



**Mapplewell - Land West of Wakefield Road
Biodiversity Mitigation and Enhancement Plan**

Netherton Construction Ltd

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1. Introduction

- 1.1.1 Ecus Ltd were commissioned by Netherton Homes Ltd in October 2015 to produce a Mitigation and Enhancement Plan for a proposed new housing development on land west of Wakefield Road, Mapplewell (Central National Grid Reference: SE 33658 10083) hereafter referred to as 'the site'.
- 1.1.2 Full planning permission (Ref: 2014/0249) has been granted for the proposed development, with a number of conditions. The Mitigation and Enhancement Plan will provide the necessary information as required to discharge Condition 4 of the planning permission which states:
- "Detailed Plans shall accompany the reserved matters submission indicating Biodiversity mitigation and enhancement measures"*
- 1.1.3 In addition to Planning Condition 4, there is a further requirement requested by council ecologist Trevor Mayne via email correspondence to translocate "a significant proportion of the on-site orchids to marshy grassland within the site as part of the mitigation". As such, this comprises a key element of this Management Plan.
- 1.1.4 The development will be undertaken in phases, with Phase 1 being constructed in the north-western section of the site. The SuDS for the whole development will be constructed in conjunction with Phase 1, with other phases connecting to the SuDS as they are constructed.
- 1.1.5 The aim of the Biodiversity Mitigation and Enhancement Plan (BMEP) is to maintain, protect and enhance the retained ecological interest present on site, in accordance with current planning policy. This will ensure medium and long-term benefits to the biodiversity of the site. The National Planning Policy Framework states that "opportunities to incorporate biodiversity in and around developments should be encouraged" (NPPF, 2012)".
- 1.1.6 Whilst this plan focuses largely on Phase 1, it should be made available to all phases to ensure a cohesive approach to nature conservation.
- 1.1.7 Previous works undertaken at the site by Ecus Ltd include an initial Ecological Appraisal in 2011, an extended Phase 1 habitat survey undertaken in August 2013, breeding bird surveys in July 2013, and an update extended Phase 1 habitat survey and final Ecological Appraisal in December 2014. This management plan should be read in conjunction with the most recent Ecological Appraisal ref: 4639 (Ecus Ltd., 2014).
- 1.1.8 Proposals for the site are illustrated in Planning Layout Full Masterplan (Drawing ref. P14:4905:10) and the detailed landscape design for the central SuDS area (Drawing ref: L7533/01).

2. Existing Condition and Features of Interest

2.1 Background

- 2.1.1 The most recent Ecological Appraisal of the site was undertaken by Ecus Ltd in September 2014 and reported in December 2014. The Phase 1 plan to accompany this report is included as Figure 1 to illustrate the existing habitats on site. A separate plan identifying the key areas of orchids on site is provided as Figure 2.
- 2.1.2 The site covers approximately 9.2 ha and is dominated by semi-improved grassland with smaller areas of marshy grassland also present. Much of the marshy grassland is undergoing extensive and on-going succession to scrub. Several native hedgerows are present across the site. A ditch network is also present along the hedge lines to the west of the site.
- 2.1.3 The site is located to the west of Wakefield Road (A61), approximately 3.5 km to the north of Barnsley in north-east Mapplewell. There is housing along the site's southern and south-eastern boundary. An arable field is present to the north of Wakefield Road, which runs along the northern boundary of the site. A narrow belt of allotments borders the site to the west, with an area of semi-improved grassland beyond.

2.2 Habitats

Semi-improved neutral grassland

- 2.2.1 The site is dominated by tall sward unmanaged, semi-improved neutral grassland. The grassland was dominated by coarse grass species such as false oat-grass (*Arrhenatherum elatius*), Yorkshire fog (*Holcus lanatus*), meadow foxtail (*Alopecurus pratensis*), red fescue (*Festuca rubra*) and cock's-foot (*Dactylis glomerata*).
- 2.2.2 Herbs present include frequent cow parsley (*Anthriscus sylvestris*) and white clover (*Trifolium repens*), occasional nettle (*Urtica dioica*), red clover (*Trifolium pratense*), common sorrel (*Rumex acetosa*), rosebay willow herb (*Chamaenerion angustifolium*), common cinquefoil (*Potentilla repens*), creeping thistle (*Cirsium arvense*), creeping buttercup (*Ranunculus repens*), common ragwort (*Senecio jacobaea*), hogweed (*Heracleum sphondylium*), yarrow (*Achillea millefolium*) and meadow vetchling (*Lathyrus pratensis*).
- 2.2.3 A large number of orchids are present within the grassland on site, with their locations mapped in Figure 2. These orchids were identified as a mix of locally frequent southern marsh orchids (*Dactylorhiza praetermissa*) and occasional common spotted orchids (*Dactylorhiza fuchsia*). On the basis of the number and spread of orchids across grassland habitats, this site is considered to be of up to local importance for its orchid populations.
- 2.2.4 Bracken (*Pteridium aquilinum*) plants are scattered throughout the grassland, with larger stands situated on the western boundary of the site adjacent to Wakefield Road.
- 2.2.5 The wider semi-improved grassland habitat type comprises a mix of common grass and occasional herb species of limited intrinsic botanical value and is a habitat which occurs frequently within the local area and throughout the UK. As such the semi-improved grassland is not considered to be important for

nature conservation outwith the zone of immediate influence.

Marshy grassland

- 2.2.6 There are three areas of marshy grassland within the site, two of which are located in the south east corner of the site and the other in a central location at a junction where two drainage ditches meet. Marshy grassland on site was dry underfoot at the time of survey in 2014; however the species present indicated a high water table in these areas for at least part of the year.
- 2.2.7 Species recorded within this habitat include greater willowherb (*Epilobium hirsutum*), marsh thistle (*Cirsium palustre*), hoary ragwort (*Senecio erucifolius*) and common fleabane (*Pulicaria dysenterica*), with frequent grasses including Yorkshire fog and locally frequent tufted hair grass (*Deschampsia cespitosa*). Rushes including frequent hard rush (*Juncus inflexus*) and occasional soft rush (*Juncus effusus*) are present, with sedges (*Carex* spp.) and horsetails (*Equisetum* spp.) locally frequent across limited areas. Occasional herb species include yellow flag iris (*Iris pseudacorus*) and yellow loosestrife (*Lysimachia vulgaris*).
- 2.2.8 This habitat supports a moderate diversity of species, although it comprises mainly common and widespread species with less common species of low abundance only and no rarities noted. Marshy grassland across the site is confined to limited wetter areas and grades into the surrounding semi-improved grassland. The marshy grassland present on site does not fall within any of the priority/principal importance habitats included on either Section 41 of the NERC Act or the Local BAP, however this habitat is considered to be of up to local importance to nature conservation given the combination of species recorded from this habitat.

