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Ecological Assessment

Proposed landfill capping, Evergreen Farm, East Grinstead

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DOCUMENT CONTROL

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ORIGINAL	DB	KP	29 January 2019	N/A	First draft to inform detailed design
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Report Summary

1. Fluid Planning Ltd instructed the Ecology Co-op to undertake a Phase 1 Habitat survey and Preliminary Ecological Appraisal on the former landfill site at Evergreen Farm, East Grinstead. This was completed in February 2018 and further protected species surveys were recommended, together with a botanical survey of the adjacent ancient woodland. This report presents the findings of these surveys, which were carried out between April and October 2018, to inform a planning application regarding a proposed scheme to cap the landfill site and implement environmental remediation.

2. The site is approximately 6.23ha in area and comprises an historical landfill to the south of East Grinstead, capped with a very thin layer of soil. In places, the underlying landfill material and plastic membrane are exposed. Habitat on site comprises improved grassland with species-poor semi-improved grassland on the sloping sides. An area of semi-natural ancient woodland borders the east side of the landfill. A small headwater stream borders the north-western side.

3. The protected species surveys revealed a small population of great crested newts to the east (off-site), presence of grass snake, but likely absence of other common reptile species on the landfill cap. Bat activity was limited to small numbers of common and widespread species only. No evidence of common dormouse was detected, though suitable habitat exists along the south-eastern boundary and the badger sett identified during the Phase 1 survey continued to be active throughout the year, confirming its classification as a 'main sett'.

4. Based on the extremely low numbers of great crested newts found in the pond, the large distance and presence of good quality terrestrial habitat (ancient woodland) in between the pond and the landfill site, the risk of adverse impacts on great crested newts is very low. Predicted impacts on common reptiles are also not significant as the only species found, grass snake, occurs in very low numbers, is mobile and can move to alternative habitat in the wider area. 'Reasonable avoidance measures' will be employed to prevent harm to reptiles, amphibians and common breeding birds that may be present during site preparation.

5. The proposed new landfill cap does not encroach upon the badger sett. However, disturbance to badgers while occupying the sett may occur as it is located approximately 20m from the edge. Working hours will be restricted to daylight hours and no additional artificial lighting will be used to minimise disturbance to nocturnal wildlife such as badgers, bats and common dormice.

6. The proposed scheme lies adjacent to designated ancient woodland. Whilst it will not result in direct loss of this priority habitat, impacts on the woodland edge are unavoidable because the existing landfill encroaches into the woodland margin and the cap would otherwise not be effective. The unavoidable damage to root protection zones along this boundary will be compensated for by native woodland planting on part of the landfill cap.

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1 INTRODUCTION

1.1 Background

The owner of Evergreen Farm intends to submit a planning application for re-capping and environmental remediation works of a former landfill site at the property. The existing landfill cap comprises a very thin layer of soil material and in places the underlying plastic membrane and landfill material is exposed. It is suspected that rainwater is percolating into the landfill material through the failed capping. It then re-emerges along the edges resulting in contamination of the local watercourses with leachate of unknown composition.

In February 2018, the Ecology Co-op undertook a Phase 1 Habitat Survey and Preliminary Ecological Appraisal (PEA)[1] on the former landfill site at Evergreen Farm, East Grinstead. Based on the findings of this assessment, presence/likely absence surveys for badgers, common reptiles, dormice, and great crested newts were recommended, together with activity surveys for bats and a botanical survey of the adjacent designated Ancient Woodland.

The proposal for remediation of the site involves the importation of inert clay material to form a new impermeable capping layer of the existing landfill, which will reduce rainwater infiltration. The proposal includes measures to contain the existing leachate by keying the capping material into the ground around the perimeter of the landfill site and installing leachate collector pipes, gas vents and surface drains. The landfill cap will then be covered with soil material to facilitate landscape planting.

1.2 The site

Evergreen Farm is located to the east of West Hoathy Road, south of East Grinstead, Surrey, East Sussex. The postcode for the site is RH19 4NE. The central grid reference for the site is TQ 3907 3629. Figure 1 shows the boundary of the site and local context.

The existing landfill site comprises an area of sloping 'made ground' covered in grassland vegetation. Evergreen Farm comprises one residential bungalow, one agricultural building, one stable block with associated hard standing, and two access roads leading to West Hoathy Lane. Taken together, the site measures approximately 6.23ha in total. The site landholding also includes an area of semi-natural Ancient Woodland known as Rockingshill Wood, which borders the south-east side of the landfill. A small headwater stream borders the north-western side.

Historically the landfill site was owned and operated by a skip waste company. The site was capped in the late 1990s with a thin layer of inert soil, but waste material including a plastic membrane and inert building rubble is visible in many places through this capping. It is not clear what types of material are contained within the landfill, although it is officially understood to comprise inert building waste. There

[1] The Ecology Co-op (2018) *Preliminary Ecological Appraisal and Phase 1 Habitat Survey: Land at Evergreen Farm, East Grinstead.* Internal report issued to client, December 2018.

is limited information available on the extent of the landfill, type of lining and contents and therefore there is a strong possibility that waste material has been deposited beyond the official perimeter, encroaching into the adjacent woodland. The client has raised environmental concerns regarding waterlogging of the capping layer and underlying landfill site, and the escape of leachate into the adjoining watercourses. In its current condition the site is understood to be unfit for agricultural use or for grazing horses.

1.3 Purpose of this report

Following the recommendations of the PEA, The Ecology Co-op undertook further protected species surveys for badgers *Meles meles*, common dormice *Muscardinus avellanarius*, great crested newts *Triturus cristatus* and common reptiles. Bat activity surveys were also undertaken throughout 2018. This report presents the findings of these surveys, together with a botanical assessment of the adjacent designated Ancient Woodland.

The report includes an assessment of potential impacts of the scheme and sets out all measures that will be put in place to avoid, mitigate and/or compensate for impacts on ecological features. Finally, habitat enhancements that would provide a net gain in biodiversity at the site are proposed.

These surveys and this report were carried out and produced at the request of Fluid Planning Ltd and supervised by Daniel Bennett, MCIEEM.

1.4 Policy and Legislation

Legal protection applying to relevant bird, mammal, herpetofauna and invertebrate species and current nature conservation planning policy is outlined in Appendix 1 of this report.

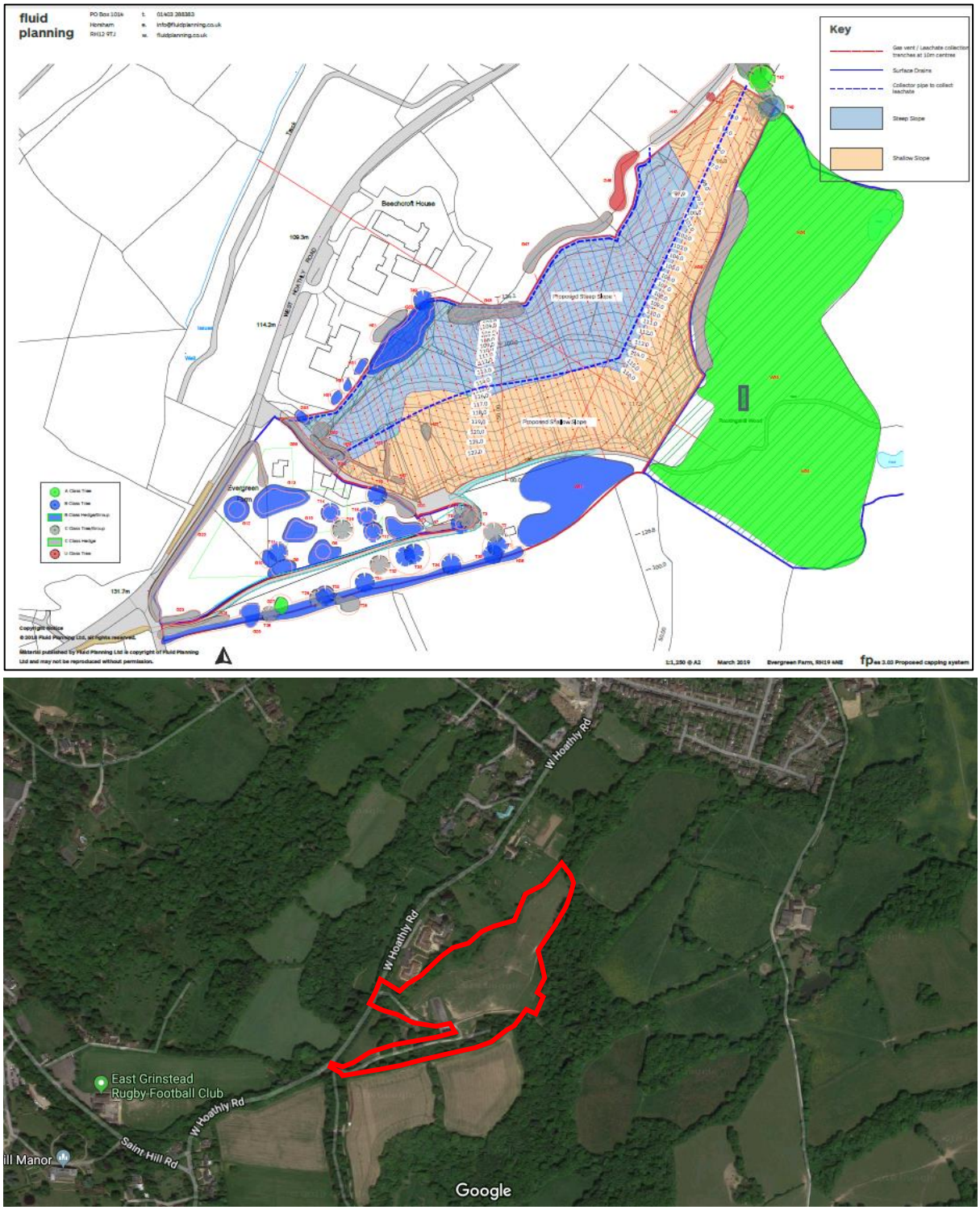


Figure 1 Top: the landfill site boundaries and areas under the same land holding. The proposed landfill capping area is shown in blue and orange shading. Trees and woodland are shown in green and blue. Image reproduced with kind permission from Fluid Planning Ltd (dated March 2018). Bottom: An aerial image showing the local context of the site. The approximate site boundary is outlined in red. Images produced courtesy of Google maps (map data ©2018 Google).

2 SURVEY METHODOLOGY

The following sections describe the methodologies used in each survey type. All survey methods are in accordance with current best practice guidance for the respective species/taxonomic groups and any limitations encountered during the survey are explained in section 2.8.

2.1 Badgers

Evidence of badger activity was recorded where encountered during the Phase 1 PEA survey. This was supplemented by a walkover survey of the site in April 2018, during which surveyors searched for badger setts, latrines, foraging marks, footprints and worn pathways, and trapped hairs on fences, with special attention paid to linear features.

Any setts identified were subject to on-going monitoring during other survey visits to determine the type of sett and current occupation by badgers. Where necessary, sand and hair traps were used to confirm occupation by badgers. This survey methodology is in accordance with Harris, et al (1989) [2].

2.2 Bats

2.2.1 Built structures

A ground-based external inspection of all buildings was carried out during the Preliminary Ecological Appraisal for the scheme[1]. This was supplemented by information gathered from an internal inspection of the two-storey agricultural building on the site, carried out by the Ecology Co-op to inform a separate development proposal in 2017.

2.2.2 Natural roosting habitats - trees

Trees and woodland were broadly assessed for their potential to support roosting bats during the Phase 1 walkover survey. At the time of the protected species surveys, information on the extent of the scheme was not available and the need for felling specific trees had not been identified. Therefore, no detailed inspections of trees have been undertaken.

When this detailed information becomes available, each tree identified for felling will be subject to a ground-based visual inspection, to identify potential roosting features, followed by climbing inspections where necessary and safe, to look for evidence of roosting bats and further assess the suitability of the feature in accordance with best practice guidance[3], with each feature categorised as shown in Table 1.

This report will be updated to reflect the information gathered at the appropriate time. The scheme programme of works should allow enough lead-in time to undertake these surveys before commencement of works and implement mitigation as necessary.

[2] Harris, S, Cresswell, P. and Jefferies, D. (1989) *Surveying Badgers*. Mammal Society.
[3]Collins, J.(ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn).* The Bat Conservation Trust, London.

Table 1 Characterising potential roost features in trees.

Category	Description
Negligible	A tree with negligible roosting habitat features likely to be used by bats.
Low	A tree of sufficient size to potentially support roosting features, but with none seen from the ground or features identified of limited roosting potential.
Medium	A tree with one or more potential roost sites that could be used by bats due to their size, conditions and surrounding habitat, but unlikely to support a roost of high conservation status such as a maternity or hibernation roost.
High	Trees with one or more potential roost sites that appear suitable for large numbers of bats or use as maternity or hibernation roosts.

2.2.3 Bat activity surveys – walked transects

Bat activity surveys followed current standard best practice guidelines (Collins 20163). Pre-determined transect routes were followed by surveyors (Figure 2), focussing on all linear features within the site boundary (tree-lines, woodland edge and hedgerows). The transect routes were walked at a slow pace during the period from sunset to two hours after sunset by a team of surveyors such that each part of the route was passed approximately every twenty minutes. All surveys were undertaken during weather conditions suitable for bat activity and at ambient temperatures above 10°C. The surveyors recorded bat activity using 'Echo Meter Touch' bat detectors featuring auto-identification of bat species and automatically triggered recording for later review. The locations of all bat 'registrations' was recorded onto a field map during the survey to correspond with all sound recordings.

