LAND OFF TEVERSHAM ROAD, FULBOURN

DOCUMENTS FOR DISCHARGE OF CONDITIONS 12 & 14
PLANNING PERMISSION S/02020/17/OL

LANDSCAPE AND BIODIVERSITY MANAGEMENT PLAN (Condition 12)

INCLUDING:
Scheme for Grassland Mitigation and Translocation (Condition 14)
Chalk Stream Habitat Restoration Plan (Condition 12)
Reptile Mitigation Strategy (Condition 12)
Biodiversity Offsetting Calculations (Condition 12)

REVISION A

For

Castlefield International Limited

March 2020

Landscape Institute
Registered practice

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1.0 Introduction and Terms of Reference

1.1 Planning Condition 12 & 14

Outline planning permission for residential development of up to 110 dwellings on Land at Teversham Road, Fulbourn, Cambridgeshire (Planning Application reference: S/0202/17/OL), henceforth referred to as the 'Site', was granted by South Cambridgeshire District Council, subject to conditions, on 26th October 2017.

This Management Plan aims to discharge Condition 12:

Planning Condition 12

Prior to the commencement of the development, a landscape and biodiversity management scheme shall be submitted to and approved in writing by the Local Planning Authority. The scheme shall include full details of the landscape and ecological management objectives for the site, including but not limited to, the following points:

i) An audit of proposed retained areas and an assessment of the existing site habitats to be retained, lost and created;

ii) The retention of areas of grassland supporting flora of local importance in situ;

iii) The management and protection measures for all retained habitats and species, including early marsh orchids, to prevent damage during construction.

iv) A habitat restoration scheme for the chalk stream.

v) The management of the surrounding tree belts and hedgerows, particularly with regard retaining dark flight corridors for bats.

vi) The management of ponds

vii) The management of grassland habitats

viii) The restoration and maintenance of the ornamental garden

ix) A reptile mitigation strategy

x) The preparation of a work schedule

xi) The frequency for the monitoring of habitats and notable species and means of reporting the findings to the LPA over a ten-year period.

xii) A timetable for the implementation of all of the landscape and biodiversity enhancement measures listed in the management scheme.

The scheme shall include full details of measures required to deliver the long-term maintenance of the all areas providing landscape and ecological management. The measures shall also address means of public access (including boardwalks). The landscape and biodiversity management plan shall be implemented in accordance with the agreed timetable, and thereafter maintained in accordance with the agreed details.

This Management Plan also includes a Scheme for Grassland Mitigation and Translocation in Appendix 1 for the discharge of Planning Condition 14. The specific wording of the condition is provided in Appendix 1.

1.2 Management Aims, Objectives and Limitations

The ecological value of the Site has been recognised from the commencement of design for the Reserved Matters and Discharge of Conditions applications and the retention, restoration and enhancement of existing or proposed habitats has been a key driver in the Development Plan and Landscaping Strategy. The Parameters Plan agreed at Outline Planning requires areas of green space to support amenity and recreational use for residents, as well as serve an aesthetic or screening function. These features have been designed to achieve the maximum ecological value where feasible within the constraints of their primary function.

The document provides a Management Plan for the Site based upon the submitted Landscaping Strategy produced by Chris Blandford Associates (CBA) and an ecological strategy produced by Landscape Science Consultancy Ltd (LSC). LSC and CBA have worked together to develop the overall scheme based upon the Management Concepts developed by Niras to support the Outline Application for the Site.

Key aims of the Management Plan are as follows:

- Secure retention of grassland swards or translocation and re-establishment of swards supporting key grassland species within the Site where this can be achieved with reference to the following constraints:
  - the Parameters Plan agreed at Outline Planning which delimits the residential development and hard landscaping from those areas of green space and ecological habitats;
  - the requirements for an economically viable and functional housing scheme;
  - the requirements for Drainage and Surface Water Runoff including Bioretention Basins;
  - the requirements for hard landscaping such as provision of Formal Play Areas and Informal Play Areas;
  - soft planting required for screening from offsite receptors such as the railway and industrial unit to the north.
- Secure the restoration/enhancement of the chalk stream that flows through the Site;
- Secure the retention and restoration of wooded habitats, hedgerows and tree lines where compatible with other ecological requirements, for example the requirement to secure enhancement of the chalk stream;
- Secure the ecological and amenity enhancement of the Pump House Gardens to combine amenity function for the new residents as well as existing residents of Fulbourn alongside ecological enhancements such as the restoration and management of the onsite pond;

- Secure the long-term viability of protected species populations which are resident on the Site or likely to use the Site as part of a wider habitat resource within the local landscaping, including common lizard, grass snake, bats and nesting birds;
- Secure the successful establishment of introduced new planting;
- Reduce ecological impacts identified from the Biodiversity Metric calculations within the Site where practicable with regards the agreed Parameters Plan which supported the Outline Application;
- Monitor developments, feedback to the LPA and allow flexibility to the management approach.

1.3 Management Timings

Due to the nature of Planning Condition 12 wording, this Management Plan covers the Construction Phase and Operational Phase of the residential scheme over a 25 year period from the commencement of ecological works, following receipt of Reserved Matters consent.

Currently, it is envisaged that key ecological works to facilitate construction will commence in the Autumn of 2020. Therefore, 2020 is henceforth referred to as Year 1, with subsequent calendar years being referred to as Years 2 to 25.

The duration of the Construction Phase of the residential scheme is currently envisaged to be 2.5 years – i.e. Years 1 to 3.

1.4 Management Responsibility and Monitoring

1.4.1 Site Ownership

The areas of the completed residential scheme and Site not within private ownership or adoptable by the Local Authority will remain within the ownership of the Applicant - Castlefield.

1.4.2 Construction Phase – Management Responsibility

It is envisaged that the implementation of ecological works prior to and during the Construction Phase will remain the responsibility of the appointed Principal Contractor.

The Project Ecologist, appointed by the Applicant or Principal Contractor, will direct and oversee the ecological works required to facilitate the Construction Phase.

Where referred to in this Management Plan, the 'Project Ecologist' includes the Ecology Team and the suitability qualified and licenced individuals who will undertake, direct and oversee the individual ecological work elements.

1.4.3 Operational Phase - Management Responsibility

Post-development, the Management Plan will be delivered by a Management Company appointed by the Applicant. The Management Company will be funded by a Maintenance Charge or equivalent, paid for by residents.

1.4.4 Monitoring

This Management Plan will be reviewed annually in the first five years (Years 1 to 5) to ensure that the management interventions and operations are relevant to the current nature of the works and to ensure that the long-term management aims and objectives can be achieved.

Following the monitoring review in Year 5 and a further monitoring review in Year 10, a Monitoring Report will be issued to the LPA identifying all findings with any necessary changes to management interventions and operations outlined. The Management Plan will be revised and re-issued to the Management Company, the Applicant and the LPA following each review period.

Further monitoring reviews will also be undertaken at Years 15, 20 & 25. The issue of a Monitoring Report during these periods is not required within Planning Condition 12 wording and will therefore be at the discretion of the LPA.

All monitoring reviews and reporting will be undertaken by the Project Ecologist as appointed by the Applicant and site owner, Castlefield.

Monitoring and review of management with regards to more sensitive habitats such as translocated grassland turves and retained grassland habitats (Appendix 1) will be annual during establishment and undertaken as deemed appropriate by the Project Ecologist, to allow for interventions or modifications if required to secure ongoing improvement in condition.

1.4.5 Triggers for Remedial Measures

During monitoring review periods, the Project Ecologist will, wherever possible, determine through professional judgement and liaison with the Management Company, where habitats or wildlife enhancements (i.e. bat and bird boxes) may need remedial works undertaking (i.e. replacement or reinstatement). The specific requirements of the remedial actions will be duly communicated to the Applicant and site owner, Castlefield, and a timetable for remedial works will be outlined and implemented. The LPA will be notified of any such remedial works which may be required.

1.5 Landscape Management and Maintenance Plan

A separate Landscape Management and Maintenance Plan (LMMP) has been produced by Land Management Services in support of this Management Plan.

The LMMP provides precise and technical prescriptions for the management of landscape and habitats in the post-development Operation Phase only, in accordance with the prescriptions outlined within this Management Plan.

The aim of the LMMP is a technical document which can be utilised by the Management Company to achieve the overriding landscape and ecological aims and objectives for the Development Plan.

For the sake of brevity, this Management Plan does not provide specific details on the establishment phase of new planting and 'created' landscaping, where such prescriptions are not underlined by key overarching ecological requirements. It should be assumed that a key aim of this Management Plan will be to ensure the successful establishment of introduced new planting, the detailed prescriptions of which are provided the submitted LMMP.

In addition, this Management Plan does not provide specific details on management prescriptions for landscaped habitats which require an overarching amenity function, such as lawns and ornamental shrubs – this detail is provided in the submitted LMMP.

1.6 Layout of Management Plan

This Management Plan provides an overall Site Description and Ecological Baseline in Section 2.0 with a Summary of Impacts and Mitigation outlined in Section 3.0.

To protect and enhance the identified ecological receptors within the Site, Section 4.0 provides Management Interventions during the Construction Phase and Section 5.0 describes Management Operations during the Operational Phase. Section 6.0 details the Management Schedules for the Operational Phase.

Due to the various ecological protection and enhancement measures required to discharge Planning Conditions 12 & 14, separate documents have been appended for mitigation and enhancement elements which require specific and detailed focus. These appended documents are:

- Scheme of Grassland Mitigation and Translocation for Condition 14 (Appendix 1);
- Chalk Stream Habitat Restoration Plan for Condition 12 (Appendix 2);
- Reptile Mitigation Strategy for Condition 12 (Appendix 3);
- A summary of Biodiversity Offsetting Calculations for Condition 12, together with a Position Statement on Biodiversity Impacts (Appendix 4).

The above documents, including the Landscape and Biodiversity Management Plan, are supported by Figures 01 to 11.

For the sake of brevity, the precise detail of the appended ecology documents is not replicated within the Management Plan text; therefore, all documents must be read and appropriately cross-referenced.

2.0 Site Description

2.1 Site Location

The Site extends over approximately 6.85ha and lies towards the northern curtilage of the village of Fulbourn, Cambridgeshire off Teversham Road. An active railway line stands immediately to the north with arable and pasture fields with hedgerow boundaries beyond. To the east, west and south there are residential and commercial properties with gardens and scattered trees.

2.2 Overview of Existing Site Habitats

The Site is dominated by two semi-improved neutral grassland fields, bounded by mature hedgerows with mature/semi-mature trees standing therein, and small blocks of woodland. A chalk stream, that arises from a spring immediately to the south of the Site, along with associated riparian trees and scrub, flows to the north, separating the two fields. The south western section of the Site comprises unmanaged former ornamental gardens, hereafter referred to as the 'Pump House Gardens'.

Site habitats are illustrated in Figure 03 and discussed in greater detail in Section 2.3 below.

2.3 Evaluation of Existing Habitats

2.3.1 Semi-Improved Neutral Grassland

The majority of the Site comprises semi-improved neutral grassland in the 'eastern' and 'western' fields. The retention of this habitat onsite has been maximised wherever possible within the constraints arising from the alternative land use requirements under the approved Parameters Plan (see Section 1.2).

Description

With reference to the Farm Environment Plan (FEP) Condition Assessment criteria (Natural England, 2010), the current condition and character of the grassland is poor – the sward is rank, mesotrophic grassland with affinity to the MG1 NVC classification, with horsetail dominant within large parts of the southern portion of the Site (see further comments on Condition in this section). The presence of adder's tongue fern throughout the sward, however, suggests that this Site represents a historic hay meadow which has developed its current character through lack of management. Ant hills occur through the sward.

Ecological Value

The sward contains several 'Strong Indicators' of neutral grassland from

Appendix 3a of the Cambridgeshire and Peterborough County Wildlife Sites Selection Guidelines. These are detailed below, along with their frequency within the sward in parenthesis. This follows the standard DAFOR method of quantifying abundance and does not relate to the relative conservation status of the species:

- Adder's tongue fern (Frequent);
- Glaucous sedge (Frequent);
- Common spotted orchid (Occasional);
- Early marsh orchid (Occasional);
- Common twayblade (Rare),
- Yellow rattle (Occasional);
- Rough hawkbit (Occasional);
- Wild basil (Occasional);
- Glaucous sedge (Frequent);
- Ploughman's spikenard (Rare);
- Pyramidal orchid (Rare).

The Site, therefore, has sufficient species which are strong indicators of calcareous and neutral grassland to qualify for LWS consideration under 2c for Grasslands of either type; however only two neutral indicators and one calcareous indicator was recorded as 'frequent' whereas three and six are required to be frequent for neutral and calcareous grassland respectively. This is likely to reflect the poor condition of the Site through cessation of traditional management.

A further route to qualification under LWS criteria is the presence of frequent numbers of more than 50 grassland species. A 2016 Wildlife Trust survey identified 46 grassland species and subsequent surveys have identified more than four further species which will allow the sward to qualify in terms of species diversity; however, the frequency of these species throughout the sward will not meet the 'frequency' criteria (Wildlife Trust, 2016).

Condition

Self-set saplings and young trees including eared willow, butterfly bush, buckthorn, and ash between 4-6m, are present throughout the sward representing ongoing succession – in the absence of management this stand is likely to develop into a dense scrub habitat within the short-medium term.

Much of the sward is now false oat grass dominated, with a dense thatch developing, which is likely to increase this dominance in time. The peripheries of the fields are frequently represented by ruderal vegetation such as common nettle, great willowherb, creeping thistle and bramble invading from the

boundaries. In some locations, mono-stands of rosebay willowherb occur. This ruderal character is also found in a linear route across the eastern field from the eastern boundary and culminating in an area of disturbance which has been colonised by a reed canary grass monoculture – the cause of this is unknown but indicates services or utility works.

Much of the western field has locally-dominant field horsetail which is likely to have resulted in the suppression of other species – this trend is likely to continue in the absence of management intervention. In contrast to condition descriptions provided by MKA between 2012 to 2014 (MKA, 2015a), this species is also establishing a local dominance in the south-western sward in the eastern field as well.

The current condition of the sward is likely to represent the historic decline following cessation of management, but the species composition indicates that the sward from which the current grasslands derive will have originally qualified under the LWS criteria. Evidence recorded since the initial surveys in 2012 to 2014 by MKA indicate that this progress of decline is ongoing.

2.3.2 Hedgerows and Tree Lines

Description

Hedgerows form the Site boundaries to the north, south and west. The course of the chalk stream also appears to have remnant hedgerow characteristics on the eastern side, although this has lost its character and now represents linear dense scrub habitat.

The southern boundary of the eastern field is frequently fenced along the rear gardens of the residential properties, with ornamental hedgerows present in places.

The eastern boundary forms a coherent hedgerow to the north including hawthorn with ash, cherry, elm and hawthorn. To the south, this becomes an unmanaged collection of shrubs and trees rather than a cohesive hedgerow feature.

The northern boundary of the eastern field comprises a mature hedgerow adjacent to the railway which links to an onsite copse at the western end and an offsite copse at the eastern end. The hedge is dominated by suckering blackthorn, hawthorn, elm and dense bramble mounds. It contains seven trees of three species ranging from semi-mature to early mature ash, sycamore and walnut.

The northern boundary of the western field is marked by the onsite woodland and further offsite tree cover associated with the industrial area to the north including ash, sycamore and butterfly bush.

The vegetation bounding the chalk stream, which runs between the eastern and

western fields, includes hawthorn shrubs (some of which on the eastern side are coppiced and mature to 7m tall) along with wild privet, elder and buckthorn. Individual semi-mature/mature trees present including ash, hybrid poplar. The eastern side is generally more established and dense than the specimens on the west, where there is frequently no cohesive woody vegetation and bramble mounds dominate along with self-set shrubs/saplings.

The boundary along the south of the Pump House Gardens is a dense tree line including sycamore, ash and horse chestnut with abundant ivy growing through.

A dense treeline runs along the southern boundary of the western field comprising Austrian pine, sycamore and ash.

Boundaries to the west tend to be fencing panels around the curtilage of adjacent properties.

Condition

The hedgerows throughout the Site are unmanaged and are in moderate condition which is likely to deteriorate over time. The lack of management of suckering woody specimens will contribute to the encroachment of the grassland by scrub over time.

The tree lines are undermanaged – this has led to the development of an understorey of species such as elder and sycamore which have poor shape and structure but function to block light beneath the tree lines and contribute to the low ecological value of the understorey.

2.3.3 Woodland

Description

A small area of semi-natural broad-leaved woodland is present along the northern boundary of the Site. The plant community here comprises abundant ash and common hawthorn with occasional birch, bearberry, white poplar, dogwood and elder.

The ground layer is dominated by rank ruderals such as ivy and common nettle; adder's tongue fern also occurs widely in the ground flora.

Condition

The woodland stand is dense and unmanaged with little light penetration. In time, it is likely that the sward beneath the trees will become depleted of vegetation with a reduction in diversity. It is also likely that the adder's tongue fern will be lost from the ground layer.

The ecotone between the woodland and the adjacent grassland provides a

degree of ecological value, although this is limited by the density of bramble and other scrub cover.

There is little in the way of mature deadwood in the ground layer, reflecting the age and character of the woodland.

2.3.4 Chalk Stream

Description

This chalk stream drains northwards through the centre of the Site linking through the network of off-site linear field drainage ditches to Caudle Ditch which in turn drains towards Teversham Fen. The stream is flanked by trees and shrubs which are likely to represent remnants of historic unmanaged hedgerows. Some mature hawthorn shrubs are present, especially along the eastern boundary, whilst much of the western boundary is represented by younger specimens and bramble scrub. A mature willow is present to the southern end of the Site alongside other trees. The channel is silted with little in the way of other substrate, although the underlying chalk bedrock can be seen in places.

This stream also runs along the southern boundary of the western field where it is heavily shaded by the trees associated with the Pump House Garden, as well as dense shrubs and self-sets on both sides of the bank including sycamore, elder and hawthorn.

Condition

The chalk stream has become significantly over-shaded by tree and shrub growth, which limits light penetration and restricts the development of stream vegetation – no aquatics or marginals have been recorded although full access to the stream bed is limited.

The stream is also canalised historically (this course is evident in OS maps from over 100 years ago) which represents a typical modification in arable land but the formalised structure restricts many of the ecologically valuable features found in a more naturalised water course.

2.3.5 Pump House Gardens

Description

The 'Pump House Gardens' are predominantly a formal area of close-planted broadleaf and coniferous trees around an ornamental pond. The planting includes a number of conifer trees including leyland cypress, yew and Scot's pine as well as sycamore and holly. A mature lime avenue occurs to the south of this area. Other ornamental species such as cherry laurel also occur within the stand. Areas of more recent planting occur to the south including laburnum and cherry.

The ground layer beneath the dense tree cover is generally bare ground, especially beneath dense canopy species such as yew, with typical species such as ivy and variegated archangel represented. In other areas there is a species-poor grassland sward often dominated by wood false brome – ant hills can also be found in the ground layer.

There is an ornamental pond within the Pump House Gardens which has a continuous stone edging which is damaged in places, especially where trees such as yew have established. The water level is lower than designed with little clear water and dense suspended sediment beneath floating aquatic duckweed. Iris is present as an occasional aquatic marginal. Around the edge of the pond is dense scrub including honeysuckle, bramble and hazel; yew dominates to the west which provides dense shading.

Condition

The Pump House Gardens are currently over-shaded with non-native conifer species representing a constraint to the ground flora both through shading and substrate/soil modification through needle drop. In places, this has resulted in the absence of a ground layer.

The grass sward is species-poor through the effects of shading and lack of management. The character of the tree stock indicates that it is planted and secondary in nature and derived from open grassland habitat in the past, such that the sward beneath the trees represents a diminished meadow sward rather than a remnant woodland sward. In places there are remnant ornamental species present, including variegated archangel (Listed on Schedule 9 of the Wildlife and Countryside Act which makes it an offence 'to plant or otherwise cause to grow these species in the wild').

The ornamental pond is in poor condition with very low water, high levels of suspended sediment and assumed high levels of silt. The abundance of duckweed is also likely to be a constraint to the development of aquatic vegetation. Over-shading of the pond will also reduce its ability to support a diverse ecological habitat.

2.3.6 Ditches

Two wet ditches are present within and on the Site boundaries.

Ditch D1 - Description

A section of ditch to the east of Teversham Road forms part of the western Site boundary. The width of the ditch (measured at the base) varies between 3-4m to the south to 2m to the north, beyond an existing culvert.

Ruderal vegetation dominates on the banks including cow parsley, common nettle, broad-leaf dock, cleavers, bramble and rosebay willowherb. Where

heavily shaded by adjacent trees, ivy for a locally dominant ground layer.

The ditch has a chalky sediment. Vegetation within the channel includes fool's water cress, water cress, starwort, lesser duck weed and water figwort.

Ditch D1 - Condition

The bank side vegetation is limited to rank, ruderal species with low diversity. To the south, the ditch is heavily shaded by adjacent trees further reducing to an ivy dominated ground layer. Vegetation within the channel also lacks diversity as a result of shading by adjacent trees and bank vegetation.

Ditch D2 Pump House Gardens - Description

An unmanaged ditch forms the boundary between the western field and the Pump House Gardens. The water within the ditch is screened from view for much of its length by surrounding vegetation. Where visible, the water was <10cm deep and 30cm wide with a silt substrate. No flow was apparent at the time the ditch was inspected. Any flow that does occur will be to the east where the ditch joins the chalk stream.

Ditch D2 - Condition

The ditch receives little light due to the overhanging scrub and consequently bank vegetation is sparse and aquatic vegetation is absent.

2.4 Protected/Notable Species

2.4.1 Great Crested Newts (GCN)

Surveys of two ponds on and adjacent to the Site were undertaken by MKA Ecology in 2015. No GCN were recorded at either pond during these surveys (MKA, 2015b).