Scattered trees and scrub

- 2.2.9 There are several trees scattered across the site. Species include ash (*Fraxinus excelsior*), rowan (*Sorbus acuparia*) and crack willow (*Salix fragilis*). The trees range from immature to mature. Scattered scrub is present across much of the site, as a result of lack of management allowing natural succession to occur. Species include silver birch (*Betula pendula*), goat willow (*Salix capraea*), dog rose (*Rosa canina*), common hawthorn (*Crataegus monogyna*), whitebeam (*Sorbus aria*) and bramble (*Rubus fruticosus* agg.).
- 2.2.10 Neither scattered broadleaved trees or scrub are included on Section 41 of the NERC Act or the local BAP and both are common within the wider landscape and across the UK. The habitat within the application area is considered to be of importance to nature conservation within the zone of immediate influence only.

Hedgerow

- 2.2.11 There are eleven lengths of intact native hedgerow on site (H1-11). Species within hedgerows on site include common hawthorn, dog-rose, elder, wild cherry (*Prunus avium*) and holly (*Ilex aquifolium*).
- 2.2.12 Whilst none of the hedges on site are classed important, as they lack the required species richness and/or associated features as stated in the Hedgerow Regulations 1997, all hedgerows comprised predominantly (>80%) of one or more native woody species which qualifies them as a habitat of principal importance under Section 41. The majority of hedgerows are mature

and well established and contribute to the overall biodiversity of the site, as well as the connectivity of the wider hedgerow network present in the local area. They will provide habitat for a range of species including invertebrates, birds and small mammals and taken as a whole is likely to be of up to local importance to nature conservation.

Ditches

- 2.2.13 Two drainage ditches are present within the application and follow the lines of H8 and H9 (Figure 1). The ditch following the line of H9 was dry at the time of survey, approximately 1 m wide and 0.5 m deep and is heavily shaded by the hedgerow, with terrestrial vegetation including extensive bramble growing within much of the channel.
- 2.2.14 A second ditch follows the line of H8 and is approximately 0.5 m deep. This ditch was dry in its northern half. Where water was present in the southern half of the ditch this was less than 10 mm deep at the time of survey and is likely to dry out completely during the driest periods. The ditch is heavily shaded by H8 and contains no aquatic plants. At the southern boundary of the site, this ditch joins a small brook which enters a culvert and exits through the housing estate to the south. The brook is indicated on Figure 1 by T1. The junction between the ditch and the brook is steep sided and heavily shaded by a hedge. It contains no aquatic vegetation and has a large amount of urban debris.
- 2.2.15 The ditches within the site appear to be unmanaged and are considered to be of low ecological value. They are not considered to fall under habitats included on Section 41 of the NERC Act or the local BAP and are considered to be of value to nature conservation within their immediate zones of influence only.

2.3 Species

- 2.3.1 Site habitats have potential to support a range of species including foraging bats, badgers, butterfly and moth species, and common amphibians.
- 2.3.2 A breeding bird survey was carried out in July 2013, in addition to the extended Phase 1 habitat survey. The survey illustrated that the grassland, scrub and hedgerow habitats on site provide shelter, nesting sites and foraging resources for local bird populations. These habitats currently support good numbers of a number of widespread Amber and Red listed birds of conservation concern, particularly linnet (Red) and whitethroat (Amber).
- 2.3.3 Given the species and numbers of birds present in the context of the suburban setting, close to extensive areas of cultivated land with hedges, woods, golf courses and the Dearne valley corridor, the site is considered to be of up to local importance with respect to its resident breeding bird population.

3. Mitigation and Enhancement Works

3.1 Proposals and Impacts

- 3.1.1 The proposed development comprises residential dwellings with associated public open space including SuDS, residential roads and other infrastructure. Phase 1 will comprise 46 dwellings.
- 3.1.2 Total landtake of grassland will be required to facilitate the development, with re-instatement of a green corridor in the centre of the site. This will accommodate a SuDS scheme to provide a flood attenuation function and also support areas of flower-rich meadow and marshy grassland. Landtake of the majority of trees and all of the scrub will also be required.
- 3.1.3 The majority of hedgerows are to be retained within the proposed scheme. The majority of H9, H8 and H7 will be retained, with small sections lost to accommodate new roads and footpaths. Boundary hedgerows will also be retained.
- 3.1.4 Impacts to species that may use site habitats include:
- loss of foraging, nesting and sheltering habitat for a variety of Amber and Red listed birds of conservation concern as a result of landtake;
 - loss of foraging and sheltering habitat for invertebrates and small mammals as a result of landtake;
 - loss of marshy grassland plant species and orchid populations;

3.2 Mitigation and Enhancement Works

- 3.2.1 Mitigation and enhancement works can be divided into the following broad categories:
- retention and protection of existing habitats, where practicable;
 - creation of new habitats to mitigate loss and enhance existing habitats;
 - incorporation of features to enhance the value of the site for specific species groups, such as bats and birds;
 - employment of an Ecological Clerk of Works during works in sensitive areas.
- 3.2.2 The specific mitigation and enhancement works are detailed below.

Habitat Retention and Protection

Hedgerows

- 3.2.3 Sections of H7, H8 and H9 will be retained within the site, and the majority of the boundary hedgerows will also be retained. Sections of hedgerow that are being retained will be protected with Root Protection Zones (RPZ) in accordance with British Standard BS5837 (2012). RPZs should be clearly fenced during the construction process to prevent encroachment by

machinery.

- 3.2.4 Additional native hedgerow and shrub is proposed on the boundaries of the central greenspace/SuDS area to replace that which has been removed and maintain connectivity across the site. Full details are provided in Appendix 2. Gap planting will be undertaken to strengthen existing hedgerows where practicable and where hedgerows will be severed, the planting of standard trees at either end of hedgerow will be considered, if appropriate, to minimise severance effect.

Orchids

- 3.2.5 Neither orchid species found on site is listed on Schedule 8 of the Wildlife and Countryside Act 1981 and therefore these plants are not afforded any special level of protection. Wild plants are generally protected against uprooting by an unauthorised person.
- 3.2.6 In an attempt to reduce the ecological impact of the development, translocation of the key areas of orchids will be undertaken in an attempt to move the seed bank and encourage the growth of the orchids within the central areas of SuDS/POS. The scheme has been designed with the aim of creating new areas of open wildflower grassland and marshy ground, so that orchids can be translocated into the SuDS area to secure their long term presence on site.
- 3.2.7 A short Method Statement is provided in Table 1 below detailing the translocation methodology.

