Technical note

ZC COLNE VALLEY OVERHEAD LINE DIVERSION

Habitat Reinstatement Plan – Issue 4

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MAY 2023

CONFIDENTIAL

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CONTENTS

TABLES

FIGURE

1 HABITAT REINSTATEMENT, COMPENSATION AND ENHANCEMENT

1.1 OVERVIEW

This habitat reinstatement plan has been produced to guide habitat reinstatement, compensation and enhancement requirements for the ZC Colne Valley Overhead Line Diversion. It covers those parts of the site reinstatement where there are specific ecological requirements, including compensation or enhancement that is a requirement of bat and great crested newt (GCN) licenced mitigation, or ecological enhancements that have been agreed with stakeholders such as Denham Country Park.

Based on the current scope of site reinstatement[1], any other areas of site reinstatement not included within this document are either not subject to specific ecological requirements (such as areas of hardstanding, existing tracks and amenity habitats such golf course greens) or will not be reinstated by National Grid (i.e. where land is being transferred to other HS2 contractors).

Figure 1 shows the location of reinstatement features, and the corresponding habitat reinstatement specification and management/aftercare prescriptions are detailed in **Table 1-1**.

1.2 ECOLOGICAL SUPERVISION AND MITIGATION

Due to the presence of a range ecological constraints at the site (including bats, reptiles, great crested newts, water vole, and designated sites), all reinstatement work must be undertaken in accordance with the existing Ecological Method Statement (EMS) for the ZC scheme[2], and in accordance with additional species-specific licences where these are referred to within the EMS. The EMS identifies the requirement for supervision by a suitably experienced ecologist/Ecological Clerk of Work (ECoW) during activities relating to known ecological constraints in certain parts of the site. Further to this, the reinstatement work outlined within this document should be guided and supervised by an ecologist/ECoW, to ensure that the enhancements fulfil the required design and specification.

[1] Figure AHS-Comments-Drg No_51350_0551 Rev A.pdf; email from National Grid 20/08/2021.

[2] Wood (2021). ZC Ecological Method Statement – Main Works. Issue 2, version 8. Technical Report for National Grid.

505000
505500
506000
506500
188000
187500
187000
186500
Gantry 1
Gantry 2
Gantry 3
ZC045R
ZC046R
ZC047R
ZC047A
ZC048R
ZC049
ZC050
Inset scale at A3 - 1:3,000
Key
Tower
Conductor spans
Bat roost monolith creation
Bat roost veteranisation - 2 features
GCN hibernacula creation
Ride for future access to remain free of tree planting
Hedgerow planting
GCN measures - pond enhancements
GCN measures: management of trees
Meadow reinstatement
Tree/shrub planting
Clearance of overgrown channel
Ditch creation
Pond creation
0
100
200
300 m
Scale at A3: 1:7,000
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Client
nationalgrid
National Grid HS2 Phase One
Environmental Support
HS2 ZC Overhead Line Realignment Scheme
Figure 1
Habitat Reinstatement Plan
May 2023
wsp
N:\Projects\41043 Nat Grid HS2 Environmental Support\Deliver Stage\D Design_TechnicalDrawings\ArcGIS\MXD\41043-WOOD-XX-XX-FG-OE-0006_S0_P01.4.mxd Originator: vicki.smith
41043-WOOD-XX-XX-FG-OE-0006_S0_P01.4

Table 1-1 - Habitat reinstatement, compensation and enhancement specification, and management/aftercare prescriptions