Updated eDNA surveys were undertaken on both waterbodies in 2019 by LSC. Although the surveys were undertaken after the optimal timeframe, they were undertaken at a time of year when GCN efts will still be in the ponds and eDNA should still be detectable. These results, though outside of the Natural England accepted timeframe, are considered to provide sufficient confidence of GCN absence taking into account the following considerations in combination:

- the negative eDNA result from samples taken on 17th July 2019;
- the historic absence of GCN confirmed by surveys undertaken to Best Practise in 2015;
- the ongoing poor quality of the aquatic habitats for GCN;
- the lack of additional ponds in the local environs to act as a source for colonisation by GCN between 2015 and 2019.

In consideration of the identified absence of a breeding GCN population within 250-500m of the Site, it is determined highly unlikely that the Site represents terrestrial habitat for GCN.

GCN are not therefore considered in any further detail in this Management Plan.

2.4.2 Reptiles

Reptile surveys within the Site were conducted in 2014 by MKA. Low populations of common lizard and grass snake were recorded, with a maximum of 3x individual common lizard and 1x individual grass snake identified in any one survey visit (MKA, 2014a).

Surveys undertaken by LSC Ltd in September 2019 confirmed the continued presence of a low population of common lizard (maximum 3x individuals). Grass snake were not recorded during the 2019 surveys. The results of the 2019 surveys are provided in Figure 08.

Habitats within the Site, including tall grassland, scrub, hedgerows and woodland remain suitable to support populations of common reptiles.

2.4.3 Bats

There are no buildings within the Site. Surveys by MKA in 2014 identified potential roosting habitat for bats in just two trees; subsequent nocturnal bat surveys undertaken in the same year identified no evidence of use. No impacts to trees identified as supporting Potential Roosting Features (PRF's) were identified at this time.

Woodland, trees, hedgerows, a pond and grassland within the Site continue to provide suitable habitat for foraging and commuting bats.

2.4.4 Badgers

A badger survey of the Site was carried out in November 2018. No badger setts or latrines were recorded and only one sign of badger presence (a snuffle hole with a badger hair within) was identified (Niras, 2018a). Limitations to this survey were noted due to the density of vegetation on the northern and western boundaries. Walkover surveys undertaken in summer 2019 by LSC did not identify any evidence of badgers accessing the Site, although inspection in some locations was also constrained by the density of scrub vegetation.

Grassland, woodland and scrub within the Site are suitable for foraging badger. Hedgerows, scrub and woodland provide suitable habitat for sett creation.

2.4.5 Otter and Water Vole

Surveys for otter and water vole were conducted by MKA in 2014. No otter or

water vole or any field signs thereof were recorded (MKA 2014b). Walkover surveys undertaken in summer 2019 by LSC Ltd did not identify any evidence of otter or watervole accessing the Site, although inspection in some locations was constrained by the density of scrub vegetation.

The Site is not considered to provide suitable habitat for otters as the chalk stream, ditch and pond will not provide suitable hunting resource, and no larger waterbodies are present in close proximity such that otters could use Site habitats as a holt.

The banks of the onsite waterbodies are not considered to represent suitable habitat for water vole being largely over-shaded by trees/scrub and supporting little growth of grasses and emergent vegetation for food plants. Consequently, the banks do not provide adequate foraging resources for this species.

The use of onsite aquatic habitats by otter and water vole is therefore likely to be restricted to transient use for dispersal only.

Water vole and otter are not therefore considered in any further detail in this Management Plan.

2.4.6 White-Clawed Crayfish

No surveys have been conducted for white-clawed crayfish (WCC) within the Site. The publicly on-line data records provide no records for the species within 5km of the Site.

The section of chalk stream falling within the Site is considered sub-optimal for WCC, as the silted channel lacks significant refugia. The chalk stream within the Site is isolated, being close to the source spring and with the immediate downstream section entering a network of field drains that are likely to provide only sub-optimal habitat similar to that within the Site.

Consequently, it is considered highly unlikely that WCC are currently present within, or adjacent to, the Site.

WCC are not therefore considered in any further detail in this Management Plan.

2.4.7 Nesting Birds

Five nesting bird surveys were carried out within the site in 2014 by MKA. The results of the surveys were reported by MKA (MKA, 2014c) and subsequently by NIRAS (NIRAS, 2017b). However, the results of the surveys as provided in these two reports are inconsistent, resulting from alternative interpretation of the 2014 survey data and changes to the conservation status of some species recorded.

The MKA report (MKA, 2014c) listed thirty-four bird species recorded on-site

(including twelve species of conservation concern) of which nineteen were considered to be breeding (five species of conservation concern, including corn bunting).

In their 2017 report, NIRAS considered that thirty-two species were recorded using the Site (with three unspecified species being noted as having been recorded only flying over the Site), with eight species being of conservation concern (green woodpecker, swallow and whitethroat were transferred from the BoCC Amber List to the Green List between 2014 and 2017. Turtle dove were presumably re-assessed as having been flying over the Site only (NIRAS, 2017b).

NIRAS also re-evaluated the number of breeding territories of the nineteen species reported as breeding on site by MKA. All of the breeding territory counts were reduced, with collard dove, jackdaw, lesser whitethroat, whitethroat, starling and corn bunting no longer considered to have been breeding on-site. Consequently, NIRAS considered only two species of conservation concern to have been breeding on-site at the time of the surveys (song thrush and dunnock). Of those species no longer considered to have been breeding on-site, whitethroat was no longer listed as being of conservation concern and starling were considered to be breeding off-site. Corn bunting was noted in the NIRAS report as having only been recorded singing within the eastern field on one occasion. As no further sightings of corn bunting were made during four other survey occasions, the species were considered not to have been breeding on site.

As corn bunting are not considered to have been breeding within the Site based upon the 2017 survey data, no mitigation has been provided within this Management Plan to specifically address loss of breeding habitat for the species.

2.4.8 Other Species

The habitats within the Site are suitable to support a range of other species including invertebrates, amphibians and mammals. NERC Act Species of Principal Importance that may be present include common toad, hedgehog and brown hare.

3.0 Impacts and Proposed Mitigation/Enhancement

The submitted Development Plan has been assessed to determine the likely extent and nature of impacts to habitats and species within the Site as a result of development.

Figure 02 illustrates the distribution of removed, retained and created habitats within the Development Plan (for the sake of illustrative clarity and simplicity, individual habitat types have not been identified).

The three categories are defined as:

- Removed – existing habitats to be permanently removed and replaced with buildings, private lawns and hardstanding *only*;
- Retained – existing habitats to be retained in-situ with or without enhancement;
- Created – existing habitats to be removed with new habitats created in-situ.

The key habitats impacted by the Development Plan will be the existing semi-improved neutral grassland resource. Impacts to other existing habitat types (i.e. woodland, trees and scrub) will be minimal in the context of the whole Site and in most cases, these habitats will be retained and enhanced, as well as created. For these reasons and the for the sake of brevity, a quantified audit of habitats impacts is not provided for any other habitats apart from the existing semi-improved neutral grassland resource.

3.1 Habitats

3.1.1 Semi-Improved Neutral Grassland

Impact Assessment

Removed, Retained and Created Grasslands

A quantified audit of impacts to the existing grassland resource is provided below. The existing semi-improved neutral grassland resource within the Site is 4.72ha.

- Removed - existing grassland to be permanently removed and replaced with buildings, private lawns and hardstanding *only* - 3.02ha;
- Retained – grassland to be retained in-situ with or without enhancement; also including translocation of higher value grassland turves - 0.66ha;

  Note: Translocation is categorised as 'Retention' as the existing habitat will be enhanced, rather than fully removed and 'Created'.
- Created 'Wildflower Grassland' - existing grassland to be fully removed with new grassland created of a similar or higher quality i.e. wildflower

meadow strips and Bioretention Basins - 0.62ha;

- Created 'Amenity Grassland' - existing grassland to be fully removed with new grassland created of a lower quality i.e. amenity grassland and open space lawns - 0.16ha;
- Created 'Other Habitats' - existing grassland to be fully removed or partly removed with new and *different* habitats created of a similar or higher quality i.e. native scrub planting - 0.26ha.

Additional Construction and Operation Phase Impacts in the Absence of Mitigation

Potential impacts to retained and translocated swards could occur at the Construction Phase through incursion of contractors and plant; spillages and pollution effects as well as airborne dust impacts; and excessive damage to the sward in those areas where interventions for amenity function (eg. tree planting) or habitat protection (eg. boardwalk installation) are proposed.

Potential impacts during the Operational Phase will occur through inappropriate public access; inappropriate management of the stands; as well as litter and other urban effects.

Summary of Mitigation and Management Measures

Details for the translocation of turves are provided in the Scheme of Grassland Mitigation and Translocation Condition 14 (Appendix 1) – this detail is not repeated here, for the sake of brevity. Once translocation has been completed, translocated turves will be subject to protection and management to maintain condition.

A summary of key mitigation measures outlined within this Management Plan are:

- Measures to secure the protection of retained and translocated swards during the Construction Phase;
- Management of retained and translocated swards in the long term to maintain and improve condition;
- Management of new grassland swards in the long term to maintain and improve condition.

3.1.2 Hedgerows

Impact Assessment

Mitigation by Design

Existing hedgerows will be retained and enhanced within the submitted Development Plan. Measures to infill plant and strengthen hedgerows are integrated into the submitted Landscaping Strategy.

Hedgerow removal will be limited to the removal of lower quality woody specimens along the chalk stream, as full retention of these features is incompatible with chalk stream restoration and enhancement. Removal of trees and shrubs in these areas will be driven by ecological rather than development factors (Appendix 2).

Impacts in the Absence of Mitigation

Impacts to retained hedgerows could arise during the Construction Phase through incursion and physical damage by contractors and plant; as well as compaction of Root Protection Zones.

Impacts to retained hedgerows during the Operational Phase could occur through litter and other urban effects; or inappropriate management.

Summary of Mitigation and Management Measures

Measures for the protection of retained hedgerows are provided in the separate LSC Arboricultural Method Statement (AMS) - Condition 7. These details are not repeated here, for the sake of brevity.

A summary of key mitigation measures outlined within this Management Plan are:

- Gapping up of hedgerows to create stronger linear features along Site boundaries;
- Thinning and management of the retained trees and shrubs around the chalk stream corridor to improve the ecological value of retained woody vegetation;
- New shrub planting along the Site boundaries and the Pump House Gardens, as well as within amenity areas of the Site to provide screening, aesthetic and ecological value;
- Long-term management of hedgerows to maintain and enhance condition.

3.1.3 Trees and Scrub

Impact Assessment

Mitigation by Design

Approximately 30x trees ranging from young to mature in age are proposed for removal in the western extremity of the Site to form the main entrance off Teversham Road. Additional removals will include areas of young scattered scrub and self-set trees, as well as x3 cut-throughs within the central hedgerow. In addition, a single semi-mature ash tree will require removal along the eastern boundary of the Site to allow for a new vehicular access. The proposed tree and shrub removal in the context of the Site-wide resource is determined to be minimal. New tree planting is proposed across the completed development site as detailed within the submitted Landscaping Strategy.

Additional tree removal within the Development Plan is not considered to represent an ecological impact as those specimens to be removed are generally of lower ecological value and the relative quantum of retention is high with new planting proposed to offset minor removals. Full details of tree removal are provided in the AMS - Condition 7. These details are not, therefore, repeated here, for the sake of brevity.

Impacts in the Absence of Mitigation

Impacts to retained trees could arise during the Construction Phase through incursion and physical damage by contractors and plant and the compaction of Root Protection Zones.

Mitigation and Management Measures

Protection measures relating to retained trees are provided in the AMS - Condition 7. These details are not repeated here, for the sake of brevity.

Key mitigation measures outlined within this Management Plan are:

- New tree planting along Site boundaries and the Pump House Gardens, as well as within amenity areas of the Site to provide screening, aesthetic and ecological value;
- Establishment and long-term management of new tree planting to maintain and enhance condition.

3.1.4 Woodland

Impact Assessment

Mitigation by Design

The woodland habitat to the north of the Site (the 'northern woodland') will be retained and enhanced within the Development Plan and is not proposed for public access or use; all impacts and modifications are therefore driven by ecological enhancement requirements rather than development.

Impacts in the Absence of Mitigation

Impacts to the northern woodland could arise during the Construction Phase through incursion and physical damage by contractors and plant; and compaction of Root Protection Zones.

During the Operational Phase, impacts to the northern woodland could occur through public access and urban effects; or inappropriate lighting of the woodland edge.

Summary of Key Mitigation and Management Measures

Protection of retained trees, including those within the northern woodland, are provided in the AMS - Condition 7. These details are not repeated here, for the sake of brevity.

A summary of key mitigation measures outlined within this Management Plan are:

- The long-term enhancement of the northern woodland through measures such as coppicing and the creation of brash piles to enhance woodland structures and species diversity, both floral and faunal (brash piles will strictly not contain grass arisings);
- Measures to reduce disturbance, specifically public access and artificial lighting spill.

3.1.5 Chalk Stream

Impact Assessment

Mitigation by Design

The chalk stream will be retained, restored and enhanced within the submitted Development Plan and development-related impacts are restricted to the installation of two bridges – a road bridge and a footbridge – to facilitate vehicular and pedestrian access between the two sides of the residential

scheme. All further impacts and modifications are therefore driven by ecological enhancement requirements rather than development.

Impacts in the Absence of Mitigation

During the Construction Phase, there is the potential for negative impacts to the chalk stream if appropriate working practises are not employed. This could occur through damage to the banks and associated vegetation; inappropriate access or incursion into the watercourse; pollution and contamination through chemical spills, runoff or airborne dust effects.

Where drainage may impact directly or indirectly upon onsite watercourses such as the chalk stream or ditches, appropriate measures to prevent pollution events arising have been incorporated into the Surface Water Management Plan submitted by Cannon.

Summary of Mitigation and Management Measures

A Habitat Restoration Plan for the Chalk Stream is provided in Appendix 2. A summary of key mitigation measures included comprises:

- Selective removal of scrub to allow light to reach the water and facilitate the enhancement of the watercourse structure;
- Retention of selected trees and shrubs with a focus on more established, mature or ecologically valuable specimens;
- Widening the stream channel and modification of the banks to create a more naturalised channel and create conditions which will encourage the stream to develop naturalistic features such as meanders, variations in depth and substrate types;
- Selective removal of silt only if required;
- Planting of aquatic flora to introduce ecological functionality and a plant community typical of the habitat;
- Protection of surrounding retained habitat during chalk stream re-modelling works – specifically the meadow in the western field.

3.1.6 Pump House Gardens

Impacts Assessment

Mitigation by Design

The Pump House Gardens will be retained and enhanced within the submitted Development Plan. Modifications are therefore driven by ecological enhancement requirements rather than development.

Impacts in the Absence of Mitigation

Impacts to the Pump House Gardens could arise during the Construction Phase through incursion and physical damage by contractors and plant. Potential impacts include compaction of Root Protection Zones and excessive damage to the sward in those areas where interventions for amenity function (eg. tree planting) or habitat protection (e.g. boardwalk installation) are proposed.

Potential impacts during the Operational Phase include inappropriate management of trees and shrubs; as well as litter and other urban effects.

Summary of Mitigation and Management Measures

Protection of retained trees and shrubs are provided in the AMS - Condition 7 These details are not repeated here, for the sake of brevity.

A summary of key mitigation measures outlined within this Management Plan are:

- Removal of variegated archangel by manual digging out of the root system;
- New tree and shrub planting to provide screening, aesthetic and ecological value;
- Enhancement of restored habitats for the benefit of reptiles (with particular regard to grass snake) will include provision of brash piles resulting from felling/pruning activity on-site (brash piles will strictly not contain grass arisings);
- Long-term management of Pump House Garden habitats to maintain and enhance condition.

3.1.7 Pump House Garden Pond

Impact Assessment

Mitigation by Design

The Pump House Garden pond will be retained and enhanced within the submitted Development Plan. Modifications are therefore driven by ecological enhancement requirements rather than development.

Impacts in the Absence of Mitigation

During the Construction Phase there is potential for pollution and contamination to enter the pond through chemical spills, runoff or airborne dust effects.

During the Operational Phase the pond will receive runoff from the spine road in the western part of the Site. Consequently, there is potential for

pollution/contamination to enter the pond through this route. Where drainage may impact directly or indirectly upon onsite watercourses such as the chalk stream or ditches, appropriate measures to prevent pollution events arising have been incorporated into the Surface Water Management Plan submitted by Cannon.

Potential indirect impacts during the Operational Phase will include litter and other urban effects.

Summary of Mitigation and Management Measures

A summary of key mitigation measures outlined within this Management Plan are:

- The removal of silt and re-profiling of the base of the pond, as required;
- The pond structure to be assessed, and any repair work will be completed, as required;
- Re-planting of the pond using an appropriate mix of native submerged and marginal species;
- Long-term management of the pond to maintain and enhance condition.

3.1.8 Ditches

Impact Assessment

Mitigation by Design

Both wet ditches (D1 & D2) are to be retained and enhanced within the submitted Development Plan.

Impacts in the Absence of Mitigation

During the Construction Phase, there is the potential for negative impacts to the ditches if appropriate working practises are not employed. This could occur through damage to the banks and associated vegetation; inappropriate access or incursion into the watercourse; pollution and contamination through chemical spills, runoff or airborne dust effects.

Where drainage may impact directly or indirectly upon onsite watercourses such as the chalk stream or ditches, appropriate measures to prevent pollution events arising have been incorporated into the Surface Water Management Plan submitted by Cannon.

Potential indirect impacts during the Operational Phase will include litter and other urban effects.

Mitigation and Management Measures

No mitigation is proposed in respect of Ditch D1, which is unlikely to be impacted as a result of development provided the pollution prevention measures detailed within the Surface Water Management Strategy, as submitted by Cannon, are adhered to.

Mitigation in respect of Ditch D2 will include silt removal in order to deepen the ditch, selective scrub removal to improve light penetration and supplementary planting if considered appropriate by the Project Ecologist.

3.2 Species

3.2.1 Reptiles

Impacts in the Absence of Mitigation

The Site supports small populations of common lizard – see Figure 08. Grass snake has also been historically recorded within the Site.

Potential impacts during the Construction Phase will include the killing and injuring of individual reptiles; the destruction of reptile habitat; and the potential for these two impacts to result in the loss of the reptile population in the Site and/or the local environs.

During the Operation Phase, there is the potential for the new and retained habitats to fail to provide suitable resources to support these populations unless their management is secured.

Mitigation and Management Measures

Mitigation and enhancement measures are provided in the Reptile Mitigation Strategy in Appendix 3. The detail is not repeated here, for the sake of brevity. A summary of key mitigation measures will comprise:

- The translocation of the reptile population from construction footprints to an on-site protected Receptor Site in accordance the Best Standard Practice;
- Enhancement measures to provide additional foraging and shelter resources for reptiles within the Site.

3.2.2 Bats

Impact Assessment

Mitigation by Design

The submitted Development Plan will secure the retention of the majority of tree and shrub habitats – therefore the impacts on the long-term availability of commuting and forging habitats are likely to be minimal.

Impacts in the Absence of Mitigation

It is identified at present, that no potential bat roosting habitat within trees will be removed. However, future tree removal during the Construction and Operational Phases for the purposes of habitat enhancement or Site management may have the potential to remove bat roosting features.

During the Operational Phase, lighting associated with the Development Plan has the potential to negatively impact commuting bats through light spillage on to formerly dark commuting corridors, specifically boundary hedgerows, tree lines and woodland.

Summary Mitigation and Management Measures

A summary of key mitigation measures outlined within this Management Plan are:

- The development of a sympathetic lighting scheme and the retention of dark corridors along Site boundaries, to maintain existing bat foraging and commuting resources;
- The pre-inspection of trees to be felled by a Licensed Bat Worker, where and as appropriate;
- Habitat enhancements proposed across the Site, especially aquatic habitats such as the Pump House Garden pond, chalk stream and bioretention basins, will increase the range of invertebrate prey available for foraging bats;
- The installation of a range of high-quality artificial bat roosting boxes on retained trees as well as houses.

3.2.3 Badgers

Impact Assessment in the Absence of Mitigation

No badger setts were identified and only one field sign indicating the presence of badgers was found during in a 2018 (Niras, 2018). No evidence of badgers was observed during site visits conducted by LSC in 2019. As such, no impacts to badgers are anticipated as a result of the development. However, it is

recognised that badgers are a widespread and mobile species that may rapidly colonise areas not previously occupied. There is, therefore, the potential for badger setts to be impacted by development at a future date.

Mitigation and Management Measures

Pre-Commencement Surveys

Measures to determine the status of the Site with regards to badgers and potential resultant impacts will be provided through the undertaking of pre-commencement badger surveys by the Project Ecologist. This is a pre-commencement requirement under Condition 13 of the Outline Planning Permission.

If evidence of badgers is identified during the pre-commencement surveys, or their presence suspected, appropriate mitigation measures will form part of the Condition 13 Discharge of Condition document submitted to the LPA. The pre-commencement surveys will be undertaken approximately three months prior to start of construction to allow for a derogation licence to be applied for and issued by Natural England, in the event that badger setts are identified within the Site.

Habitat Enhancements

The retained boundary features, woodland and grassland will provide permanent potential foraging habitat and commuting routes for badgers.

3.2.4 Nesting Birds

Impact Assessment

Mitigation by Design

The submitted Development Plan will secure the retention of the majority of tree and shrub habitats; therefore the impacts on the long-term availability of nesting habitats are likely to be minimal.

Impacts in the Absence of Mitigation

Potential impacts to breeding birds could occur during the Construction Phase through the removal of individual nesting sites; the disturbance or damage of birds or their nests and eggs; or the killing and injuring of nesting birds.

During the Operation Phase, the nature of the development is likely to increase the presence of cats which will result in an increase in predation. However, the scheme is also likely to benefit local bird populations through the creation of new nesting habitat associated with residential buildings and gardens; as well as supplemental feeding by new residents.