Table 1. Method Statement for orchid translocation

Task	Date
Pre-construction works	
The key areas of orchids will be identified in summer 2016. Location of these areas will be initially pinpointed using the central grid references obtained during Ecus Ltd 2014 works and marked out using stakes when orchids are flowering.	Spring/early summer 2016 when the orchids are flowering
Construction of SuDS	
Construction of the SuDS area will be undertaken at the start of the scheme, in conjunction with Phase 1.	Summer 2016
Construction of the SuDS area will begin in the north of the site. This will ensure that a suitable area of habitat will be created in the north, allowing translocation of an area of orchids identified in the southern SuDS area to the completed northern section. The remainder of the SuDS will then be constructed.	Summer 2016
Machinery should have a designated route through the site, likely from the north, remaining within the central SuDS area. The site team should ensure that machinery does not encroach into other areas of the site, inadvertently damaging other areas of orchids.	Summer 2016
Vegetation clearance should ideally be prioritised between September to February to avoid the breeding bird season where practicable. As this is unlikely to be possible, a nesting bird check of the area to be cleared should be undertaken by an ecologist prior to works.	Summer 2016
Orchid translocation	
Once the northern section of SuDS has been created, turves from the southern area of SuDS will be translocated, to remove them from the footprint of works, allowing the rest of the SuDS to be created.	Summer-Autumn 2016
The receptor area will be stripped first to bare soil and raked through to create a suitable substrate. Turves containing the orchid plants and seed bank will be removed using a small excavator and dumper truck, with the size of the turves dictated by the size of the bucket. Ideally these should be approximately 1 m ² and a minimum of 300 mm in depth to ensure root structure and seed bank are transferred. The turves will be collected and translocated on the same day. No gaps should be left between turves and water should be available on site to thoroughly water in the new turves.	Summer-Autumn 2016
The orchid translocation should avoid the coldest and hottest months of the year and be supervised by an ecologist. If this cannot be undertaken during the months recommended, it should avoid times of drought and freezing weather.	Summer-Autumn 2016
Post-construction works	
Grassland areas that contain orchids will need a sensitive mowing regime. It is recommended that mowing is avoided between April and August.	Mow between August - April
A short site visit will be undertaken by an ecologist for the first two years after translocation to monitor if the works have been effective. Whilst most wildflowers may not flower in the first year, a visit would be beneficial to ensure establishment of grassland.	June/July 2017 and 2018

Habitat Creation

Flower-rich meadow and marshy grassland

- 3.2.8 Approximately 0.7 ha of grassland will be created on site within the central area of POS/SuDS. The SuDS area will be created with a varied topography to provide a range of differing growing conditions with varying moisture levels. A species-rich meadow mix will be used to seed the majority of the grassland, with additional marshy grassland mixes in the basins of the SuDS area. Appendix 2 includes the soft landscape proposals drawing for the central SuDS area together with the planting schedule, specifications and five year maintenance schedule.
- 3.2.9 Suitable species mixes have been chosen for the SuDS banks and basins. The mixes specified will provide good quality habitat for insects, small mammals, birds and amphibians, providing nesting sites during spring, food during summer and autumn, and shelter during winter.
- 3.2.10 In addition to the proposed planting, strips of turf will be translocated from existing grassland areas to new grassland habitat areas, as per the Method Statement in Table 2.
- 3.2.11 An access track will be required along the top of SuDS basin Pond 1 and 2. This will comprise a strip of stone aggregate, which can be driven over. It is anticipated that this will vegetate with low growing species and ephemerals over time, creating a different habitat niche in the SuDS area, with potential to benefit invertebrates. A detail for the access track is included on drawing L7533-01 in Appendix 2.

Trees

- 3.2.12 Landtake on the majority of trees on site will be required. Should any trees be retained then they should be protected with Root Protection Zones (RPZ) in accordance with British Standard BS5837 (2012). RPZs should be clearly fenced during the construction process to prevent encroachment by machinery.
- 3.2.13 Replacement tree planting will be incorporated across the site. Any new tree planting will utilise native species, where practicable, favouring fruiting or flowering species to enhance site biodiversity. Where possible, trees will be clustered to provide enhanced habitat structure/be of greater value to birds and bats. Heavy standards will be used to reduce establishment time.
- 3.2.14 Trees will not be planted within the SuDS area, however they may be incorporated around the amenity grassland margins to provide a distinct edge between the street scene and the SuDS area. Planting standard trees within boundary hedgerows would also be considered beneficial. Suitable tree species for the site include field maple (*Acer campestre*), rowan (*Sorbus aucuparia*), whitebeam (*Sorbus aria*), lime (*Tilia* spp. and silver birch (*Betula pendula*). See Appendix 2 for tree detail within the SuDS/POS area.

Species-specific Enhancements

Birds

- 3.2.15 Bird boxes will be incorporated within new buildings at a density of 10 %. Boxes will include a mix of:

- sparrow terraces e.g. Schwegler 1SP
- starling boxes e.g. Schwegler 3S
- bird boxes for houses e.g. Avianex boxes

3.2.16 Schwegler-type nest boxes will be used, due to their long-lasting construction and design. Nest boxes will be placed on new houses and positioned to face onto areas of potential foraging habitat, where practical, such as the central area of greenspace. All nest boxes should be positioned to avoid true south aspects which carry a risk of overheating during the summer months.

3.2.17 Hedgerow retention, replacement and new tree planting will maintain and enhance nesting and foraging potential for birds currently using the site and the local area. Whilst it is acknowledged that farmland bird species will be less likely to use the site upon completion, habitats for other Red List species, such as house sparrow and starling, may be improved.

Bats

3.2.18 Bat roosting provision will be incorporated on new buildings and trees at a density of 5 %. Boxes will be located at a minimum of 4 m from the ground with clear flight lines from the boxes and heavily lit areas will be avoided. Boxes will include a mix of:

- tree-mounted boxes e.g. Schwegler 2F with double front panel
- building mounted boxes e.g. integral 1FR bat tubes and/or Low Profile WoodStone Bat Box or Schwegler Wall-Mounted Bat Shelter 2FE

3.2.19 It is recommended that some of the boxes are placed on different elevations upon the same tree to maximise microclimates available to bats roosting within the boxes and increasing likelihood of occupation.

3.2.20 Hedgerow retention and tree planting will maintain and enhance commuting and foraging opportunities for any bats resident in the local area.

3.2.21 A sensitive lighting scheme will be designed to limit illumination of the central area of POS to maximise its functionality for foraging bats. Direct lighting of any new bat boxes will also be avoided.

Ecological Clerk of Works

Birds

3.2.22 Nesting birds are protected under the Wildlife and Countryside Act 1981 as amended. Vegetation clearance and any arboricultural works will be undertaken outwith the bird-breeding season, which falls between March to August (inclusive), where possible to minimise risks of disturbance to nesting birds. Should clearance within the breeding season be unavoidable, no such works will be undertaken until the site has been inspected by an appropriately trained, qualified and experienced ecologist to ensure that no nests are disturbed.

3.2.23 Should active nests be found, works will cease in the immediate area to avoid disturbance and no works will be undertaken until young have fledged. The nest will be monitored by an ecologist to establish when the young have

fledged.

Badger

3.2.24 A pre-commencement badger check will be undertaken by an ecologist prior to site works commencing to ensure that no badger setts have been established on the site. There may be a requirement for the removal of dense scrub using hand tools (including brushcutter) if these cannot be adequately inspected.