Feature	Target note – see figure 1	Overview and timing	Reinstatement specification	Management/aftercare prescription
Requirements under the HS2 great crested newt organisational licence (WML-OR25) AMP009 method statement.				
GCN measures – management of pond	5	Management of pond habitat and control of dominant vegetation to enhance open water habitat for GCN. Activity targeted to the north and west sides of the pond adjoining the golf course. **Timing:** September to November inclusive.	Management of habitat within and the pond is required to enhance the aquatic habitat for GCN in accordance with the HS2 GCN Organisational Licence WML-OR25. The location the pond is shown on **Figure 1**, with the enhancement areas shown in detail in **Section 1.4** and described below: ▪ Removal of dominant vegetation (e.g. bulrush, reeds and encroaching willow scrub) using a 360 excavator with long reach boom (working from the bankside only). The vegetation and roots must be removed. **Objective: to reinstate 50% of the pond area as open water.** ▪ Removed vegetation should be left on the bankside overnight before disposal off site; to allow any animals within the material to escape. Alternatively, removed material could be spread and allowed to compost within an adjacent area of woodland, as advised by the supervising ecologist; an indicative area for disposal is shown in **Section 1.4**. ▪ Remove any rubbish/debris/fallen branches from the pond and leave on the bankside overnight before disposal off site (branches/logs can be left in surrounding habitat close to pond). ▪ As advised by the supervising ecologist (see below), silt removal may be required following vegetation removal. Excavated silt can be spread thinly amongst the surrounding woodland habitat, as advised by the supervising ecologist. **Objective: create open water up to 1m deep at maximum depth.** ▪ Work to be supervised/guided by an appropriately experienced/licenced ecologist (i.e. Accredited Agent 'AA' authorised under WML-OR25 or an Assistant authorised by the AA).	N/A – not required under GCN licence AMP009 method statement.
GCN measures – management of trees	6	Management of trees surrounding GCN pond to reduce overshading of pond margins and deposition of leaf litter in pond. **Timing:** September to November inclusive.	Management of overshading trees around the pond is required to enhance the aquatic habitat for GCN in accordance with the HS2 GCN Organisational Licence WML-OR25. The location the pond is shown on **Figure 1**, with the tree management areas shown in detail in **Section 1.4** and described below: ▪ Management of trees around GCN pond to reduce shading and deposition of leaves, to include: removal and/or thinning of surrounding trees/understorey; pruning of overhanging branches. **Objective: to reduce shading of pond margins to no more than 60% of pond margins**: • Tree removal shall be targeted to the north and west sides of the pond adjoining the golf course. Trees at these locations are predominantly a narrow band of semi-mature trees such as willow growing along the pond margin. Removal of trees along these margins will significantly reduce overshading and deposition of leaf litter to the pond. • In addition to the above tree removal, pruning of overhanging tree branches and thinning of understory scrub to take place around the remaining margins to the south and east of the pond. ▪ Felled timber should be utilised for hibernacula creation (see below), and logs/brash can also be cut and stacked in adjoining woodland to create additional habitat features; minimising the requirement for disposal off site. ▪ Work to be supervised/guided by an appropriately experienced/licenced ecologist (i.e. Accredited Agent (AA) authorised under WML-OR25 or an Assistant authorised by the AA).	N/A – not required under GCN licence AMP009 method statement.
GCN hibernacula creation	Green dot	Creation of 4x GCN hibernation features at ground level. **Timing:** Year-round.	▪ Four hibernacula to be created at locations shown on **Figure 1**. ▪ Each hibernaculum shall be constructed to meet the specification and design outlined in **Section 1.3**. ▪ Work to be supervised/guided by an appropriately experienced/licenced ecologist (i.e. Accredited Agent 'AA' authorised under WML-OR25 or an Assistant authorised by the AA).	N/A – not required under GCN licence AMP009 method statement.