Mitigation and Management Measures

A summary of key mitigation measures outlined within this Management Plan are:

- Construction phase vegetation clearance to be carried out under a Method Statement overseen by the Project Ecologist, to ensure that no impacts to nesting birds occur;
- The enhancement of habitats as well as additional tree and shrub planting to increase the quality of nesting and foraging resources for birds;
- The installation of a range of high-quality artificial bird nesting boxes on retained trees, as well as on houses, for the benefit of the local swift population.

3.2.5 Other Species

Impact Assessment

Habitats present within the Site have potential to support other notable species such as brown hare, hedgehog and common toad which may be at risk of being killed/injured during the Construction Phase.

Otter, water vole, great crested newts and white-clawed crayfish have been determined to be unlikely to be present within the Site. Precautionary measures for these species are provided as appropriate within this Management Plan and associated Appendices.

Mitigation and Management Measures

A summary of key mitigation measures outlined within this Management Plan are:

- A pre-commencement toolbox talk will be provided to contractors for the Construction Phase;
- The general habitat enhancement and creation measures identified will provide habitat resources for the additional species and potentially allow for future colonisation of others (i.e. crayfish and the chalk stream improvements);
- The creation of hedgehog highways within garden plots to allow the free movement of hedgehogs and other wildlife, as well as the installation of hedgehog houses and insect houses.

4.0 Management Interventions – Construction Phase

This section provides details of the management intervention that will be undertaken prior to and during the Construction Phase in order to retain, protect, restore and enhance habitats and to provide mitigation and enhancement for identified ecological receptors with the Site. The duration of the Construction Phase of the residential scheme is currently envisaged to be 2.5 years – i.e. Years 1 to 3.

Management interventions for the long-term management of habitats during the Operational Phase are detailed in Sections 5.0 & 6.0.

For the sake of brevity, the following specific and focussed management interventions are not provided in precise detail in this section:

- Protection measures relating to retained trees and hedgerows - LSC AMS document for Condition 7 (separate document);
- Key strategies to be utilised with respect to retained grassland and translocated grassland turves prior to and during the Construction Phase - Scheme of Grassland Mitigation and Translocation for Condition 14 (Appendix 1);
- Key strategies to be utilised for the improvement of the Chalk Stream – Chalk Stream Habitat Restoration Plan for Condition 12 (Appendix 2);
- Key strategies for the preparation of a Receptor Site and translocation of reptiles from construction footprints – Reptile Mitigation Strategy for Condition 12 (Appendix 3).

The following text outlines management interventions in each identified location. The submitted Landscaping Strategy, Planting Schedules and associated Landscape Management and Maintenance Plan should be referred to for locations and extents of each intervention.

4.1 Retained Habitats

4.1.1 Retained Hedgerows and Scrub

Existing boundary features will be strengthened with the planting of a variety of native shrub species to enhance habitat structures, diversify woody species and improve habitat connectivity across the Site, as identified within the submitted Landscaping Strategy and Planting Schedules.

4.1.2 Retained Trees

The AMS document for Condition 7 provides prescriptions on tree pruning works which may be needed to facilitate the Construction Phase. Measures in respect to safety and condition checks for trees are provided in the submitted Landscape Management and Maintenance Plan.

Any such works will be kept to a minimum and trees will be allowed to retain their natural form, wherever practicable, to maximise their ecological functioning.

4.1.3 Retained Woodland

For the purposes of the Construction Phase, management interventions and enhancements in the retained northern woodland will include:

- The creation of brash/log piles to provide additional reptile refugia (see Reptile Mitigation Strategy - Appendix 3);
- Fencing of the woodland edge to deter unauthorised public access (see submitted Landscaping Strategy);
- Management interventions to be overseen and directed by the Project Ecologist.

4.1.4 Pump House Gardens

Tree Removal

Selected trees will be removed in order to maximise the ecological and aesthetic value of the Pump House Gardens, as well as ensure the health and vigour of retained trees. This will be targeted towards self-set specimens which are inappropriately placed, or those of low ecological value such as Leyland cypress. Full details of tree removal works and the specifications for such works are provided in the separate AMS document for Condition 7.

Additional tree removals to enhance habitats will be directed by the Project Arboriculturalist and Project Ecologist based on site-specific conditions to optimise habitat structures within the Pump House Gardens. Timing of all removals will be subject to appropriate liaison with the Project Arboriculturalist and Project Ecologist with pre-commencement checks for nesting birds and roosting bats undertaken as appropriate, in accordance with Best Industry Practice.

Brash and Log Piles

Brash and log piles will be created at locations identified by the Project Ecologist using material created through thinning/pruning of vegetation either within the gardens or elsewhere on-site - indicative locations are provided in Figure 09. Brash piles will strictly not contain grass arisings.

Pond Enhancements

If required, the ornamental pond located within the Pump House Gardens will be drained and cleared of silt during the winter (September to mid-January) during or shortly after the Construction Phase i.e. Years 1 to 3. The dredged silt will be removed from Site.

If required, the pond structure will be assessed, and any repair work will be completed prior to re-planting using a mix of native submerged and marginal species, as detailed in the submitted Landscaping Strategy and Planting Plans, within the following spring/early summer period.

The exact timing of the pond enhancement works will be subject to the constraints of the construction programme; however, this will be managed by the Project Ecologist and Landscape Architect to ensure completion. The Project Ecologist will also undertake any necessary pre-commencement inspections to ensure compliance with statutory wildlife legislation, if deemed appropriate.

Created Habitats

Native shrub planting will be undertaken within the Pump House Gardens as well as additional in-fill tree planting to enhance habitat structures. Wildflower meadow strips will also be seeded around the pond with a proprietary general purpose meadow mixes (Emorsgate EM2, EM6 & EM6F or equivalent). See the submitted Landscaping Strategy and Planting Schedules.

Retained Grassland

Areas of retained grassland within the Pump House Gardens will be protected following the measures provided within the Scheme of Grassland Mitigation and Translocation for Condition 14 (Appendix 1), during the installation of boardwalks and paths.

4.1.5 Ditches

No interventions are considered necessary in respect of Ditch D1.

Ditch D2 (which flows into the chalk stream to the east) will be deepened by clearing of silt to provide additional aquatic habitat within the Site. Scrub standing on the banks will be thinned to increase light penetration and to encourage the development of bank and aquatic vegetation.

Supplementary planting may be implemented, using species at specified for the chalk stream, depending upon the conditions within the ditch following the deepening of the channel. This will be determined by the Project Ecologist.

The extent and timing of ditch excavation will be determined by the Project Ecologist to minimise impacts to wildlife (i.e. undertake works during September to mid-January). Appropriate pre-commencement inspections will be undertaken by the Project Ecologist to ensure legislative compliance with wildlife legislation, as appropriate.

4.1.6 Retained Grassland Swards and Grassland Receptor Sites

Key strategies to be utilised with respect to Retained Grassland Swards and Grassland Receptor Sites prior to and during the Construction Phase is provided in the Scheme of Grassland Mitigation and Translocation for Condition 14 (Appendix 1). All management interventions will be overseen and directed by the Project Ecologist.

The distribution of Retained Grassland Swards and Grassland Receptor Sites is provided in Figure 04. Translocation is categorised as 'retention' as the existing habitat will be enhanced, rather than fully removed and 'created'. Retained Grassland Swards are also located within the Pump House Gardens, as previously detailed in Section 4.1.4.

4.1.7 Retained and Restored Chalk Stream

Key strategies to be utilised for the improvement of the chalk stream during the Construction Phase is provided in the Habitat Restoration Plan for Condition 12 (Appendix 2). All management interventions will be overseen and directed by the Project Ecologist.

4.2 Created Habitats

4.2.1 Proposed Trees

In accordance with the submitted Landscape Strategy and Planting Schedules, a variety of tree species will be planted within and adjacent to the residential scheme, comprising a mix of native species, ornamental species of value to wildlife and cultivars of an appropriate form and habit suitable for urban areas with constrained space for incremental growth.

Tree and shrub planting will also be undertaken within the Pump House Gardens.

4.2.2 Proposed Native Shrub Planting

Existing tree, hedge and scrub site boundaries will in part be planted with adjacent linear strips comprising a variety of native shrub species to improve habitat connectivity across the Site and edge structures, as identified within the submitted Landscaping Strategy and Planting Schedules.

4.2.3 Proposed Wildflower Meadow Strips

Areas of wildflower meadow strips will be created in the locations shown in the submitted Landscaping Strategy, by seeding with a proprietary general purpose meadow mix (Emorsgate EM2, EM6, EM6F or equivalent). Locations for meadow strips include the Pump House Gardens, the Linear Park, the Meadow Park and the Local Equipped Area for Play (LEAP).

4.2.4 Proposed Bioretention Basins

Bioretention basins will be lain with a proprietary turf (Tiller's Turf Flora Aqua or equivalent) to create a species-rich mix to maximise ecological enhancement opportunities and provide a sward which is suited to the local conditions, as identified within the submitted Landscaping Strategy.

4.2.5 Proposed Amenity Lawns and Road Verges

The residential scheme identified within the Parameters Plan at the Outline Application Stage will require raising from existing levels in order to manage flood risk. There is no potential for the retention of the existing sward within these areas; furthermore, the front lawns will be required to adhere to aesthetic expectations of new residents. Therefore, the areas of lawn detailed in the submitted Landscaping Strategy will be turfed using Lindum Festival landscape turf LT7 or equivalent.

Linear strips of road verge within the residential scheme will be sown with a species-rich lawn turf (Wildflower Turf WFT-Species-Rich-26). It is likely that these verges will be regularly mown; however, the turf supports a number of low growing wildflower species that will survive the mowing process.

4.2.6 Proposed Ornamental Planting

The submitted Landscaping Strategy and Planting Schedules detail specifications for ornamental shrub, hedgerow and climber planting within the residential scheme, as part of individual plot Planting Pallets. These planting specifications are purely for aesthetic and amenity function and are therefore not considered in this Management Plan as specific and measurable ecological enhancements.

4.3 Species

4.3.1 Reptiles

Details of the management interventions to be undertaken as mitigation for reptiles during the Construction Phase are provided in the Reptile Mitigation Strategy (Appendix 3).

4.3.2 Bats

Retention of Dark Corridors

A sympathetic lighting scheme has been developed with reference to guidance provided in Bats and Artificial Lighting in the UK (BCT, 2018). The lighting scheme secures the retention of existing dark corridors along existing Site boundaries for the benefit of foraging and commuting bats and other nocturnal wildlife – this is illustrated in Figure 06 in accordance with the submitted lux

plan and Artificial Lighting Strategy.

Installation of Artificial Bat Roosting Features

32Nos bat boxes will be erected on retained trees within retained woodland, tree lines and the Pump House Gardens. These will be of a high-quality woodcrete or similar material which will remain serviceable for the medium term. Indicative locations for installing the bat boxes are shown in Figure 09. The precise locations/aspects of the bat boxes will be determined on-site by the Project Ecologist when considerations such as shading, obstruction of flight lines and protection from vandalism can be directly assessed. Bat boxes will be installed at a minimum height of 5m to minimise the potential for interference by members of the public.

Bat roost features will also be installed within approximately 25% of housing units (30Nos), these will comprise discrete and integrated Soffit Bat Boxes as distributed by Wildcare. The soffit bat boxes are specified for installation on mostly southernly aspect elevations facing areas of existing vegetation. The choice of integrated bat boxes is limited by the narrow cavity wall in properties (50mm). Locations for the soffit bat boxes are plotted on Figure 10.

In summary, the following bat box types as detailed in Table 4.01 are to be incorporated into the Development Plan. Note that where specific boxes are not available, a specification of similar or higher quality will be used.

Table 4.01: Bat boxes proposed for incorporation into the Development Plan – Figures 09 & 10

Model	Type	Quantity
Schwegler 1FF	Flat	6 Nos
Schwegler 2FN	Universal double entrance	15 Nos
Schwegler 2F	Universal double panel	11 Nos
Wildcare Soffit Bat Box	Integrated (for installation in buildings)	30 Nos (~ 25% of housing units)

Installation of Artificial Bat Roosting Features

Should any trees be removed as a result of habitat management or for reasons of public safety, an inspection for roosting bats will be undertaken by the Project Ecologist (using a Licenced Bat Worker) prior to work commencing, in accordance with Industry Best Practice.

4.3.3 Badgers

Pre-Commencement Surveys

Measures to determine the status of the Site with regards to badgers and potential resultant impacts will be provided through the undertaking of pre-commencement badger surveys by the Project Ecologist. This is a pre-commencement requirement under Condition 13 of the Outline Planning Permission.

If evidence of badgers is identified during the pre-commencement surveys, or their presence suspected, appropriate further mitigation measures will form part of the Condition 13 Discharge of Condition document submitted to the LPA. The pre-commencement surveys will be undertaken approximately three months prior to start of construction to allow for a derogation licence to be applied for and issued by Natural England, in the event that badger setts are identified within the Site.

Good Practice during Construction

The following standard protection measures will be implemented during the Construction Phase:

Site Compounds

Site compounds will not be located within 30m of badger setts (if present) in order to reduce disturbance.

Night Working and Artificial Lighting

There will be no artificial lighting of any boundary hedgerows, construction exclusion zones and badger setts (if present) during the Construction Phase. Lighting will be specifically focused on the works area only.

All construction traffic will adhere to a 10mph speed limit during all night workings.

Fuel and Materials Storage

Fuels and materials will be stored within designated site compounds only (30m+ from badger setts, if present). Standard good practise methodology will be observed to ensure the proper storage and sealing of chemicals to prevent poisoning.

Avoidance of Trapping Badgers

Any open trenches left overnight will be rendered escapable by the insertion of a plank, ramp or 1 in 2 slopes that badgers could climb. Pipes 200mm+ in diameter will be capped overnight to prevent badgers potentially becoming trapped.

4.3.4 Nesting Birds

Installation of Artificial Bird Nesting Features

20Nos bird boxes will be erected on retained trees within woodland, tree lines and the Pump House Gardens. These will be of a high-quality woodcrete or similar material which will remain serviceable for the medium term. Indicative locations for installing the bird boxes are shown in Figure 09. The precise

locations/aspects of the bird boxes will be determined on-site by the Project Ecologist when considerations such as shading, obstruction of flight lines and protection from vandalism can be directly assessed. Bird boxes will be installed at a minimum height of 4m to minimise the potential for interference by members of the public.

A nearby development (Windmill Estate) has achieved success in encouraging swifts to nest in purpose-designed swift nest boxes located on properties. Consequently, Ibstock Swift Eco Habitat boxes will therefore be integrated into approximately 25% of properties within the Site (24 Nos). The swift boxes will be located on mostly northern facing aspects on gable-ends, incorporated into the brick work near the gable apex. The swift boxes will additionally provide suitable nesting habitat for other bird species (i.e. house sparrow and robin). The choice of integrated swift boxes is limited by the narrow cavity wall in properties (50mm) – Cambridge Swift Boxes were considered for use into the houses but regretfully could not be used within cavity walls to the standard size of the internal nesting chamber (250mm). Locations for the swift boxes are plotted on Figure 10.

In summary, the following bird box types as detailed in Table 4.02 are to be incorporated into the Development Plan. Note that where specific boxes are not available, a specification of similar or higher quality will be used.

Table 4.02: Bird boxes proposed for incorporation into the Development Plan – Figures 09 & 10

Model	Type	Quantity
Schwegler 1B	Standard Hole fronted	12 Nos
Schwegler 2FN	Standard Open fronted	8 Nos
Ibstock Swift Eco	Integrated (for installation in buildings)	24 Nos (~ 25% of housing units)

Protection of Nesting Birds

Vegetation and Site clearances will take place where possible outside of the breeding bird season (i.e. October to February inclusive). Where this is not possible, a pre-commencement nesting bird check will be undertaken by the Project Ecologist.

Should nesting birds be identified following checks, restrictions to the timing and proximity of works in relation to any active nests will be determined by the Project Ecologist on the ground, specific to the identified nesting sites, prevailing ground conditions and required construction works.

Site vegetation which has the potential to support nesting birds which will require nesting checks prior to removal will include trees, shrubs, hedgerows, bramble scrub, tall vegetation, grassland and ponds.

4.3.5 Other Species

Installation of Artificial Habitat Features

8Nos Schwegler Insect Boxes and 8Nos Schwegler Hedgehog Houses will be installed in appropriate locations across the Site. Insect boxes will be installed on trees and hedgehog houses will be installed under hedgerows or dense scrub boundaries.

These features will be of a high-quality woodcrete or similar material which will remain serviceable for the medium term. Indicative locations for installing the features are shown in Figure 09. The precise locations/aspects of the features will be determined on-site by the Project Ecologist when considerations such as protection from vandalism and disturbance can be directly assessed.

In summary, the following insect/hedgehog features as detailed in Table 4.03 will be incorporated into the Development Plan. Note that where specific boxes are not available, a specification of similar or higher quality will be used.

Table 4.03: Insect/hedgehog features proposed for incorporation into the Development Plan – Figure 09

Model	Type	Quantity
Schwegler Insect House	Tree mounted	8 Nos
Schwegler Hedgehog Dome	Locate under hedgerows/trees	8 Nos

Hedgehog Highways

Figure 11 plots the locations of access points in garden fences and brickwalls which will be incorporated in the Development Plan to provide 'Hedgehog Highways' and therefore access for this mammal into garden plots.

The specification for the gaps will comprise 130mm x 130mm access points within fences and walls as marked by the 'red crosses' on Figure 11. To prevent residents from blocking access points, discrete signage will be provided above each access point identifying the holes as 'Hedgehog Highways'.

Construction Phase Protection Measures

With regards to other species such as brown hare, common toad, otter, water vole, white-clawed crayfish and hedgehog, the following mitigation measures will be employed during the Construction Phase:

A pre-commencement toolbox talk will be provided to contractors by the Project Ecologist. The toolbox talk will include advice regarding species which have not been confirmed to be present within the Site but may possibly occur on an occasional or transient basis (e.g. otter and water vole). The Project Ecologist will inform contractors of appropriate working methods to minimise the risk to wildlife and the appropriate course of action to take should animals be encountered during works.

5.0 Management Prescriptions – Operational Phase

Operational Phase post-development management prescriptions to be implemented in respect of habitats and species are provided below (Year 3 onwards). Management Schedules which provide the timing and frequency with which the management prescriptions are to be implemented are provided in Section 6.0.

As detailed within the Introduction of this Management Plan (Section 1.5), a Landscape Management and Maintenance Plan has been developed alongside this document which provides specific and technical management prescriptions to be implemented by the appointed Management Company.

For the sake of brevity, this Management Plan does not provide specific details on the establishment phase of new planting and 'created' landscaping, where such prescriptions are not underlined by key overarching ecological requirements. It should be assumed that a key aim of this Management Plan will be to ensure the successful establishment of introduced new planting, the detailed prescriptions of which are provided the submitted Landscape Management and Maintenance Plan.

In addition, this Management Plan does not provide specific details on management prescriptions for landscaped habitats which require an overarching amenity function, such as lawns and ornamental shrubs; this detail is provided in the submitted Landscape Management and Maintenance Plan.

The submitted Landscaping Strategy, Planting Schedules and associated Landscape Management and Maintenance Plan should be referred to for locations and extents of each management prescription.

5.1 Retained Habitats

5.1.1 Retained Hedgerows and Scrub

The following management prescriptions will be implemented in relation to retained hedgerows and scrub, to promote good form and canopy growth and maintain food sources for wild birds.

- The management regime will require cutting every other year, removing the first or second year's growth only;
- Where hedgerows and scrub restrict access along footpaths, roads or other areas of public access, these features will be cut annually to maintain access, removing the first or second year's growth only;
- Hedgerows will be cut during January or February wherever possible to reduce the removal of berry crops - hedgerows must be cut during September to February inclusive to avoid the bird nesting season;

- Cutting of hedgerows will be undertaken to current best practice arboricultural methods (BS 3998:2012) ensuring clean and neat cut faces with no jagged ends, tears or scars;
- Dead/diseased/damaged shrubs will be replaced as directed by the Contracts Manager;
- No herbicide spraying of grass or weeds will be undertaken under hedgerows, to allow an understorey to develop;
- Hedgerows and sections of linear scrub adjacent to the chalk stream will be managed to form compact, well-structured shapes to a height of 3-5m and width of 2-3m – no herbicides to again be used;
- Use arisings to supplement brash piles within the Site or remove from Site, under the advice of the Project Ecologist (brash piles will strictly not contain grass arisings).

5.1.2 Retained Trees

The following management prescriptions will be implemented in relation to retained trees, to promote good form and canopy growth and maintain food sources for wild birds.

- Allow the natural growth and spread of trees/shrubs with minimal management, where this does not conflict with access or safety requirements;
- Only when necessary (i.e. for reasons of access, safety or removal of dead/diseased/damaged branches), trees/shrubs will be pruned during January or February, wherever possible, to reduce the removal of berry crops – trees/shrubs must be pruned during September to February inclusive to avoid the bird nesting season;
- Pruning of trees/shrubs will be undertaken to current best practice arboricultural methods (BS 3998:2012) ensuring clean and neat cut faces with no jagged ends, tears or scars;
- No herbicide spraying will be undertaken below the drip line of trees/shrubs;
- Dead/diseased/damaged trees/shrubs will be replaced as directed by the Contracts Manager;
- Should any trees require removal, a pre-commencement inspection for roosting bats and nesting birds will be undertaken by the Project Ecologist in accordance with Best Industry Practice;
- Use arisings to supplement brash piles within the Site or remove from Site, under the advice of the Project Ecologist (brash piles will strictly not contain grass arisings);
- The amenity management of trees will not conflict with the wider biodiversity management goals for the Site; therefore, trees in low occupancy areas such as the retained woodland to the north should be

identified as least priority, where deadwood and hazard features will be of benefit to flora and fauna.