3.3 Summary

3.3.1 A summary of the above mitigation and enhancements are provided in Table 2 below.

Table 2. Summary of mitigation and enhancements

Action	Benefit
Protection of retained trees and hedgerows	Trees, birds, bats and invertebrates
Translocation of orchids	Orchids and invertebrates
Creation of flower-rich grassland and SuDS	Birds, invertebrates, bats and small mammals
Inclusion of suitable native and wildlife attracting soft landscaping plan, including tree planting	Birds, invertebrates, bats and small mammals
Bat boxes	Roosting bats
Bird boxes	Nesting birds
Sensitive lighting plan	Bats and badger

4. Future Management

4.1 Management Responsibility

- 4.1.1 The site should be maintained in accordance with the maintenance schedule detailed by the landscape architects for the scheme. A schedule for the SuDS/POS area is provided in Appendix 2. The exact maintenance contractor has yet to be confirmed at the time of writing this report. Responsibility for ensuring that bat and bird boxes remain in place should also fall to the appointed maintenance contractor.

4.2 Restrictions and Limitations for Maintenance Operations

- 4.2.1 Should any trees or vegetation require thinning or removal in the future, works will be undertaken outside nesting bird season which falls between March and August inclusive, unless checked prior to works by a suitably experienced ecologist.
- 4.2.2 The grassland within the SuDS area should be mown on a relaxed mowing regime, avoiding the flowering season (May-August) to allow species to flower and set seed. See full details in landscape specification (Appendix 2).

4.3 Plant Replacements

- 4.3.1 Any plants that fail to establish within a period of five years are to be replaced in the next planting season with others of similar size and species unless written consent is provided by the Local Planning Authority to vary the approved details.
- 4.3.2 After five years it is recommended that a requirement of the yearly site inspections is to record where replacement planting or over-seeding is required to maintain the quality of the landscape scheme, to be actioned following client instruction.

4.4 Monitoring

The success of the orchid translocation will be monitored during 2017 and 2018 by an ecologist.

5. References

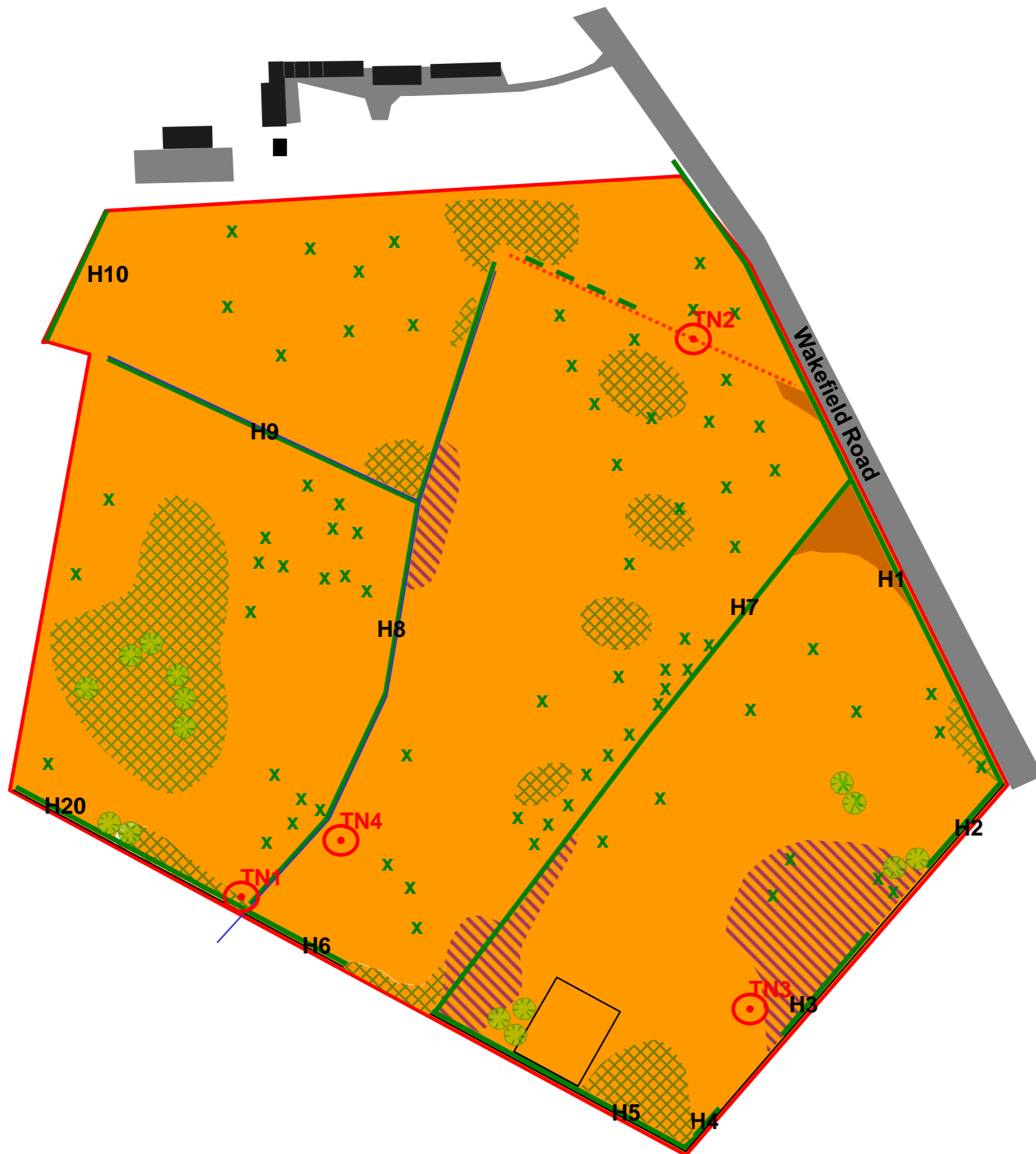
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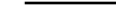



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Figure 1. Existing Site Habitats



Legend:

-  Site boundary
-  Semi-improved grassland
-  Continuous scrub
-  Marshy grassland
-  Bracken
-  Native intact hedgerow
-  Defunct hedgerow
-  Derelict stone wall
-  Post and wire fence
-  Scattered tree
-  Scattered shrub (indicative)
-  Target Note



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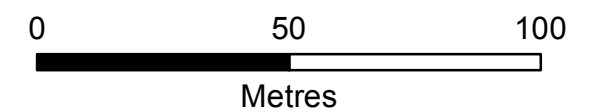
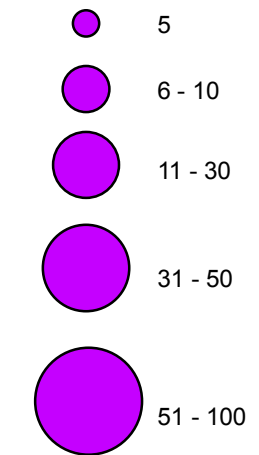
Wakefield Rd, Mapplewell

Figure 1: Survey Findings	Date: August 2013
Schematic	ECUS Ref: 4639

Figure 2. Orchid Location Map

Legend

Approximate number of orchid stems



Wakefield Road, Mapplewell





Orchid Distribution Map

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Figure 3. Suggested Bird and Bat Box Locations for Phase 1



Legend

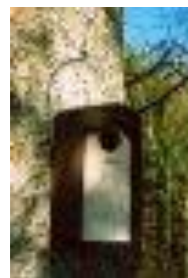
-  Locations of Avianex bird boxes (three boxes in total)
-  Locations of Schwegler 1SP sparrow terrace (one terrace in total)
-  Locations of 3S Schwegler starling boxes (one box in total)
-  Location of integrated bat box e.g. Schwegler 1FR (three boxes in total)

Note:

Avoid placing bird boxes on south-facing elevations.