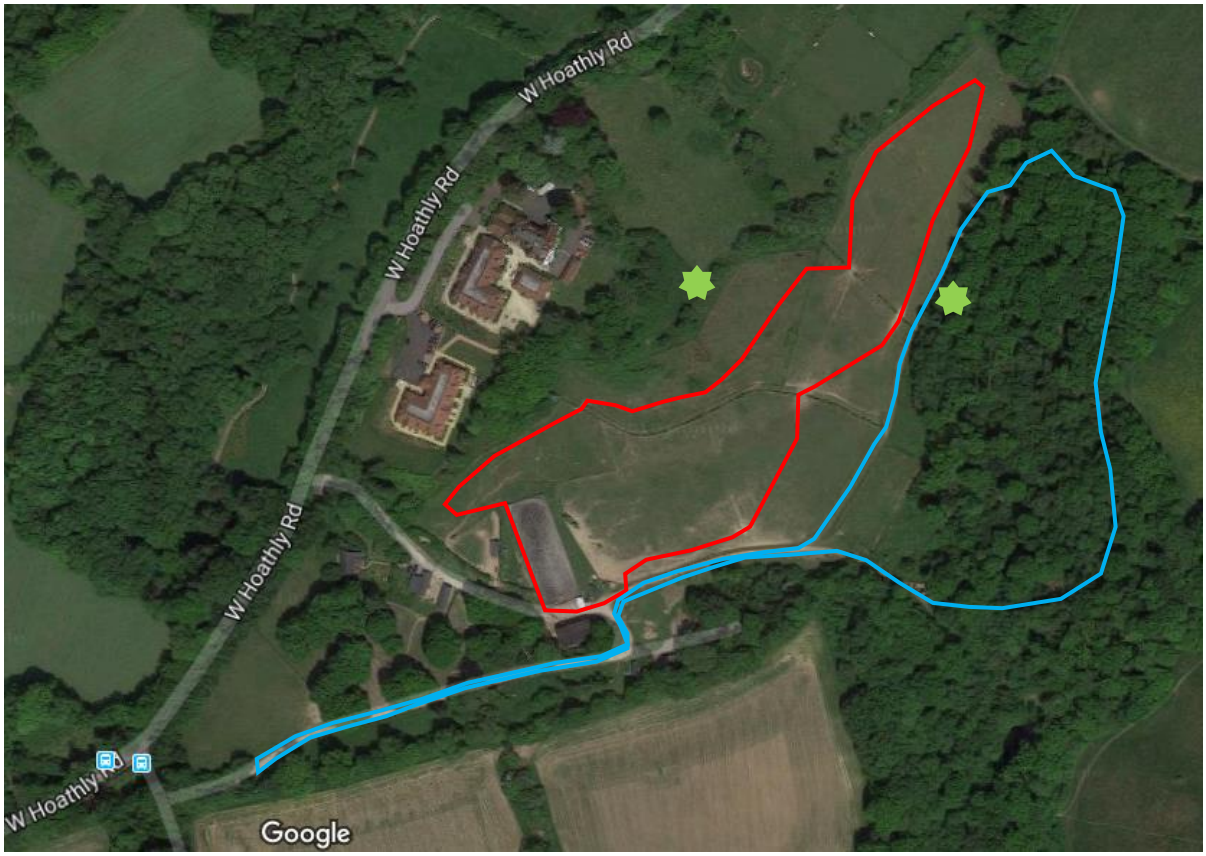


Figure 2 Transect routes walked during all bat activity surveys: Transect route 1 (red) and 2 (blue). The position of static bat detectors when deployed is indicated with a green star.

2.2.4 Bat activity surveys – automated static bat detecting

Two static bat detectors (Peersonic Detector and Full Spectrum Recorder RPA2 enclosed within a waterproof IP67 box) were deployed across the site on three separate occasions, in May, July and October 2018, and left in the field for a minimum of five days; the expected maximum lifetime of the battery. Static bat detectors comprise a passive recording device with real-time full-spectrum calls that can be viewed in detail once downloaded on analysis software, allowing accurate identification of most bat calls to species level (or genus level in the case of *Myotis* and *Plecotus* spp.).

These two methodologies complement each other with the transect surveys providing information on foraging and commuting patterns, and distribution across the site, and automated static detector surveys giving more prolonged coverage through consecutive nights, thus increasing the likelihood of detecting scarce species.

2.3 Great crested newts

2.3.1 Habitat suitability assessment

The Phase 1 PEA identified nine ponds within 500m of the site boundary. Of these, three ponds were carried forward for environmental DNA (eDNA) surveys; field surveys were subsequently carried out at those ponds that were tested positive or had indeterminable results.

2.3.2 Environmental DNA sampling and analysis

This relatively new technique allows a quick and reliable qualitative measure of the presence/likely absence of great crested newts. It involves collection of water samples from a pond, using a standard protocol set out by Natural England[4]. The samples are sent to an approved laboratory to isolate and determine presence of 'environmental DNA (eDNA) shed into the water by amphibians during the breeding season. The eDNA samples were taken on 16th April.

Ponds that were confirmed as positive for great crested newt DNA were then carried forward to full field survey (population size class assessment). Samples from some ponds were returned by the laboratory as 'indeterminate', due to unforeseen chemical factors preventing eDNA isolation. These ponds were also subject to full field survey (presence/likely absence) as set out below.

2.3.3 Field survey

The survey methodology followed standard guidance on field surveys for great crested newts[5]. Four survey visits were undertaken using a combination of bottle-trapping, torchlight searching and egg searching during each survey visit. All surveys were undertaken during weather conditions suitable for great crested newts – above the minimum temperature of 5°C – and at least two of the survey visits were undertaken during the 'peak activity period' for breeding great crested newts (i.e. between 15 April and 15 May). Weather conditions, temperature and pond turbidity during each survey visit is presented in Appendix 2. If great crested newts were confirmed present by either of the above methods at a given

[4] Biggs J, Ewald N, Valentini A, Gaboriaud C, Griffiths RA, Foster J, Wilkinson J, Arnett A, Williams P and Dunn F (2014). Analytical and methodological development for improved surveillance of the Great Crested Newt. Defra Project WC1067. Freshwater Habitats Trust: Oxford.

[5] English Nature (2001) *Great Crested Newt Mitigation Guidelines*. English Nature, Peterborough.

pond, the field survey was extended to six separate visits to allow the population size class to be estimated.

2.4 Common dormouse

Dormouse surveys are undertaken by attaching purpose built 'nest tubes' on trees and shrubs in suitable habitat such as woodland, scrub and hedgerows. Nest tubes are used by dormice as places of shelter and they will often construct their nests within them during their periods of activity (typically between April and November). In accordance with current best practice guidelines[6], fifty nest tubes were deployed approximately 20m apart in the adjacent Ancient Woodland site on 25 April 2018 and left *in situ* for the survey season (see Figure 3). These were checked on a monthly basis for presence of animals and evidence of dormouse presence (distinctively woven nests) from May to October 2018. Since the likelyhood of use by dormice varies through the year, an index of probability score is used to determine confidence in a particular survey (see Table 2 below) comprising checks over several months. A minimum score of 21 is normally accepted to establish 'likely absence' in the event that no signs of dormice are found during the survey.

Table 2. Search effort score for each month that dormouse tubes are out on the site and subject to checks for occupation.

Month of check	Index of probability
April	1
May	4
June	2
July	2
August	5
September	7
October	2
November	2

Dormice checks were undertaken in the mornings and commenced one month after the nest-tubes were positioned. Surveys were undertaken under the supervision of licenced surveyors: Paul Whitby and Dan Bennett.

[6] Bright, B., Morris, P., Mitchell-Jones, A.J. and Mitchell-Jones, T (1997) *The Dormouse Conservation Handbook*. English Nature.

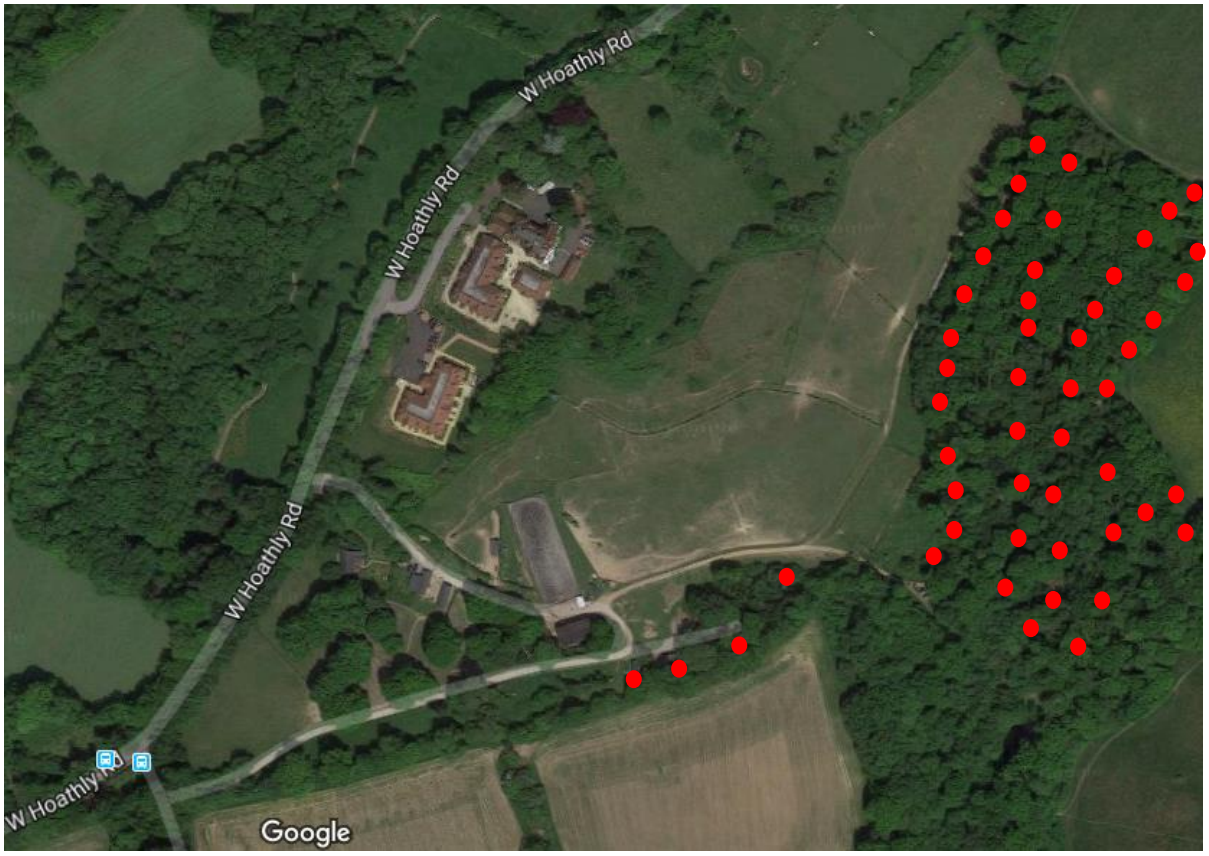


Figure 3. Dormouse nest tube locations across all suitable habitat.

2.5 Reptiles

Standard reptile presence/likely absence surveys involve setting out artificial refugia (reptile 'mats') in potentially suitable habitat. Reptile mats are either pieces of roofing bitumen felt or corrugated metal sheets, which absorb heat from the sun more rapidly than the surroundings and provide cover and basking places attractive to reptiles. These are then checked for presence of animals under suitable weather conditions. There are no up-to-date best practice guidelines for reptile surveys, but a minimum of seven survey visits under suitable weather conditions is generally considered to be enough to determine their presence/likely absence.

A total of forty roofing felt mats were used in this survey and placed in areas of suitable habitat within long vegetation, such as along the field edges and around patches of bramble scrub or rushes in sunny locations across the former landfill area (see Figure 4 below). The mats were left *in situ* for a minimum of one week to 'bed in' and allow reptiles to locate them before the first check. The mats were checked at least seven times over the period May to September 2018 and all reptile observations recorded together with the weather conditions, temperature and time of day.

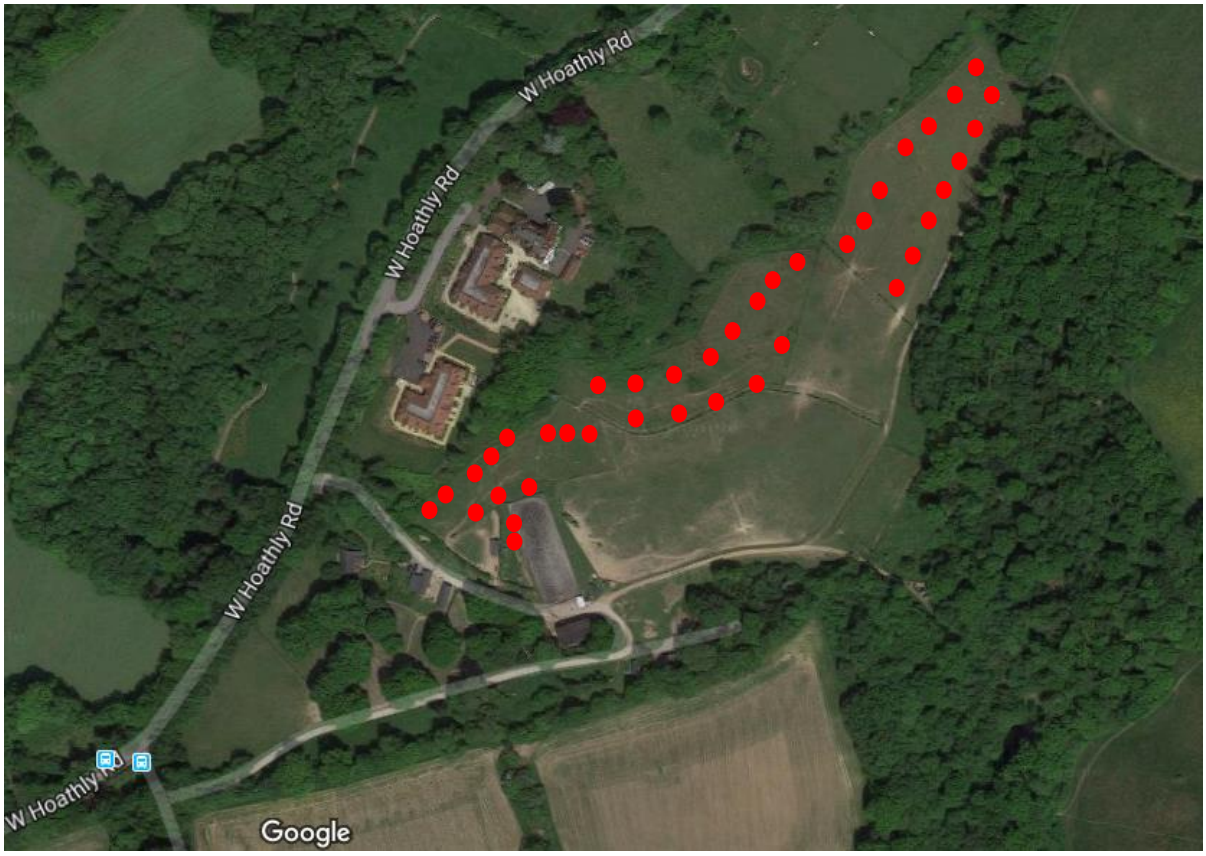


Figure 4 Location of reptile refuges.