5.1.3 Retained Woodland

The following management prescriptions will be implemented in relation to retained 'northern' woodland, to diversify woodland structures and promote botanical richness.

- Rotational coppicing of the scrub layer will be carried out every eight years between November to February inclusive (Years 3, 11 & 19). No more than 15% of the total woodland area will be coppiced each year:
  - Trees and shrubs to be coppiced will be marked by the Contracts Manager (under the advice of the Project Ecologist where appropriate) and treated as specified. Trees and shrubs will be selected with regard to providing maximum structural diversity, particularly where homogeneous stands occur. Mature trees will be left in situ. No trees with bat roosting potential will be removed without prior inspections by the Project Ecologist.
  - Trees and shrubs identified for coppicing will be cut as near to the ground as possible leaving a clean, sloping face. Single stems will be cut at one point near ground level. Multiple stems will be removed individually by a cut as near as possible to the main timber/stool.
- Use arisings to supplement brash piles within the Site or remove from Site, under the advice of the Project Ecologist (brash piles will strictly not contain grass arisings).

5.1.4 Pump House Gardens

The following management prescriptions will be implemented in relation to the Pump House Gardens, to diversify the various habitat structures present and promote botanical richness.

- The management of trees, hedgerows and shrubs will follow the prescriptions outlined in Sections 5.1.1 & 5.1.2;
- The management of created wildflower meadow strips and retained grassed areas will follow the prescriptions outlined in Sections 5.1.6 & 5.2.3;
- Variegated archangel will be removed by manual digging out of the root system during the summer of Year 3 and spring of Year 4 when the plant is readily identifiable (May to June);

The following management prescriptions will be implemented in relation to the Pump House Garden pond:

- Supplementary planting and sediment control will be implemented, if required, under the advice of the Project Ecologist following the prescribed monitoring visits (Years 5, 10, 15, 20 & 25);

- Vegetation clearance will be undertaken, if required, on a five yearly basis commencing in Year 5. The extent of the clearance will be determined by the Project Ecologist following prescribed monitoring visits to ensure an appropriate ratio of open water to aquatic vegetation;
- Sediment and vegetation control will be undertaken between September to mid-January. Arisings will be left onsite for 48 hours before removal from Site.

5.1.5 Ditches

The following management prescriptions will be implemented in relation to Ditches D1 and D2:

- Supplementary planting and sediment control will be implemented, if required, under the advice of the Project Ecologist following the prescribed monitoring visits (Years 5, 10, 15, 20 & 25);
- Vegetation clearance will be undertaken, if required, on a five yearly basis commencing in Year 5. The extent of the clearance will be determined by the Contracts Manager under the advice of the Project Ecologist to ensure an appropriate ratio of open water to aquatic vegetation;
- Sediment and vegetation control will be undertaken between September to mid-January. Arisings will to be left onsite for 48 hours before removal from Site.

5.1.6 Retained Grassland Swards and Grassland Receptor Sites

Key strategies to be utilised with respect to Retained Grassland Swards and Grassland Receptor Sites prior to and during the Construction Phase is provided in the Scheme of Grassland Mitigation and Translocation for Condition 14 (Appendix 1).

The distribution of Retained Grassland Swards and Grassland Receptor Sites is provided in Figure 04. These grassland areas are located along the south-eastern Site boundary, the linear boundary between the residential scheme and the Pump House Gardens and below the retained woodland to the north of the Site. Retained Grassland Swards are also located within the Pump House Gardens.

The proposed mowing regime is low in intensity and timed towards the end of the growing season and if needed, the start of the growing season to control weeds. This will allow seeds to set and germinate, as well as allow translocated orchids a full flowering and bulb development period over the growing season. The removal of arisings following each annual cut must be treated as a primary management objective (where access for equipment allows), as this prevents nutrient enrichment of the sward and the dominance of weeds and aggressive grasses.

The following management prescriptions will be implemented in relation to

Retained Grassland Swards and Grassland Receptor Sites during the Operational Phase:

- Each year, a single cut in late July (not before the 15th July) and a single cut in early September (not after the 15th September) with all arisings removed, from Year 2 onwards;
- Cutting bar set to a height of no less than 15cm (to avoid adverse impacts to reptiles and small mammals);
- Arisings removed from Site or located within an appropriate area designated by the Contracts Manager;
- If weeds become too dominant within the sward, a further single cut in early April (not after 15th April) to be undertaken with all arisings removed, subject to the advice of the Project Ecologist;
- Watering of translocated grassland will be carried out as advised by the Project Ecologist during periods of dry weather in the x2 years following translocation (Years 2 & 3).

The management of retained grasslands, particularly translocated turves, may be subject to change following the habitat specific Project Ecologist monitoring requirements for this habitat type, as detailed in the Scheme of Grassland Mitigation and Translocation for Condition 14 (Appendix 1). Where changes to the management prescriptions are required, this Management Plan will be updated following the review process detailed in Section 1.4.4.

The selection of suitable equipment/tools will be critical to the success and efficiency of specified operations and will be left to the Contracts Manager. Factors to consider in equipment selection include:

- Length of vegetation to be cut;
- Size of area to be cut;
- The nature and spacing of any obstacles;
- The required removal of arisings.

5.1.7 Retained and Restored Chalk Stream

Specific details for the restoration of the chalk stream during the Construction Phase are provided in Appendix 2. Post-restoration and during the Operational Phase, the following management prescriptions will be implemented in relation to the chalk stream and associated riparian habitats, to diversity the various habitat structures present and promote botanical richness.

- Undertake remedial action as appropriate to encourage the stream to develop a natural appearance with variations of flow, depth and width through installation of additional flow deflectors and gravel and removal of silt if required. Interventions will be under the advice of the Project Ecologist following the prescribed monitoring visits (Years 5, 10, 15, 20 & 25);

- Supplementary planting and sediment control will be implemented as deemed appropriate by the Project Ecologist, based on the findings of the prescribed monitoring visits;
- Pruning of woody scrub species on and adjacent to the stream banks as deemed appropriate by the Project Ecologist following the prescribed monitoring visits, in order to control shading of the bankside and aquatic vegetation;
- Annual management of encroaching bramble scrub as well as aquatic vegetation as advised by the Project Ecologist, to maintain a diverse flora and to ensure that rank species such as reedmace and common reed do not become established;
- Sediment and vegetation control will be undertaken between September to mid-January. Arisings will to be left onsite for 48 hours before removal from Site.

5.2 Created Habitats

5.2.1 Proposed Trees

Prescriptions to secure the successful establishment of new trees is provided within the submitted Landscape Management and Maintenance Plan. Any trees which fail during the establishment will be replaced in accordance with the submitted Landscaping Strategy and Planting Schedules.

The following long-term management prescriptions will be implemented in relation to proposed trees, to promote good form and canopy growth and maintain food sources for wild birds.

- Allow the natural growth and spread of trees/shrubs with minimal management, where this does not conflict with access or safety requirements;
- Only when necessary (i.e. for reasons of access, safety or removal of dead/diseased/damaged branches), trees/shrubs will be pruned during January or February, wherever possible, to reduce the removal of berry crops – trees/shrubs must be pruned during September to February inclusive to avoid the bird nesting season;
- Pruning of trees/shrubs will be undertaken to current best practice arboricultural methods (BS 3998:2012) ensuring clean and neat cut faces with no jagged ends, tears or scars;
- No herbicide spraying will be undertaken below the drip line of trees/shrubs;
- Dead/diseased/damaged trees/shrubs will be replaced as directed by the Contracts Manager;
- Should any trees require removal, a pre-commencement inspection for roosting bats and nesting birds will be undertaken by the Project Ecologist in accordance with Industry Best Practice;

- Use arisings to supplement brash piles within the Site or remove from Site, under the advice of the Project Ecologist (brash piles will strictly not contain grass arisings).

5.2.2 Proposed Native Shrub Planting

Prescriptions to secure the successful establishment of new native shrub planting is provided within the submitted Landscape Management and Maintenance Plan. Any shrubs which fail during the establishment will be replaced in accordance with the submitted Landscaping Strategy and Planting Schedules.

New shrub planting will be allowed to attain natural growth and spread with minimal management where this does not conflict with access or safety requirements, as detailed in Section 5.1.1 for new trees.

Scrub encroachment into retained and created grassland swards will be controlled through the mowing regimes prescribed for these habitat types.

5.2.3 Proposed Wildflower Meadow Strips

Locations for wildflower meadow strips include the Pump House Gardens, the Linear Park, the Meadow Park and the Local Equipped Area for Play (LEAP).

Establishment

Following the first year of sowing, wildflower meadow strips will be cut frequently and arisings removed offsite or located within an appropriate area designated by the Contracts Manager. The mowing will be undertaken to a height of 15cm. This will control the flush of annual weeds which will occur at the establishment stage. The number of cuts will be dependent on sward establishment and weather conditions; however, at least six to eight cuts will be undertaken during April to August inclusive.

The work year for establishment of wildflower meadow strips will be dependant on when individual areas are sown; however, this is likely to be at the end of the Construction Phase. Establishment is most likely to be within Years 3 & 4.

Herbicides and pesticides are not to be deployed in the establishment or management of these areas.

Mowing Regime

Following successful establishment, the following management prescriptions will be undertaken to maintain tall sward structures and allow seeds to set and germinate. The removal of arisings following each annual cut must be treated as a primary management objective (where access for equipment allows), as this prevents nutrient enrichment of the sward and the dominance of weeds and

aggressive grasses.

- Each year, a single cut in late July (not before the 15th July) and a single cut in early September (not after the 15th September) with all arisings removed, from Year 2 onwards;
- Cutting bar set to a height of no less than 15cm (to avoid adverse impacts to reptiles and small mammals);
- Arisings removed from Site or located within an appropriate area designated by the Contracts Manager;
- If weeds become too dominant within the sward, a further single cut in early April (not after 15th April) to be undertaken with all arisings removed, subject to the advice of the Project Ecologist.

The selection of suitable equipment/tools will be critical to the success and efficiency of specified operations and will be left to the Contracts Manager. Factors to consider in equipment selection include:

- Length of vegetation to be cut;
- Size of area to be cut;
- The nature and spacing of any obstacles;
- Any requirement to extent the establishment period, where advised by the Project Ecologist or Landscape Architect;
- The required removal of arisings.

5.2.4 Proposed Bioretention Basins

The establishment and mowing regimes for species-rich turf on the Bioretention Basins will follow the prescriptions outlined for the proposed wildflower meadow strips in Section 5.2.3.

5.2.5 Proposed Amenity Lawns and Road Verges

Amenity lawns will function as an amenity landscaping type, therefore management prescriptions for establishment and mowing regimes are not detailed here and outlined within the submitted Landscape Management and Maintenance Plan.

It is likely that species-rich road verges within the residential scheme will be regularly mown if not by the Management Company by local residents. However, the turf supports a number of low growing wildflower species that will survive the mowing process.

5.2.6 Proposed Ornamental Planting

The proposed ornamental planting will function as an amenity landscaping type, therefore management prescriptions for establishment and mowing regimes are not detailed here and outlined within the submitted Landscape

Management and Maintenance Plan.

Pruning of ornamental shrubs will be undertaken outside of bird nesting season during October to February inclusive.

5.3 Species

5.3.1 Reptiles

As prescribed for the management of non-amenity grasslands, cutting bars will be set to a minimum height of 15cm to minimise the chance of killing/injuring reptiles and other wildlife.

All brash pile features will be maintained/restored annually as deemed appropriate by the Project Ecologist using logs and brash arisings resulting from management activities within the Site (brash piles will strictly not contain grass arisings).

5.3.2 Badgers

In the event that badgers colonise any area of the Site such that destruction or disturbance of a sett may occur as the result of any management activity, advice will be sought from the Project Ecologist prior to work commencing.

5.3.3 Nesting Birds

As detailed in the relevant prescriptions, management of woodland, hedgerows, trees and shrubs will be undertaken between October to February inclusive to avoid the nesting bird season.

5.3.4 Other Species

When undertaking management activities, contractors will be mindful of the potential presence of other species including hedgehog, brown hare and common toad. Should any animals be encountered during management work, they will be allowed to disperse of their own accord.

5.3.5 Wildlife Enhancements

All bird, bat and insect boxes installed on trees, as well as hedgehog houses installed under hedgerows, will be subject to inspections by the Project Ecologist following the prescribed monitoring visits (Years 1 to 5 & 10).

Any boxes which are identified as damaged or missing will inspected internally and then replaced under the direction of the Project Ecologist to the same or equivalent specification and quality.

Monitoring of wildlife enhancements do not include bat and bird boxes on houses, as these will be privately owned.

6.0 Management Schedules

6.1 Retained Hedgerows and Scrub

Table 6.04: Hedgerows and Scrub Management Activities

OPERATION	YEARS	J	F	M	A	M	J	J	A	S	O	N	D	COMMENT
General Cutting/Pruning	Biennially (2, 4, 6 etc..)	X	X									(X)	(X)	Outside of bird nesting season (March to September inclusive) and to allow retention of berry resource in winter, wherever possible. SEE SECTION 5.1.1.

6.2 Retained Trees

Table 6.05: Trees Management Activities

OPERATION	YEARS	J	F	M	A	M	J	J	A	S	O	N	D	COMMENT
General cutting/pruning	As required	X	X									(X)	(X)	Outside of bird nesting season and to allow retention of berry resource in winter, wherever possible. SEE SECTION 5.1.2.

6.3 Retained (Northern) Woodland

Table 6.06: (Northern) Woodland Management Activities

OPERATION	YEARS	J	F	M	A	M	J	J	A	S	O	N	D	COMMENT
Selective thinning/ coppicing	3, 11 & 19 only	X	X									X	X	Coppicing of scrub and young trees, no more than 15% of total woodland area in each management year. Outside of bird nesting season. SEE SECTION 5.1.3.

6.4 Pump House Gardens

For Management of Hedgerows and Scrub follow Section 6.1, for management of Trees follow Section 6.2, for management of Wildflower Meadow Strips follow Section 6.10, for management of Retained Grassland follow Section 6.6.

Table 6.07: Pump House Gardens Management Activities

OPERATION	YEARS	J	F	M	A	M	J	J	A	S	O	N	D	COMMENT
Manual removal of Variegated Yellow Archangel	3 & 4					X	X							Manual removal to dig out roots in May and June. SEE SECTION 5.1.4
POND (SEE SECTION 5.1.4)														
Supplementary planting	5 & 6				X	X								As required under advice of Project Ecologist.
Sediment control	As required	X								X	X	X	X	As required under advice of Project

OPERATION	YEARS	J	F	M	A	M	J	J	A	S	O	N	D	COMMENT
														Ecologist. Excavated material to be left onsite for 48 hours before removal.
Aquatic vegetation management	As required	X								X	X	X	X	As required under advice of Project Ecologist. Material to be left onsite for 48 hours before removal.

6.5 Ditches (D1 & D2)

Table 6.08: Ditch Management Activities

OPERATION	YEARS	J	F	M	A	M	J	J	A	S	O	N	D	COMMENT
Supplementary planting	5 & 6				X	X								As required under advice of Project Ecologist. SEE SECTION 5.1.5.
Sediment control	As required	X								X	X	X	X	As required under advice of Project Ecologist. Excavated material to be left onsite for 48 hours before removal. SEE SECTION 5.1.5.
Aquatic vegetation management	As required	X								X	X	X	X	As required under advice of Project Ecologist. Material to be left onsite for 48 hours before removal. SEE SECTION 5.1.5.

6.6 Retained Grassland Swards and Grassland Receptor Sites

Table 6.09: Retained Grassland Management Activities

OPERATIONS	YEARS	J	F	M	A	M	J	J	A	S	O	N	D	COMMENT
Mowing	Twice Annually (2, 3, 4, 5 etc..)							X1		X1				x1 cut late July (not before 15th July). x1 cut early September (not after 15th September). Mower bar set at 15cm. Remove arisings. SEE SECTION 5.1.6.
Mowing to control weeds	Once Annually (2, 3, 4, 5 etc..)				X1									Additional cut in early April (not after 15th April) to control weeds, under the advice of Project Ecologist. Mower bar set at 15cm. Remove arisings. SEE SECTION 5.1.6.
Watering translocated	2 & 3				X	X	X	X	X	X				Watering as appropriate during

OPERATIONS	YEARS	J	F	M	A	M	J	J	A	S	O	N	D	COMMENT
turves														dry weather, as advised by Project Ecologist. SEE SECTION 5.1.6.

6.7 Retained and Restored Chalk Stream

Table 6.10: Chalk Stream Management Activities

OPERATIONS	YEARS	J	F	M	A	M	J	J	A	S	O	N	D	COMMENT
Remedial works to the river channel	As required			X	X					X	X			As required by project Ecologist following monitoring visits. SEE SECTION 5.1.7.
Supplementary planting	As required			X	X					X	X			As required by Project Ecologist following monitoring visits. SEE SECTION 5.1.7.
Pruning adjacent woody scrub	As required	X	X									X	X	As required by Project Ecologist following monitoring visits. Outside of bird nesting season. SEE SECTION 5.1.7.
Removal of encroaching bramble scrub	Annually (2, 3, 4, 5 etc..)	X	X									X	X	Annually as required, to control shading and bankside vegetation. Outside of bird nesting season. SEE SECTION 5.1.7.
Aquatic vegetation management	As required	X								X	X	X	X	As required by Project Ecologist following monitoring visits. Material to be left onsite for 48 hours before removal from site. SEE SECTION 5.1.7.
Sediment control	As required	X								X	X	X	X	As required by Project Ecologist following monitoring visits. Material to be left onsite for 48 hours before removal from site. SEE SECTION 5.1.7.

6.8 Proposed Trees

For establishment prescriptions please see the submitted Landscape Management and Maintenance Plan. For long-term management of Trees see Section 6.2 (5.2.1).

6.9 Proposed Native Shrub Planting

For establishment prescriptions please see the submitted Landscape Management and Maintenance Plan. For long-term management of Native Scrub Planting see Section 6.1 (5.2.2).

6.10 Proposed Wildflower Meadow Strips

Table 6.11: Wildflower Meadow Strips Management Activities

OPERATIONS	YEARS	J	F	M	A	M	J	J	A	S	O	N	D	COMMENT
ESTABLISHMENT														
Mowing	3 & 4				X1	X1	X1	X1	X1	X1				Regular mowing to remove flush of weeds. Mower bar set at 15cm. Remove arisings. SEE SECTION 5.2.3.
MOWING REGIME														
Mowing	Twice Annually (2, 3, 4, 5 etc..)							X1		X1				x1 cut late July (not before 15th July). X1 cut early September (not after 15th September). Mower bar set at 15cm. Remove arisings. SEE SECTION 5.2.3.
Mowing to control weeds	Once Annually (2, 3, 4, 5 etc..)				X1									Additional cut in early April (not after 15th April) to control weeds, under the advice of Project Ecologist. Mower bar set at 15cm. Remove arisings. SEE SECTION 5.2.3.

6.11 Proposed Bioretention Basins

Follow Section 6.10 for Wildflower Meadow Strips (5.2.4).

6.12 Proposed Amenity Lawns and Road Verges

For establishment and management prescriptions of amenity habitats please see the submitted Landscape Management and Maintenance Plan.

6.13 Ornamental Shrub Planting

For establishment and management prescriptions of amenity habitats please see the submitted Landscape Management and Maintenance Plan.

6.14 Wildlife Boxes (Excluding House Mounted Boxes)

Table 6.12: Wildlife Box Management Activities

OPERATIONS	YEARS	J	F	M	A	M	J	J	A	S	O	N	D	COMMENT
Condition inspections of wildlife boxes	5 & 10	AS APPROPRIATE												By Project Ecologist.
Remounting/replacement of wildlife boxes	5 & 10			X						X	X			As required based upon the findings of the inspections. Bat boxes must not be remounted or removed without prior inspection by a Licensed Bat Worker.

References

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APPENDIX 1
-
SCHEME OF GRASSLAND MITIGATION AND TRANSLOCATION (DoC 14)

LAND OFF TEVERSHAM ROAD, FULBOURN

SCHEME OF GRASSLAND MITIGATION AND TRANSLOCATION

REVISION A

FOR THE DISCHARGE OF PLANNING CONDITION 14

PLANNING REFERENCE: APPLICATION S/0202/17/OL

For

Castlefield International Limited

March 2020

Landscape Institute
Registered practice

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CONTENTS

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1.0 Introduction

1.1 Planning Condition 14

Outline planning permission for residential development of up to 110 dwellings on Land at Teversham Road, Fulbourn, Cambridgeshire (Planning Application reference: S/0202/17/OL), henceforth referred to as the 'Site', was granted by South Cambridgeshire District Council, subject to conditions, on 26th October 2017.

This Scheme of Grassland Mitigation and Translocation 'the Scheme' aims to discharge Condition 14:

> Condition 14
>
> Prior to the commencement of the development, full details of a Scheme of Grassland Mitigation and Translocation has been submitted to and approved in writing by the Local Planning Authority. These measures shall include (but shall not be limited to):
>
> i. Botanical surveys to be undertaken in order to determine the distribution and densities of important grassland species plotted using GPS and presented on a plan.
> ii. The Scheme's aims and objectives.
> iii. The evaluation of the ecological, hydrological and geological requirements of the important grassland species.
> iv. The selection of suitable receptor sites.
> v. A method statement for the grassland removal.
> vi. The location of works and/or measures required to successfully implement the translocation.
> vii. Full details of long-term management and ownership of the receptor sites.
> viii. Details of the persons responsible for the implementation of the Scheme.
> ix. A timeframe for the Scheme's implementation.
> x. Measures for the monitoring of the Scheme for a minimum period of twenty-five years.
>
> The agreed mitigation and translocation scheme shall be carried out as approved and the site maintained and managed thereafter in accordance with it.
>
> Reason - To mitigate ecological interests in accordance with Policies DP/1, DP/3 and NE/6 of the adopted Local Development Framework 2007.