Bird boxes should be placed at a minimum of 3 m from the ground or at eaves level.

Bat boxes should be placed a minimum of 4 m from the ground or at eaves level.



Starling box



Avianex bird box



Sparrow terrace



Schwegler bat tube



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Wakefield Rd, Mapplewell

Figure 3:
 Bat and Bird Boxes

Date:
 February 2016

Schematic

Ecus Ref: 7110

Appendix 1. Bats and Lighting Technical Advice Note

Bats and Lighting

Bats and lighting

Artificial lighting is known to affect bat roosting and foraging behaviour with lighting shown to result in a range of impacts including roost desertion (BCT, 2009), delayed emergence of roosting bats (Downs *et al.*, 2003), increased activity of some bat species and decreased activity by others (Stone *et al.*, 2012).

An experimental approach using LED units, demonstrated that relatively fast-flying bat species, including common pipistrelle, showed no significant impacts as a result of new artificial lighting, even when lighting was set at relatively high levels close to 50 lux. In contrast slow flying bats, including myotis bats (*Myotis* spp.) showed sharp reductions in presence, even at low light levels of 3.6 lux (Stone *et al.*, 2012). Current recommendations for all bat species specifies that no bat roost should be directly illuminated (BCT 2014).

Mitigation and lighting design

Bat friendly lighting plans should firstly look to avoid lighting where possible and minimise lighting impacts by adopting the following measures:

- **Lighting curfews or use of PIR sensors.** Lighting curfews can be an effective way of avoiding impacts on bats. These curfews may involve either turning off lighting or dimming light units at specific times of the night, dimming units at key times of the year, providing the luminaire allows for this option via a control unit. Lighting to be triggered by PIR sensors can be expected to be illuminated only when required and for a low proportion of the overall time.
- **Use only high pressure sodium or warm white LED lamps where possible.** High pressure sodium and warm white LED lamps emit lower proportions of insect attracting UV light than mercury, metal halide lamps and white LED lighting. Generally lamps should have a lower proportion of white or blue wavelengths, with a colour temperature <4200 kelvin recommended (BCT, 2014).
- **Minimise the spread of light.** Light spread should be kept at or near horizontal in order to ensure that only the task area is lit. Flat cut-off lanterns or accessories should be used to shield or direct light to where it is required. Baffles, hoods, louvres and shields should be used where necessary to reduce light spill.
- **Consider the height of lighting column.** Whilst downward facing bollard lighting is often preferable, it should be noted that a lower mounting height does not automatically reduce impacts to bats as bollard lighting can often be designed to provide uplighting. Where bollard lighting is considered to be the most appropriate system, bollard spacing or unit density should be kept to a minimum and units should be fitted with the appropriate hoods/deflectors to reduce uplighting. Column height should be carefully considered to balance task and mitigation measures.
- **Avoid reflective surfaces below lights.** The polarisation of light by shiny surfaces attracts insects increasing bat activity (BCT, 2012). Consequently surface materials around lighting require consideration.

References

BCT (2009) Bats and Lighting in the UK. Bat Conservation Trust.

BCT (2014) Artificial lighting and wildlife. Interim Guidance: Recommendations to help minimise the impact of artificial lighting.

Downs N., Beaton, V., Guest J., Polanski S., Robinson, S. & P. Racey (2003) *The effects of illuminating the roost entrance on the emergence behaviour of Pipistrellus pygmaeus*. Biological Conservation, 111: 247-252.

Hundt (2012) *Bat Surveys: Good Practice Guidelines, 2nd edition*. Bat Conservation Trust.

Stone, E., Jones, G. & S. Harris (2012) *Conserving energy at a cost to biodiversity? Impacts of LED lighting on bats*. Global Change Biology, 18: 2458-2465.

Appendix 2. Soft Landscaping Details for SuDS Area

Central SuDS Area - Soft Landscape Proposals

Planting Specifications

Refer to Ecus Ltd drawing L7533/01 Soft Landscape Proposals for details of planting locations.

General Planting Notes

All plants to be healthy, hardened-off and with good fibrous root systems and to comply with the requirements of BS3936 Specification for Nursery Stock. All planting to be undertaken in accordance with BS4428 Code of Practice for General Landscape Operations.

All plants to be protected from wind exposure at all times. All plants to be soaked in water for several hours prior to planting and to be well watered in.

No planting to be carried out during poor weather conditions, i.e. when ground is frozen, waterlogged, or during droughts, hot sunshine or persistent dry or cold winds. All plant material to receive enough water to ensure healthy establishment.

Site Clearance

The site shall be free from old foundations, concrete bases and other similar obstructions. Before topsoiling the formation is to be loosened to a depth of 150mm by harrowing or ripping to assist in natural draining of the land. All coarse rubble, and artifacts greater than 75mm in diameter exposed by ripping operations shall be removed to a licensed facility.

Subsoil

Subsoil grading of the site shall leave landscape areas with smooth flowing contours to achieve the specified finished levels when topsoiled. Prior to topsoiling, subsoil formation should be ripped and loosened to a minimum depth of 450mm. Imported subsoil shall be in accordance with BS3882 for amenity use.

Cultivation

Cultivate the soil of all areas prior to seeding and planting. This should include loosening, aerating and breaking up soil into particles 2-8mm to depth of 150mm. Remove any undesirable material brought to surface to a depth of 100mm including visible weeds, roots and large stones or clay balls with any dimension exceeding 30mm. Final Cultivation prior to seeding topsoil shall be brought to a fine tilth by approved mechanical means or by hand raking, and if necessary regrading of the surface will be carried out to conform to the prescribed finished levels.

Topsoiling

Topsoil to general planting and grass seeded areas to be to BS3882: 2007 Multipurpose Grade.

Topsoil must be free from pernicious weeds and roots, clay lumps, non-soil materials, brick or other building materials, foreign matter and chemical contamination. Topsoil should be

spread evenly over areas to be seeded and planted. Minimum topsoil depths after settlement shall be: Grass-150mm, Shrubs- 450mm and Trees-750mm. Topsoil shall be spread in layers not exceeding 150mm and firm each layer before spreading the next. At the time of laying, both material and weather should be reasonably dry. Soil levels should be 30mm higher than adjacent kerbs and paving after settlement and married in with existing soil levels.

Weed Treatment

All areas to be planted are to be treated with Roundup a minimum of 10 days prior to planting. Planted areas are to be kept weed free with the use of herbicides. Following the use of herbicides remove dead vegetation.

Planting General

All plant material to be supplied in accordance with HTA National Plant Specification.

All planting to be local provenance wherever possible and from local supplier.

Tree Planting

Trees to be pit planted. Minimum pit size: Extra Heavy Standard trees 900x900x750mm. Excavate tree pits with slightly raised centre. Retain topsoil for re-use. Dig a hole which is substantially bigger than the volume of roots to be accommodated. Break up and loosen the base and sides of the pit. The trees will be planted to the same depth as they were in the nursery. Back fill the pit in stages, whilst firming up the soil around the roots until the original ground level is restored.