2.6 Woodland botanical assessment

As an extension to the Phase 1 Habitat Survey, a walkover survey was undertaken on 5 June 2018 to assess the woodland habitat adjacent to the former landfill. This is the optimum time of year for botanical surveys when most woodland ground flora is actively growing, and trees are in leaf. The aim of the survey was to list the dominant species composition of the woodland and, using Ancient Woodland Indicator species (AWIs), general vegetation structure and land form, divide the site into various stand types and look for evidence to support its classification as Ancient Woodland. The walkover surveys were undertaken by Dan Bennett MCIEEM and James Rowland BSc.

2.7 Impact assessment methodology and mitigation

The assessment of ecological impacts and mitigation recommendations in this report follow best practice guidelines for Ecological Impact Assessment (EcIA)[7]. This involves recognising the importance of an 'ecological feature' (habitat, vegetation community, population of a single species or assemblages of species) in terms of nature conservation priority, followed by the application of the mitigation hierarchy.

[7] CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine* (3rd ed.). Chartered Institute of Ecology and Enivironmental Management, Winchester.

2.7.1 Importance of ecological features

This approach assigns a level of importance to all existing ecological features, considering the rarity and distribution of a habitat or species, the population size, ecological function, and trends (declining/expanding), together with any designations, legal status, or conservation policies. CIEEM recommend that the importance of an ecological feature, in terms of nature conservation priority, should be considered within a defined geographical context (for definitions used by The Ecology Co-op, see Appendix 2):

- International and European
- National
- Regional
- Metropolitan, county, vice-county or local authority area
- Local or parish
- Site/negligible

Where protected species are present and there is the potential for a breach of the legislation, those species should always be considered as 'important' features and included in the EcIA. However, the level of importance assigned to the affected population of a protected species will vary depending on contextual information about the population size, distribution, abundance and trends across the range of geographical scales.

Similarly, irreplaceable habitats such as ancient broadleaved woodland should always be considered as 'important features and included in the EcIA. The level of importance will vary depending on the size of the habitat parcel, its distribution and abundance at different geographical scales.

2.7.2 Significance of impacts

In accordance with EcIA (CIEEM 2018[7]), a significant effect is defined as "an effect that either supports or undermines biodiversity conservation objectives for important ecological features". Conservation objectives may be specific (e.g. for a designated site) or broad (e.g. national/local nature conservation policy). The effects may be described as significant at a range of geographic scales as defined above.

The impacts are described in relation to the following characteristics:

- Adverse or positive – does the impact result in the loss or gain in biodiversity/ quality of the environment?
- Extent/magnitude – the spatial area over which the impact may occur, the area of habitat lost, or the number of individuals/populations affected.
- Timing – in relation to the life cycle of the ecological feature (e.g. nesting bird season)
- Duration, frequency – is the impact temporary or permanent, frequently repeated or a one-off event?
- Reversibility – is the impact temporary or permanent? Would the ecological feature recover after the impact? For example, the destruction of ancient woodland, an irreplaceable habitat, would be permanent, whereas a one-off disturbance event to a bat roost, where bats return after the event would be temporary and reversible.

It is only necessary to describe in detail the impacts that are likely to be significant. Impacts that are either unlikely to occur, or if they did occur are unlikely to have a significant effect may be discounted or 'scoped out'. Effects on conservation status are only assessed in detail for ecological receptors of high enough value (local or above) that impacts upon them may be a material consideration in decision-making in terms of legislation and planning policy. Impacts on features below local value are categorised as of neutral significance and are not considered further.

2.7.3 The 'mitigation hierarchy'

The assessment of impact significance is made initially in the absence of mitigation. This is followed by a sequential process of determining the most appropriate way to remove or minimise the impact. The preferred option is to avoid impacts in the first place, for example by redesigning the scheme to retain an important area of habitat, or timing works outside of the breeding season of a sensitive species ('embedded mitigation'). Mitigation measures such as translocation or displacement of populations will be applied as a last resort where impacts are unavoidable.

When all practicable measures are applied to avoid and/or minimise impacts, an assessment of 'residual impacts' is made. Compensation measures are proposed to make up for any residual impacts that remain despite mitigation. These include habitat creation in alternative locations that off-set unavoidable habitat lost to a development. Finally, enhancements are proposed that do not relate to a specific impact but provide net gains in biodiversity, taking advantage of certain opportunities in the design and operation of the development.

2.8 Constraints/limitations to surveys

Surveys record any flora or fauna that is present at the time of the survey visits. It is therefore possible that some species may not have been present during the survey but may be evident at other times of the year and may appear or disappear from the site if habitat conditions change. For this reason, the surveys are considered valid for up to eighteen months for badgers and bats, two years for reptiles and three years for great crested newts and dormice. If the habitat conditions change significantly in the intervening period, then it is recommended that the surveys are updated.

3 RESULTS

3.1 Badgers

The badger sett found during the Phase 1 walkover survey was found to be active throughout the survey season from February to October 2018, confirming its classification as a 'main sett'. The sett comprises approximately six entrances, of these four were active through most of the season. Evidence of badger activity included loose spoil heaps, numerous guard hairs, and presence of discarded bedding at the entrance. Furthermore, live badgers were encountered during each bat activity survey on the grassland near to the sett and across the landfill area.

Badger populations have been rising for several decades and they are now a common and widespread species across most of the UK countryside. Badgers are therefore not currently considered to be of great conservation concern in the UK, although the UK supports a significant proportion of the global

population. A badger main sett is the primary location for a badger territorial group, which may extend across a wide area beyond the site. However, the sett at Evergreen Farm represents a very small proportion of the total UK badger population and as such, is not considered important beyond the local level for the conservation of badgers.

3.2 Bats

3.2.1 Built structures

Details of external building inspections of all built structures on Evergreen Farm are presented in the Preliminary Ecological and Phase 1 Survey report[1], during which four built structures were assessed. Of these, the two-storey agricultural building was rated as having 'low' potential to support roosting bats, while the stable block and temporary open-sided storage sheds had negligible potential. The residential bungalow was not fully assessed as it is not part of the proposed scheme.

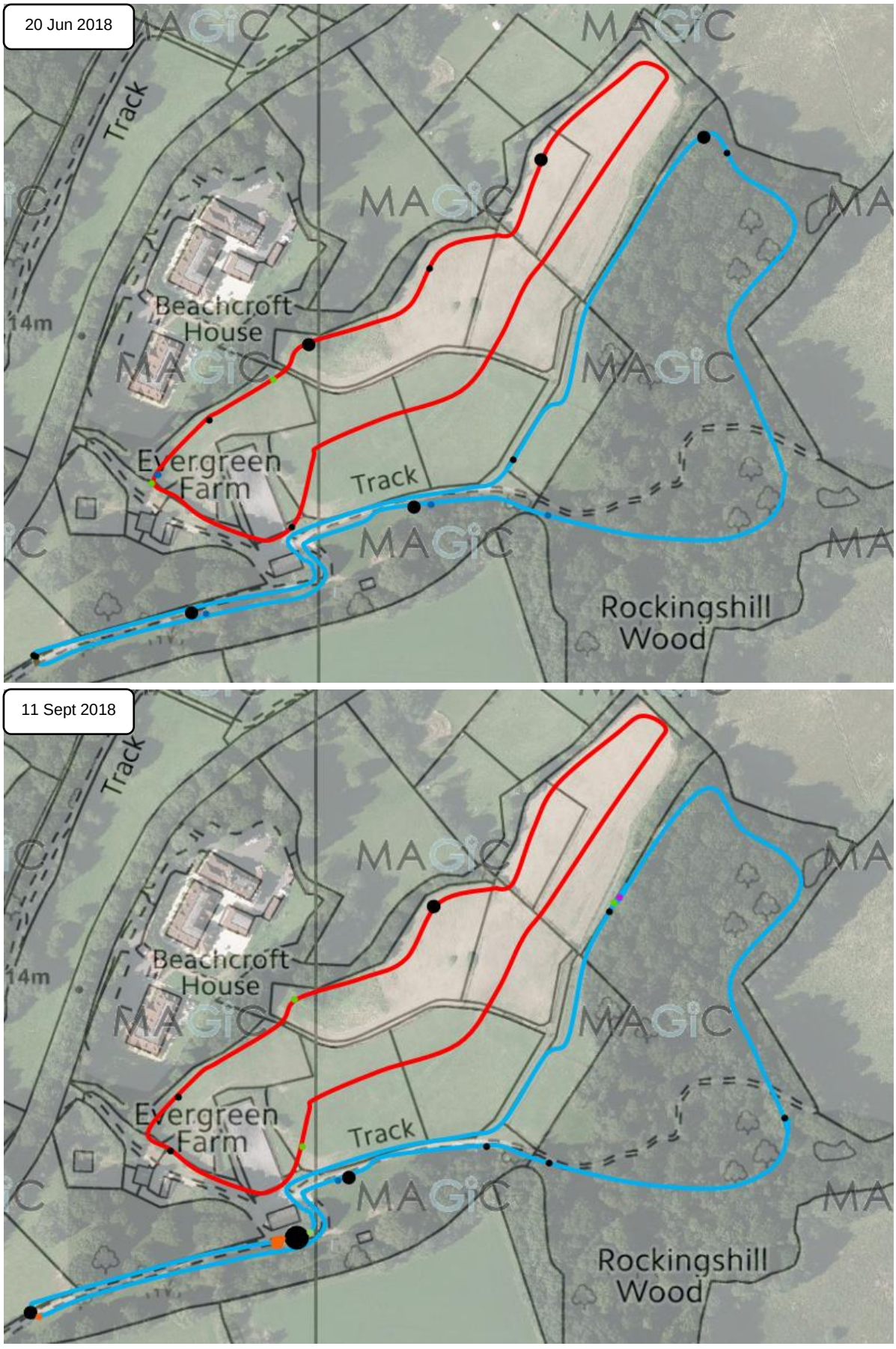
3.2.2 Natural roosting habitats - trees

Many of the trees around the edge of the proposed capping scheme are of insufficient size and age to support good quality bat roosting features. However, some of the mature oak trees along the ancient woodland boundary towards the north-east corner of the landfill area do have potential to support suitable roosting features such as flaking bark, rot holes and splits/cracks, possibly as a result of the waterlogging. These were not assessed individually during the survey visits as it was not known which trees would be directly affected by the proposal. The semi-mature oak trees along the western boundary, near Beechcroft House, were broadly assessed for their potential to support roosting features, and based on the species, age and size of these trees, are considered to have low potential. No specific roosting features were observed but these trees were not individually checked in detail during the survey.

3.2.3 Bat activity surveys – walked transects

The results of each walked transect survey is summarised in Figure 5. This shows the distribution of all bat 'observations' on each walked transect, during which the route was covered at least three times in a session. Weather conditions, timings and temperature during each survey visit is presented in Appendix 3. Over the survey period, five species of bat were recorded across the former landfill site. All species identified are relatively common and widespread across the UK. The common pipistrelle *Pipistrellus pipistrellus* was the most frequently encountered species followed by the soprano pipistrelle. These bats were typically foraging bats patrolling back and forth along linear features for a while, and then moving on. A few noctule bats *Nyctalus noctula* were recorded in June and September, these were typically high-altitude single passes just after dusk, indicating commuting bats. In August, a serotine bat *Eptesicus serotinus* was recorded foraging around the trees along the concrete access track into the site. Myotis bats were recorded on two occasions, once in August along the woodland edge and again in September over the concrete track near the entrance to the site.

The level of bat activity recorded on each survey visit was low relative to other sites, and no pattern of distribution is obvious from the results, although most bats were recorded along linear features on either side of the former landfill and surprisingly few in the ancient woodland. No bats were recorded in the open grassland part of the transect route.


20 Jun 2018
Track
Beachcroft House
14m
Evergreen Farm
Track
Rockingshill Wood
11 Sept 2018
Track
Beachcroft House
14m
Evergreen Farm
Track
Rockingshill Wood

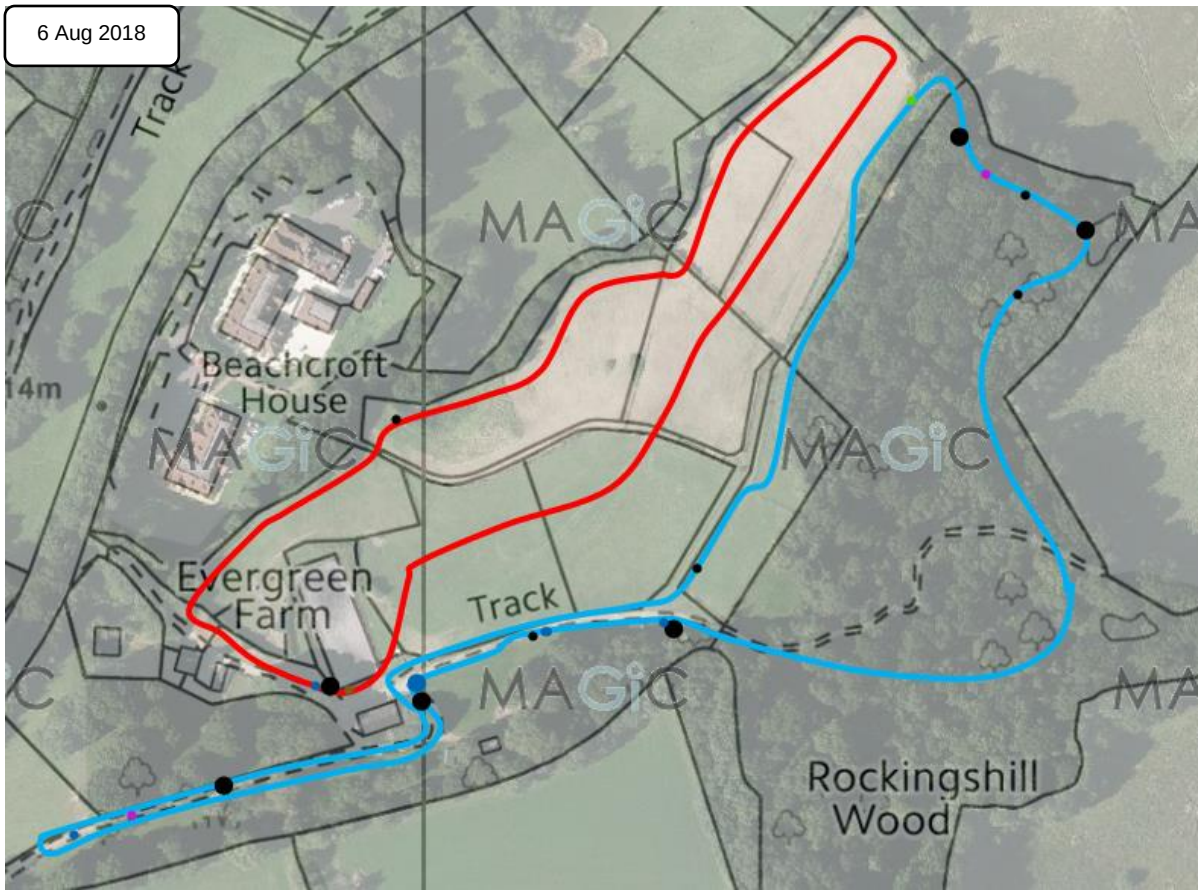


Figure 5 Approximate distribution of bats detected during each walked transects survey. Coloured dots represent bat activity. Black = common pipistrelle, blue = soprano pipistrelle, brown = brown long-eared bat, purple = Myotis spp., orange = serotine bat and green = noctule bat. The size of the dot indicates the intensity of activity: Small dot = a single pass of one bat; medium dot = multiple passes on two to three separate occasions; large dot = activity recorded on four or more occasions at that location during the night.