1.2 Management Aims, Objectives and Limitations

The ecological value of the Site has been recognised from the commencement of Design for the Reserved Matters and Discharge of Conditions applications; and the retention, restoration and enhancement of existing or proposed habitats has been a key driver in the Landscaping Strategy and Development Plan.

The approved Parameters Plan for the residential scheme, agreed at Outline Application stage, requires areas of green space to support amenity and recreational use for residents, as well as serve an aesthetic or screening function. These features have been designed to achieve the maximum ecological value where feasible within the constraints of their primary function.

Key aims and objectives of the Scheme for Grassland Mitigation and Translocation are as follows:

- Secure the in-situ retention of grassland swards and translocation/re-establishment of grassland turves supporting 'Target' grassland species, where this can be achieved with reference to the following constraints:
  - the Parameters Plan agreed at Outline Planning which delimits the residential development and hard landscaping from those areas of green space and ecological habitat;
  - the requirements for an economically viable and functional housing Scheme;
  - the requirements for Drainage and Surface Water Runoff including bioretention basins;
  - the requirements for landscaping such as provision of Formal Play Areas and Informal Play Areas;
  - planting required for screening from offsite receptors such as the railway and industrial unit to the north.
- The selection of turves for translocation;
- The selection of appropriate receptor sites;
- Secure the success of translocated turves to receptor sites;
- The appropriate protection of retained swards in-situ and translocated turves during the Construction and Operational Phases;
- Secure the long-term condition of retained swards in-situ and translocated turves;
- Monitor developments and allow flexibility to the management approach.

1.3 Scheme Timings

Currently, it is envisaged that key ecological ground works to facilitate the Scheme will commence in the Autumn of 2020. Therefore, 2020 is henceforth referred to as Year 1, with subsequent calendar years being referred to as Years 2 to 25. The duration of the Construction Phase of the residential scheme is currently envisaged to be 2.5 years – i.e. Years 1 to 3.

An overview of the timings for the implementation of the Scheme is detailed in Section 7.0.

1.4 Scheme Implementation

1.4.1 Pre-Construction Phase Works

The process of translocating grassland turves prior to the Construction Phase will be managed and directed by the Project Ecologist with ground-work support either from the Principle Contractor or a contractor appointed by the Applicant, Castlefield.

Currently, the proposed timings for the grassland translocation phase of the Scheme is Autumn 2020.

Where referred to in this Scheme, the 'Project Ecologist' includes the Ecology Team and the botanically qualified individuals who will undertake, direct and oversee the individual ecological work elements.

1.4.2 Construction Phase Works

The protection of retained swards and translocated turves will during the Construction Phase remain the responsibility of the Principle Contractor supported by monitoring visits and advice from the Project Ecologist.

1.4.3 Operational Phase

Post-development, the long-term management of retained swards and translocated turves will be delivered by a Management Company appointed by the Applicant. This will form part of the Landscape and Biodiversity Management Plan of which this Scheme is an Appendix.

The Management Company will be funded by a Maintenance Charge or equivalent, paid for by residents.

1.5 Site Ownership

The areas of retained swards and translocated turves will remain in the ownership of the Applicant - Castlefield.

1.6 Monitoring Programme

1.6.1 Monitoring – Years 1 to 3

Immediately following the grassland translocation process in Year 1 (Autumn 2020), bi-monthly monitoring will take place through the winter and up until October of Year 3 (or until the end of the Construction Phase). During April to July, monitoring will be undertaken monthly during the key flowering periods for translocated plants ('Target Species').

The monitoring programme will permit compliance checks to ensure retained swards and translocated turves are being adequately protected as well as to assess the condition of the turves and allow the Project Ecologist to determine additional remedial measures such as watering.

All monitoring will be undertaken by the Project Ecologist. A summary report will be provided by the Project Ecologist after each monitoring visit to the party responsible (either the Principle Contractor and/or the Management Company appointed by the Applicant), which will include recommendations for any changes to the management regime as considered necessary.

1.6.2 Monitoring – Years 4 - 25

Post-development and in the Operational Phase, monitoring by the Project Ecologist will be undertaken on a twice annual basis in May and July of each year (Years 4 to 25) to coincide with the flowering times of translocated 'Target Species' and allow the sward condition to be assessed prior to mowing. The Project Ecologist will provide an annual summary report to the Management Company appointed by the Applicant, as well as to the LPA.

The summary report will include findings of the monitoring visits and recommendations for management during the next year, where this will differ from the prescriptions currently outlined.

Where appropriate, the Landscape and Biodiversity Management Plan will be updated following the prescribed methods in this document, following any changes to recommendations resulting from the monitoring visits.

2.0 Grassland Survey Baseline

2.1 Description

The majority of the Site comprises semi-improved neutral grassland in the 'eastern' and 'western' fields. With reference to the Farm Environment Plan (FEP) Condition Assessment criteria (Natural England, 2010), the current condition and character of the grassland is poor – the sward is rank, mesotrophic grassland with affinity to the MG1 NVC classification, with horsetail dominant within large parts of the southern portion of the Site (see further comments on Condition in this section). The presence of adder's tongue fern throughout the sward suggests that this Site represents a historic hay meadow which has developed its current character through lack of management. Ant hills occur through the sward.

2.2 Ecological Value

The sward contains several 'Strong Indicators' of neutral grassland from Appendix 3a of the Cambridgeshire and Peterborough County Wildlife Sites Selection Guidelines. These are detailed below, along with their frequency within the sward in parenthesis. This follows the standard DAFOR method of quantifying abundance and does not relate to the relative conservation status of the species:

- Adder's tongue fern (Frequent);
- Glaucous sedge (Frequent);
- Common spotted orchid (Occasional);
- Early marsh orchid (Occasional);
- Common twayblade (Rare);
- Yellow rattle (Occasional);
- Rough hawkbit (Occasional);
- Wild basil (Occasional);
- Ploughman's spikenard (Rare);
- Pyramidal orchid (Rare).

The Site therefore has sufficient species which are 'Strong Indicators' of calcareous and neutral grassland to qualify for LWS consideration under 2c for grasslands of either type; however, only two neutral indicators and one calcareous indicator was recorded as 'frequent' whereas three and six are required to be frequent for neutral and calcareous grassland respectively. This is likely to reflect the poor condition of the Site through cessation of traditional management.

A further route to qualification under LWS criteria is the presence of frequent numbers of more than 50 grassland species. A 2016 Wildlife Trust survey identified 46 grassland species and subsequent surveys have identified more than four further species which will allow the sward to qualify in terms of species diversity; however, the frequency of these species throughout the sward will not meet the 'frequency' criteria (Wildlife Trust, 2016).

Occasional spikes of bee orchid have also been identified within the Site. This species is not a strong indicator of calcareous grassland, although is typical of free draining base-rich soils.

2.3 Condition

Self-set saplings and young trees including eared willow, butterfly bush, buckthorn, and ash between 4-6m, are present throughout the sward representing ongoing succession; in the absence of management this stand is likely to develop into a dense scrub habitat within the short-medium term.

Much of the sward is now false oat grass dominated with a dense thatch developing, which is likely to increase in dominance over time. The peripheries of the fields are frequently represented by ruderal vegetation such as common nettle, great willowherb, creeping thistle and bramble invading from the boundaries. In some locations, mono-stands of rosebay willowherb occur. This ruderal character is also found in a linear route across the eastern field from the eastern boundary and culminating in an area of disturbance which has been colonised by a reed canary grass monoculture – the cause of this is unknown but indicates services or utility works.

Much of the western field has locally dominant field horsetail which is likely to have resulted in the suppression of other species – this trend is likely to continue in the absence of management intervention. In contrast to condition descriptions provided by MKA between 2012 to 2014 (MKA, 2015a), this species is also establishing a local dominance in the south-western sward in the eastern field as well.

The current condition of the sward is likely to represent the historic decline following cessation of management, but the species composition indicates that the sward from which the current grasslands derive will have originally qualified under the LWS criteria. Evidence recorded since the initial surveys in 2012 to 2014 by MKA indicate that this progress of decline is ongoing.

3.0 Grassland Mitigation and Translocation Strategy Overview

3.1 Updated Botanical Surveys

The current survey baseline of Target Species (2014 to 2019) is illustrated in Figure 04. Previous surveys were provided by MKA in 2014 and the Wildlife Trust in 2016, which were verified by LSC 2019 although not fully updated.

Therefore, to maximise the efficacy of the grassland translocation process, updated botanical surveys will be undertaken between April to July 2020, by the Project Ecologist. The timing of the surveys will coincide with the period during which Target Species will be at a growth stage such that they are readily identifiable by the Project Ecologist. 'Target Species' are defined as those species identified as 'Strong Indicators' of calcareous grassland in Section 2.2.

The surveys will identify spot locations or areas where Target Species are present and record the density or numbers of each Target Species within the areas where they are present.

The surveys will extend to all areas of grassland within the Site, regardless of impact. The locations and densities of any additional 'Strong Indicators' identified during the surveys will also be recorded.

The plotting of locations and densities of Target Species will be as accurately as possible using conventional GPS. The locations of individual Target Species or areas containing elevated densities of one or more Target Species will be marked using survey flags to allow them to be confidently identified during the translocation process. The records obtained will be used to prepare digitised maps using GIS software, that will be used by the Project Ecologist overseeing and directing contractors to readily identify sections of turf to be translocated.

Whilst the proposed 2020 surveys will be required to further inform the translocation process, the current 2104 to 2019 baseline is considered sufficient to determine an appropriate Scheme of Grassland Mitigation and Translocation for the Site.

3.2 Retention of Swards In-Situ

In accordance with the Parameters Plan agreed at the Outline Application stage, as well as the revised Development Plan and Landscaping Strategy submitted for the Reserved Matters application, swards proposed for retention in-situ are identified in Figure 04. These areas will not be affected by construction work processes to deliver the residential scheme and bioretention basins.

Retained Swards include areas not known to support Target Species along the southern Site boundary. Retained Swards also includes the reptile Receptor Site (Appendix 3 of Landscape Biodiversity and Management Plan) to the north of the Site, a strip of grassland adjacent to the chalk stream and patches of grassland within the Pump House Gardens.

The Retained Swards will be appropriately protected and managed during pre-Construction Phase operations and the Construction Phase, as detailed in Section 5.0.

The Retained Swards will, in the long-term, be appropriately managed to maintain and enhance condition in the Operational Phase, as detailed in Section 6.0.

3.3 Receptor Sites and Translocation of Target Species

3.3.1 Overview

In accordance with the Parameters Plan agreed at the Outline Application stage, as well as the revised Development Plan and Landscaping Strategy submitted for the Reserved Matters application, swards proposed for 'Receptor Sites' are identified in Figure 04. These areas will not be affected by construction work processes to deliver the residential scheme and bioretention basins.

The Receptor Sites will comprise existing areas of semi-improved neutral grassland identified as being appropriate for the translocation of Target Species from within construction footprints - Donor Sites. The Receptor Sites are located along the southern Site boundary, as well as below the reptile Receptor Site to the north of the Site.

A Method Statement for the translocation of Target Species from Donor Sites to Receptor Sites is provided in Section 4.0.

The Receptor Sites will be appropriately protected and managed during pre-Construction Phase operations and the Construction Phase, as detailed in Section 5.0.

The Receptor Sites will, in the long-term, be appropriately managed to maintain and enhance condition in the Operational Phase, as detailed in Section 6.0.

3.3.2 Evaluation of the Ecological, Hydrological and Geological Requirements of Target Species

The identified Target Species are strong indicators of neutral grassland and calcareous grassland. Consequently, these Target Species favour nutrient-poor soils where rank species are less able to out-compete for resources. The Operational Phase management methods following translocation are designed to reduce soil nutrient levels, in order to maintain and enhance the suitability of grassland swards retained within the Site for Target Species.

Early marsh orchid and adder's tongue fern have a preference for damper soils than other Target Species. This preference will be reflected in the selection of siting within the Receptor Sites, by the Project Ecologist.

Five orchids are included in the Target Species. Terrestrial orchids are dependent on the presence of symbiotic mycorrhizal fungi to facilitate seed germination. Therefore, cut translocation turves will be of a suitable size to contain both the orchid plants and their symbiotic fungi, to ensure the establishment of orchids in the Receptor Sites. The size of cut turves will be judged by the Project Ecologist.

Yellow rattle is an annual species and produces abundant seeds. Rather than undertaking turve cutting and translocation, seed will be collected from the yellow rattle population on-site and redistributed within the Receptor Sites. This process may also be used for Target Species such as wild basil and rough hawkbit, depending on presence following the updated 2020 surveys and realistic scope for translocation within Receptor Sites.

Selection of Suitable Receptor Sites

Information regarding soil chemistry and hydrology parameters of Donor Sites and Receptor Sites was obtained in September 2019 at indicative locations illustrated in Appendix A. Specialist contractors (Tim O'Hare Associates LLP) undertook the surveys and analysis.

Soil parameters for both the topsoil and subsoil at each spot location included:

- a physical description of the soil characteristics;
- pH;
- nutrient levels (plant-available NO_3^-, PO_4^- and K); and
- rooting depth of the sward.

The results of the surveys indicate that the identified key Receptor Sites are suitable for translocation of turves following removal of topsoil. However, potential locations along the eastern Site boundary were identified as having significantly elevated nutrient levels in both the topsoil and the subsoil; therefore, these locations are not proposed to be used as Receptor Sites.

The soil chemistry analysis represents spot samples taken from indicative locations within the Site. These results are combined with expert judgement by the Project Ecologist and comparison of sward characteristics to infer the extent of the Site for which the parameters returned are likely to be representative – the Receptor Sites illustrated in Figure 04 are therefore based on this expert judgement.

The Receptor Sites will, following the Construction Phase, remain at the same level as existing, therefore no significant changes in the hydrology of the Receptor Sites is predicted. The removal of material from the Receptor Sites will be carefully matched to the depth of the translocated turves to ensure that the level remains constant, under the direction of the Project Ecologist.

4.0 Translocation Method Statement – Pre-Construction Phase

A Method Statement to be employed in the translocation of grassland turves supporting Target Species, prior to the start of the Construction Phase, is outlined below.

4.1 Roles and Responsibilities

The process of translocating and re-establishing grassland turves prior to the Construction Phase, as well as all seed collections and sowing, will be managed and directed by the Project Ecologist with ground-work support either from the Principle Contractor or a contractor appointed by the Applicant, Castlefield.

Where referred to in this Scheme, the 'Project Ecologist' includes the Ecology Team and the botanically qualified individuals who will undertake, direct and oversee the individual ecological work elements.

4.2 Timing and Duration

The translocation of grassland turves supporting Target Species is currently scheduled to take place in the Autumn of 2020 (Year 1).

The work will be undertaken during warm weather when the soil is moist (conditions most often occurring during the Autumn), to promote root growth prior to winter, in preparation for the following growing season. The translocation process will not be undertaken in excessively wet periods of weather, where potential damage to grassland swards will be significantly higher.

4.3 Selection of Target Species for Translocation

The selection of Target Species for translocation will be focussed following the proposed updated botanical surveys in April to July 2020, as well as being assessed through expert judgement by the Project Ecologist based on prevailing Site conditions.

4.3.1 Orchids

Given their symbiotic relationship with soil mycorrhizal fungi, identified orchids within the Site are defined as the key Target Species for translocation through cutting of turves. These Target Species are:

- Early Marsh Orchid;
- Common Spotted Orchid;
- Pyramidal Orchid;
- Common Twaybale;
- Bee Orchid.

4.3.2 Adder's Tongue Fern

Adder's tongue fern occurs frequently throughout the grassland resource within the Site. It is considered not feasible and practicable to translocate all of this Target Species population to identified Receptor Sites.

Adder's tongue fern occurs frequently within the northern woodland and also occurs within the proposed reptile Receptor Site – both of these areas are to be retained and protected within the Construction and Operational Phases.

A proportion of the adder's tongue fern population will be translocated to the Receptor Sites. This will be determined by the Project Ecologist using expert judgement and following the updated 2020 surveys, with specific consideration of available space within Receptor Sites.

4.3.3 Yellow Rattle

Yellow rattle is an annual species and produces abundant seeds. Rather than undertaking turve cutting and translocation, seed will be collected from the yellow rattle population on-site and redistributed within the Receptor Sites. This process may also be used for Target Species such as wild basil and rough hawkbit, depending on presence following the updated 2020 surveys and realistic scope for translocation within Receptor Sites.

4.3.4 Other Target Species

Other Target Species such as wild basil, rough hawkbit and glaucous sedge will be considered for translocation to Receptor Sites following the updated 2020 surveys and expert judgement by the Project Ecologist.

4.4 Site Preparation

The following site preparation measures will be undertaken prior to the grassland translocation process.

4.4.1 Pegging-Out of Target Species

Following the updated 2020 surveys and a focussed assessment of translocation scope, the Project Ecologist will peg-out (or re-peg-out – Section 3.1) on the ground, all Target Species proposed for translocation and seed-collection Donor Sites.

This will assist in guiding the translocation process and will also prevent contractors from tracking machinery through populations of Target Species to be translocated.

4.4.2 Pegging-Out of Receptor Sites and Construction Footprints

The Project Engineer (or their representative) will peg-out on the ground all Receptor Sites, Retained Swards and associated adjacent construction footprints including bioretention basins, boardwalks and paths.

This will assist in guiding the translocation process, particularly the appropriate placement of translocated turves in consideration of adjacent demands and constraints from construction, as well as delineating Receptor Sites and Retained Swards from potential excavator tracking damage.

The Project Ecologist will liaise with the Project Engineer to ensure all of the required areas for marking-out are done so in a manner which will best secure the effective translocation and re-establishment of turves to Receptor Sites.

4.4.3 Reptile Exclusion Fencing and Habitat Modification

Works to install reptile Exclusion Fencing and the carrying out of habitat modification to facilitate the reptile translocation process, would be carried out before the grassland translocation process – August 2020. This is described in the Reptile Mitigation Strategy (Appendix 3 of Landscape Biodiversity and Management Plan).

A Method Statement for the protection of existing grasslands is provided in the Reptile Mitigation Strategy, as well as appropriate measures to avoid damaging or removing Target (plant) Species during the prescribed habitat modification works for reptiles.

Where turves are cut from Donor Sites, the Project Ecologist will undertake a finger-tip search of each location for potential presence of reptiles. Turves will, by the nature of the grassland translocation, require careful cutting, reducing potential impacts to reptile species if present. Any reptiles identified during the turve cutting process will be caught by hand or net, placed in a cloth bag and immediately moved to the designated reptile Receptor Site as identified in the Reptile Mitigation Strategy.

The reptile and grassland translocation schemes will be managed in tandem by the Project Ecologist.

4.5 Translocation Process

The on-the-ground translocation works will always be directed and overseen by the Project Ecologist.

The translocation process is intended to be sequential, with an individual turve cut from a Donor Site, moved to the selected Receptor Site and situated following topsoil removal.

4.5.1 Contractor Briefing Session

Prior to starting translocation works, the Project Ecologist will undertake a detailed briefing session with the appointed contractor to discuss the key objectives and aims of the translocation process, to ensure the successful re-establishment of the translocated turves and the protection of all translocated and retained swards during works.

4.5.2 Selection of Equipment

The cutting out of larger translocation turves, particularly for orchids, will be undertaken by a mechanical excavator using a bucket. A wheeled excavator will be utilised to avoid ground damage. To avoid ground damage further, the final choice of excavator will be determined by sufficient torque (to effectively cut turves) as a ratio to mass-ground pressure. This will be discussed and determined by the Project Ecologist and contractor before works commence.

The need for protective compressible matting under digger tracking and haul routes will be determined by the Project Ecologist and contractor, depending on the prevailing weather and Site conditions at the time of translocation.

Specific turf cutting equipment is not considered to be required, numerous case studies of orchid translocations within the UK have been undertaken using standard, non-specialist machinery operated by skilled drivers.

Wherever possible, Target Species will be dug using hand tools by the Project Ecologist and contractors to avoid the need for tracking over extensive areas of the Site, particularly where individual stands of Target Species may occur in distant Site corners.

4.5.3 Selection of Tracking and Haul Routes

Prior to starting translocation works, the Project Ecologist and contractor will determine tracking and haul routes between Donor and Receptor Sites which will most effectively reduce potential compaction and damage to grassland swards. The tracking and haul routes will be pegged-out if deemed appropriate and proportional, by Project Ecologist and contractor.

4.5.4 Receptor Site Preparation

When deciding on the appropriate locations for translocated turves in Receptor Sites, the Project Ecologist will consider constraints from adjacent impacts such as the construction of boardwalks and installation of bioretention basins. This will be assisted by the pegging-out of such areas by the Project Engineer.

A minimum of 40cm of topsoil will be carefully and slowly scraped off the Receptor Sites, in accordance with the size and number of individual turves which will need to be accommodated. The removal of material from the Receptor Sites will be carefully matched to the depth of the translocated turves

to ensure that the level remains constant. Deeper scraping may be required if subsoil translocation or deeper turves are to be used to maintain the soil parameters of the Donor Sites.

Preparation of the Receptor Site scrapes to produce a loose surface will be achieved through use of Cambridge Rollers or similar. If there has not been significant rainfall prior to translocation such that the soil of the Receptor Sites is not moist, artificial watering will be applied immediately prior to translocation.

4.5.5 Donor Site Preparation

Turves will be carefully and slowly cut to a minimum of 40cm. However, deeper turves may be cut where it is deemed appropriate to maintain soil chemistry. The Project Ecologist overseeing and directing the works will be responsible for deciding on the appropriate thickness of turves to be cut.

4.5.6 Placement of Cut Turves in Receptor Sites

Cut turves will not be stored prior to placing into the Receptor Sites. Turves will be transported to the Receptor Sites immediately after cutting and placed in their pre-identified locations.

