparation and construction works to avoid killing amphibians.

4.12.2 The provision of new open water will provide additional breeding sites.

Bats

4.12.3 The development will provide opportunities to enhance the area for bats as the area of broad-leaved woodland and scattered scrub along the western boundary (the busway verge) will not be affected by any clearance. This area will be enhanced to improve habitat connectivity across the Site linking it to other habitats and thus providing commuting routes for a range of wildlife, including bats.

4.12.4 The individual development LEMPs will include installation of bat boxes of different designs to provide new roosting opportunities, these will be positioned on retained trees and other structures. In addition, lighting will comply with guidance provided in the Bat Conservation Trust 'Bats and Lighting in the UK' (BCT 2009) (see chapter 10) with excessive light spill from artificial night lighting being kept to a minimum through appropriate design.

Water Vole

4.12.5 Whilst the survey of the water bodies indicated that water voles were currently absent from the Site, they are reportedly known to be present in the vicinity and habitat for them along the Cowley Road cycleway will be enhanced through opening up of the vegetation alongside the First Public Drain.

4.12.6 The provision of new open water will provide additional potential sites including Swale Street.

Other

4.12.7 In addition, the following measures will be implemented and detailed in each development CEMP:

- Strict controls on dust and other emissions from construction vehicles
- Implementation of pollution prevention measures & compliance with best practice
- Minimisation of light spill from night lighting.

4.13 Ecological Clerk of Works

- 4.13.1 An ECoW should be commissioned by the Contractor and be in place prior to construction starting. The ECoW will aid the Contractor in their compliance of the relevant legislative and ecological requirements through pre- works checks.
- 4.13.2 To this end, the ECoW shall be involved with the planning of all site operations where environmental mitigation measures are required and will advise the Contractor where these need to be in place prior to commencement of individual exploratory holes.
- 4.13.3 The ECoW will liaise with the project Ecologist with respect to the planning and executing of all mitigation measures for ecological and environmental issues. They will also provide independent reports to the project team with regards to legal compliance. The ECoW will submit reports to the Engineer to summarise the inspections undertaken, mitigation measures utilised and any other relevant information.
- 4.13.4 The ECoW is not responsible for Contractor's compliance with the LEMP or any other contractual conditions required by the Engineer; this responsibility lies with the Contractor. The ECoW will have responsibility to authorise any minor deviations if required.

4.14 Timetable

- 4.14.1 All measures detailed within this document will be undertaken in accordance with the project programme set out in the LEMP to ensure completion. Any ecological mitigation and or surveys will be undertaken according to current legislation and during the appropriate survey / mitigation season.

4.15 Aftercare and long-term maintenance

- 4.15.1 The LEMP should set out specific aftercare & long-term maintenance measures for habitats and this should be captured in the development specific LEMPs.
- 4.15.2 An ecological management plan will be produced to provide full details of the habitat management required to ensure that the aims of the mitigation strategy are met. This will tie into the site monitoring to ensure that management measures are responsive to how the habitats develop.

Maintenance of completed landscape works

- 4.15.3 All landscaping work shall be maintained by the Contractor during the period of the Contract for the Permanent Works including the Defects Correction Period and for a further additional Period of Maintenance of 5 years from commencement of the Defects Correction Period.
- 4.15.4 Maintenance shall be carried out at sufficiently frequent intervals to ensure the health and integrity of the landscaping work allowing for the normal seasonal variations in weather and growing conditions.
- 4.15.5 The minimum number of maintenance visits for landscaped embankments or cuttings shall be as follows:
- Wildflower areas will be cut twice per year. This will be done on a rotational basis, so only half of the resource is removed per cut. The cutting will be timed to ensure that flowering resource for invertebrates is retained through the summer. Cuts will be timed in April and September (but adjusted according to seasonal variations in weather conditions as required.)
 - 4 per year for specimen trees maintenance.

- Invasive species, such as dandelions, docks or creeping thistles, appearing in the grassed areas shall be removed by hand weeding or treated by spot spraying or weed wiping in accordance with the manufacturer's instructions before grass cutting is carried out.

4.15.6 The Employer's Representative requires a minimum seven days' notice of any proposed maintenance visit.

Grass Maintenance

4.15.7 During the execution of the Works and throughout the Defects Correction Period, all grassed and turfed amenity areas shall be kept watered, mown, or cut as necessary.

4.15.8 Before the initial cut, the grass shall be rolled lightly to firm in the roots and the surface cleared of any large stones, litter or debris.

4.15.9 Grass cutting of amenity areas shall be carried out as follows:

- Initial cut to 30-50 mm height when growth has reached 100 mm average height
- Cut to 30-50 mm height whenever growth reaches 150 mm in same growing season
- Cut to 30-50 mm in September or October at end of growing season

4.15.10 Grass on embankments shall be cut to 30-50 mm in September or October at the end of the growing season

4.15.11 Grass cutting machines shall have sharp blades to prevent newly established growth being torn out at the roots or otherwise damaged. All mowings and other arisings from amenity areas shall be removed from the Site.