3.2.4 Bat activity surveys – automated static bat detecting

The automatic static detector results reflect the findings of the walked transects, with a clear dominance of common pipistrelle and soprano pipistrelle *Pipistrellus pygmaeus* and very small numbers of recordings from other species. These figures indicate the level of activity by bats, not the number of individuals and should be viewed with caution. For instance, the apparently high numbers of common pipistrelle passes detected in June at the eastern woodland edge site probably represents multiple passes by the same bat foraging back and forth over a small territory during one or all of the evenings and does not necessarily represent a large number of bats. However, the use of automated bat detectors has contributed records for two additional species to those recorded using walked transects; brown long-eared bat *Plecotus auritus* and Nathusius' pipistrelle *Pipistrellus nathusii*.

Table 3 Mean number of passes recorded by each static detector (rounded to nearest whole number) per night. Note that some deployments were affected by noise or interference leading to differences in the number of nights successfully recorded; in October, the device located on the eastern boundary failed to record at all and the one on the north/west side was limited to four nights.

Location	Date	Common pipistrelle	Soprano pipistrelle	Nathusius pipistrelle	Brown long-eared	*Myotis* sp.	Serotine	Noctule
East boundary (woodland	June (6 nights)	168	297	1	1	2	2	1
	July (7	10	11	0	0	0	1	0

edge)	nights)							
	October (failed device)	–	–	–	–	–	–	–
North/west boundary (stream)	June (5 nights)	45	28	1	0	2	1	1
	July (7 nights)	11	4	0	1	0	1	1
	October (4 nights)	3	1	0	0	1	1	0

Overall, the bat activity surveys revealed that Evergreen Farm including the access roads, grassland covered landfill area and adjacent ancient woodland combined, supports an unremarkable foraging bat assemblage comprising a small number of common and widespread species. Based on these findings, the landfill site is not considered to be important to foraging bats beyond local level.

3.3 Dormice

No common dormice or distinctively woven nests were found during the survey. A wood mouse *Apodemus sylvaticus* was found on one occasion in one nest tube; further evidence of this species (food caches) was found in some of the other tubes. The dates of checks, weather conditions and other findings are presented in Appendix 4.

A possible explanation for this result is that most of the woodland compartments adjacent to the landfill site are sub-optimal for common dormice, as described in detail in the next section. The area of self-set alder lacks the foodplant species that attract dormice and will be avoided by hibernating dormice due to waterlogged ground. The oak-dominated area of replanted ancient woodland also lacks suitable food sources that would attract common dormice and the shrub layer is too sparse. The central part of the woodland has been subject to browsing by wild deer and is dominated by species that are not important food sources for dormice. However, the areas to the north and far south do contain small areas of good quality habitat for dormice.

Based on the survey findings, the woodland bordering the landfill site is considered to have negligible importance to common dormouse, although given the good interconnectivity of the woodland block adjacent to the landfill site, the possibility of this species being present in the future cannot be completely discounted.

3.4 Great crested newts

The Phase 1 PEA identified nine ponds within 500m of the proposed development (see Figure 6). Of these, four were within 250m of the development site and access permission was secured for three of these for presence/likely absence surveys including eDNA sampling. The eDNA results were positive for Pond 7, and 'indeterminate' for ponds 6 and 8 due to water chemistry and sedimentation problems within the samples. Therefore, they were all carried forward for field surveys. Access permission was not secured for Pond 5. The detailed results of the field survey are presented in Appendix 5.

Based on these results, it is concluded that Pond 7 supports a 'small' population of great crested newts and that they are absent from ponds 6 and 8. The former landfill site is considered unlikely to support

great crested newts for the following reasons; the nearest breeding pond supports very small numbers of great crested newts, it is nearly 250m away, great crested newts are unlikely to regularly disperse as far as this because there is very good terrestrial habitat (ancient woodland) between the pond and the landfill site. Based on these factors, the site is considered to have negligible importance to great crested newts.

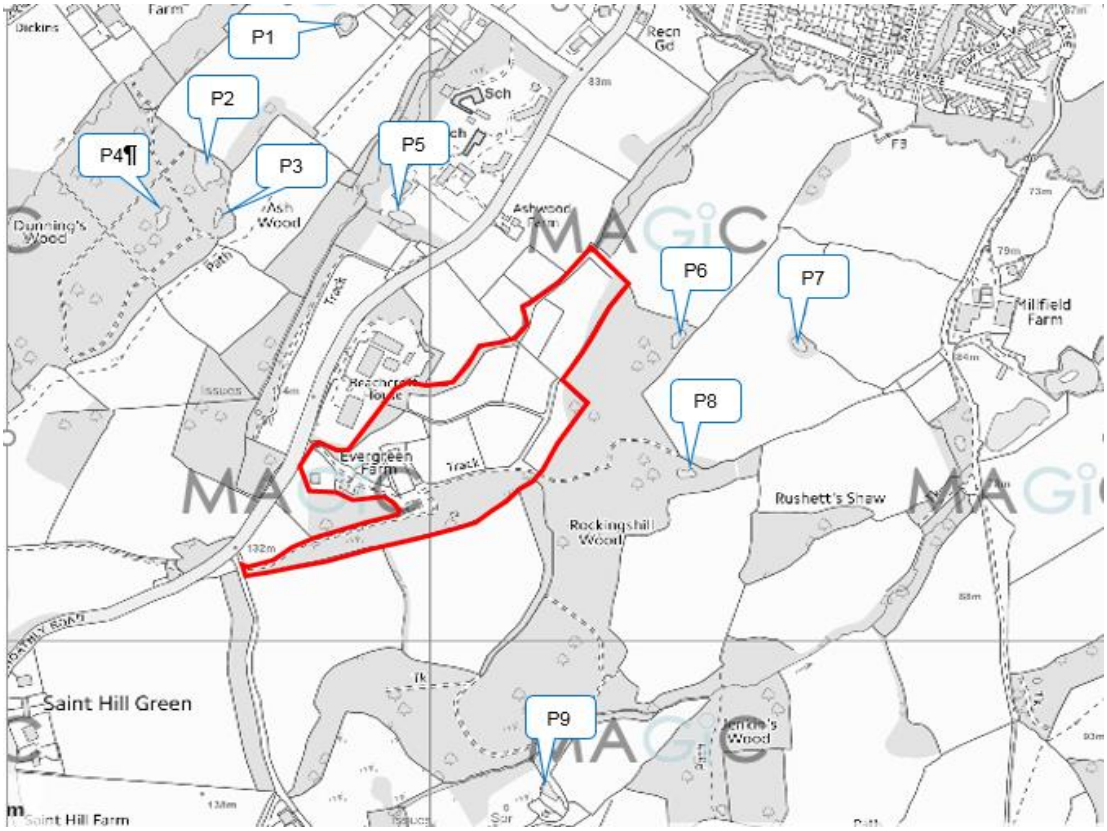


Figure 6 Ponds within 500m of the boundary to the site.

3.5 Reptiles

The survey findings, dates and conditions are presented in Appendix 6. The surveys revealed the presence of small numbers of grass snake but indicate that all other common reptile species are likely to be absent from the grassland habitat covering the former landfill. The grass snake is a highly mobile species and probably uses this site as part of a wider foraging resource rather than being resident there. Based on the small numbers involved, and absence of other reptile species, the site is not considered important to common reptiles beyond the local level.

3.6 Woodland botanical assessment

The botanical survey of woodland bordering the eastern side of the landfill site recorded at least 54 species of vascular plant, including 11 AWIs for south east England[8]. The most important area in terms of botanical richness and closest resemblance to ancient woodland is around the north and east

[8] Rose, F. Ed. And revised by Claire 'Reilly (2006) *The Wildflower Key*. Frederick Warne.

boundary, away from the former landfill site. However, much of the woodland has appeared to have suffered the effects of past intervention by humans, such as clear felling, replanting, soil disturbance and enrichment, reducing the structural complexity, the botanical diversity and overall value to wildlife. More recently, intense deer browsing has the potential to impact on the woodland's ability to regenerate.

The woodland parcel can be divided into seven distinct compartments, based on the species composition and the habitat structure. These are labelled alphabetically for convenience and shown on Figure 7. A description of each compartment is presented in Table 4 below. Full species lists are presented in Appendix 7.

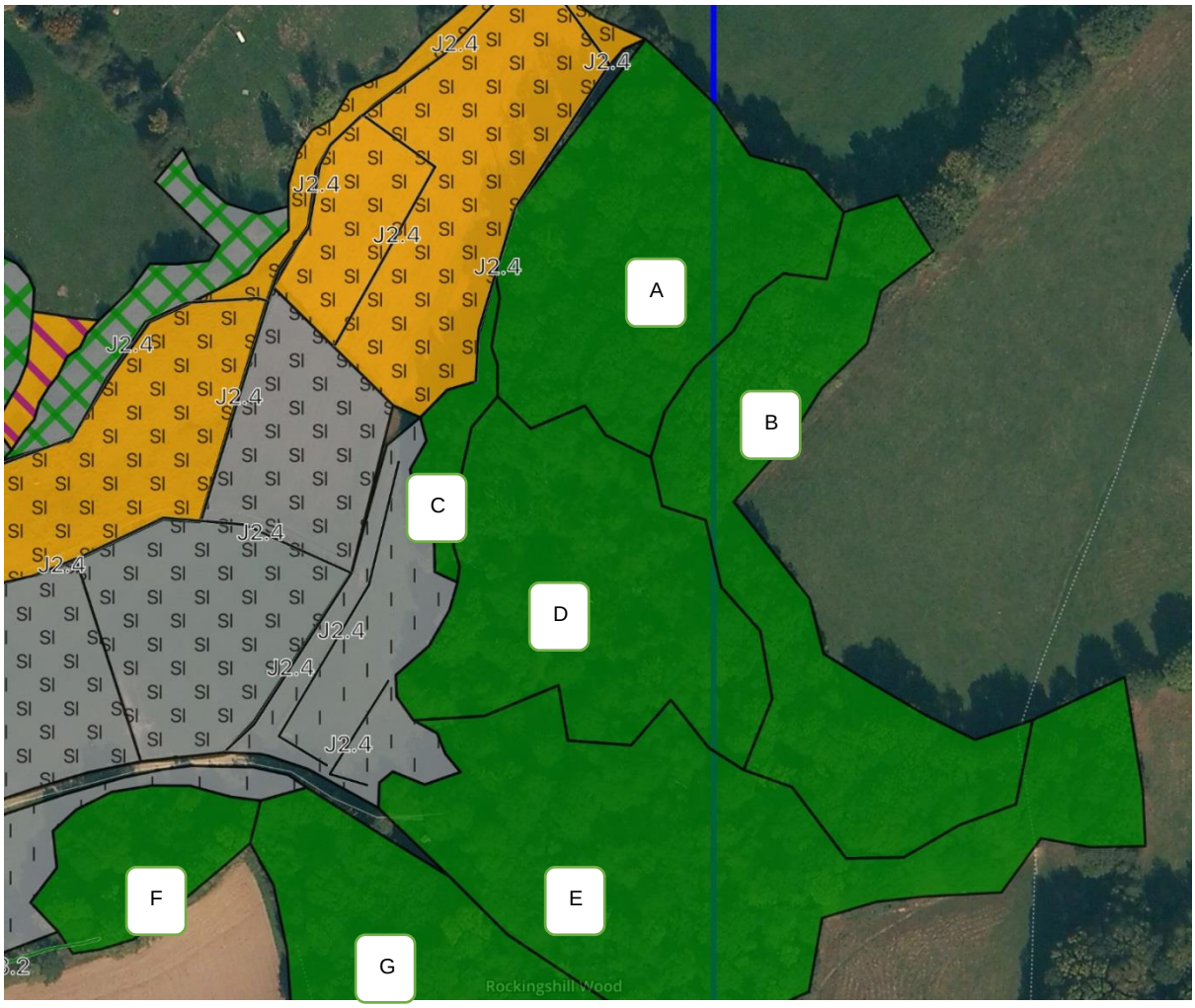


Figure 7 Woodland compartments.