Tree pits to be filled with 1:3 mixture of compost and topsoil. Topsoil to contain peat free organic matter and Growtab fertiliser to be incorporated into each pit.

Tree Support

Short treble stakes and adjustable rubber ties.

Stakes to be first grade pressure impregnated round timber with chamfered tops. Position stake close to tree on windward side and drive vertically at least 300mm into bottom of pit before planting. Backfilling: consolidate material around stake. Height of stakes: cut to approximately one third of the tree height above ground level. Tying: secure tree firmly but not rigidly to stake with ties within 25mm of top of stake.

Tree Accessories

Tree irrigation pipes to be provided to all Extra Heavy Standard trees.

Irrigation pipe with cap to be looped around the shoulder of the root ball. Ensure inlet is slightly above finished surround level. GreenBlue Urban RootRain or equal and approved.

Native Hedgerow Planting

All transplants to be planted with rabbit protection (tree/ shrub shelters) and stake support. Trench to be excavated 800mm wide x 450mm deep then backfilled with topsoil mixed with compost in a 3:1 ratio.

Hedge plants to be planted in a double staggered row 450mm apart at 450mm centres (6 per linear metre). All hedgerow planting to be covered with bark mulch to 50mm depth.

Bulb Planting

Where planting in established grass, grass to be mown to 50mm high before planting, cuttings removed. Planting hole of an approximate diameter and depth for each bulb to be created. Bulbs to be planted root down at depth specified for each species, then soil backfilled and firmed over the top.

Naturalized planting in grassed areas:

- Scattering: Random. Plant bulbs/ corms/ tubers where they fall.
- Planting: Neatly remove a plug of turf and replace after planting.

Grass Seeding

After cultivation operations have been carried out, use a pre-seed herbicide on areas to be seeded. Existing vegetation and stones should be removed and a light tilth prepared. Sow areas to be seeded with grass seed which has been stored off the ground in a clean, dry place free from vermin. Following an even distribution of seed, the contractor shall carry out a light raking or light harrowing of the area and ensure consolidation of the seed with the soil by the use of a light roller.

All reasonable precautions shall be taken to ensure that pedestrian and other traffic does not cross areas during cultivation and until the grass has established.

The grass will be dense, of uniform green colour, free of broadleaved weeds and not visibly affected by pest or disease.

Allowance should be made to keep the grass watered during dry periods encountered throughout the establishment period.

Grass Meadow Mixes - General

Prepare ground in accordance with supplier's cultivation, sowing and after care guidance and the following instructions.

To prepare a seed bed first remove weeds using repeated cultivation or a herbicide. Cultivation close to established trees and shrubs can be damaging to their root systems so take care not to dig too deep, keeping disturbance to the minimum required to expose fresh soil.

A minimum 150mm depth of clean subsoil (or topsoil stripped to lower fertility) to be spread over all areas of proposed wildflower seeding.

Soil to be cultivated using a disk harrow or rotovator to 100mm depth then further cultivated to 30mm depth, graded and rolled to produce a firm, level seed bed.

Seed must be surface sown and can be applied by machine or broadcast by hand. To get an even distribution and avoid running out, divide the seed into two or more parts and sow in overlapping sections. Do not incorporate or cover the seed but firm in with a roll, or by treading, to give good soil/seed contact.

Meadow mix to be sown in August-September or March-April but can be sown at other times of the year if there is sufficient warmth and moisture.

Accessible slopes are to be seeded conventionally or by hydraulic seeding. Inaccessible slopes will be hydraulic seeded. Hydro-seeding should be carried out by an experienced hydro-seeding contractor. Hydro-seeding will spray a mix of seed, mulch, fertilisers and binders on the area to be seeded at the following rates:

- seed mix (refer to plant schedule) 15gm/m²
- alginure soil improver 75gm/m²
- cellulose 100gm/m²
- cocoa fibre 120gm/m²
- bio-organic fertiliser 50gm/m²
- slow release phosphate fertiliser 30gm/m²
- terrabind 50gm/m²

The above materials are to be mixed with water to form a homogenous slurry, to be evenly applied over the surface to be treated at a total rate of 4 litres/m².

Mulch and Compost Materials

General: Free from toxins, pathogens or other extraneous substances harmful to plant, animal or human life.

Submit certification of source, analysis, suitability for purpose and absence of harmful substances.

Certified materials: Sanitized and stabilized compost and Spent mushroom compost. Mulch to be fine grade bark mulch.

Purity: Free of pests, disease, fungus and weeds. Preparation: Clear all weeds. Water soil thoroughly.

Mulch: Sustainable UK produced biomulch to base of hedgerow and to trees in grass (Melcourt Forest Biomulch or similar).

Coverage: planted areas and ornamental trees to 75 mm depth, 50mm depth to hedgerows.

Trees in grass: 500mm radius circle area from trunk to 75mm depth.

Finished level of mulch: 30 mm below adjacent grassed or paved area.

As part of good horticultural practice, use peat-free composts, mulches and soil conditioners.

Soft Landscape Plant Schedule

TREES

QTY	CODE	PLANT NAME	STOCK	FORM	GIRTH/HEIGHT
17No.	ACE CAM xhs14	Acer campestre	RB	STD	14-16cm
8No.	BET PEN ms3	Betula pendula	RB	MSTEM3	350-400cm

HEDGE MIXES

PERCENT	QTY	PLANT NAME	STOCK	SIZE
100m NATIVE HEDGE MIX 28 planted @ 6/m in a double staggered row				
50%	300No.	Crataegus monogyna	B Trans	60-80cm
20%	120No.	Cornus sanguinea	B Trans	60-80cm
5%	30No.	Corylus avellana	B Trans	60-80cm
10%	60No.	Prunus spinosa	B Trans	60-80cm
10%	60No.	Rosa canina	B Trans	60-80cm
5%	30No.	Viburnum opulus	B Trans	60-80cm

To be planted in species groups of approximately 9-15.

notch plant in a double staggered row, 450mm between rows, 450mm centres (6no. Per lin.m), notch planted with rabbit protection and staked.

PLANT MIXES

PERCENT	QTY	PLANT NAME	STOCK	SIZE
34m2 AQUATIC PLANTING MG10 planted @ 8/m2				
10%	27No.	Agrostis stolonifera	50cc	Plug; established root 2-3 months min; native British origin
5%	14No.	Angelica sylvestris	50cc	Plug; established root 2-3 months min; native British origin
5%	14No.	Holcus lanatus	50cc	Plug; established root 2-3 months min; native British origin
30%	82No.	Juncus effusus	50cc	Plug; established root 2-3 months min; native British origin
10%	27No.	Phleum pratense	50cc	Plug; established root 2-3 months min; native British origin
5%	14No.	Plantago lanceolata	50cc	Plug; established root 2-3 months min; native British origin
5%	14No.	Potentilla anserina	50cc	Plug; established root 2-3 months min; native British origin
10%	27No.	Ranunculus repens	50cc	Plug; established root 2-3 months min; native British origin

Individual varieties to be planted in groups of approximately 7-21.