4.15.2 Watering

- Planted areas shall be kept watered during dry periods by irrigating the ground to field capacity, using, preferably, a hose pipe fitted with a coarse rose.
- Watering with sprinklers during hot or sunny weather shall be carried out only in the early morning, late afternoon or evening.
- The water supply and any necessary tanks, bowsers, pumps etc. shall be provided by the Contractor. Water shall not be taken from watercourses or other body of water, unless an abstraction license has been obtained from the Environment Agency or Water Authority as applicable.
- Soil shall be firmed round plants affected by frost heave, strong winds or ground disturbance.

4.15.3 Tree & shrub maintenance

- Plants shall be pruned where necessary to remove any dead or damaged growth. Dead wood and timber derived through management should be retained and used to replenish habitat mounds
- Removal or suppression of weeds in planted areas shall be by hand weeding or by the application of an herbicide, to an area of 0.5 to 1.0 metre diameter around each plant, according to size and reapplication of mulch. Care shall be taken to avoid damage to trees and shrubs when applying herbicides.
- Pernicious or invasive species shall be removed by hand weeding.
- The condition of all stakes, ties and tree guards shall be checked and replaced or refitted as necessary. Ties shall be adjusted if required to prevent rubbing of the bark and any damaged areas of bark shall be treated with an approved fungicidal sealant.
- When redundant, tree stakes shall be removed and the post hole backfilled with topsoil.

- All losses of plants or grassed areas occurring up to the end of the Defects Correction Period as a result of defective materials or workmanship, theft, malicious or other damage, disease, or failure to thrive shall be replaced by the Contractor at his own expense.
- All details and circumstances of losses occurring from any cause up to the end of the Defects Correction Periods shall be reported to the Landscape Architect.
- Mulch shall be replaced after any replanting operations and maintained at the specified depth until the end of the additional Period of Maintenance.
- Edges adjacent to paved areas, kerbs, manholes, etc. shall be cut back to prevent encroachment of vegetation.
- All planted and landscaped areas shall be kept free at all times of refuse, wind-blown litter and other rubbish which, together with all prunings, cuttings and other arisings shall be removed from the Site.
- The Works shall be regularly inspected by the Contractor up to the end of the Defects Correction Period for any signs of pests, diseases or infections of the soil or vegetation and any such signs of diseases or infections shall be reported to the Landscape Architect for acceptance together with proposed methods of eradication.
- Records shall be kept of all maintenance visits including date, time, weather conditions, work carried out, operatives and Contractor's Equipment employed, hours worked and materials used. Any evidence of damage, vandalism, theft or trespass shall also be recorded.
- Copies of these records shall be passed to the Landscape Architect in duplicate within 2 weeks of each visit being completed and their receipt will be a condition precedent to the issue of the Maintenance Certificate at the end of the Defects Correction Period and payment for work carried out during the additional Period of Maintenance.
- Approximately one month before the end of the Maintenance Period, the Landscape Architect shall be advised by the Contractor of any outstanding work, and a joint inspection of the landscaping works shall be carried out by the Contractor and Landscape Architect.
- Should any part of the landscaped work not be in accordance with the Specification, maintenance of the landscaped works shall remain the responsibility of the Contractor until all defects are made good.
- Following handover of the landscaped works, any temporary fencing shall be removed.

Green and Brown Roofs

- Little maintenance is required due to the exposed, low nutrient with shallow substrate nature of the design.
- Root barriers will be used to slow the process of ecological succession.
- Two maintenance visits per year likely to be required by a suitably qualified contractor; during these visits drainage outlets to be inspected for blockages and any unwanted colonising plants or any vegetation will be removed.
- Irrigation not usually required, but roof to be thoroughly watered after installation

4.16 Monitoring and Remediation Measures

- 4.16.1 The following monitoring programme will be implemented following the completion of construction and habitat creation. These monitoring proposals tie in with the duration of the landscape management plan which covers a 5 year period and will then follow the BNG requirements up to the 30 year limit.

Table 1: Post construction monitoring

Year	Monitoring Surveys
1	Habitat survey – timed August/ September. (The key purpose of this visit will be to identify any unwanted species encroaching on the planting areas, with the data feeding into the landscape management to ensure that these are removed where required)
2	Reptile surveys focusing on site periphery. Reptile mats to be used and 5 checks of these undertaken in accordance with standard survey guidance. Invertebrate surveys – 2 visits. Bird and bat box checks
3	Habitat survey – timed between April and September, to compile a complete list of species present on the site. Reptile surveys focusing on site periphery. Reptile mats to be used and 5 checks of these undertaken in accordance with standard survey guidance. Invertebrate surveys – 2 visits. Bird and bat box checks

4.16.2 A monitoring survey report will be produced at the end years 2 and 5 following the detailed surveys, a copy of which will be provided to the local planning authority.

4.16.3 The results of the monitoring will be reviewed against the habitat creation objectives and the site management will be adjusted accordingly should be surveys identify a requirement to alter approaches. This review will be undertaken bi-annually in years 2 and 5 following the completion of the invertebrate surveys to ensure that management approaches are suitable to achieving the aims of this EDS. The scope of the further survey monitoring beyond 5 years will align with the BNG monitoring requirements and should be agreed and conditioned.

4.17 Waste Management

4.17.1 A site waste management plan will be produced for each development. For any woody material removed during the landscape maintenance this will be used to replenish the habitats piles on site.

Appendix 1

Figure 1: OMH Phasing Plan