Table 4 Woodland compartments descriptions

Ref.	Woodland type	Area/ha	Description
A	Replanted ancient woodland	0.92ha	English oak standards of even aged and regular spacing indicating historical planting. Sparse shrub layer with occasional young self-set shrubs and dense bramble. Bisected with bare ground access tracks, camping and picnic bays. Field layer of grasses and sedges mainly along edges of tracks and cleared areas.
B	Ancient broad-leaved woodland	0.90ha	Well balanced semi-natural broadleaved ancient woodland, a varied topography and two natural ponds (Ponds 6 and 8). The canopy is open allowing a dense shrub layer to form in places, with a rich groundflora supporting several AWIs

Ref.	Woodland type	Area/ha	Description
C	Secondary woodland on waterlogged soil	0.11ha	Self-set secondary wet woodland dominated by young alders *Alnus glutinosa* growing in a dense stand and occasional grey/goat willow *Salix cinerea/caprea*, on very waterlogged soil. The ground flora also indicative of boggy conditions and higher fertility with sedges and common nettle *Urtica dioica* dominant.
D	Broadleaved woodland – seminatural but degraded	0.94ha	This appears to be secondary woodland dominated by semi-mature birch *Betula* spp. with thickets of holly and rhododendron *Rhododendron ponticum*. There is no shrub layer and the ground flora is virtually absent, with bare ground and mud dominant. There is a clear 'browse line' indicating that deer grazing is having a strong influence. The current woodland structure suggests an historical disturbance event took place in this area, such as clear-felling and soil compaction/disturbance.
E	Broadleaved ancient woodland partly replanted	1.43ha	A closed canopy woodland with varied structure including a mix of native and possibly planted mature trees, areas of recent self-set birch and alder, with patches of dense hazel and holly shrub layer in places. The ground flora indicates ancient woodland with a gradual increase in dominance of bluebell *Hyacinthoides non-scripta* towards the south and bordering compartment G.
F	Broadleaved ancient woodland disturbed by recent activity.	0.27ha	A narrow strip of woodland bordering the former landfill with a land form indicating a possible ancient bank/ditch feature towards the site boundary, but disturbance from the landfill is evident with rubble material exposed in places and old abandoned machinery and evidence of old concrete loading bays. The canopy is closed by mature native trees, and a dense shrub layer of holly and hazel. The ground is either bare beneath this shade, or dominated by common nettle indicating heavy soil enrichment.
G	Ancient broad-leaved woodland	N/A	Semi-natural high forest with closed canopy and ground flora dominated by bluebells. Most of this compartment lies outside of the land holding of Evergreen Farm and was not surveyed in detail

4 POTENTIAL IMPACTS AND MITIGATION RECOMMENDATIONS

4.1 Overview of impacts

The proposed scheme will largely result in direct loss of existing grassland habitats on the landfill site and disturbance to adjacent woodland habitats. These impacts are temporary during the construction activities, as semi-natural habitats will be reinstated once the works are complete. The working area is contained within the capping zone shown on Figure 1, and the existing agricultural buildings and area of bare ground 'sand school' will be used for the welfare facilities and plant storage respectively. The scheme will require the importation of an estimated 150,000 m^2 of inert fill material to form the cap. This involves an estimated 40 HGV deliveries over a period of between 18-24 months leading to potential air pollution, dust, noise, vibration and human/vehicular disturbance impacts on the surrounding habitats at Evergreen Farm.

The scheme extends up to the boundary with the designated ancient woodland site. Whilst the proposed scheme will not result in direct loss of this priority habitat and no trees will be felled, indirect impacts on the woodland edge are inevitable. Earthworks within the root protection zone of some of the trees include excavation of trenches to install gas vent and leachate collector pipes and placing of the capping material over the existing ground level, followed by a layer of soil material, which will raise the ground

by up to 2m. These impacts cannot be avoided because the existing landfill material extends right up to the edge of the woodland, and the cap would otherwise not be effective.

Other potential effects in the absence of mitigation include direct mortality of a small number of reptiles and amphibians that may be present on the existing grassland landfill area. There is also potential for use of artificial lighting during construction, which could cause disturbance to foraging bats and badgers.

In the following sections, the predicted impacts of the proposed scheme are described in accordance with EcIA guidance[7] on each important ecological feature in turn. This is based on the best available information, both on the baseline ecological condition and on the method of construction, timescales and other development/planning constraints known at the time. The significance of the impact on nature conservation is assigned in accordance with EcIA guidance and the degree of uncertainty relating to the occurrence and severity of an impact is discussed.

The mitigation measures proposed to reduce or eliminate significant adverse impacts is then presented for each ecological feature, following the principles of the 'Mitigation Hierarchy' wherever possible, followed by an assessment of the 'residual impacts' after mitigation.

4.2 Designated sites and important habitats

4.2.1 Potential impacts

Detailed information on statutory and non-statutory designated sites for nature conservation are presented in the Phase 1 PEA[1] for this project, which concluded that: "Evergreen Farm lies some distance from all statutory designated nature conservation sites. In terms of significant adverse effects resulting from the proposed recapping works, the statutory designated sites are outside the zone of influence in all cases.

However, as Evergreen Farm lies within the High Weald Area of Outstanding Natural Beauty (AONB) it is recommended that the High Weald AONB unit is consulted at an early stage in the design process to address any landscape character concerns.

The proposed scheme will impact on the adjacent designated Ancient Woodland site. This is unavoidable. There is some evidence that the historical landfill has encroached into the bordering woodland and this may have resulted in historical ecological impacts through direct physical damage and changes in the hydrological regime. There is some evidence of this visible on the ground– some of the mature oak trees along the woodland edge appear to be suffering from die-back, or are completely dead, the ground is waterlogged in places, marked by a dominance of young, self-set alder and willow secondary woodland. Consequently, the actual boundary of the Ancient Woodland is indistinct on the ground. The ancient woodland designation reflects this uncertainty as it excludes a narrow wedge-shaped area of broadleaved woodland bordering the landfill site (Figure 8).

The proposed scheme has been designed to not require the felling of any trees along this woodland boundary, although it does encroach upon the root protection zones (RPZs) of some of the trees. In order to ensure that the proposed capping scheme is effective, trenches will be dug into the existing

ground to install gas vent and leachate collector pipework and capping material will cover a proportion of the root systems of some of the mature trees at the edge of the woodland up to a depth of 2m. This may lead to a gradual decline in the health of these trees that is considered significant at a local level. However, this unavoidable impact on a small number of trees is outweighed by the wider environmental benefits of capping the landfill site and containing the leachate.

The proposed scheme will result in the direct loss of a small area of woodland and dense continuous scrub along the north-western boundary amounting to approximately 0.3 Ha. This is unavoidable due to the encroachment of the original landfill material onto these areas and the need to ensure that the capping completely covers the full extent of the landfill site. The habitats contained in this area are relatively low value and comprise a small number of semi-mature English oak trees, with sparse shrub and ground flora, together with thickets of bramble and blackthorn on drier ground and sallow lining the waterlogged lower ground. This area is further degraded by the encroachment of landfill material and presence of Japanese knotweed *Fallopia japonica*.

The scheme will also result in the direct loss of the improved and semi-improved grassland habitats that currently cover the existing landfill area. This example of habitat is of limited botanical diversity and loss of this area of habitat is therefore not considered significant beyond local level.

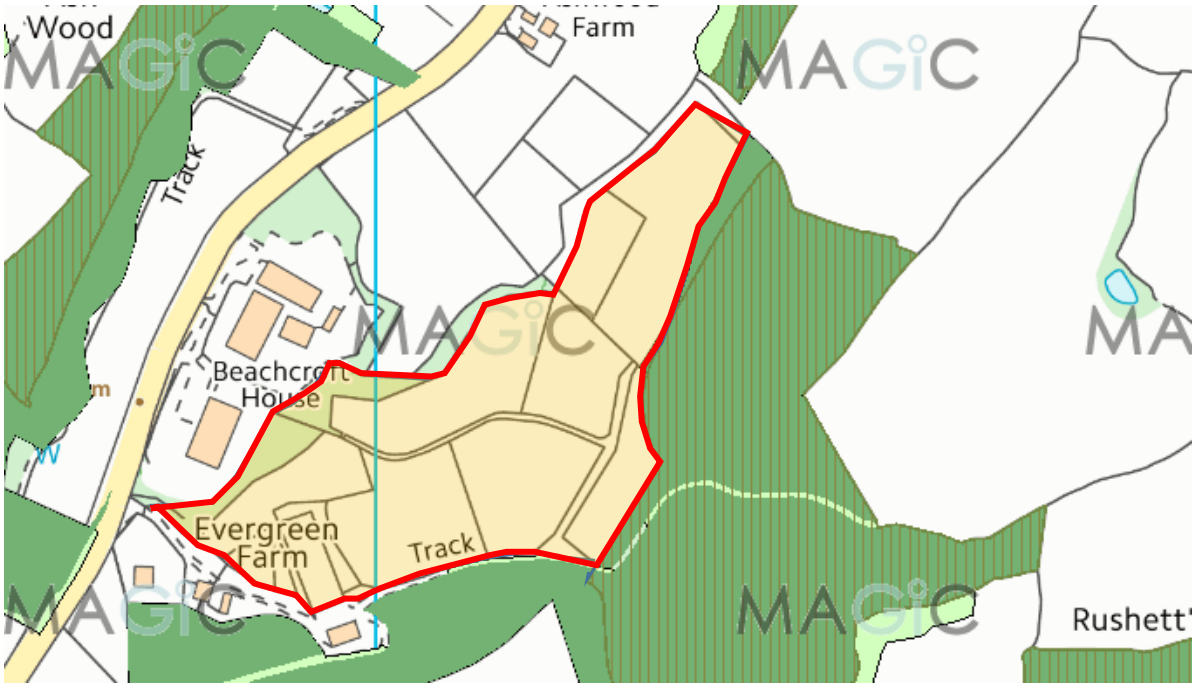


Figure 8. Extent of broadleaved woodland (green shading) and Designated ancient woodland boundary (vertical hatch). The extent of landfill capping works is superimposed (red outline and sand-coloured shading). Image produced courtesy of Magic maps http://www.magic.gov.uk/, contains public sector information licensed under the Open Government Licence v3.0.

4.2.2 Outline mitigation measures

National planning policy is designed to protect Ancient Woodland – a nationally important and irreplaceable habitat type – and advises that any development scheme must avoid direct loss of this habitat and should include a minimum 15m buffer of undeveloped land between the woodland boundary

and the construction zone[9].

This has not been possible along the full extent of the woodland boundary due to the importance of ensuring that the new landfill cap covers the full extent of the existing landfill material and is properly keyed into the surroundings. However, the proposed capping scheme avoids direct loss of trees from this habitat, and only affects the marginal area of woodland that is already degraded (Compartments A and C – Figure 7). The scheme will not directly impact on the core areas of ancient woodland (compartments B, E and G – Figure 7). The wider environmental benefits of capping this landfill site therefore outweigh this minor impact on the ancient woodland edge.

To compensate for these impacts on woodland habitats, it is proposed that once the landfill cap is complete, part of the site will be replanted with broadleaved trees to form an area of woodland. This is described in more detail in Section 5.2 of this document together with other habitat enhancements.

4.3 Badgers

4.3.1 Potential impacts

The proposed construction method involves placing material on top of the existing ground surface to an approximate depth of 2m, with up to 500mm deep trenches cut at 10m intervals to install gas vent and leachate collection pipes. The active badger sett is located approximately 20m from the edge of the proposed landfill cap at the nearest point. At this distance the risk of direct damage to the sett and underground tunnels is reduced to some extent, but it cannot be completely discounted. Most of the existing sett entrances are directed away from the landfill area, and it is considered unlikely, though not impossible, that badgers would choose to excavate through the landfill material. Heavy construction activity at this distance has potential to cause significant disturbance to badgers through noise, vibration and regular presence of persons near to the sett entrances.

The scheme will also result in the loss of grassland habitats during construction that is potentially used by this family group of badgers for foraging. However, alternative foraging habitat for badgers exists all around the construction zone and this temporary loss represents a small proportion of the total resource available. Badgers are generally quite adaptable to some degree of human disturbance, with foraging, commuting routes and occupation or establishment of new setts constantly adjusting in response to new food sources and disturbance, so this impact is of negligible significance.

Since badgers are common and widespread, the impact of this scheme on one badger sett is not considered significant in nature conservation terms, but it is important to consider badgers from a welfare perspective and to ensure compliance with legislation.

4.3.2 Outline mitigation measures

Standard mitigation for a badger sett impacted by development involves putting measures into place to exclude badgers from using such a sett, either permanently where a sett would be destroyed by the

[9] Standing advice on ancient woodland, ancient trees and veteran trees: protecting them from development. Available at: https://www.gov.uk/guidance/ancient-woodland-and-veteran-trees-protection-surveys-licences

development, or temporarily, where the sett is not destroyed but may be damaged. In this case, the sett may be reinstated, and badgers allowed to return.

In either case, the mitigation work results in significant disruption to badgers and their normal behaviour patterns. Displacement of badgers from a main sett should be considered as a last resort as it can lead to territorial disputes and knock-on effects on neighbouring communities. At Evergreen Farm it is considered that this disruption would outweigh the low risk of harm to badgers; it would be better to allow the badgers to remain in-situ for the duration of the works, allowing them to relocate to an alternative sett under their own volition.

However, it is important to maintain a degree of flexibility with badger mitigation and the consultant ecologist may decide that a licensed temporary sett closure is required before the start of construction if the condition of the sett or scheme design changes. A licence from Natural England may still be necessary to cover for vibration and noise disturbance impacts. In any case, the following safeguarding measures will be put in place:

1. On-going monitoring of the known sett and walkover surveys of the construction zone will be undertaken a minimum of six months in advance of the proposed capping work commencement. Badgers can establish new setts at any time, and it is important to identify these with sufficient early warning to adapt mitigation strategies to deal with changes in the status of badgers on a site. If a sett closure becomes necessary, this lead in time must be allowed in the construction programme to obtain a licence for sett closures, which can only be issued for the period July – November inclusive.
2. A minimum 30m exclusion zone will be established around all tunnel entrances of the main sett, preventing heavy machinery and storage of materials in the vicinity of the sett, unless a licence is sought.
3. All deep excavations across the construction zone should be kept covered at night, or a means of escape provided (ramp or ladder) to prevent entrapment of badgers.
4. All hazardous waste, chemicals or food should be suitably contained to prevent access by badgers during the works.

4.4 Bats

4.4.1 Potential impacts

The proposed landfill capping scheme will not result in impacts on any of the existing buildings at Evergreen Farm. Therefore, no further surveys or mitigation are required with respect to roosting bats in buildings.

It is understood that the scheme will not require the felling of trees along the ancient woodland boundary. However, there will be considerable construction activity around the trees along the woodland edge as trenches are excavated and capping material is deposited and formed. This could result in significant noise and vibration disturbance to any roosting bats and result in further deterioration in the health of these trees. The scheme will result in the loss of some semi-mature oak trees on the north-western boundary.

There remains some uncertainty over the scale of these impacts on roosting bats, though it is stressed that the scheme has been designed to avoid the removal of mature trees. Should the removal of any trees with bat roosting potential become necessary, it is essential that further surveys (ground based visual inspections, followed by either tree climbing inspections using an endoscope, or bat emergence surveys), are undertaken to fully assess their potential to support roosting bats in advance of construction, to ensure that targeted and effective mitigation can be put in place.

The proposed working hours for the construction of the new landfill cap would be restricted to daylight hours and do not require the use of artificial lighting. The temporary loss of grassland vegetation covering the landfill site is unlikely to lead to significant effects on bats because suitable alternative foraging habitat is widely available and the small number of bats that use the site do so as part of a much wider foraging resource. Therefore, the proposed scheme is unlikely to result in significant adverse impacts on foraging bats.