36m2 BULB PLANTING 1 planted @ 15/m2				
100%	540No.	Galanthus nivalis		Grade 5/6

NOTES AND ABBREVIATIONS:

B = Bare root (bagged).

FORM = Shape of tree as supplied by the nursery.

QTY = Quantity

RB = Rootballed (balled and wrapped).

Std = (clear stem) Standard.

STOCK = Root condition/protection method eg Bare root.

Trans = Transplant (or undercut seedling).

- Refer to specification for further information.
- All plants to be completely hardened off
- Substitutions to be agreed with Landscape Architect.

Grass-Wildflower Plant Mixes and Establishment

The base and sides of the ponds will be stabilised with suitable grass wildflower meadow mixes which will form rough grassland on the slopes and boggy marshland on the basin floor. The ponds will be planted with the mixes during the spring or summer immediately after basin construction to stabilise planting prior to flooding/ drainage entering.

Suitable plant mixes have been chosen to complement the site conditions, increase biodiversity and reduce maintenance.

Suggested plant mixes listed below are available from Emorsgate Seeds or similar approved. Refer to manufacturer's specification for full details.

Pond 1 SuDS Basins

EM8 – Meadow Mixture for Wetlands

EM8 contains species suitable for seasonally wet soils and is based on the vegetation of traditional water meadows. Soils in wet meadows may flood for shorter periods in winter, but are usually well drained in summer.

Sowing Rate – 40kg/ha, 4g/m².

WILDFLOWERS		
%	Latin Name	Common Name
0.5	Achillea millefolium	Yarrow
0.3	Achillea ptarmica	Sneezewort
1	Betonica officinalis – (Stachys officinalis)	Betony
2.5	Centaurea nigra	Common Knapweed
1.5	Filipendula ulmaria	Meadowsweet
1	Galium verum	Lady's Bedstraw
0.8	Leucanthemum vulgare	Oxeye Daisy
0.8	Lotus pedunculatus	Greater Birdsfoot Trefoil
2	Plantago lanceolata	Ribwort Plantain
0.4	Primula veris	Cowslip
2	Prunella vulgaris	Selfheal
2.5	Ranunculus acris	Meadow Buttercup
1.5	Rhinanthus minor	Yellow Rattle
1.5	Rumex acetosa	Common Sorrel
0.2	Silene flos-cuculi – (Lychnis flos-cuculi)	Ragged Robin
1.5	Vicia cracca	Tufted Vetch
Total 20% wildflowers		

GRASSES		
%	Latin Name	Common Name
10	Agrostis capillaris	Common Bent
4	Alopecurus pratensis	Meadow Foxtail
1	Anthoxanthum odoratum	Sweet Vernal-grass

1	Briza media	Quaking Grass
36	Cynosurus cristatus	Crested Dogtail
1	Deschampsia cespitosa	Tufted Hair-grass
24	Festuca rubra	Slender-creeping Red-fescue
3	Hordeum secalinum	Meadow Barley
Total 80% grasses		

Establishment

Ground preparation

- Remove weeds using repeated cultivation or a glyphosate herbicide.
- Plough or dig to bury the surface vegetation, harrow or rake to produce a medium tilth, and roll, or tread, to produce a firm surface.

Sowing

- Sow into a clean seedbed that has been first cleared of all weeds and other vegetation and then cultivated to produce optimum conditions for germination.
- Sow in early autumn (August-September) or spring (March-April) once the land is drained to allow time for plants to grow mature enough to withstand flooding.
- Surface sow the seed by machine. Do not incorporate or cover the seed but firm in with a roll to give good soil/seed contact.

Rough Grass Wildflower on Pond Slopes

EM3 – Special General Purpose Meadow Mixture

EM3 contains a very wide range of species. It may be used to create a very diverse sward where conditions vary across the site.

Sowing Rate – 40kg/ha, 4g/m².

WILDFLOWERS		
%	Latin Name	Common Name
0.5	Achillea millefolium	Yarrow
2.4	Centaurea nigra	Common Knapweed
0.8	Centaurea scabiosa	Greater Knapweed
0.4	Daucus carota	Wild Carrot
0.6	Filipendula ulmaria	Meadowsweet
0.8	Galium verum	Lady's Bedstraw
1	Knautia arvensis	Field Scabious
0.3	Leontodon hispidus	Rough Hawkbit
0.8	Leucanthemum vulgare	Oxeye Daisy
1	Lotus corniculatus	Birdsfoot Trefoil
0.1	Origanum vulgare	Wild Marjoram
1	Plantago lanceolata	Ribwort Plantain
0.5	Plantago media	Hoary Plantain
1.5	Poterium sanguisorba – (Sanguisorba minor)	Salad Burnet

0.4	Primula veris	Cowslip
1.5	Prunella vulgaris	Selfheal
2	Ranunculus acris	Meadow Buttercup
1	Rhinanthus minor	Yellow Rattle
0.6	Rumex acetosa	Common Sorrel
1	Silene dioica	Red Champion
0.2	Silene flos-cuculi – (Lychnis flos-cuculi)	Ragged Robin
1	Silene vulgaris	Bladder Champion
0.1	Trifolium pratense	Wild Red Clover
1.5	Vicia cracca	Tufted Vetch
Total 20% wildflowers		

GRASSES		
%	Latin Name	Common Name
8	Agrostis capillaris	Common Bent
40	Cynosurus cristatus	Crested Dogstail
28	Festuca rubra	Slender-creeping Red-fescue
4	Phleum bertolonii	Smaller Cat's-tail
Total 80% grasses		

Establishment

Ground preparation

- Remove weeds using repeated cultivation or a glyphosate herbicide.
- Plough or dig to bury the surface vegetation, harrow or rake to produce a medium tilth, and roll, or tread, to produce a firm surface.

Sowing

- Sow into a clean seedbed that has been first cleared of all weeds and other vegetation and then cultivated to produce optimum conditions for germination.
- Sow in the autumn or spring but can be sown at other times of the year if there is sufficient warmth and moisture.
- Surface sow the seed by machine. Do not incorporate or cover the seed but firm in with a roll to give good soil/seed contact.

Pond 2 SuDS Basin

EP1 – Pond Edge Mixture

Pond edge mixture EP1 contains wild flowers and grasses suitable for sowing at the wet margins of ponds, streams and ditches. The mixture is suitable for boggy areas which remain waterlogged for much of the year.

Sowing Rate – 40kg/ha, 4g/m².