Following placement in the Receptor Sites, turves will be carefully and slowly tamped down using the excavator bucket or trodden down to ensure contact between the turves and the underlying soil. Turves will be placed so as to tightly abut each other. Any remaining gaps will be filled with topsoil taken from around the Donor Sites from which the turves were cut, which will be likely to contain a seed bank including Target Species.

4.6 Seed Collection and Re-Distribution

4.6.1 Seed Collection

Seeds will be collected during the translocation process in the Autumn from the identified Target Species populations i.e. yellow rattle.

All seeds collected will be placed in clean and pre-marked paper bags and re-sealed. Until collected seeds are to be re-distributed, seed bags will be kept in a cool, dry and dark storage location at the offices of the Project Ecologist.

4.6.2 Seed Re-Distribution

All collected seeds will be re-distributed across Receptor Sites and Retained Swards. This will be undertaken at the end of the translocation process. The re-distribution of seeds by Target Species, locations and spread will be determined by the Project Ecologist, using expert knowledge and a detailed understanding the botanical communities within the pre-existing grassland resource.

4.7 Erection of Protection Fencing

Following the translocation process but prior to the start of the Construction Phase, Protection Fencing will be erected around all identified areas of Retained Grassland Swards and Grassland Receptor Sites to create Construction Exclusion Zones. This is provided in more detail in Section 5.0.

5.0 Protection of Grassland – Construction Phase

5.1 Construction Exclusion Zones

5.1.1 Erection of Protection Fencing

Following the translocation process but prior to the start of the Construction Phase, Protection Fencing will be erected around all identified areas of Retained Grassland Swards and Grassland Receptor Sites to create Construction Exclusion Zones (CEZs). Locations of required Protection Fencing and CEZs are plotted in Figure 07.

5.1.2 Characterisation of CEZs

Throughout the Construction Phase and during pre-Construction Phase preparation works, the CEZs will strictly be treated as areas in which no construction works or access by construction plant, materials or contractors shall take place.

The exceptions for this will be where mitigation measures are provided and agreed by the Project Ecologist, as detailed in Sections 5.2 & 5.3 below. The identified mitigation measures will be strictly adhered to when undertaking works within/adjacent to CEZs.

Where mitigation measures are not prescribed, any form of construction, ground works or access MUST NOT be undertaken within the CEZs without agreement and mitigation measures from the Project Ecologist and if deemed necessary, the LPA.

5.1.3 Potential for Impacts into CEZs in the Absence of Mitigation Measures

A minor linear section of the Retained Grassland Sward and Grassland Receptor Site to the north and south of the Site will be affected by the short-term installation of boardwalks and paths. Temporary Protection Fencing is proposed in this location. Protection measures are outlined in Section 5.2, which also cover potential impacts to patches of Retained Grassland Swards within the Pump House Gardens.

There is the potential for indirect impacts into CEZs, such as the spillage of fuels and chemicals, excessive dust creation and deposition of waste and litter during the Construction Phase. Protection measures are outlined in Section 5.3.

5.1.4 Protection Fencing Specification

Protection Fencing will be robust enough to exclude construction works and activity. Heras fencing will be used and braced to withstand impacts, with a small base plate and pin to sufficiently secure the stabilising strut but with a small enough footprint to avoid damaging translocated turves.

All-weather notices will be fixed to the Protection Fencing stating '*Construction Exclusion Zone- Keep Out*' or similar.

5.1.5 Project Ecologist Oversight and Tool-Box Talk

Protection Fencing installation will be overseen and directed by the Project Ecologist as appropriate and a tool-box talk provided to contactors before starting works, to ensure Retained Grassland Swards and Grassland Receptor Sites are not damaged.

5.1.6 Protection Fencing and CEZ Duration

Protection Fencing will remain in-situ for the duration of the Construction Phase. The removal of the Protection Fencing will only be undertaken following the authorisation of the Project Ecologist.

5.1.7 Protection Fencing Inspections and Maintenance

During the Construction Phase, the Construction Manager will regularly check the Protection Fencing for damaged sections and sections which are out of alignment. The Project Ecologist will also check Protection Fencing during the prescribed monitoring visits (Section 1.6). Any required repairs will be acted upon immediately by the Construction Manager, to ensure continuity of protection functionality.

5.2 Protection of Grassland – Temporary Works

A section of the Retained Grassland Sward and Grassland Receptor Site to the north and south of the Site will be affected by the short-term installation of boardwalks and paths. Temporary Protection Fencing is proposed in this location. Protection measures to be employed during these works are provided below.

The below protection measures will also be utilised in respect of the Pump House Gardens.

5.2.1 Project Ecologist Oversight and Tool-Box Talk

Boardwalk and path installation will be overseen and directed by the Project Ecologist as appropriate and a tool-box talk provided to contactors before starting works.

5.2.2 Choice of Equipment

For boardwalk and path installation, where absolutely necessary, a low ground-pressure micro/mini digger will be utilised to facilitate works.

5.2.3 Working Corridors

For boardwalk and path installation, a single linear working corridor will be chosen with the advice of the Project Ecologist and delineated with Temporary Protection Fencing (unbraced Heras fencing). Works will strictly be located within the delineated working corridor only.

In respect of works within the Pump House Gardens, a single linear working corridor will be required; however, the use of Temporary Protection Fencing will be at the discretion of the Project Ecologist, depending on the magnitude of the potential impact.

5.2.4 Compressible Matting

Where deemed appropriate by the Project Ecologist, compressible matting will be utilised to protect adjacent areas of Retained Grassland Swards and Grassland Receptor Sites during the works process.

5.2.5 Refuelling

Refuelling of machinery will only be undertaken within designated areas of the main construction site - this will strictly not be within, or adjacent to, areas of Retained Grassland Swards and Grassland Receptor Sites.

5.2.6 Completion of Works

Upon completion of works, all Retained Grassland Swards and Grassland Receptor Sites will be left tidy of any litter and materials.

5.3 Protection of Grassland – Indirect Works

There is the potential for indirect impacts into CEZs, such as the spillage of fuels and chemicals, excessive dust creation and deposition of waste and litter. Protection measures to be employed during the Construction Phase to protect Retained Grassland Swards and Grassland Receptor Sites are provided below.

- Site operations will be planned to prevent over-silting and mud spraying of Retained Grassland Swards and Grassland Receptor Sites;
- Spillage or surface wash of chemicals or fuel towards Retained Grassland Swards and Grassland Receptor Sites will be avoided – spill kits and sufficient water will be located in all site compounds and/or signposted locations;
- The creation of dust and other particulates will be minimised;
- Construction materials, fuels, waste and concrete batching stations will not be stored within 10m of Retained Grassland Swards and Grassland Receptor Sites unless control measures have been implemented by the Project Ecologist, particularly where Retained Grassland Swards and Grassland Receptor Sites are downslope of such activities.

As part of the Site Induction scheme for Construction Phase, all contractors will be informed of the locations of Retained Grassland Swards and Grassland Receptor Sites, the presence of CEZs and the necessary protection measures which must be undertaken.

Upon completion of the Construction Phase, all Retained Grassland Swards and Grassland Receptor Sites will be left tidy of any litter.

6.0 Long-Term Management of Grassland – Operational Phase

6.1 Management Overview

The distribution of Retained Grassland Swards and Grassland Receptor Sites is provided in Figure 04. These grassland areas are located along the south-eastern Site boundary, the linear boundary between the residential scheme and the Pump House Gardens and below the retained woodland to the north of the Site. Retained Grassland Swards are also located within the Pump House Gardens.

6.2 Management Justifications

The proposed mowing regime is low in intensity and timed towards the end of the growing season and if needed, the start of the growing season to control weeds. This will allow seeds to set and germinate, as well as allow translocated orchids a full flowering and bulb development period over the growing season. The removal of arisings following each annual cut must be treated as a primary management objective (where access for equipment allows), as this prevents nutrient enrichment of the sward and the dominance of weeds and aggressive grasses.

6.3 Management Prescriptions

The following management prescriptions will be implemented in relation to Retained Grassland Swards and Grassland Receptor Sites during the Operational Phase:

- Each year, a single cut in late July (not before the 15th July) and a single cut in early September (not after the 15th September) with all arisings removed, from Year 2 onwards;
- Cutting bar set to a height of no less than 15cm (to avoid adverse impacts to reptiles and small mammals);
- Arisings removed from Site or located within an appropriate area designated by the Contracts Manager;
- If weeds become too dominant within the sward, a further single cut in early April (not after 15th April) to be undertaken with all arisings removed, subject to the advice of the Project Ecologist;
- Watering of translocated grassland will be carried out as advised by the Project Ecologist during periods of dry weather in the x2 years following translocation (Years 2 & 3).

The selection of suitable equipment/tools will be critical to the success and efficiency of specified operations and will be left to the Contracts Manager. Factors to consider in equipment selection include:

- Length of vegetation to be cut;
- Size of area to be cut;

- The nature and spacing of any obstacles;
- The required removal of arisings.

6.4 Modifications following Monitoring

The management of retained grasslands, particularly translocated turves, may be subject to change following the habitat specific Project Ecologist monitoring requirements for this habitat type, as detailed in Section 1.6.

7.0 Implementation Schedule

Table 01. Grassland Mitigation and Translocation Implementation Schedule

Phase	Timeframe	Action
Botanical Surveys	April – July 2020 (Year 1)	Carry out updated botanical surveys for Target Species. Record and identify Donor Sites to be translocated. Focus translocation effort. PROJECT ECOLOGIST.
Pre-Translocation Phase Preparation	Aug 2020 (Year 1)	Peg-out Donor and Receptor Sites. Peg-out of adjacent construction areas. Determine appropriate tracking and haul routes. Project Ecologist oversight during reptile Exclusion Fencing installation and habitat modification. PROJECT ECOLOGIST AND GROUNDWORKS CONTRACTOR.
Translocation Phase	Sep to Oct 2020 (Year 1)	Project Ecologist pre-works briefing to contractor. Cutting and translocation of turves from Donor Sites to prepared Receptor Sites. PROJECT ECOLOGIST AND GROUNDWORKS CONTRACTOR.
Pre-Construction Phase Preparation	~Oct/Nov 2020 (Year 1)	Installation of Protection Fencing and setting up of Construction Exclusion Zones (CEZs). PRINCIPLE CONTRACTOR WITH SUPPORT FROM PROJECT ECOLOGIST.
Construction Phase	Oct/Nov 2020 to ~Oct 2023 (Years 1 to 3) *Construction Phase dates are approximate*	Project Ecologist 'tool-box' talks. Strict CEZ retention and protection, fence maintenance. Project Ecologist oversight during installation of boardwalks and paths. PRINCIPLE CONTRACTOR WITH SUPPORT FROM PROJECT ECOLOGIST.
Monitoring	Oct/Nov 2020 to ~Oct 2023 (Years 1 to 3)	Bimonthly monitoring of the Receptor Sites (monthly between April to July). Assess condition of translocated turves, provide advice and remedial actions where necessary. Report to Principle Contractor. Inspection of CEZ fencing, advise Construction Manager on repairs. PROJECT ECOLOGIST AND PRINCIPLE CONTRACTOR.

Phase	Timeframe	Action
	Year 4 to Year 25	Yearly monitoring in May and July. Assess condition of translocated turves, provide advice and remedial actions where necessary. Report to Management Company and LPA. PROJECT ECOLOGIST.
Long-Term Management	Year 3/4 to Year 25	Low intensity hay cut and removal of arisings to maintain and enhance condition of swards. Other management interventions advised in accordance with recommendations following monitoring visits. MANAGEMENT COMPANY WITH ADVICE FROM PROJECT ECOLOGIST.

REFERENCES

MKA (2015). Land at Teversham Road Fulbourn, Assessment of Species of Botanical Interest, MKA.

Natural England (2010). Higher Level Stewardship Farm Environment Plan (FEP) Manual – Third Edition. Natural England.

Wildlife Trust (2016). Land at Teversham Road, Fulbourn, Targeted Botanical Survey, Wildlife Trust.

APPENDIX A
-
SOIL CHEMISTRY ANALYSIS RESULTS

TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

James Faulconbridge
Landscape Science Consultancy Ltd
The South Wing
The Old Barracks
Sandon Road
Grantham
Lincs
NG31 9AS

9th September 2019

Our Ref: TOHA/19/6512/ML
Your Ref: as below

Dear Sirs

Soil Investigation Report for Grassland Translocation

Land off Teversham Road, Cambridge

We have completed our soil investigation at the land off Teversham Road and have pleasure reporting our findings.

Working Brief

It is understood that a translocation exercise has been proposed, whereby turves from a semi-improved grassland are to be moved to 3-4 No. new locations. Little or no information was available on the type and properties of the soils present.

A soil sampling and testing exercise (topsoil and subsoil) was requested at 6 no. preselected locations as shown on the supplied and attached site plan. Of these, TH1 and TH2 represent 'donor' sites and TH3 to TH6 are 'recipient' locations.

At each location an assessment of soil properties including soil texture, topsoil depths, pH and nutrient levels was requested.

SITE VISIT

The site visit was conducted on 28th August 2019 during period of warm, dry weather.

Site Overview

The site consisted of 2 no fields as indicated on the supplied site plan (**Appendix 1**).

Both fields were reasonably flat and level, overgrown with frequent brambles and thistles with occasional small to medium shrubs. The fields were bounded by hedgerow and mature trees on all sides. The grass cover contained frequent patches of Spagnum moss and a dense grass thatch layer.

Plate 1 : Example of the typical landscape conditions

Plate 2 : Grass turf containing grass thatch and spagnum moss

Soil Sampling and Soil Descriptions

The sampling locations are shown on the attached site plan in **Appendix 1**.

Representative samples of topsoil and subsoil were taken from each sample location for laboratory analysis, with reference to Natural England Technical Information Note 035 **–** *Soil sampling for habitat creation and restoration*. The soil samples were taken using a hand driven soil auger (50mm Dutch Head) from the following depths:

- Topsoil Samples: GL **–** 75mm
- Subsoil Samples: 200mm from the base of the topsoil

During the sampling exercise, soils were examined with reference to the Soil Survey Field Handbook. Important physical soil characteristics were recorded, including texture, structure, compaction, moisture status, drainage characteristics, topsoil depths, stone content and the presence of deleterious materials.

Typical Soil Profile

A single typical soil profile was encountered between sampling locations, described as below:

Topsoil GL **–** 280 / 340mm Average depth: 315mm	Brown to greyish brown, slightly moist, friable, very calcareous CLAY LOAM. Well-developed, fine to medium granular to sub angular blocky structure. Slight stony with flints up to 25mm and no observable deleterious materials. The average rooting depth within the topsoil profile was 170mm (140 **–** 200mm).
Subsoil 200mm from the base of the topsoil	Light grey with occasional faint orange mottling, slightly moist, slightly plastic, very calcareous CLAY to SILTY CLAY with weathered parent material. Virtually stone free with no observable deleterious materials.

Plate 3 : Typical Soil Profile

Plate 4 : Typical Topsoil

Plate 5 : Typical Subsoil

LABORATORY TESTING

The samples of topsoil and subsoil were submitted to the laboratory for a limited range of chemical analyses to confirm their soil reaction and fertility status. The following parameters were determined:

- pH value;
- extractable phosphorus;
- extractable potassium;
- extractable magnesium.

The results are presented on the attached Certificates of Analysis as **Appendix 2** and an interpretation of the results is given below.

Results of Analysis

pH Values

The topsoil samples from each sampling location were strongly alkaline in reaction (pH 8.2 – 8.5).

The subsoil samples from each sampling location were strongly alkaline in reaction (pH 8.5 – 8.9).

Fertility Status

The samples of topsoil displayed varying levels of extractable nutrients as outlined in the table below;

Topsoil Extractable Nutrients and Fertility Status			
Trial Hole	Extractable Phosphorus	Extractable Potassium	Extractable Magnesium
1	10 mg/l Low Fertility	100 mg/l Low Fertility	37 mg/l Low Fertility
2	13 mg/l Low Fertility	156 mg/l Slightly Low to Medium Fertility	33 mg/l Low Fertility
3	11 mg/l Low Fertility	122 mg/l Slightly Low to Medium Fertility	34 mg/l Low Fertility
4	32 mg/l Medium to High Fertility	186 mg/l Slightly Low to Medium Fertility	37 mg/l Low Fertility
5	27 mg/l Medium to High Fertility	170 mg/l Slightly Low to Medium Fertility	31 mg/l Low Fertility
6	84 mg/l Very High Fertility	343 mg/l Medium to High Fertility	40 mg/l Low Fertility

The samples of subsoil also displayed varying levels of extractable nutrients as outlined in the table below;

Subsoil Extractable Nutrients and Fertility Status			
Trial Hole	Extractable Phosphorus	Extractable Potassium	Extractable Magnesium
1	4 mg/l Very Low Fertility	54 mg/l Very Low Fertility	13 mg/l Very Low Fertility
2	9 mg/l Very Low Fertility	75 mg/l Low Fertility	14 mg/l Very Low Fertility
3	2 mg/l Very Low Fertility	38 mg/l Very Low Fertility	15 mg/l Very Low Fertility
4	3 mg/l Very Low Fertility	58 mg/l Very Low Fertility	21 mg/l Very Low Fertility
5	3 mg/l Very Low Fertility	68 mg/l Low Fertility	20 mg/l Very Low Fertility
6	55 mg/l High Fertility	127 mg/l Slightly Low Medium Fertility	19 mg/l Very Low Fertility

CONCLUSION

The purpose of this soil investigation was to assess the existing soil conditions at 2 no. 'donor' locations and 4 no. 'recipient' locations in relation to a grassland translocation exercise.

It is understood that TH1 and TH2 ('donor') sites are representative of the conditions from which the grass turves were growing in prior to translocation. TH3 to TH6 ('recipients') are representative of the locations where it is planned to translocate the grass turf to.

The topsoil and subsoil encountered at the site were physically characterised by medium textured topsoil and heavy textured subsoil. Faint mottling was observed within the subsoils at all locations. These observations indicate these soil profiles are 'imperfectly drained' and, as such, may be expected to be subject to 'seasonal waterlogging'.

The soils were strongly alkaline in reaction and were very calcareous. 'Chalky' soils such as these are not suited to the establishment of neutral and acid grasslands, which typically prefer lower pH values and low levels of carbonate. This should be taken into account when considering additional seeding and/or planting at this site.

Soil Fertility Status

Semi-improved grassland occurs in the UK on soils with a low fertility status (*infertile*) and plant available phosphorus is the key nutrient when considering the fertility status of soil in relation to these meadow types. As such, *infertile / low fertility* soil is required to maximise the floristic diversity of the sward and to reduce the risk of domination by grasses and aggressive weeds such broad-leaved dock (*Rumex obtusifolius)* and stinging nettle (*Urtica dioica*).

Topsoil

The topsoil from the donor locations (TH1 and TH2) and recipient location TH3 was found to have low fertility status ('infertile') conditions typical of semi-improved grassland.

The areas represented by TH 4 to TH6 displayed a high to very high fertility status. Topsoil such as this may be prone to future colonisation by aggressive weeds and grasses. Phosphorus is relatively immobile in soils and it would therefore be difficult to remove from the topsoil. This topsoil would have a low potential for successful translocation of semi-improved grassland turves.

Subsoil

The subsoil layers at TH1 to TH5 have a low fertility status ('infertile') and therefore have potential for semi-improved grassland establishment. Subsoils such as these typically have a beneficial balance of plant nutrients and microbial activity needed to provide a suitable growing medium for this purpose. The subsoils have the additional advantage of having a negligible weed seed bank.

The subsoil at TH6 was found to have a high fertility status with high levels of extractable phosphorus and as such has a low potential for the translocation of semi-improved grassland turf.

Next Steps

If it is desired to utilise the subsoil from the locations represented by TH3 to TH5 for translocating the turf, it would be necessary to treat the soil profile(s) to expose the subsoil(s) for preparation and turfing. The required earthworks and tillage operations should be timed and managed to minimise damage to soil structure. This should include vegetation treatment prior to commencement. Should the topsoil be stripped, a suitable 'home' (either on-site or off-site) would need to be found for it.

The topsoil (or subsoil once exposed) should be prepared appropriately for turfing. This is likely to require suitable cultivation(s) to break up any compacted lumps and provide a suitable seed-bed, followed by rolling if necessary.

Soil Handling Recommendations

The heavy texture of this soil will make it particularly vulnerable to physical degradation (compaction) during all phases of soiling and landscape works. It is important to ensure that the soil is not unnecessarily compacted by trampling or trafficking, and soil handling should be stopped during and after heavy rainfall, and not continued until the soil has returned to a friable state. If this soil is damaged its potential for re-use will be limited. Therefore, to maintain the physical condition of the soil and avoid structural damage, all phases of soil handling operations (e.g. stockpiling, respreading, cultivating, and planting, seeding or turfing) should only be carried out when the soil is reasonably dry and non-plastic (friable) in consistency.

If the soil is structurally damaged and compacted at any stage during the course of soiling or landscaping works, it should be cultivated appropriately to relieve the compaction and to restore the soil's structure prior to any planting, turfing or seeding.

We would like to thank Landscape Consultancy Ltd for entrusting the practice with this commission. We trust this report meets with your approval and provides the necessary information. Please do not hesitate to contact the undersigned for further assistance.