In the longer term, the proposed scheme could lead to positive impacts on bats through the provision of increased woodland cover, and through the natural development of new roosting features as retained trees at the edge of the new landfill cap deteriorate and develop cracks, peeling bark and rot holes through distress to their root system.

4.4.2 Outline mitigation measures

In the first instance, the felling of trees with high potential for roosting bats will be avoided if possible. However, if it becomes apparent that some trees require felling, for example because of unforeseen safety reasons, these trees must be subject to thorough inspection for potential roosting features and appropriate surveys. Mitigation for bats, depending on the results of surveys, will either use precautionary felling techniques ('soft-felling') at an appropriate time of year, or, exceptionally, may require a European Protected Species (EPS) licence if bats are clearly using the feature on a regular basis, or are likely to be present at the time of the works. In any case, it is important that detailed records are kept, and trees are not felled before being thoroughly checked for bats.

4.5 Common dormice

4.5.1 Potential impacts

The surveys indicated that common dormouse is likely to be absent from the woodland habitat adjacent to the landfill site and therefore no impacts on this species are predicted. The scheme includes a proposal to plant up the new landfill cap with deciduous trees. This has potential to result in positive impacts for dormice by increasing woodland coverage.

4.5.2 Outline mitigation measures

Whilst no specific mitigation with respect to dormice is necessary, the measures set out to prevent impacts on breeding birds, i.e. timing the works outside the nesting season, will also serve as a precautionary measure for dormice, and clearance works of any trees and shrubs should be undertaken carefully in winter, unless the tree in question has potential roosting features for bats. In the unlikely event that a dormouse or dormouse nest is found during the clearance work, all activity must cease until a licensed ecologist has been consulted and mitigation measures are put into place.

The landscape planting scheme should include tree and shrub species that are known to encourage common dormice, especially hazel and other fruiting trees. The planting scheme should be designed and managed in such a way as to provide a varied structure that includes open glade areas, areas of dense scrub and tall trees with a dense understory. This will benefit biodiversity in general, including breeding birds and invertebrates, as well as common dormice.

4.6 Great crested newts

4.6.1 Potential impacts

Based on the survey results, the great crested newt is present but very scarce in the local area around the proposed development. The pond where great crested newts were found in small numbers is located in an area of high-quality terrestrial habitat and, whilst the north-eastern half of the proposed development site falls within 250m of this pond, it is reasonable to assume that great crested newts are very unlikely to disperse outside of this habitat in significant numbers and reach the former landfill site. The proposed development is therefore considered to have a very 'low risk' of impacts on great crested newts (see Figure 8).

Component	**Likely effect** (select one for each component; select the most harmful option if more than one is likely; lists are in order of harm, top to bottom)	**Notional offence probability**
Great crested newt breeding pond(s)	No effect	0
Land within 100m of any breeding pond(s)	No effect	0
Land 100-250m from any breeding pond(s)	0.01 - 0.1 ha lost or damaged	0.01
Land >250m from any breeding pond(s)	1 - 5 ha lost or damaged	0.04
Individual great crested newts	No effect	0
	Maximum:	0.04
Rapid risk assessment result:	**GREEN: OFFENCE HIGHLY UNLIKELY**	

Guidance on risk assessment result categories

"Green: offence highly unlikely" indicates that the development activities are of such a type, scale and location that it is highly unlikely any offence would be committed should the development proceed. Therefore, no licence would be required. However, bearing in mind that this is a generic assessment, you should carefully examine your specific plans to ensure this is a sound conclusion, and take precautions (see **Non-licensed avoidance measures tool**) to avoid offences if appropriate. It is likely that any residual offences would have negligible impact on conservation status, and enforcement of such breaches is unlikely to be in the public interest.

Figure 8 'Rapid risk assessment' extracted from Natural England's great crested newt mitigation method statement template instructions[10].

4.6.2 Outline mitigation measures

Based on the above analysis, the proposed development does not require mitigation under an EPS licence. However, the presence of the occasional individual great crested newt cannot be completely discounted and therefore it is recommended that the scheme proceeds under 'reasonable avoidance measures': the preparation of the site for earthworks, including all areas used for storage of materials, haulage routes and temporary accommodation, should be subject to careful habitat management in advance, to reduce the habitat suitability for great crested newt. This includes cutting back the grass

[10] Available from https://www.gov.uk/government/publications/great-crested-newts-apply-for-a-mitigation-licence

vegetation in two stages and removing arisings, followed by careful hand searches and removal of any features that could provide places of shelter, such as log piles, debris or rubble. The working area should then be maintained as short grassland and clear of any potential resting places before earthworks commence. These preparatory works should be undertaken at an appropriate time of year to enable any remaining amphibians (and reptiles) to move away from the site under their own volition. These measures will be set out under a detailed method statement, coupled with a tool box talk and watching brief by a licensed ecologist. In the unlikely event that a great crested newt is encountered at any stage during this process, all works should cease, and this assessment re-evaluated to determine whether an EPS licence is now required.

4.7 Reptiles

4.7.1 Potential impacts

The surveys demonstrated that the proposed landfill capping will not result in significant impacts on common reptiles, although in the absence of mitigation there is a small risk of harm to a small number of grass snakes that may be present from time to time.

4.7.2 Outline mitigation measures

Based on the results of the presence/likely absence survey, there is no requirement for specific mitigation measures for reptiles. The reasonable avoidance measures proposed for great crested newts, as described above, will also be effective mitigation for grass snake as this species is highly mobile and capable of moving away from disturbed areas by itself when given the opportunity.

However, the existing grassland habitat is suitable to support reptiles and if left undisturbed it is possible that larger reptile populations could establish over time. It is therefore recommended that a repeat presence/likely absence survey be undertaken if the commencement of construction does not take place within three years from the date of this survey. If a reptile population has established in that time, full mitigation involving trapping and translocation may be required.

5 BIODIVERSITY ENHANCEMENT OPPORTUNITIES

5.1.1 Woodland planting

Most of the landfill cap will be planted with native broadleaved trees to create woodland habitat. This will provide compensation for the damage caused by the landfill capping scheme encroaching onto the root protection zones of the woodland edge, and ultimately result in a net increase in broadleaved woodland coverage at Evergreen Farm.

It is recommended that a wide selection of native species is used, and that the species composition is typical for the local area - the introduction of non-native ornamental species is to be discouraged. These should be used to create a variety of distinct stand types to reflect the local natural woodland. A suggested mix of species is presented in Appendix 9; table 3. Areas of dense continuous scrub, scattered scrub and open areas or ‘glades’ should be incorporated into the planting design, to improve structural complexity, and provide a wide range of habitat types; scrub and woodland edge habitats

support a much more diverse invertebrate and breeding bird assemblage than a monoculture of evenly spaced and aged planted trees.

Where possible, natural regeneration from the surrounding ancient woodland should be encouraged in preference to planting trees in some areas of the site. This can be unpredictable and takes longer to establish but it often creates a more structurally diverse and robust habitat than artificial planting as trees and shrubs which have succeeded from naturally germinating seedlings are much better adapted to the site conditions than planted saplings, with a reduced risk of spreading pests, disease and invasive non-native species[11].

5.1.2 Wildflower meadow creation

To enhance biodiversity and compensate for the loss of grassland habitats to the proposed scheme, it is recommended that some parts of the site, ideally where there is a south-facing sloping aspect could be re-seeded with a wildflower meadow mix, in addition to woodland planting. Once established, this will contribute to the diversity of habitat types at Evergreen Farm, allowing a rich invertebrate assemblage to develop which in turn will provide an additional food source for the birds and bats that will also be supported by the surrounding woodland.

For wildflower meadows to be successful it is important that the site selected for seeding has relatively low soil fertility and that an appropriate seed mix that reflects the soil conditions is used. The new landfill cap will be covered with a layer of subsoil to a depth of 600mm and then top dressed with a 150mm layer of topsoil. The imported topsoil and subsoil will meet British Standards BS 3882:2015 and BS 8601:2013[12]. It is essential for the areas for establishing wild flower meadow, that the imported topsoil chosen meets the guidelines for the 'Specific Purpose Topsoil category', which reflect guidance on Low Fertility soils for species-rich, biodiverse habitats. A suggested seed mix would be Emorsgate Seeds mixture EM4 – Meadow Mixture for clay soils (see Appendix 9: Table 1). Emorsgate Seeds are native, sourced from UK genetic stock and are supplied with details of the county of origin, but other commercial seed suppliers are available.

The seed mix should be scattered evenly across a pre-prepared soil (cultivated to a fine tilth) in late summer/early autumn. The sward should be cut and gathered to a height of approximately 5cm at least three times in its first year of establishment to control the flush of annual weeds which will grow during the first growing season.

The wildflower meadow will require frequent management to prevent dominance of coarser grass species and maintain its botanical richness. This can be achieved by a combination of mechanical cutting (hay cropping) and aftermath grazing from late July and into autumn, timed to allow all flowering plants to set seeds. Stock animals should be removed during winter to prevent excessive poaching of the ground, and all arisings from hay cutting should be removed to reduce soil fertility. Depending on

[11] Farjon, A. and Hill, L. (2019) Natural woodland generation as an alternative to tree-planting. *British Wildlife* Vol. 30 pp 177-185. British Wildlife Publishing, part of NHBS Ltd ISSN 0958-0956

[12] British Standard BS 3882:2015 sets out requirements for topsoil classification and composition, specifying characteristics such as texture, acidity and contaminants. It includes information on sampling and analysis and gives guidance on handling and site preparation. BS 8601 specifies requirements for the classification, composition and use of subsoils which are moved or traded to create soil profiles intended to support plant growth. It specifies requirements for multipurpose subsoil for general applications and also specific purpose subsoils to create acidic or calcareous profiles, or low fertility soils for biodiversity.

the productivity, the meadow may benefit from a second spell of cutting or grazing in early spring; this would be determined on an ad-hoc basis depending on the condition of the sward in that particular year.

The meadow should be allowed to grow unrestricted from April through to July to allow herbaceous species to flower and set seed, and to realise the potential benefits of the flowering meadow to biodiversity (i.e. attracting pollinating insects and their predators: bats, birds, amphibians and reptiles).

It is essential that the meadow and surrounding grassland is not dressed with artificial fertiliser or manure at any time as this will increase the fertility and encourage dominance of more rigorous grasses that out-compete the flowering plants.

The parts of the site that lie on steeper gradients could also be re-seeded with a tussock forming native grass species mix (for example see Appendix 9, Table 2), to encourage common reptiles, amphibians and provide nesting habitat for birds. The maintenance of this habitat type would be easier on the steeper slopes than a wildflower meadow – involving periodic scrub control rather than frequent mowing or grazing.

5.1.3 Woodland management

The following options for habitat enhancement measures are put forward:

1. Introducing good woodland habitat management designed to maximize opportunities for biodiversity within the existing Ancient Woodland site (e.g. rotational coppicing in appropriate areas, coupled with a deer management strategy, retention of standing deadwood habitat, eradication of invasive non-native species such as rhododendron, avoiding soil nutrient enrichment);
2. Introducing habitat enhancement features (e.g. providing a variety of bird nest box and bat boxes, deadwood habitat piles, desilting the existing woodland ponds, establishing wild flower-rich woodland glades);
3. Improving recreational use of the woodland that encourages education about ecology and conservation and the wellbeing benefit of exposure to the natural environment to people, while ensuring that nature conservation objectives are not compromised (e.g. education panels and events, signage and dead hedging to direct users along designated paths and confine pets, camping in designated areas away from the best ancient woodland areas, and promoting code of conduct);
4. Supplementary planting, using native trees and shrubs of local provenance, together with a deer management strategy to improve structural diversity of the replanted Ancient Woodland areas (especially beneficial for compartment A).

5.1.4 Landscape and Ecology Management Plan

The above measures could be secured through the production of an Evergreen Farm Landscape and Ecology Management Plan (LEMP) document, as conditioned through the planning system, that sets out the details of all habitat enhancements that will be provided and the on-going maintenance needs and responsibilities.

APPENDIX 1 – LEGISLATION AND POLICY

Introduction

The following text is intended for general guidance only and does not constitute comprehensive professional legal advice. It provides a summary of the current legal protection afforded to wildlife in general and certain species. It includes current national planning policy relevant to nature conservation.

The 'Birds Directive', 'Habitats Directive' and 'Natura 2000 Sites'.

The Council Directive 79/409/EEC on the Conservation of Wild Birds ("the Birds Directive") sets a framework for the protection of wild birds. Under the directive, a number of provisions are made including the designation and protection of 'Special Protection Areas' (SPAs) – areas which support important bird populations, and the legal protection of rare or vulnerable species.

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the "Habitats Directive") directs member states of the EU to take measures to maintain favourable conservation status of important habitats and species. This requires the designation of a series of sites which contain important populations of species listed on Annex II of the directive. Together with 'Special Areas of Conservation' (SPAs), designated under the Birds Directive, SACs form a network across Europe of protected areas known as the 'Natura 2000'.

Annex IV lists species in need of more strict protection, these are known as "European Protected Species (EPS)". All bat species, common dormice *Muscardinus avellana*, otter *Lutra lutra* and great crested newts *Triturus cristatus* are examples of EPS that are regularly encountered during development projects.

The 'Habitats Regulations'

The Conservation of Habitats and Species Regulations 2010 (the Habitats Regulations") is the principle means of transposing the Habitats Directive and the Birds Directive, and updates the Conservation (Natural Habitats, &c.) Regulations 1994 ("the 1994 regulations") in England and Wales.

'Natura 2000' sites receive the highest level of protection under this regulation which requires that any activity within the zone of influence of these sites would be subject to a Habitats Regulations Assessment (HRA) by the competent authority (e.g. planning authority), leading to an Appropriate Assessment (AA) in cases where 'likely significant effects on the integrity of the site are identified.

For European Protected Species, Regulation 41 makes it a criminal offence to;

- Deliberately capture, injure or kill any such animal;
- Deliberately disturb wild animals of such species;
- Deliberately take or destroy their eggs (where relevant);
- Damage or destroy a *breeding or resting place* of such an animal;
- Possess, control, sell or exchange any live or dead animal or plant, of such species;
- Deliberately pick, collect, cut, uproot or destroy a wild plant of such species.

The Habitats Directive and Habitats Regulations provide for the derogation from these prohibitions for specific reasons provided certain conditions are met. An EPS licensing regime allows operations that would otherwise be unlawful acts to be carried out lawfully. Natural England is the licensing Authority and, in order to grant a license, ensures that three statutory conditions (sometimes referred to as the

'three derogation tests') are met:

- A licence can be granted for the purposes of "preserving public health or safety or for other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment" (Regulation 53 (2) (e).
- A licence can be granted if "there are no satisfactory alternatives" to the proposed action.
- A licence shall not be granted unless the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

Wildlife and Countryside Act (1981) as amended.