Feature	Target note – see figure 1	Overview and timing	Reinstatement specification	Management/aftercare prescription
Requirements under the National Grid bat organisational licence (WML-OR74)				
Bat roost veteranisation	Pink dot	Creation of 12x veteranised bat roost features on trees (2x veteranised feature per tree). **Timing:** September to October inclusive.	▪ **Figure 1** shows indicative locations for veteranisation of trees to create bat roost features. Suitable trees to be identified and agreed between ecologist (see below) and stakeholder (e.g. Denham Country Park). Selected trees should have no existing potential bat roost features (otherwise pre-works bat surveys may be required). ▪ 2x veteranised feature to be added to each tree to meet the specification and design outlined in **Section 1.5**. ▪ Work to be supervised/guided by an appropriately experienced/licenced ecologist (i.e. the Named Ecologist, AA or their Assistant under WML-OR74).	N/A – not required under bat licence.
Bat roost monolith creation	Orange dot	Creation of 2x bat roost monoliths. Each monolith to include 5x veteranised bat roost features. **Timing:** September to October inclusive.	▪ **Figure 1** shows indicative locations for bat roost monolith creation. Suitable trees to be identified and agreed between ecologist (see below) and stakeholder (e.g. Denham Country Park). Selected trees should have no existing potential bat roost features (otherwise pre-works bat surveys may be required). ▪ Monolith to be created by removing the crown and side branches from an existing tree (retaining a short section of the butt of the main branches), while leaving the main trunk of the tree standing in situ to create the 'monolith'. ▪ 5x veteranised features to be added to each monolith to meet the specification and design outlined in **Section 1.5**. ▪ Work to be supervised/guided by an appropriately experienced/licenced ecologist (i.e. the Named Ecologist, AA or their Assistant under WML-OR74).	N/A – not required under bat licence.
Other requirements (e.g. stakeholders)				
Pond creation	13	Creation of a pond to encourage species such as birds, reptiles, amphibians and invertebrates. **Timing:** September to October inclusive.	▪ The pond should be located at the southern end of new ditch 9, with the ditch terminating in the pond. ▪ Pond size: approximately 5m x 10m (50m^2). ▪ Pond shape: the shape of pond should be varied, to create un-even margins with spits and sheltered bays. ▪ Depth: there should be variations in depth within the pond, with the maximum depth between 1.0m and 1.5m. ▪ Shallow sloping margins: overall the sides of the pond should be gently sloping at a gradient of no more than 1 in 3, but pond margins should be very shallow in places (between 1 in 10 and 1 in 20) to create a wide drawdown zone and shallow margins to encourage marginal vegetation. Shallow drawdown zones are important for establishing vegetation and invertebrate diversity, and this is encouraged by creating varied micro-topography with hummocks and hollows. ▪ Bed morphology: the morphology of the pond bed should be varied, with the pond dropping to the deepest point through a series of steps or undulations. Occasional bars or shallow shoals should be created on the pond beds to encourage sediment to settle between the bars whilst the raised surface of the bar provides substrate for aquatic vegetation. ▪ Work to be supervised/guided by an appropriately experienced ecologist to ensure the ditch meets the design specification.	During the aftercare period, the following activities should be undertaken each year: ▪ Ensure the pond remains free of litter and debris such as logs and branches. ▪ Strim margin vegetation to maintain bare muddy margins around half of the pond. ▪ Monitor for natural colonisation of aquatic and marginal vegetation. ▪ Monitor for encroachment of scrub and dominant emergent vegetation, and control if necessary.
Ditch creation	9 and 19	Creation of two new ditche channels linking to the Flagmoor Ditch to create additional water vole habitat. **Timing:** Spring/summer.	▪ For the most northerly of the two new ditches, aerial imagery suggests this is an old section of ditch that has become defunct and densely overgrown, and this should be reinstated to form the new channel. ▪ The ditch channels shall be excavated to a depth of 0.5-1m consistent with the depth of the adjoining section of Flagmoor Ditch, and shall have steep earth banks. ▪ The ditch channels shall be approximately 1.5-2m wide consistent with the width of the adjoining section of the Flagmoor Ditch. ▪ The ditch channels should be created using an excavator. Arisings should either be spread very thinly within the floodplain. ▪ Work to be supervised/guided by an appropriately experienced ecologist to ensure the ditch meets the design specification.	During the aftercare period, the following activities should be undertaken each year: ▪ Ensure the ditches remain free of litter and debris such as logs and branches.