Yours faithfully

Matthew Lowry
BSc MSc
Graduate Soil Scientist

Tim White
BSc MSc MISoilSci CSci
Senior Associate

For & on behalf of Tim O'Hare Associates LLP

Attachments

Appendix 1 – Site Plans
Appendix 2 – Certificates of Analysis

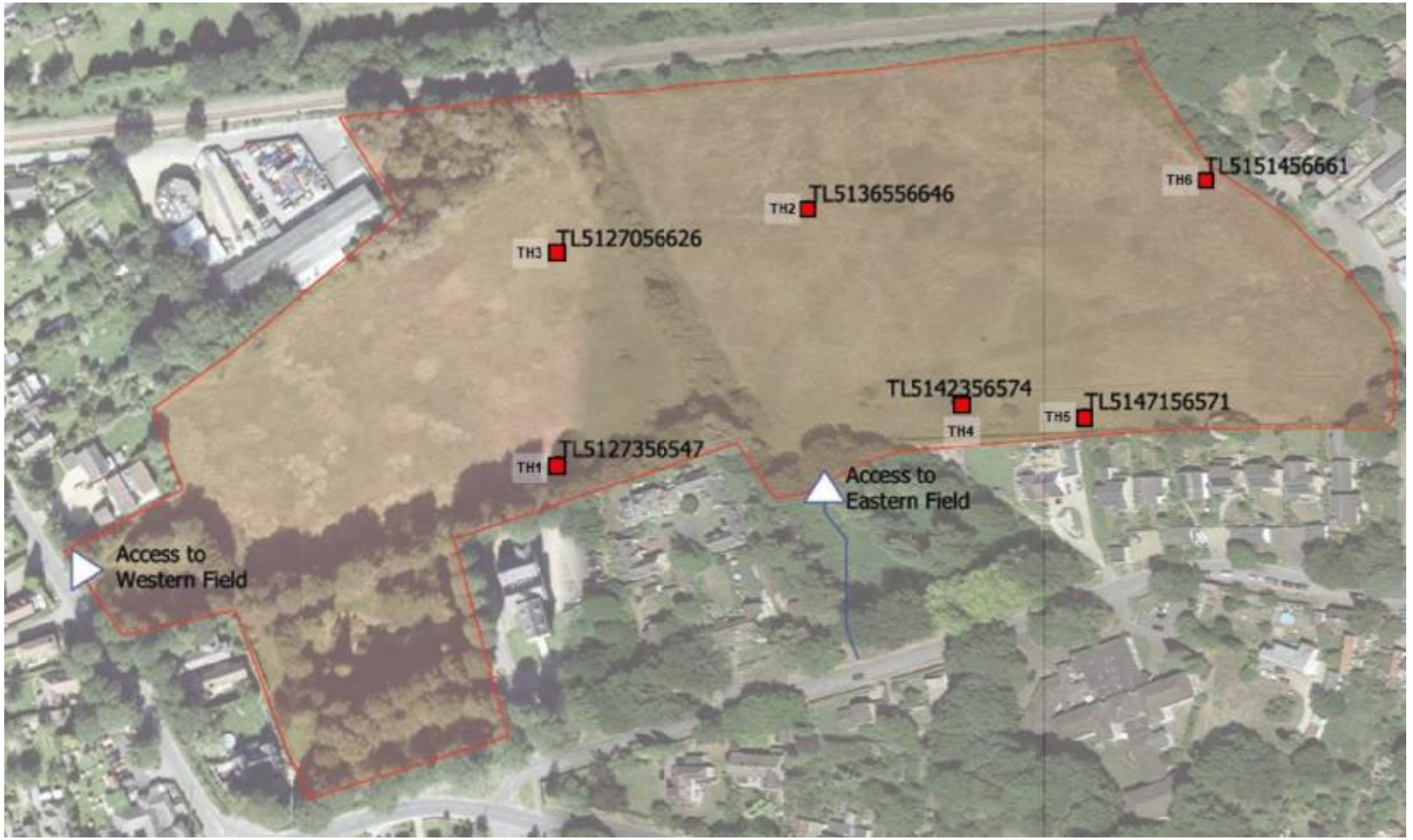
Report Qualifications

TOHA's interpretation of the soil conditions is based on observations made during the site investigation and the results of laboratory tests. This report presents TOHA's site observations and test results and the interpretation of those observations and results. On any site there may be variations in soil conditions between these exploratory positions. TOHA can therefore not accept any responsibility for soil conditions that have not been exposed by this investigation.

This investigation considers the re-use of the site soils for semi-improved grassland translocation at the land off Teversham Road, Cambridge. It should not therefore be relied on for alternative end-uses or for other schemes. This report has been prepared solely for the benefit of the client Landscape Science Consultancy Ltd. No warranty is provided to any third party and no responsibility or liability will be accepted for any loss or damage in the event that this report is relied upon by a third party or is used in circumstances for which it was not originally intended.

Appendix 1

Site Plan – Survey Area and Trial Hole Locations



Trial Hole Location (approx.)

Site boundary

TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Client:	Landscape Consultancy Ltd		
Project:	Land Off Teversham Road, Cambridge		
Job ref no.:	TOHA/19/6512/ML		
Drawing no.:	6512/1		
Drawing title	Soil Investigation Report		
Date:	September '19	Scale:	NTS
Drawn by:	ML	Checked by:	TW

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Appendix 2

Laboratory Analysis

TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Client:	**Landscape Science Consultancy Ltd**
Project:	**Teversham Road, Cambridge**
Job:	**Soil Investigation**
Date:	**September 2019**
Job Ref No:	**TOHA/19/6512/ML**

Location Reference			**TL5127356547**	**TL5136556646**	**TL5127056626**	**TL5142356574**	**TL5147156571**	**TL5151456661**
Trial Hole			**TH1**	**TH2**	**TH3**	**TH4**	**TH5**	**TH6**
Soil Type			**Topsoil**	**Topsoil**	**Topsoil**	**Topsoil**	**Topsoil**	**Topsoil**
		Accreditation						
pH Value (1:2.5 water extract)	units	UKAS	8.3	8.4	8.2	8.1	8.5	8.4
Extractable Phosphorus	mg/l	UKAS	10.4 [1]	13 [1]	11 [1]	32 [3]	27 [3]	84 [5]
Extractable Potassium	mg/l	UKAS	100 [1]	156 [2]	122 [2]	186 [2]	170 [2]	343 [3]
Extractable Magnesium	mg/l	UKAS	37 [1]	33 [1]	34 [1]	37 [1]	31 [1]	40 [1]

[ ] = Adas Nutrient Index

Results of analysis should be read in conjunction with the report they were issued with

TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Client:	**Landscape Science Consultancy Ltd**
Project:	**Teversham Road, Cambridge**
Job:	**Soil Investigation**
Date:	**September 2019**
Job Ref No:	**TOHA/19/6512/ML**

Location Reference			**TL5127356547**	**TL5136556646**	**TL5127056626**	**TL5142356574**	**TL5147156571**	**TL5151456661**
Trial Hole			**TH1**	**TH2**	**TH3**	**TH4**	**TH5**	**TH6**
Soil Type			**Subsoil**	**Subsoil**	**Subsoil**	**Subsoil**	**Subsoil**	**Subsoil**
		Accreditation						
pH Value (1:2.5 water extract)	units	UKAS	8.8	8.8	8.5	8.8	8.9	8.7
Extractable Phosphorus	mg/l	UKAS	4 [0]	9 [0]	2 [0]	3 [0]	3 [0]	55 [4]
Extractable Potassium	mg/l	UKAS	54 [0]	75 [1]	38 [0]	58 [0]	68 [1]	127 [2]
Extractable Magnesium	mg/l	UKAS	13 [0]	14 [0]	15 [0]	21 [0]	20 [0]	19 [0]

[ ] = Adas Nutrient Index

Results of analysis should be read in conjunction with the report they were issued with

APPENDIX 2
-
CHALK STREAM - HABITAT RESTORATION PLAN (DoC 12)

LAND OFF TEVERSHAM ROAD, FULBOURN

DOCUMENTS FOR DISCHARGE OF CONDITION 12
PLANNING PERMISSION S/02020/17/OL

CHALK STREAM HABITAT RESTORATION SCHEME

REVISION A

For

Castlefield International Limited

March 2020

Landscape Institute
Registered practice

Registered Office:
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VAT Reg No 738 3576 01

Certificate Number 3269
ISO 9001

CONTENTS

NOTE: Figures are provided at the end Landscape & Biodiversity Management Plan of which this Restoration Plan forms an Appendix.

Report Ref No:	H75.19d
Author:	Steven Weber BSc (Hons) MCIEEM
Scientific check:	Ian Stephens BSc (Hons) MSc
Presentation check:	Zoe Lewis BA (Hons)
Date:	March 2020

1.0 Introduction

1.1 Planning Condition 12

Outline planning permission for residential development of up to 110 dwellings on Land at Teversham Road, Fulbourn, Cambridgeshire (Planning Application reference: S/0202/17/OL), henceforth referred to as the 'Site', was granted by South Cambridgeshire District Council, subject to conditions, on 26th October 2017.

This document provides a scheme for the restoration of a canalised stretch of chalk stream which flows the Site and as such forms Appendix 2 of the Landscape and Biodiversity Management Plan for the Proposed Development, for the part-discharge of Planning Condition 12.

1.2 Restoration Scheme Timings

Currently, it is envisaged that key ecological ground works for the Restoration Scheme will be completed by the end of the Construction Phase. The duration of the Construction Phase is currently envisaged to be 2.5 years – i.e. Years 1 to 3.

The winter of Year 1 at the start of the Construction Phase or the autumn/winter of Year 2 during the Construction Phase will be the most appropriate periods for the key stages restoration works to be completed, as this avoids key nesting periods for birds and other potential impacts to chalk stream flora and fauna.

Ground conditions within the winter period may limit restoration works however, this will be continually assessed by the Project Ecology and Principal Contractor.

Measures such as planting of aquatics will be undertaken in the spring period following completion of river channel re-modelling works.

1.3 Restoration Scheme Implementation and Responsibilities

1.3.1 Construction Phase Works

Restoration works to the chalk stream and its protection during the Construction Phase will be the responsibility of the Principal Contractor. Direction, advice and oversight will be provided by the Project Ecologist.

Where referred to in this Restoration Scheme, the 'Project Ecologist' includes the Ecology Team and the suitability qualified individuals who will undertake, direct and oversee the individual ecological work elements.

1.3.2 Operational Phase

Post-development, the long-term management of the chalk stream will be delivered by a Management Company appointed by the Applicant. This will form part of the Landscape and Biodiversity Management Plan of which this Mitigation Scheme is an Appendix. The Management Company will be funded by a Maintenance Charge or equivalent, paid for by residents.

1.4 Site Ownership

The chalk stream will remain in the ownership of the Applicant, Castlefield.

1.5 Monitoring

Post-development monitoring of the chalk stream within the Operational Phase will be undertaken be the Project Ecologist following the prescribed methods outlined within the Landscape and Biodiversity Management Plan.

2.0 Baseline Evidence and Overview

2.1 Current Baseline Evidence

A small chalk stream flows from south to north forming the boundary between two grassland fields which dominate the Site. The stream arises from a spring located immediately to the south of the Site and continues to the north where it enters a ditch system flowing towards Teversham Fen.

The stream within the Site has been straightened and canalised within a ditch and is heavily shaded by scrub for the entire length. The vegetation bounding the chalk stream includes mature coppiced hawthorn shrubs to 7m tall along with wild privet, elder and buckthorn; however, in many locations the vegetation is represented by more ruderal self-set scrub including bramble mounds. Individual semi-mature/mature trees are present including ash and hybrid poplar. The vegetation on the eastern side is generally more established and dense than that to the west.

The dense scrub prevents access to most of the stream banks. Where visible, the ditch banks are steep (>45°) with submerged and emergent vegetation being absent and vegetation on the ditch banks is sparse. The substrate, where visible, appears to be dominated by silt with some chalk gravel visible.

Figure 03 shows the current distribution of habitats around the chalk stream.

2.2 Restoration Scheme Overview

The Restoration Scheme was prepared with reference to the Manual of River Restoration Techniques, published online by the River Restoration Centre (RRC) and included consideration of appropriate case studies such as the opening up of a canalised section of the River Ravensbourne.

The habitat restoration methods that will be implemented, and the principal ecological objectives arising therefrom, are provided in Table 1 below.

Table 1: Habitat Restoration Methods and Principal Ecological Objectives.

Habitat Restoration Method	Principal Ecological Objectives
Selective removal of scrub.	To increase light levels and allow the development of a diverse submerged, emergent and bankside flora.
Retention of selected trees and shrubs with a focus on more established, mature or ecologically valuable specimens.	To retain the ecological value of such features (e.g. foraging and commuting route for bats, foraging and nesting birds etc.).
Widening the stream banks (where practicable).	To increase the diversity of habitats available to invertebrates and floral species.
Encouraging the stream to develop naturalistic features such as meanders, variations in depth and substrate types.	To increase the diversity of habitats available to invertebrates and floral species.
Selective removal of silt only if required.	To increase the diversity of habitats for

Habitat Restoration Method	Principal Ecological Objectives
	aquatic plants and invertebrates.
Planting of aquatic flora.	To increase floristic diversity within the riparian habitats and to enhance the stream in respect to aquatic invertebrates.
Protection of surrounding retained habitat – specifically the meadow in the western field.	To prevent damage to adjacent retained grassland habitat during restoration works.
Avoiding impacts to protected/notable species.	To maintain the conservation status of protected/notable species within the site.
Pollution Control	To prevent sediment and/or pollution entering the chalk stream and being carried off site.

Figure 05 provides an indicative plan for the Chalk Stream Habitat Restoration Scheme. The precise location and extent of features of the Restoration Scheme will be directed by the Project Ecologist during the works, in order to achieve the principal ecological objectives provided in Table 1. This takes into account the significant limitations on access into the stream channel throughout the year, due to density of tree, shrub and outgrown hedgerow habitats for the length of each bankside.

It may be necessary to apply to the lead local flood authority for Ordinary Watercourse Consent to enable the Restoration Scheme to proceed. Further dialogue by the Project Ecologist is proposed with the relevant bodies and, if required, such consent will be obtained prior to the commencement of works.

The Project Ecologist will direct and oversee all elements of the Restoration Scheme on the ground, including any necessary pre-works inspections in respect of Protected Species, such as nesting birds, to ensure legal compliance.

3.0 Habitat Restoration Scheme

3.1 Scrub Removal

Dense scrub growth on both banks of the stream will be thinned. Mature trees and those shrubs that are identified as being of elevated ecological value (due to factors including species, size, age or features with potential to support faunal species), will be retained. In addition, individual or groups of shrubs not meeting the above criteria, will also be retained, where it will be beneficial in order to maintain the current ecological functionality of the stream (e.g. as a potential commuting route for bats). The extent of the retained scrub is estimated to be 60% but will be judged by the Project Ecologist, with the principal objective being to achieve an optimal compromise between increasing light levels onto the stream and banks and maintaining the current ecological functionality of the existing habitats.

The aims and objectives for scrub removal will be the:

- Retention of the existing vegetation on the western bank to the north of the proposed road bridge;
- Removal of the existing vegetation on the eastern bank between the proposed road bridge and the footbridge;
- Retention of existing vegetation on both sides of the boundary to the south of the proposed footbridge.

This will secure the retention of existing cohesive blocks of vegetation and maintain the 'wooded corridor' on one side or the other throughout the stream corridor, to ensure the preservation of an appropriate flight route for bats and functional terrestrial green corridor.

New native shrub planting is proposed within the submitted Landscaping Strategy and will be located across the Site, particularly along existing boundary features to enhance connectivity.

3.2 Modification of the Stream Channel

Due to constraints inherent in the Development Plan, modification to the stream channel to the south of the footbridge will not be practicable. This section of the stream will remain within its current banks with habitat enhancements deriving from scrub removal, planting and possibly silt removal, dependent upon subsequent assessment by the Project Ecologist.

The banks of the stream, adjacent to the area of retained grassland habitat, between the access road bridge and the section of woodland towards the northern Site boundary, will be re-profiled.

The objective will be to produce a bank with a shallow gradient providing transitional habitats of varying inundation and hydrology between the retained grassland and the stream channel. Within this section, the stream will be

encouraged to take on a more natural appearance including meanders and variation in depth and substrate.

The methods used to achieve these objectives are likely to include deliberate diversion of the existing channel. The new course will follow a meander towards the area of retained grassland the west, north of the road bridge and a slight easterly meander to the south of the road bridge. Maintaining a smooth longitudinal profile, whilst creating variation of the bed width and infilling with excess gravel, will enable the stream to shape its new bed rather than constructing pools, riffles and beaches artificially. The gravel infill will be selected to be compatible with the geology of the stream bed and, if feasible, will be obtained from excavated material from elsewhere within the Site (e.g. during excavations).

An indicative cross section of the altered stream profile is provided in Figure 05.

The use of flow deflectors, ideally sourced from the arisings associated with the removal of trees and shrubs on the bankside, will also be considered in order to speed flow in specified locations and encourage the development of deeper pools and stream bed variation.

3.3 Silt Removal

Targeted removal of silt from the stream bed may be beneficial by enhancing the habitat diversity particularly in respect of aquatic invertebrates. However, this approach is not universally advocated as, without due care, it can result in the loss of existing habitat features.

The requirement for silt removal will be determined approximately 12 months following the modification of the stream channel. This will enable changes to the substrate characteristics to occur naturally in response to any changes in flow patterns induced by modifications to the channel.

The location and extent of silt removal, if required, will be determined by the Project Ecologist, with the overall aim being to produce a range of substrate conditions typical of chalk stream habitats.

3.4 Aquatic Planting

Planting of aquatic and marginal species will be used to enhance the floristic diversity of the riparian habitat. The species planted will be those typical of similar Cambridgeshire Chalk Stream habitats. Where possible, planting will be sourced locally. Advice will be sought from third party stakeholders including the Bedfordshire, Cambridgeshire & Northamptonshire Wildlife Trust regarding the appropriate species to be included in the planting and to identify potential local sources of stock. An indicative species list is provided below:

Aquatic species for inclusion include:

- Stream water crowfoot (*Ranunculus penicillatus*);
- Brook water crowfoot (*R. peltatus*);
- Watercress (*Nasturtium officinale*);
- Common Water-starwort (*Callitriche stagnalis*).

Marginal species for inclusion include:

- Purple loosestrife (*Lythrum salicaria*);
- Hemp agrimony (*Eupatorium cannabinum*);
- Water forget-me-not (*Myosotis scorpioides*);
- Branched bur-reed (*Sparganium erectum*);
- Lesser water-parsnip (*Berula erecta*).

4.0 Work Mitigation Measures

4.1 Protection of Adjacent Retained Grasslands

The Strategy for Grassland Mitigation and Translocation - SGMT (Appendix 1 of the Landscape and Biodiversity Management Plan) provides detailed measures for the protection of retained grass swards in Section 5.0, including the erection of Protection Fencing and creation of Construction Exclusion Zones (CEZs).

In respect of the chalk stream an area of retained grassland sward will be located directly to the west. In order to protect the retained sward during the chalk stream restoration works, this grassland will be designated as a CEZ with Protection Fencing installed prior to works taking place.

The requirement for the protection of the retained grassland sward will be outlined to the restoration contractors during the Project Ecologist Toolbox Talk. Restoration works will progress strictly adhering to the mitigation measures provided in Section 5.0 of the SGMT.

4.2 Avoiding Impacts on Protected/Notable Species

To avoid negative impacts on protected/notable species within the restoration corridor, no works will be undertaken until the Project Ecologist has given the 'all clear' and the following measures and pre-commencement surveys are implemented by the Project Ecologist:

- The proposed reptile translocation has been completed (Appendix 3 of Landscape and Biodiversity Management Plan);
- The proposed grassland translocation scheme has been completed (Appendix 1 of Landscape and Biodiversity Management Plan);
- A badger survey has been undertaken and the restoration corridor and a surrounding 30m buffer have been declared free of badger setts;
- Scrub and tree removal works to ideally be undertaken outside of the bird nesting season, otherwise:
    - Pre-commencement nesting bird checks have been completed and it is confirmed that no active bird nests are present within or adjacent to the work areas;
- Precautionary checks for the presence of water vole and otter have been completed; and
- Contractors have been given a Toolbox Talk by the Project Ecologist. The Toolbox Talk will inform contractors of appropriate working methods to minimise the risk to wildlife, and the appropriate course of action to take should animals be encountered during works.

Should potential impacts to protected species be identified by the Project Ecologist, the works schedule will be amended to enable appropriate action to be undertaken to enable works to proceed with legislative compliance.

4.3 Pollution and Damage Control of Chalk Stream

4.3.1 Overview

Best Industry Practice working methods will be implemented during all restoration works impacting the chalk stream to ensure that any arisings and silts generated are not carried off site.

Similarly, during the Construction Phase, standard safeguards will be implemented to prevent any silt or pollutants being released into the stream and migrating downstream, or the stream features being directly damaged by construction activities.

All contractors working during the Construction Phase will undertake the site induction process during which environmental protection measures will be outlined, including the protection measures required to safeguard the chalk stream.

These protection measures will be developed within the Construction Management Plan provided by the Principal Contractor with advice from the Project Ecologist, specific to their working requirements. These measures will, in principle, comprise:

4.3.2 Scrub Removal Works

- Contractors will ensure that the deposition of arisings into the stream channel is minimised through planned and control extraction working measures;
- Waste brash will not be stored within 10m of the stream channel;
- All chipping operations will be undertaken facing away from the stream channel, with consideration of the prevailing wind direction.

4.3.3 Channel Re-Grading, Ground Level Changes and Water Run-Off

- Deposition of silts into the stream channel will be minimised through planned and controlled working measures by machinery drivers;
- Waste silt and soils will not be stored within 10m of the stream channel;
- Where deemed appropriate by the Project Ecologist and Principal Contractor, specialist protective fencing or bunding will be used to prevent over silting and water run-off to the stream channel.

4.3.4 Fuels and Chemicals

- All fuels/chemicals will be bunded, appropriately labelled and stored on impermeable surfaces within the identified construction compound;
- Bunded fuels/chemicals will not be located within 10m of the stream channel;
- There will be no storage, re-fuelling or servicing of plant or machinery

within 10m of the stream channel.