The Wildlife and Countryside Act (1981)[13] remains one of the most important pieces of wildlife legislation in the UK. There are various schedules to the Act protecting birds (Schedule 1), other animals including insects (Schedule 5), plants (Schedule 8), and control of invasive non-native species (Schedule 9).

Under the Wildlife and Countryside Act (WCA) 1981, all wild birds (with the exception of those listed on Schedule 2), their eggs and nests are protected by law and it is an offence to:

- Take, damage or destroy the nest of any wild bird while it is in use or being built.
- Take or destroy the egg of any wild bird.
- Disturb any bird listed on Schedule 1, while it is nest building, or at a nest with eggs or young, or disturb the dependant young of any such bird.

Schedule 5 lists all non-avian animals receiving protection to a varied degree. At its strongest, the Act makes it an offence to intentionally kill, injure or take any wild animal listed on Schedule 5, and prohibits interference with places used for shelter or protection, or intentionally disturb animals while occupying such places. Examples of species with *full protection* include all EPS, common reptile species, water vole *Arvicola amphibius*, white-clawed crayfish *Austropotamobius pallipes* and Roman snail *Helix pomatia*. Other species are protected from sale, barter or exchange only, such as white letter hairstreak *Satyrium w-album*.

The Act makes it an offence to intentionally pick, uproot or destroy any plant or seed, and sell or possess any plant listed on Schedule 8. It is also an offence to intentionally uproot any wild plant not listed on Schedule 8 unless authorised [by the land owner]. Species on Schedules 5 and 8 are reviewed every 5 years when species can be added or removed.

Measures for the prevention of spreading non-native species which may be detrimental to native wildlife is included in the Act, which prohibits the release of animals or planting of plants into the wild of species listed on Schedule 9 (for example Japanese knotweed *Fallopia japonica*, Himalayan balsam *Impatiens glandifera*, New Zealand Pygmyweed *Crassula helmsii*).

The Wildlife and Countryside Act 1981 (as amended) also prohibits certain inhumane methods of traps and devices for the capture or killing of wild animals and certain additional methods such as fixed trap, poisoning with gas or smoke, or spot-lighting with vehicles for killing species listed on Schedule 6 of the Act (this includes all bat species, badger, otter, polecat, dormice, hedgehog and red squirrel).

Natural Environment and Rural Communities (NERC) Act (2006)

[13] Wildlife and Countryside Act (WCA) (1981). HMSO London.

The NERC Act (2006)[14] places a statutory duty under Section 40 on all public bodies, including planning authorities, to take, or promote the taking by others, steps to further the conservation of *habitats and species of principal importance for the conservation of biodiversity* in England (commonly referred to as the 'Biodiversity Duty'). This duty extends to all public bodies the biodiversity duty of Section 74 of the Countryside and Rights of Way (CROW) Act 2000, which placed a duty only on Government and Ministers. Section 41 lists the habitats and species of principle importance. This includes a wide range of species from mosses, vascular plants, invertebrates through to mammals and birds. It originates from the priority species listed under the UK Biodiversity Action Plan (UK BAP) with some omissions and additions.

Protection of Badgers Act (1992)

The Badger *Meles meles* is afforded specific legal protection in Britain under the Protection of Badgers Act (1992)[15], and Schedule 6 of the Wildlife and Countryside Act 1981 (as amended) (see above).

Under this legislation, it is a criminal offence to:

- intentionally kill, injure, take, possess, or cruelly ill-treat, a Badger, or to attempt to do so;
- interfere with a sett, by damaging or destroying it;
- to obstruct access to, or any entrance of, a Badger sett; or
- to disturb a Badger when it is occupying a sett.

A licence may be obtained from Natural England to permit certain prohibited actions for a number of defined reasons including interference of a sett for the purpose of development, provided that a certain number of conditions are met. Note that licenses are not normally granted for works affecting badgers between the end of November and the start of July.

National Planning Policy Framework

The National Planning Policy Framework (NPPF 2018)[16] sets out the Government's view on how planners should balance nature conservation with development and helps ensure that Government meets its biodiversity commitments regarding the operation of the planning system.

Paragraph 174b, which states that council policies should "promote the conservation, restoration and enhancement of priority habitats, ecological networks and the protection and recovery of priority species; and identify and pursue opportunities for securing measurable net gains for biodiversity". In accordance with the NPPF, it is important that developments should contribute to and enhance the natural and local environment by:

- Minimising impacts on existing biodiversity and habitats,
- Providing net gains in biodiversity and habitats, wherever possible,
- establishing coherent ecological networks that are more resilient to current and future

[14] Natural Environment and Rural Communities Act (2006). HMSO London.

[15] Protection of Badgers Act (1992). HMSO London.

[16] HM Government (2018). National Planning Policy Framework. Department for Communities and Local Government. Available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/728643/Revised_NPPF_2018.pdf.

pressures.

UK Post-2010 Biodiversity Framework

The UK Biodiversity Action Plan (UK BAP), published in 1994, was the UK's response to the commitments of the Rio Convention on Biological Diversity (1992). The UK BAP was replaced by the UK Post-2010 Biodiversity Framework. This framework covers the period 2011 to 2020 and forms the UK government's response to the new strategic plan of the United Nations Convention on Biodiversity (CBD) published in 2010. This promotes a focus on individual countries delivering target for protection for biodiversity through their own strategies.

The most recent biodiversity strategy for England, 'Biodiversity 2020: A strategy for England's wildlife and ecosystem services' was published by Defra (2011)[17], and a progress update was provided in July 2013 (Defra 2013)[18].

'Biodiversity 2020' builds on the Natural Environment White Paper for England – 'The Natural Choice', published on 7 June 2011, and sets out the strategic direction for biodiversity policy for the next decade.

Biodiversity 2020 deliberately avoids setting specific targets and actions for local areas because Government believes that local people and organisations are best placed to decide how to implement the strategy in the most appropriate way for their area or situation.

Birds of Conservation Concern (BoCC)

In 1996, the UK's leading non -governmental bird conservation organisations reviewed the conservation status of all bird species in the UK against a series of criteria relating to their population size, trends and relative importance to global conservation. The lists, known as the 'Red', 'Amber' and 'Green' lists (in order of decreasing concern) are used to inform key conservation policy and decisions. The lists are reviewed every 5 years and are a useful reference for determining the current importance of a particular site for birds. The most recent review was undertaken in 2015[19] (Eaton et al, 2015), which provides an up to date assessment of the conservation status of birds in the UK.

[17] Defra (2011) Biodiversity 2020: A strategy for England's wildlife and ecosystem services. Available at: https://www.gov.uk/government/publications/biodiversity-2020-a-strategy-for-england-s-wildlife-and-ecosystem-services.

[18] Defra (2013) Progress Update. Available at: https://www.gov.uk/government/publications/biodiversity-2020-simple-guide-and-progress-update-july-2013.

[19] Eaton, M., Aebischer, N., Brown, A., Hearn, R., Lock, L., Musgrove, A., Noble, D., Stroud, D.,and Gregory, R. (2015) Birds of Conservation Concern 4: the population status of birds in the UK, Channel Islands and Isle of Man. British Birds 108. December 2015. 708–746

APPENDIX 2 – IMPORTANCE OF ECOLOGICAL FEATURES

Table 1: Determining importance of an ecological feature

Level of importance	Criteria
International	Internationally designated site; Special Protected Area (SPA), Special Areas of Conservation (SAC), Ramsar, Biosphere Reserves; Regularly occurring population of internationally important species listed in Annex 1, 2 or 4 of the Habitats Directive and Annex 1 of the Birds Directive; A viable area of a habitat listed in Annex 1 of the Habitats Directive or area important for maintaining viability listed as in Annex 1 of the Habitats Directive; Areas outside designated sites that are important for supporting and maintaining the viability of the above designated habitats and/or species.
National	Nationally designated sites; Site of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Local Nature Reserves (LNR). A sufficiently large population of a species or area of habitat listed as a priority for nature conservation (S41 NERC Act) to make a significant contribution to the national conservation status (e.g. greater than 1% of the national total). A viable or regularly occurring population of a species that is nationally scarce, threatened or declining on a national scale. A habitat type that is nationally scarce, threatened or declining on a national scale.
Regional	A habitat type that is scarce, threatened or declining on a regional scale. A sufficiently large population of a species or area of habitat listed as a priority for nature conservation (S41 NERC Act) to make a significant contribution to the regional conservation status (e.g. greater than 1% of the national total).
County	Locally designated sites; Local Wildlife Sites (LWSs), Sites of Nature Conservation (SNCIs) and Site of Importance for Nature conservation (SINCs). A sufficiently large population of a species or area of habitat listed as a priority for nature conservation (S41 NERC Act) to make a significant contribution to the conservation status of the species at county level (e.g. greater than 10% of the county total). A viable or regularly occurring population of a species that is rare in the county, but may be common and widespread elsewhere, For example, a population at the edge of a species' range. A habitat type that is scarce in a county but may be more frequent elsewhere.
Local/parish	Habitats and species which are scarce in the local area but are sufficiently common and widespread elsewhere that they do not meet the above criteria.
Site / negligible	Habitats with little to no ecological value (amenity grassland and hardstanding)

APPENDIX 3 WEATHER CONDITIONS DURING BAT SURVEYS

Table 1. Weather conditions during bat activity surveys.

Date	Survey start time/end time	Temp. degrees centigrade, weather conditions throughout survey	Surveyors
20 June 2018	21:18–11:00 Sunset – 21:28	Max/Min temp.: 20–18°C 40% cloud cover, calm, dry.	Dan Bennett, BSc, MCIEEM, Class licence: 2017-27499-CLS-CLS James Rowland BSc.
6 August 2018	20:30–22:15 Sunset: 20:39	Max/Min temp: 28–20°C. 10% cloud cover, still, dry but very humid.	Dan Bennett, BSc, MCIEEM, Class licence: 2017-27499-CLS-CLS James Rowland BSc.
11 September 2018	19:20–21:30 Sunset: 19:31	Max/Min temp.: 19–16°C 10% cloud cover, 5-10mph	Dan Bennett, BSc, MCIEEM, Class licence: 2017-27499-CLS-CLS James Rowland BSc.

APPENDIX 4 – COMMON DORMOUSE SURVEY RESULTS

Abbreviations: DM=dormouse; WM=wood mouse; YN=yellow-necked mouse; ad=adult; juv=juvenile, N=nest only; NM=nest material, not woven, unspecified; F=food cache (wood mouse); bee=tree bumblebee *Bombus hypnorum* nest. Bird=bird nest (BTO codes apply to species); E=empty; nf=tube not found or tube damaged.

Completion date	**29 May 2018**	**5 June 2018**	**4 July 2018**	**17 August 2018**	**13 September 2018**	**9 October 2018**
Temp/ºC	**18**	**15**	**19**	**19**	**15**	**12**
Cloud cover	**100%**	**100%**	**0%**	**40%**	**10%**	**100%**
Precipitation	**None**	**Light drizzle**	**Dry**	**Dry**	**Dry**	**Dry**
1	E	E	E	E	E	E
2	E	E	E	E	E	E
3	E	E	E	E	E	E
4	E	E	E	E	E	E
5	E	E	E	E	E	E
6	E	E	E	E	E	E
7	E	E	E	E	E	E
8	E	E	E	E	E	E
9	E	E	E	E	E	E
10	E	E	E	E	E	E
11	E	E	E	E	E	E
12	E	E	E	E	nf	E
13	E	E	E	E	E	E
14	E	E	E	E	E	E
15	E	E	E	E	E	E
16	E	E	E	E	E	E
17	E	E	E	E	E	E
18	E	E	WM	E	E	E
19	E	E	E	WM	E	E
20	E	E	E	Nf	E	E
21	E	E	E	E	E	E
22	E	E	E	E	E	E
23	E	E	E	E	nf	E
24	E	E	E	E	E	E
25	E	E	E	E	E	E
26	E	E	E	E	E	E
27	E	E	E	F	nf	F
28	E	E	E	E	nf	E
29	Nf	Nf	E	E	E	E
30	E	E	E	E	E	E
31	E	E	E	E	E	E
32	E	E	E	E	E	E
33	E	E	E	E	E	E
34	E	E	E	E	E	E
35	Bird (wren)	Bird (wren)	Bird (wren)	NM	NM	NM

36	E	E	E	E	E	E
37	E	E	E	E	nf	E
38	E	E	E	E	E	E
39	E	E	E	E	E	E
40	E	E	E	E	E	E
41	E	E	E	E	E	E
42	E	E	E	E	E	E
43	E	E	E	E	E	E
44	E	E	E	E	E	E
45	E	E	E	E	E	E
46	E	E	E	E	nf	E
47	E	E	E	E	E	E
48	E	E	E	E	E	E
49	E	E	E	E	nf	E
50	E	E	E	E	E	E

APPENDIX 5 GREAT CRESTED NEWT SURVEY RESULTS

Table 1. Weather conditions and temperature during presence/ likely absence surveys

Survey date	Air temperature	Water temperature	Weather notes	Surveyor
25 April 2018	10 ºC	Not recorded	Cloud 100%; moderate breeze, showers	D. Bennett, Hamish Muirden
10 May 2018	14 ºC	11 ºC	Cloud 100%; light breeze, dry	D. Bennett, James Rowland
24 May 2018	15 ºC	13 ºC	Cloud 100%, calm, humid	D. Bennett, James Rowland
29 May 2018	15	17	Cloud 100%, mod breeze, heavy rain	D. Bennett, James Rowland
5 June 2018	15 ºC	14 ºC	Cloud 100%, light breeze, drizzle	D. Bennett, James Rowland
13 June 2018	16 ºC	14 ºC	Cloud 50%, calm, dry	D. Bennett, James Rowland

Table 2. Results of great crested newt field surveys.