Feature	Target note – see figure 1	Overview and timing	Reinstatement specification	Management/aftercare prescription
Meadow reinstatement	2	Reinstatement of tussocky grassland with a diversity of grass and wildflower species. **Timing:** September to October inclusive.	▪ A tussocky grassland and wildflower sward shall be reinstated using a native species general meadow mix such as the EM2 Standard General purpose Meadow Mixture: https://wildseed.co.uk/mixtures/view/3 ▪ The ground shall be prepared using mechanical harrowing or raking to alleviate compaction, expose bare soil and produce a medium tilth and firm surface. ▪ Upon completion of ground preparation, seed shall be sown by surface broadcasting, and firmed in with a roll.	During the aftercare period, the following activities should be undertaken each year: ▪ Targeted weed control should take place to remove perennial weeds. This can be achieved by spot-spraying or mechanical removal. ▪ A regular cutting regime should be maintained on annual basis by taking a 'hay cut' to a level of approximately 50mm in early autumn. Leave the 'hay' to dry and drop seed for 7 days and then remove from site. ▪ To increase sward diversity, 20% of the area should be left uncut each year, on a rotational basis, to vary the sward height and increase habitat complexity.
Tree/shrub planting	1	Reinstatement with native shrub and tree species. **Timing:** November to March inclusive when the ground is free from frost and snow.	Amongst other species, laurel shrubs were removed from this location. Although not legally controlled, laurel is an invasive non-native plant species, which spreads to the detriment of native flora and fauna. It is therefore recommended that replanting with laurel is avoided. Reinstate shrubs using the following native species mix: ▪ 30% *Crataegus monogyna* (hawthorn); ▪ 20% *Corylus avellana* (mix of hazel); ▪ 20% *Prunus spinosa* (blackthorn); ▪ 10% *Malus sylvestris* (crab apple); ▪ 10% *Viburnum opulus* (guelder rose); and ▪ 10% *Ilex aquifolium* (holly). Plant stock shall follow the specification outlined in **Section 1.6**.	Aftercare shall follow the specification outlined in **Section 1.6**.
Tree/shrub planting	3	Reinstatement of scattered riverbank trees. **Timing:** November to March inclusive when the ground is free from frost and snow.	Reinstate scattered *Alnus glutinosa* (alder) along riverbank at approximate 2.5m spacing. Plant stock shall follow the specification outlined in **Section 1.6**.	Aftercare shall follow the specification outlined in **Section 1.6**.
Tree/shrub planting	4	Reinstatement of deciduous woodland and shrub understorey. **Timing:** November to March inclusive when the ground is free from frost and snow.	Reinstate deciduous woodland and shrub understory. An approximately 5m wide woodland ride shall be maintained along the haul road route to provide an access track from the ford river crossing to the golf course (see approximate route on **Figure 1**). Woodland edges shall be varied rather than linear, and be feathered using a predominance of lower-growing trees and shrubs to soften the boundary of the woodland. The willow species and guelder rose should be targeted to areas of damper ground, with species such as pedunculate oak, hazel and hawthorn and blackthorn restricted to drier areas, while alder and silver birch are more tolerant of varying ground conditions. Tree and shrub planting shall use the following native species mix:	Aftercare shall follow the specification outlined in **Section 1.6**.

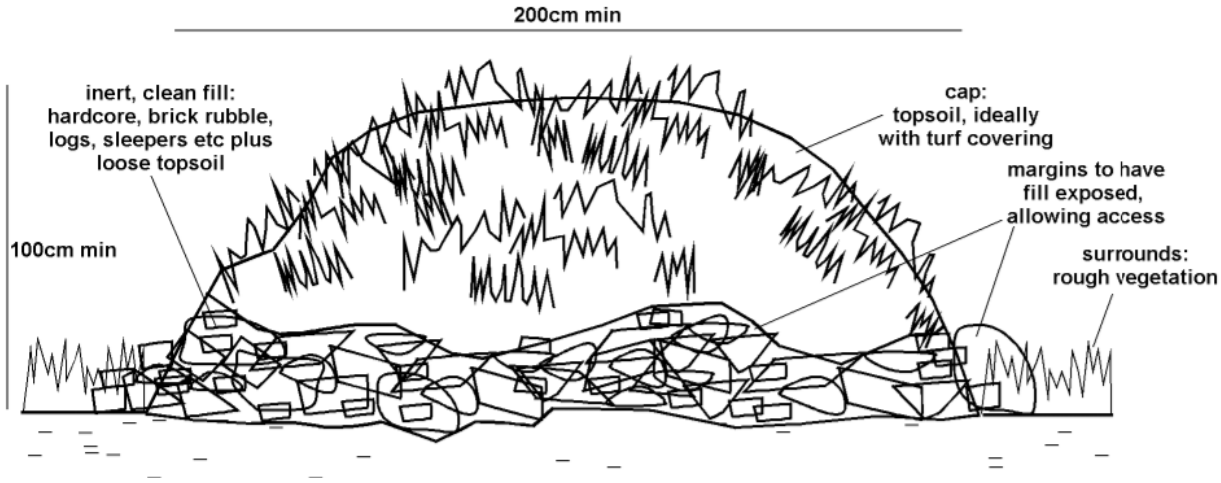
Feature	Target note – see figure 1	Overview and timing	Reinstatement specification	Management/aftercare prescription
			▪ 20% *Quercus robur* (pedunculate oak) (tree/canopy); ▪ 20% *Alnus glutinosa* (alder) (tree/canopy); ▪ 15% *Corylus avellana* (hazel) (shrub/understory); ▪ 10% *Betula pendula* (silver birch) (tree/canopy); ▪ 10% *Salix cinerea* (grey willow) (lower-growing tree); ▪ 10% *Salix caprea* (goat willow) (lower-growing tree); ▪ 5% *Crataegus mongyna* (hawthorn) (shrub/understory); ▪ 5% *Prunus spinosa* (blackthorn) (shrub/understory); and ▪ 5% *Viburnum opulus* (guelder-rose) (shrub/understory). Plant stock shall follow the specification outlined in **Section 1.6**.	
Tree/shrub planting	7	Reinstatement of boundary treeline. **Timing:** November to March inclusive when the ground is free from frost and snow.	Reinstate connectivity of treeline between edge of golf course and ditch, with the following native species mix: ▪ 25% *Alnus glutinosa* (alder); ▪ 25% *Betula pendula* (silver birch); ▪ 25% *Salix caprea* (goat willow); and ▪ 25% *Salix cinarea* (grey willow). Plant stock shall follow the specification outlined in **Section 1.6**.	Aftercare shall follow the specification outlined in **Section 1.6**.
Tree/shrub planting	8	Reinstatement of boundary shrubs. **Timing:** November to March inclusive when the ground is free from frost and snow.	Laurel shrubs were removed from this location. Although not legally controlled, laurel is an invasive non-native plant species, which spreads to the detriment of native flora and fauna. It is therefore recommended that replanting with laurel is avoided. Reinstate shrubs using the following native species mix: ▪ 30% *Crataegus monogyna* (hawthorn); ▪ 20% *Corylus avellana* (mix of hazel); ▪ 20% *Prunus spinosa* (blackthorn); ▪ 10% *Malus sylvestris* (crab apple); ▪ 10% *Viburnum opulus* (guelder rose); and ▪ 10% *Ilex aquifolium* (holly). Plant stock shall follow the specification outlined in **Section 1.6**.	Aftercare shall follow the specification outlined in **Section 1.6**.
Tree/shrub planting	10, 11, 12 and 17	Reinstatement of low-growing shrubs around new tower infrastructure and beneath span, and adjacent to retained carparking where tower ZC046 was removed. **Timing:** November to March inclusive when the ground is free from frost and snow.	Trees reinstated as low-growing shrubs around new overhead line tower infrastructure and beneath conductor span. Species will be suitable for coppicing for future access and to maintain statutory safety clearance. Reinstate shrubs using the following native species mix: ▪ 33% *Salix caprea* (goat willow); ▪ 33% *Salix cinerea* (grey willow); and ▪ 33% *Corylus avellana* (hazel) (restrict this species to areas of drier ground). Plant stock shall follow the specification outlined in **Section 1.6**.	Aftercare shall follow the specification outlined in **Section 1.6**.