4.3.5 Handling and Movement

- The mixing and use of any materials (i.e. concrete) which have the potential to cause spillages will not be undertaken in close proximity to the stream channel, wherever possible. If this is required, specific Method Statements to Best Industry Practice will be devised by the Principal Contractor to ensure works are suitably controlled;
- Cleaning of plant, machinery, mixers (i.e. concrete) and storage facilities will not be undertaken within 10m of the stream corridor;
- Spillage kits will be made available in appropriate signed locations, particularly near the stream channel;
- Any spillage or leaks of fuels/oils/chemicals will be reported immediately to the Construction Manager and remedial works immediately undertaken.

4.3.6 Treatment of Waste

- Waste materials will not be stored within 10m of the stream channel;
- All waste will be strictly controlled, contained, recycled and removed from the construction site in accordance to Industry Best Practice.

4.3.7 Protection Fencing

- The use of braced Heras fencing to protect and delineate the stream corridor will be designed and implemented by the Principal Contractor, with advice from the Project Ecologist.
- All-weather notices will be fixed to the Protection Fencing stating '*Construction Exclusion Zone - Keep Out*' or similar.
- The Construction Manager (and Project Ecologist as appropriate) will regularly check the Protection Fencing for damaged sections and sections which are out of alignment. Any required repairs will be acted upon immediately by the Construction Manager, to ensure continuity of protection functionality.

APPENDIX 3
-
REPTILE MITIGATION STRATEGY (DoC 12)

Landscape Science Consultancy Ltd

LAND OFF TEVERSHAM ROAD, FULBOURN

DOCUMENTS FOR DISCHARGE OF CONDITION 12
PLANNING PERMISSION S/02020/17/OL

REPTILE MITIGATION STRATEGY

Revision A

For

Castlefield International Limited

March 2020

Landscape Institute Registered practice

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CONTENTS

NOTE: Figures are provided at the end of the Landscape & Biodiversity Management Plan of which this Reptile Mitigation Strategy forms an Appendix.

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Date:	March 2020

1.0 Introduction

1.1 Planning Condition 12

Outline planning permission for residential development of up to 110 dwellings on Land at Teversham Road, Fulbourn, Cambridgeshire (Planning Application reference: S/0202/17/OL), henceforth referred to as the 'Site', was granted by South Cambridgeshire District Council, subject to conditions, on 26th October 2017.

The Site currently supports a low population of common lizard (*Zootoca vivipara*), following surveys undertaken in 2019. A single grass snake (*Natrix helvetica)* was recorded within the Site following surveys in 2014. This document provides a Mitigation Strategy with respect to reptiles within the Site and as such forms Appendix 3 of the Landscape and Biodiversity Management Plan for the Proposed Development, for the part-discharge of Planning Condition 12.

1.2 Mitigation Strategy Implementation and Responsibilities

1.2.1 Pre-Construction Phase Works

The process of translocating and relocating reptiles prior to the start of the Construction Phase will be managed and undertaken by the Project Ecologist with construction and groundworks support either from the Principle Contractor or a contractor appointed by the Applicant, Castlefield.

The translocation period is currently proposed for September to mid-October 2020, which will be an appropriate timeframe for this exercise in accordance with Best Industry Practice.

Where referred to in this Mitigation Strategy, the 'Project Ecologist' includes the Ecology Team and the suitability qualified individuals who will undertake, direct and oversee the individual ecological work elements.

1.2.2 Construction Phase Works

The protection of the Receptor Site and exclusion fencing during the Construction Phase will remain the responsibility of the Principle Contractor with advice from the Project Ecologist. The duration of the Construction Phase of the residential scheme is currently envisaged to be 2.5 years – i.e. Years 1 to 3.

1.2.3 Operational Phase

Post-development, the long-term management of the Receptor Site and other habitats within the Site for benefit of reptiles will be delivered by a Management Company appointed by the Applicant. This will form part of the Landscape and Biodiversity Management Plan of which this Mitigation Strategy

is an Appendix. The Management Company will be funded by a Maintenance Charge or equivalent, paid for by residents.

1.3 Site Ownership

The areas of the Site retained and enhanced for reptiles will remain in the ownership of the Applicant, Castlefield.

2.0 Reptile Mitigation Strategy

2.1 Legislative Protection

Reptiles are protected from killing and injuring under the Wildlife and Countryside Act 1981.

2.2 Current Baseline Evidence

Low populations of common lizard and grass snake were identified within the Site in 2014 and 2019. No other reptile species have been identified within the Site.

The most recent reptile surveys, undertaken in September 2019 by LSC, confirmed the continued presence of a low population of common lizard (*Zootoca vivipera*) within the Site (see Figure 08). This finding is consistent with the results of reptile surveys previously undertaken in 2014 within the Site.

The presence of grass snake (*Natrix helvetica*), previously recorded within the Site in 2014, was not confirmed during the 2019 survey. However, grass snake are a relatively common and widespread species and habitats within the Site remain suitable for this species.

This Mitigation Strategy therefore provides appropriate mitigation and protection measures in respect of common lizard and grass snake.

2.3 Mitigation Strategy Overview

Due to the constraints of space and programme within the Site, this Mitigation Strategy has been developed in order to ensure the protection of reptiles from killing and injuring; to ensure the protection of the population during the Construction Phase; and to ensure the long-term management and enhancement of habitats during the Operational Phase. An overview of the Reptile Mitigation Strategy is provided below and is also illustrated in Figure 01:

- Enhancement of the Receptor Site prior to translocation;
- The installation of exclusion fencing to prevent reptiles re-entering the Site during the translocation phase and the Construction Phase;
- Habitat manipulation prior to the translocation phase;
- A translocation period during the active reptile season to Best Practice Industry standards;
- Oversight and direction from the Project Ecologist throughout this process, as appropriate;
- Long-term management and enhancement of Site habitats to provide additional resources for reptiles as part of the Development Plan.

2.4 Receptor Site

2.4.1 Requirement

The Receptor Site is located at the northern edge of the Site (see Figure 01) and incorporates an area of existing broadleaved woodland and semi-improved neutral grassland.

The Receptor Site will be retained without significant intervention within the Development Plan. The scope and location of the Receptor Site is considered appropriate and proportionate for the low population of reptiles identified within the Site. Justification for the Receptor Site scope and location is provided below.

- Due to the scale of the residential scheme across the Site, along with requirements for drainage and bioretention, it is not possible to accommodate the reptile population elsewhere within the Site without requiring additional future translocation of the same population – double-handling in this way is not considered good practise;
- The Receptor Site provides, in-part, open grassland habitat which is adjacent to and similar in character to habitats where common lizard was recorded in 2019;
- The Receptor Site will allow reptiles to be translocated to suitable habitat close to the railway embankment to the north, which will allow individuals to disperse to alternative suitable habitats during the Construction Phase and recolonise the Site during the Operational Phase;
- The Receptor Site will not be subject to further direct disturbance during the Construction Phase;
- Post-development, the Receptor Site will form part of a connective corridor of retained and enhanced habitats, such as the chalk stream, Pump House Gardens and boundary trees, scrub and hedgerows.

2.4.2 Receptor Site Habitat Enhancement Measures

The Receptor Site comprises in-part open grassland habitat which is adjacent to and similar in character to habitats where common lizard was recorded in 2019. Significant enhancement of this habitat is therefore not deemed to be required; however, a small number of brash piles will be located within the grassland habitat for shelter and protection (see Figure 01).

The brash will originate from tree removal works required to facilitate construction. Brash piles will strictly not include grass arisings. The installation and final location of the brash piles will be directed and overseen by the Project Ecologist.

2.5 Exclusion Fencing

2.5.1 Requirement

The exclusion fencing will prevent reptiles re-entering the Site during the translocation phase and the Construction Phase. Two specifications for exclusion fencing are proposed:

1. One-Way Exclusion Fencing – Angled fencing forwards the Receptor Site and adjacent suitable off-site habitats. This will permit reptiles to disperse from construction footprints but prevent their return.
2. Upright Exclusion Fencing – Straight vertical fencing adjacent to areas of off-site sub-optimal habitats which will prevent reptiles from entering or returning to construction footprints.

2.5.2 Exclusion Fencing Layout

The proposed layout of the exclusion fencing is detailed in Figure 01 which is appropriately annotated, detailing locations of one-way and upright fencing, as well as the proposed Receptor Site.

2.5.3 Exclusion Fencing Timing and Duration

Timing

The exclusion fencing will be installed prior to the start of the proposed translocation period, currently proposed for September to mid-October 2020.

Duration

Once installed, the exclusion fencing will remain in-situ for the duration of the Construction Phase.

Maintenance

During the Construction Phase, the Principle Contractor and (Project Ecologist as appropriate) will regularly check the exclusion fencing for damage and for overtopping of the fence by adjacent vegetation. Any required repairs or vegetation management will be acted upon immediately, to ensure continuity of exclusion functionality.

2.5.4 Project Ecologist Oversight

The installation of the exclusion fencing will be overseen and directed by the Project Ecologist at critical works stages. This will include habitat manipulation (in the manner as detailed in Section 2.6), finger-tip inspections of working areas and access routes prior to installation and direct oversight of installation works where adjacent to sensitive habitats, specifically areas designated as Retained Swards, Receptor Sites and Donor Sites (Scheme of Grassland

Mitigation and Translocation – Appendix 1 of Landscape and Biodiversity Management Plan).

2.5.5 Exclusion Fencing Specification

Exclusion fencing will comprise 1.2m high, 1000 polythene gauge barrier membrane or similar. The membrane will be timber-staked and riveted every 150cm minimum and will be dug into the ground by approximately 15cm-20cm, with a continuous membrane under-lap of 10cm, sufficiently back-filled to ensure no gaps. The top of the fencing will include a continuous 20cm top-curl, through twice rolling the membrane.

Where one-way exclusion fencing is required, predominantly along the northern boundary, angled fencing will be to the above specification but with stakes set into the ground at approximately 45°. The one-way fencing will slope away from the construction footprints so that reptiles can transverse over the fencing but not return to the construction footprints.

2.5.6 Exclusion Fencing Installation

Overview

The installation of the exclusion fencing will be overseen and directed by the Project Ecologist at critical works stages – see Section 2.5.4. The actual installation of the exclusion fencing will be undertaken by a specialist contractor.

Choice of Equipment

For reptile exclusion fence installation, a low ground pressure, hand driven and wheeled trencher will be utilised to excavate neat trenches, thereby negating damage to adjacent grassland swards and other habitats which are to be retained. A mini-digger will strictly not be used.

Working Corridors

A single linear working corridor to install the reptile fence will be chosen and delineated by temporary Heras fencing, as deemed appropriate by the Project Ecologist, such as adjacent to grassland swards which are to be retained.

Compressible Matting

Where deemed appropriate by the Project Ecologist, compressible matting will be utilised to protect adjacent areas of grassland swards which are to be retained, during the works process.

Re-Fuelling

Refuelling of machinery will only be undertaken within designated areas of the main construction site - this will strictly not be within or adjacent to areas of grassland swards which are to be retained.

2.6 Habitat Manipulation

2.6.1 Requirement

Following exclusion fencing installation but prior to the translocation phase, habitats (grassland, ruderals and bramble scrub) proposed for removal to facilitate the Construction Phase will be rendered sub-optimal for reptiles. This is in order to encourage reptiles to migrate to the Receptor Site and other areas of suitable habitat off-site by traversing sections of one-way fencing (see Figure 01).

The Receptor Site will not be subject to habitat manipulation. Other habitats proposed for retention and enhancement will not be subject to manipulation unless this is compatible with the long-term management strategy pertinent to that habitat. Areas designated as Retained Swards, Receptor Sites and Donor Sites (Scheme of Grassland Mitigation and Translocation – Appendix 1 of Landscape and Biodiversity Management Plan) will also not be subject to habitat manipulation. The reptile and grassland translocation schemes will be managed in tandem by the Project Ecologist.

Habitat manipulation works will be directed and overseen by the Project Ecologist. The ground works will be undertaken by a contractor.

2.6.2 Habitat Manipulation Methods

Grassland and Tall Ruderal

Mowing will be undertaken using a low ground pressure mower. The mower cutting bar will be set to cut the sward to no lower than 15cm above ground level, to avoid killing and injuring of reptiles.

The cutting direction will strictly be from south to north with the aim of flushing any reptiles present towards the one-way exclusion fencing on the northern boundary of the Site (see Figure 01).

Bramble Scrub

Bramble scrub will be cut to a minimum height of 15cm using hand tools only (strimmer/brushcutter).

Woody Scrub and Trees

The minor areas of tree or shrub cover to be removed to facilitate the

Construction Phase, will not be removed at the habitat modification stage, but will instead be removed as part of the general site clearance following completion of the reptile translocation, with precautionary ecological oversight as deemed appropriate by the Project Ecologist (see Section 2.8).

2.7 Translocation Period

2.7.1 Requirement

The translocation period is required to remove reptiles from construction footprints to the Receptor Site, located behind the exclusion fencing (see Figure 01).

2.7.2 Translocation Timing and Duration

Best Practice

The translocation phase will be conducted with reference to guidelines published by the Herpetofauna Groups of Great Britain and Ireland (HGBI, 1998).

Timing

The translocation period is currently proposed for September to mid-October inclusive when reptiles are likely to bask for longer periods and therefore provide the best opportunities for capture.

Weather Conditions

The translocation will be undertaken with regard for suitable weather conditions, that is temperatures ranging from 9°C - 21°C with little or no wind/rain.

2.7.3 Translocation Methods

Project Ecologist

All works to facilitate and complete the translocation phase as detailed below will be undertaken by the Project Ecologist.

Refugia Technique

A 'refugia' technique will be used to translocate reptiles. Squares of roofing felt will be laid onto areas of suitable habitat and suntraps in order to provide potential sheltering and basking sites.

Refugia will be made from high-density roofing felt cut into 0.5m^2 tiles. The refugia will be laid on cut vegetation with the darkest side of the tile facing upwards so that it will absorb more heat throughout the day.

Refugia will be left to 'bed in' for a period of two weeks before the first translocation check is carried out. The bedding-in stage will be necessary to allow reptiles to locate and begin to utilise the new refugia areas.

Wherever practicable, natural areas of refugia will be searched.

Refugia Density

The refugia density will be 50/ha in accordance with HGBI guidance for a low population of common lizard/grass snake.

Translocation Duration

Based the presence of a low population of common lizard/grass snake and with reference to the HGBI guidance, reptile translocation will take place over 60 days. However, if after 30 days or more of translocation, no reptiles have been recorded for a minimum of ten days, the translocation will be terminated. Translocation may therefore be considered complete at any time between 30 and 60 days when the 10 clear days requirement has been met. Should reptiles be caught on day 50 onwards, translocation will 'continue until the 10 clear days' requirement has been met.

Capture and Translocation

Any identified reptiles will be caught by hand or net, placed in a cloth bag and immediately moved to the Receptor Site (see Figure 01). Numbers of captured reptiles will be recorded, with the age class and sex noted where possible.

Translocation Completion

Once the translocation phase has been completed in accordance with the methods detailed above, the Principal Contractor will be informed to allow the controlled site clearance phase to be completed.

2.8 Controlled Site Clearance

2.8.1 Requirement

Controlled site clearance will be undertaken to enable the Construction Phase of the development to proceed.

The Project Ecologist will direct and oversee controlled site clearances. A Principal Contractor or a sub-contractor will provide the necessary machinery, equipment and trained workers.

The timings of controlled site clearance will vary dependant on area. The methods below are provided as a generic methodology to be followed in each instance. The Project Ecologist will determine appropriate timings when works

are in progress, based on site conditions and professional judgment.

2.8.2 Controlled Site Clearance Methods

Timing and Duration

Timing of controlled site clearance will be subject to completion of additional ecology related activities such as translocation of grassland turves (Scheme of Grassland Mitigation and Translocation – Condition 14). This will be directed by the Project Ecologist during controlled site clearance who will have a complete understanding of all ecological protection and enhancement measures prescribed for Site.

Treatment of Grasslands and Tall Vegetation

Controlled clearance of grasslands and tall vegetation will be undertaken using mechanical excavators and toothed buckets. The stripping of vegetation to the soil layer will be undertaken in a slow and deliberate manner, working from the southern to the northern boundary.

Treatment of Natural Refugia

Any natural refugia (e.g. logs, brash piles, etc.) will be lifted and searched by hand by the Project Ecologist. Any refugia which cannot be lifted and searched by hand, will be moved mechanically by an excavator under the oversight and direction of the Project Ecologist.

Treatment of Trees and Woody Shrubs

Trees and woody scrub to be removed will be cut at 20cm above ground level using hand tools only. The area around the base of the stems will be inspected by the Project Ecologist to check for any features that may provide refugia for reptiles (e.g. mammal burrows). If such features are present, they will be dug out carefully, by hand until the Project Ecologist is satisfied that no reptiles are present.

Treatment of Arisings

All brash will be chipped and removed off-site. All stripped turf will be put into mounds or windrows within the Site but away from residual reptile habitat. The mounds/windows will be compacted by tracking over with excavators to remove voids that could be used by reptiles.

Capture and Translocation

Any identified reptiles will be caught by hand or net, placed in a cloth bag and immediately moved to the Receptor Site (see Figure 01). Numbers of captured reptiles will be recorded, with the age class and sex recorded noted possible.

2.8.3 Start of Construction Phase

Once the controlled site clearance has been completed and the Project Ecologist has given the 'all clear', the Site will be deemed free of reptiles and the Construction Phase can proceed without constraint within translocated areas.

2.8.4 During the Construction Phase

The exclusion fencing and Receptor Site will remain in-situ for the duration of the Construction Phase. During the Construction Phase, the Construction Manager (and Project Ecologist as appropriate) will regularly check the exclusion fencing for damage and for overtopping of the fence by adjacent vegetation. Any required repairs or vegetation management will be acted upon immediately, to ensure continuity of exclusion functionality.

Any requirement for minor re-alignments to the exclusion fencing must be discussed with the Project Ecologist before being carried out.

2.8.5 End of Construction Phase

The removal of the exclusion fencing will only be undertaken following the authorisation of the Project Ecologist.

On completion of the Construction Phase, the removal of the exclusion fencing will be overseen and directed by the Project Ecologist. The removal works will be undertaken by a specialist contractor.

2.9 Mitigation and Enhancement

The methodologies for the creation and management of reptile habitat in retained and enhanced areas of the Site are detailed within the Landscape and Biodiversity Management Plan of which this Mitigation Strategy forms an Appendix. A summary is provided below for context.

- Creation of habitat suitable for reptiles in the Pump House Gardens. This will be focussed towards grass snake including brash pile creation within the island of the pond which will prevent disturbance or interference from the public, as well as the enhancement of grasslands and further brash creation within this area;
- The creation of a more naturalised chalk stream corridor with areas to bask close to the water's edge – it is anticipated in time this will develop a greater foraging resource as the new habitats develop;
- Creation of areas of species-rich grasslands and brash piles for reptiles in appropriate locations within the retained and enhanced habitat areas;
- Appropriate long-term management of retained and enhanced habitats to maintain habitat suitability for reptiles including measures to discourage public access to reptile habitats where practicable.

APPENDIX 4
-
BIODIVERSITY PERFORMANCE CALCULATION SUMMARY (DoC 12)

Statement on Biodiversity Impacts

A summary of the biodiversity performance calculation for the submitted Development Plan is provided in this Appendix, overleaf. The performance calculation indicates a 'net biodiversity loss' as a result of the Development Plan (-11.04 credits). This is specifically as a result of the permanent loss of portions of the semi-improved neutral grassland resource. Constraints and limitations inherent in the Development Plan which have resulted in this loss of resource is detailed in Section 1.2 of this Management Plan.

In order to mitigate this net biodiversity loss, this Management Plan has outlined a number of ecological enhancements which will be built into the Development Plan:

- The installation of high-quality integrated bat roosting features into the soffit boxes of x30 properties.
- The installation of high-quality integrated swift boxes into the gable-end walls of x24 properties. Swifts are identified as a local priority species in Cambridge. The boxes would also be suitable for other urban bird species.
- The erection of x68 high-quality bat, bird and insect boxes on trees across the Site. The boxes will be installed by ecologists to maximise the potential for colonisation by wildlife;
- The installation of x8 high quality hedgehog domes (houses) under boundary hedgerows and scrub across the Site, as well as the creation of 'Hedgehog Highways' through garden fences and walls, allowing this mammal to exploit a large urban foraging resource.

In total, 122 wildlife boxes will be installed across the Site in the urban and 'green' environment. This is double the requirement set out within South Cambridgeshire's Biodiversity SPD (Supplementary Planning Document).

Habitat enhancement and creation measures are proposed across the Site as outlined within this Management Plan and the submitted Landscaping Strategy. Whilst it is recognised that these measures are included within the biodiversity performance calculation as individual habitat types, the metric is not able to quantify benefits of a restored and/or enhanced ecosystem, due to the complex and interconnected ecological functioning of the individual habitats (and species) present within.

In this respect, the additional ecological enhancements outlined within this Management Plan are:

- The restoration of the Chalk Stream through the modification of individual aquatic and terrestrial habitats to create a significantly enhanced riverine ecosystem;
- The enhancement and planting of a variety of habitat types within the Pump House Gardens to create an enhanced 'urban woodland' ecosystem;
- The retention, creation and enhancement of connective green corridors throughout and along the whole Site perimeter, linking the enhanced Pump House Gardens through to the restored Chalk Stream and connected northern woodland, as well as through to retained and boundary habitats which link to off-site habitat resources.

BIODIVERSITY IMPACT ASSESSMENT

Utilising Warwickshire County Council Biodiversity Metric

Habitats	Area (ha)	Habitat Biodiversity Value
Total existing area onsite	6.76	31.86
Habitats negatively impacted by development Habitat Impact Score	4.69	20.34
On site habitat mitigation Habitat Mitigation Score	6.51	9.30
Habitat Biodiversity Impact Score If -ve further compensation required		**-11.04**
Percentage of biodiversity impact		**54.26**