Abbreviations: Tc=great crested newts; Lv=common newt *Lissotriton vulgaris*; Lh=palmate newt *Lissotriton helveticus*; Bb=common toad *Bufo bufo*; Rt=common frog *Rana temporaria*; ad=adult; spwn=spawn (toad or frog); td=tadpoles, ns=not surveyed

Pond 6 NGR: TQ 3930 3638	**Torching results: Tc numbers**			**Bottle trapping results: Tc numbers**				**Egg search**	**Other methods (netting, searches)**	**Other species**
Date (visit no.)	**M**	**F**	**Juv**	**No. traps**	**M**	**F**	**Juv**	**Present – Y/N**		
25 April 2018	0	0	0	10	0	0	0	N	No	Lh 1F; Rt td - abundant
10 May 2018	0	0	0	5	0	0	0	N	No	Rt td - abundant
24 May 2018	0	0	0	5	0	0	0	N	No	Rt td - abundant
29 May 2018	0	0	0	Ns	Ns	Ns	Ns	N	No	Almost dried out
5 June 2018	0	0	0	Ns	Ns	Ns	Ns	N	No	Dried out
13 June 2018	0	0	0	Ns	Ns	Ns	Ns	N	No	Dried out

Pond 7 NGR: TQ 3944 3637	**Torching results: Tc numbers**			**Bottle trapping results: Tc numbers**				**Egg search**	**Other methods net /eDNA)**	**Other species**
Date (visit no.)	**M**	**F**	**Juv**	**No. traps**	**M**	**F**	**Juv**	**Present – Y/N**		
25 April 2018	0	0	0	Ns	Ns	Ns	Ns	N	No	Lh 6M; 10F
10 May 2018	0	0	0	10	0	0	0	N	No	Lv 6M; 1F;

										Lh 1m 1F
24 May 2018	0	0	0	10	0	**2**	0	N	No	0
29 May 2018	**1**	**2**	0	10	**3**	**2**	0	N	No	Lv 1M, Lh 4M; small L 10; *Dytiscus* and *Acilius* beetle larvae
5 June 2018	0	**2**	0	10	0	**2**	0	N	No	Lv 2M; Lh2M; Lv 4F
13 June 2018	0	0	0	10	0	0	0	N	No	Lh 2M, 1F; *Notonecta* abundant

Pond 8 NGR: TQ 3930 3622	**Torching results: Tc numbers**			**Bottle trapping results: Tc numbers**				**Egg search**	**Other methods net /eDNA)**	**Other species**
Date (visit no.)	**M**	**F**	**Juv**	**No. traps**	**M**	**F**	**Juv**	**Present – Y/N**		
25 April 2018	0	0	0	6	0	0	0	N	No	Lh 1M; 1F, Rt td - abundant
10 May 2018	0	0	0	10	0	0	0	N	No	Lv 1F; Rt td - abundant
24 May 2018	0	0	0	10	0	0	0	N	No	Rt td – abundant; *Dytiscus* and *Acilius* beetles
29 May 2018	0	0	0	10	0	0	0	N	No	Lv 1M; Lh 1M; Rt td - abundant
5 June 2018	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns
13 June 2018	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns	Ns

APPENDIX 6 REPTILE SURVEY RESULTS

Table 1. Weather conditions, temperatures and findings during presence/likely absence surveys

Date	Start time	Air temperature/ºC	Refugia temperature/ ºC	Weather conditions	Findings
10 May 2018	18:00	16	32	Cloud 20%, light breeze	1no. M grass snake (west side)
16 May 2018	14:22	15	26	Cloud 70%, mod breeze	1no. M grass snake (west side)
13 Jun 2018	19:32	17	32	Cloud 5%, calm	1no. M grass snake (north field)
20 Jun 2018	20:00	20	27	Clear sky, calm	Nil
4 Jul 2018	10:02	19	31	Clear sky, calm	Nil
17 Aug 2018	14:38	17	26	Cloud 60%, light breeze	Nil
11 Sept 2018	17:05	15	26	Overcast, mod breeze	Nil

APPENDIX 7 BOTANICAL SURVEY RESULTS

Table 1. Species list and abundance (DAFOR Scale) in each woodland compartment A-G. AWI= Ancient Woodland indicator species; SCH 9=invasive non-native species listed on Schedule 9 of the Wildlife and Countryside Act (1981) as amended.

English name	Scientific name	A	B	C	D	E	F	G
English oak	*Quercus robur*	D	O	O		O	O	F
Silver birch	*Betula pendula*				D	F	F	O
Downy birch	*Betula pubescens*				F			
Ash	*Fraxinus excelsior*		O				O	F
Grey/goat willow	*Salix cinereal/caprea*			O			F	O
Sweet chestnut	*Castanea sativa*	O				F	F	F
Hornbeam	*Carpinus betulus*		O					
Beech	*Fagus sylvatica*		O			O	O	O
Alder	*Alnus glutinosa*		O	D		F		
Elder	*Sambucus niger*						O	
Bramble	*Rubus fruiticosus*	A			O	F	F	
Hazel	*Corylus avellana*	O	F			F	F	A
Field maple	*Acer campestris*		O					
Honeysuckle	*Lonicera periclymenum*	O		F	O	F		
Hawthorn	*Crataegus monogyna*	O	F				O	
Midland hawthorn	*Crataegus laevigata*[AWI]		R					
Holly	*Ilex aquifolium*[AWI]	O	F		A	F	F	F
Rhododendron	*Rhododendron ponticum*				F			
Ivy	*Hedera helix*		F					
Cleavers	*Galium aparine*		O	O				
Common nettle	*Urtica dioica*		O	F	R		F	
Dock spp.	*Rumex* spp.						O	
Herb robert	*Geranium robertianum*		O					
Wood avens	*Geum urbanum*		O	O				
Bugle	*Ajuga reptans*					O		
Dog's mercury	*Mercurialis perennis*		O			O		F
Enchanter's nightshade	*Circaea lutetianna*		O					
Lords-and-ladies	*Arum maculatum*		O					
Primrose	*Primula vulgaris*		O					
Common figwort	*Scrophularia nodosa*		O			O		
Water figwort	*Scrophularia auriculate*			O				
Great willowherb	*Epilobium hirsutum*			O				
A starwort	*Callitriche* sp.			F				
Varigated yellow archangel	*Lamiastrum galeobdolon subsp. Argentatum*[SCH 9]		R					
Bluebell	*Hyacinthoides non-scripta*[AWI]					F		D
Opposite-leaved golden saxifrage	*Chrysosplenium oppositifolium*					R		
Yellow pimpernel	*Lysimachia nemorum*[AWI]		F	F		O		
Wood speedwell	*Veronica montana*[AWI]		F					
Wood sorrel	*Oxalis acetosella*[AWI]		R					
Remote sedge	*Carex remota*[AWI]		F	F				
Pendulous sedge	*Carex pendula*[AWI]	F	F	D				

Wood sedge	*Carex sylvatica*[AWI]	R	F	O				
Smooth sedge	*Carex laevigata*[AWI]					R		
Hairy sedge	*Carex hirta*		O					
Field woodrush	*Luzula campestris*		O					
Slender rush	*Juncus tenuis*		O					
Hard rush	*Juncus inflexus*		O					
Soft rush	*Juncus effusus*			F				
Creeping bent (grass)	*Agrostis stolonifera*			O				
Hairy brome	*Bromopsis ramosa*		O					
Tufted hair-grass	*Deschampsia cespitosa*	O						
Broad buckler fern	*Dryopteris dilatata*					F		
Male fern	*Dryopteris filix-mas*		F		R			
Bracken	*Pteridium aquilinum*				O	O		
A Moss	*Polytrichum* sp.				O			
Total species recorded	54	10	33	16	10	18	13	10
Total AWI species	11	3	8	4	1	5	1	?

APPENDIX 8 ARTIFICIAL LIGHTING AND WILDLIFE

Bright external lighting can have a detrimental impact upon foraging and commuting bat flight paths, but more importantly can also cause bats to remain in their roosts for longer. Artificial lighting can also cause significant impacts on other nocturnal species, most notably moths and other nocturnal insects. It can also result in disruption of the circadian rhythms of birds, reducing their fitness. Guidelines issued by the Bat Conservation Trust[20] should be considered while designing the lighting scheme. A simple process which should be followed where the impact on bats is being considered as part of a proposed lighting scheme. It contains techniques which can be used on all sites, whether a small domestic project or larger mixed-use, commercial or infrastructure development. This includes the following measures:

Avoid lighting on key habitats and features altogether
there is no legal duty requiring any place to be lit. British Standards and other policy documents allow for deviation from their own guidance where there are significant ecological/environmental reasons for doing so. It is acknowledged that in certain situations lighting is critical in maintaining safety, such as some industrial sites with 24-hour operation. However, in the public realm, while lighting can increase the perception of safety and security, measurable benefits can be subjective. Consequently, lighting design should be flexible and be able to fully consider the presence of protected species

Apply mitigation methods to reduce lighting to agreed limits in other sensitive locations – lighting design considerations

Where bat habitats and features are considered to be of lower importance or sensitivity to illumination, the need to provide lighting may outweigh the needs of bats. Consequently, a balance between a reduced lighting level appropriate to the ecological importance of each feature and species, and the lighting objectives for that area will need to be achieved. The following are techniques which have been successfully used on projects and are often used in combination for best results;

- Dark buffers, illuminance limits and zonation
- Sensitive site configuration, whereby the location, orientation and height of newly built structures and hard standing can have a considerable impact on light spill
- Consider the design of the light and fittings, whereby the spread of light is minimised ensuring 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. Consider the height of lighting columns. It should be noted that a lower mounting height is not always better. A lower mounting height can create more light-spill or require more columns. Column height should be carefully considered to balance task and mitigation measures. Consider no lighting solutions where possible such as white lining, good signage, and LED cats eyes. For example, light only high-risk stretches of roads, such as crossings and junctions, allowing headlights to provide any necessary illumination at other times.
- Screening, whereby light spill can be successfully screened through soft landscaping and the installation of walls, fences and bunding
- Glazing treatments, whereby glazing should be restricted or redesigned wherever the ecologist and lighting professional determine there is a likely significant effect upon key bat habitat and

[20] Bat Conservation Trust and Institute for Lighting Professionals (2018) Guidance note 8. Bats and Artificial Lighting. https://www.theilp.org.uk/documents/guidance-note-8-bats-and-artificial-lighting/

features.

- Creation of alternative valuable bat habitat on site, whereby additional or alternative bat flightpaths, commuting habitat or foraging habitat could result in appropriate compensation for any such habitat being lost to the development.
- Dimming and part-night lighting. Depending on the pattern of bat activity across the key features identified on site it may be appropriate for an element of on-site lighting to be controlled either diurnally, seasonally or according to human activity. A control management system can be used to dim (typically to 25% or less) or turn off groups of lights when not in use.

Demonstrate compliance with illuminance limits and buffers

- *Design and pre-planning phase*; It may be necessary to demonstrate that the proposed lighting will comply with any agreed light-limitation or screening measures set as a result of your ecologist's recommendations and evaluation. This is especially likely to be requested if planning permission is required.
- *Baseline and post-completion light monitoring surveys*; baseline, pre-development lighting surveys may be useful where existing on or off-site lighting is suspected to be acting on key habitats and features and so may prevent the agreed or modelled illuminance limits being achieved.

Post-construction/operational phase compliance-checking

APPENDIX 9 EXAMPLE SEED MIXES AND NATIVE TREE/SHRUB PLANTING SPECIES

Table 1. Composition of EM4 – meadow mixture for clay soils.

Wildflowers		
%	**Latin name**	**Common name**
0.5	*Achillea millefolium*	Yarrow
1	*Betonica officinalis - (Stachys officinalis)*	Betony
3.5	*Centaurea nigra*	Common Knapweed
1	*Filipendula ulmaria*	Meadowsweet
2.5	*Galium verum*	Lady's Bedstraw
0.4	*Lathyrus pratensis*	Meadow Vetchling
1	*Leucanthemum vulgare*	Oxeye Daisy
0.5	*Lotus corniculatus*	Bird's-foot Trefoil
1	*Plantago lanceolata*	Ribwort Plantain
0.3	*Primula veris*	Cowslip
2	*Prunella vulgaris*	Selfheal
3	*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
0.1	*Trifolium pratense*	Wild Red Clover
Grasses		
10	*Agrostis capillaris*	Common Bent
2	*Alopecurus pratensis*	Meadow Foxtail (w)
2	*Anthoxanthum odoratum*	Sweet Vernal-grass (w)
1	*Briza media*	Quaking Grass (w)
36	*Cynosurus cristatus*	Crested Dogstail
24	*Festuca rubra*	Slender-creeping Red-fescue
1	*Hordeum secalinum*	Meadow Barley (w)
4	*Phleum bertolonii*	Smaller Cat's-tail

Table 3. Composition of EM10 – tussock mixture.

Wildflowers		
%	**Latin name**	**Common name**
0.5	*Achillea millefolium*	Yarrow
1.5	*Agrimonia eupatoria*	Agrimony
1	*Arctium minus*	Lesser burdock
2.5	*Centaurea nigra*	Common Knapweed
2	*Centaurea sacbiosa*	Greater knapweed
2	*Daucus carota*	Wild carrot
1	*Dipsacus fullonum*	Wild teasel
1	*Galium album (mollugo)*	Hedge bedstraw
0.2	*Geranium pratense*	Meadow cranesbill
0.5	*Leucanthemum vulgare*	Ox-eye daisy
1	*Pastinaca sativa*	Wild parsnip

0.1	*Plantago lanceolata*	Ribwort Plantain
2	*Pulicaria dysenterica*	Common fleabane
2	*Silene dioica*	Red campion
2	*Vicia sativa*	Common vetch
Grasses		
2	*Alopecurus pratensis*	Meadow Foxtail (w)
20	*Cynosurus cristatus*	Crested Dogstail
16	*Dactylis glomerate*	Cocksfoot
2	*Deschampsia cespitosa*	Tufted hair-grass
20	*Festuca rubra*	Strong-creeping Red-fescue
2	*Holcus lanatus*	Yorkshire fog
10	*Schedonorus arundinaceus*	Tall fescue
8	*Schedonorus pratensis*	Meadow fescue

Table 3. Recommended list of native trees and shrubs

Native trees and shrubs		
	Latin name	**Common name**
1	*Prunus avium*	Wild cherry
2	*Sorbus aucuparia*	Rowan
3	*Malus sylvestris*	Crab apple
4	*Corylus avellana*	Hazel
5	Cornus sanguinea	Dogwood
6	*Crataegus monogyna*	Hawthorn
7	*Prunus spinosa*	Blackthorn
8	*Viburnum opulus*	Guelder rose
9	*Viburnum lantana*	Wayfaring-tree
10	Ilex aquifolium	Holly
11	*Rhamnus cathartica*	Buckthorn
12	*Eunonymus europaea*	Spindle
13	*Ligustrum vulgare*	Wild privet
14	*Quercus robur*	English oak
15	*Betula pendula*	Silver birch
16	*Prunus avium*	Wild cherry
17	*Carpinus betulus*	Hornbeam
18	*Fagus sylvatica*	Beech