Feature	Target note – see figure 1	Overview and timing	Reinstatement specification	Management/aftercare prescription
Tree/shrub planting	14	Creation of new deciduous woodland and shrub understorey. **Timing:** November to March inclusive when the ground is free from frost and snow.	Denham Country Park requested woodland 'screen planting' in front of the viaduct. The southern edge of the woodland shall be varied rather than linear, and be feathered using a predominance of lower-growing trees and shrubs to soften the boundary of the woodland. The willow species and guelder rose should be targeted to areas of damper ground, with species such as pedunculate oak, hazel and hawthorn and blackthorn restricted to drier areas (likely closer to the viaduct), while alder and silver birch are more tolerant of varying ground conditions. New planting should not extend west beyond the western side of original tower ZC047 (due to be removed), as tree cover between the tower and the River Colne was recently removed as part of local water vole conservation efforts. Tree and shrub planting shall use the following native species mix: ▪ 20% *Quercus robur* (pedunculate oak) (tree/canopy); ▪ 20% *Alnus glutinosa* (alder) (tree/canopy); ▪ 15% *Corylus avellana* (hazel) (shrub/understory); ▪ 10% *Betula pendula* (silver birch) (tree/canopy); ▪ 10% *Salix cinerea* (grey willow) (lower-growing tree); ▪ 10% *Salix caprea* (goat willow) (lower-growing tree); ▪ 5% *Crataegus monogyna* (hawthorn) (shrub/understory); ▪ 5% *Prunus spinosa* (blackthorn) (shrub/understory); and ▪ 5% *Viburnum opulus* (guelder-rose) (shrub/understory). Plant stock shall follow the specification outlined in **Section 1.6**.	Aftercare shall follow the specification outlined in **Section 1.6**.
Tree/shrub planting	15	Reinstatement of low-growing shrubs beneath overhead line span. **Timing:** November to March inclusive when the ground is free from frost and snow.	Reinstatement of trees and shrubs on embankment for screening/visual amenity/slope stabilisation. Focus on low-growing shrub species beneath conductor span. Guelder rose is more tolerant of damper conditions and should be targeted to localised areas of damper ground such as at the toe of the slope. Tree and shrub planting shall use the following native species mix: ▪ 30% *Crataegus monogyna* (hawthorn); ▪ 20% *Corylus avellana* (mix of hazel); ▪ 20% *Prunus spinosa* (blackthorn); ▪ 10% *Malus sylvestris* (crab apple); ▪ 10% *Viburnum opulus* (guelder rose); and ▪ 10% *Ilex aquifolium* (holly). Plant stock shall follow the specification outlined in **Section 1.6**.	Aftercare shall follow the specification outlined in **Section 1.6**.
Hedgerow planting	16	Creation of dense hedgerow boundary feature adjacent to industrial site. **Timing:** November to March inclusive when the ground is free from frost and snow.	Creation of dense hedgerow boundary feature to aid dust suppression adjacent to Hanson and Thames Materials sites, provide visual screening, and prevent access to the slope. Hedgerow shrub planting shall use the following native species mix: ▪ 60% *Crataegus monogyna* (hawthorn); ▪ 15% *Prunus spinosa* (blackthorn); ▪ 10% *Corylus avellana* (mix of hazel); ▪ 5% *Malus sylvestris* (crab apple); ▪ 5% *Rosa canina* (dog rose); and ▪ 5% *Ilex aquifolium* (holly). Plant stock shall follow the specification outlined in **Section 1.6**.	Aftercare shall follow the specification outlined in **Section 1.6**.