WILDFLOWERS		
%	Latin Name	Common Name
1	Achillea ptarmica	Sneezewort
2	Angelica sylvestris	Wild Angelica
0.2	Caltha palustris	Marsh Marigold
1	Eupatorium cannabinum	Hemp Agrimony
2.6	Filipendula ulmaria	Meadowsweet
1	Geum rivale	Water Avens
4	Iris pseudacorus	Yellow Iris
1	Lotus pedunculatus	Greater Birdsfoot Trefoil
1	Lycopus europaeus	Gypsywort
0.5	Lythrum salicaria	Purple Loosestrife
2.5	Ranunculus acris	Meadow Buttercup
0.5	Scrophularia auriculata	Water Figwort
1	Silene flos-cuculi – (Lychnis flos-cuculi)	Ragged Robin
0.2	Succisa pratensis	Devil's-bit Scabious
1.5	Vicia cracca	Tufted Vetch
Total 20% wildflowers		

GRASSES		
%	Latin Name	Common Name
10	Agrostis capillaris	Common Bent
4	Alopecurus pratensis	Meadow Foxtail
1	Anthoxanthum odoratum	Sweet Vernal-grass
1	Briza media	Quaking Grass
36	Cynosurus cristatus	Crested Dogstail
1	Deschampsia cespitosa	Tufted Hair-grass
28	Festuca rubra	Slender-creeping Red-fescue
4	Hordeum secalinum	Meadow Barley
Total 80% grasses		

Establishment

Ground preparation

- Remove weeds using repeated cultivation or a glyphosate herbicide.
- Cultivate to bury the surface vegetation and harrow or rake to produce a medium tilth.

Sowing

- Sow into a clean seedbed that has been first cleared of all weeds and other vegetation and then cultivated to produce optimum conditions for germination.
- Sow in late summer or spring once the land has drained to allow time for plants to grow mature enough to withstand flooding.
- Surface sow the seed by machine. Do not incorporate or cover the seed.

5 Year Maintenance Schedule - Central SuDS Area Soft Landscape						
Component	Management Objectives	Code	Operation(s)	Time of Year	Frequency (per Year)	Year 1-5
1. General maintenance requirements to all planted areas, unless otherwise stated in the detailed schedule below.	To maintain high standard planting scheme across site and ensure healthy establishment of plants.	A	Inspection	March-September	Annually.	x
		B	Inspect tree stakes, ties and shelters and replace where necessary. Remove in Year 5.	February and after strong winds	Annually. In Year 5- Remove.	x
		C	Watering - during establishment and to ensure continued thriving	As necessary during dry spells, or indicated in the detailed schedule below.	As required- daily in dry spells mainly April-September.	x
		D	Refirm new tree / shrub planting	February and after strong winds	Annually and as required following inspection.	x
		E	Removal of debris and litter	Throughout	Each maintenance visit.	x
		F	Plant replacements and reinstatement to Year 5 when instructed	November to March	Annually next following planting season.	x
		G	Fertiliser	March	Annually.	x
		H	Top up mulch to 60mm or 75mm depth (bark or gravel - refer to specification)	November	Annually.	x
		2. New tree planting (incl. standard trees. multi-stemmed specimens)	To ensure that trees establish and remain in a healthy condition.	A	Establishment maintenance (weed control, fertiliser, tree guy wires, refirming, formative pruning)	As necessary following inspection
B	Maintain 1m diameter weed free area, adjust soil and maintain depth of mulch			As necessary following inspection	As required.	x
3. Native Hedgerow	To ensure the healthy establishment of new hedgerows. To encourage bushy side growth of hedgerow and maintain A-shaped profile once established. To provide more fruit, berries, flowers and nesting opportunities. To maintain to a maximum height of 1.8m.	A	Establishment pruning- heavy trim sides first year to encourage bushy side growth followed by light trimming to sides until established.	November- March	First year.	x
		B	Trimming- alternate sides on an annual basis to promote berrying/ fruit	November- February	Once, annually on alternate sides, from Year 2 onwards.	x
4. Amenity Grassland e.g. Germinal Seeds A19 (All Purpose Landscaping)	Good sward of even colour and smooth gradients. Height maximum 50mm	A	Reinstatement of eroded / damaged areas:	May-September	As required	x
		B	Cutting, remove arisings, trim edges and collect trimmings- remove	April-October Note: allow six weeks between end of flowering to cutting bulbs areas. Note: Ox-Eye Daisy drifts from end of May do not cut until end of August.	15 visits. Maintain 50-70mm height. Approx. every 2 weeks in growing season	x
		C	Reforming edges to paths	Autumn	Annually	x
		D	Fertiliser- Spring	April	Annually	x
		E	Fertiliser- Autumn	October	Annually	x
		F	Light scarification / raking	March	Annually (if required)	x
		G	Weed control	March - October	As required	x
5. Bulbs	To display to best advantage.	A	Areas of bulbs shall be left uncut until after they have finished flowering and their foliage yellowed and died back, after which they shall be cut as part of the routine grass cutting regime (see 8 below).	Throughout, according to flowering time.	As required	x
6. Wildflower Meadow Mix e.g. Emorsgate EM3 and EM8	Maintain to achieve the greatest species diversity. Prevent future encroachment by scrub/ saplings. Control coarse grasses from outcompeting perennial wildflowers.	A	General: Inspection frequency - at regular intervals (twice a year) and after severe events (to check bank stability, vegetation growth, debris and erosion).			
		B	Year 1: Most of the sown species are perennial and will be slow to germinate and grow and will not usually flower in the first growing season. There will often be a flush of annual weeds from the soil in the first growing season. This weed growth is easily controlled by topping or mowing.	March, May and September (weed growth control)	3	x (Y1)
		C	Year 1 Establishment cut - AUTUMN SOWN Avoid cutting in the spring and early summer if the mixture is autumn sown. These sown annuals should be allowed to flower, then in mid-summer cut and remove the vegetation.	August (cut and remove vegetation)	1	x (Y1)
		D	Year 1 establishment cut SPRING SOWN	September / October	1	x (Y1)
		E	Cutting to 50mm (after establishment). July - August: After flowering take a 'hay cut'. Leave 'Hay' to dry and shed seed for 1-7 days then remove from site. September - October: Mow the re-growth and remove clippings. March - April: Mow the re-growth and remove clippings.	July / August, September / October and March / April	3	x
7. Pond Edge Mix e.g. Emorsgate EP1 and aquatic plug plants	Develop a variety of vegetation structure, from dense tussock stands, to bare and recently colonised muddy areas to enhance habitat value. Aim to create variation with minimum disturbance to	A	General: Inspection frequency - at regular intervals (twice a year) and after severe events (to check bank stability, vegetation growth, debris and erosion).			

	animal populations. To ensure that central areas of the pond are kept clear and any excessive encroachment of vegetation is managed in the long term.	B	Year 1: Annual weed growth may be cut back to encourage the development of a good perennial ground cover. Note: Establishment on sites prone to flooding may be patchy and may take several years to fully colonise.	September	1	Y1
		C	Year 2+: To achieve variation in vegetation structure, cut back and remove short sections of vegetation every 2-3 years in rotation. Remove vegetation in wedges.	September and November	Every 2-3 years.	Y2+
		D	Dense stands of single species (e.g. Yellow Iris) may benefit from selective thinning.	September and November	As required	Y2+
		E	Any vegetation removal should take place during September and November to cause the least disruption to wildlife.	September and November	As required	Y2+
			Note: Machines and heavy equipment should be used with care on wet sites to avoid damage to soil and vegetation.			