Feature	Target note – see figure 1	Overview and timing	Reinstatement specification	Management/aftercare prescription
Channel restoration	18	Clearance of overgrown vegetation along two narrow channels. **Timing:** any time of year, subject to absence of water vole burrows. If water vole burrows are identified to be present during the pre-work check, seasonal timing restrictions may be required as advised by the supervising ecologist.	Two channels linking between a pond and the River Colne have become overgrown with in-channel and bankside vegetation. These channels are part of an overflow from the Grand Union Canal to the River Colne, via the pond. Removal of dense vegetation along the two channels is required to reinstate the functioning of the channels, and enhance habitat connectivity for water voles between the River Colne and the pond, which is used periodically for foraging. To date, water vole surveys have recorded foraging activity at the channels and adjacent pond, but no conclusive evidence of water vole burrows has been recorded. The channel restoration work should be subject to a pre-work check by a suitably experienced ecologist to confirm that no water vole burrows are present within ten meters of the access and working areas. Should presence of water vole burrows be recorded, additional mitigation and seasonal timing restrictions may be required and should be agreed with the supervising ecologist prior to works commencing.	During the aftercare period, the following activities should be undertaken each year: ▪ Ensure the channels remain free of litter and debris such as logs and branches.
General haul road route	-	Natural regeneration of habitat following removal of haul road temporary trackway panels. **Timing:** trackway removal in October to December inclusive.	For all other areas of the haul road in Denham Country Park that are not covered by specific requirements elsewhere within **Table 1-1/ Figure 1**, it is anticipated that the underlying habitat (predominantly marshy grassland or tall ruderal vegetation) should regenerate naturally from the existing seedbed that lay beneath and adjacent to the temporary trackway panels. Once the temporary trackway panels are removed, the requirement for harrowing or another surface preparation to alleviate compaction shall be determined by a suitably experienced ecologist.	The haul road route shall be assessed by a suitably experienced ecologist after one growing season following removal of the temporary trackway panels to ensure that natural regeneration is progressing appropriately. Should natural regeneration prove unsuccessful, remedial measures shall be implemented as recommended by the ecologist.

1.3 GREAT CRESTED NEWT HIBERNACULA CREATION

Hibernacula shall be located in areas where flooding is less likely to occur, both close to the breeding pond and within suitable terrestrial habitat away from the pond (see **Figure 1**). Each hibernaculum shall have a footprint of approximately 2m x 2m and be 1m high, and be created by stacking a combination of materials such as rocks, rubble, logs and loose earth to create a variety of crevices and cavities which lead deep within the structure. The structure shall be covered in soil and turf (which can be cut from the footprint of the hibernaculum prior to stacking the materials). An exposed margin of 20-30cm shall be left between the surface of the ground and lower edge of the soil/turf covering; enabling animals to access the structure. The following images display the hibernaculum structure and a finished example:

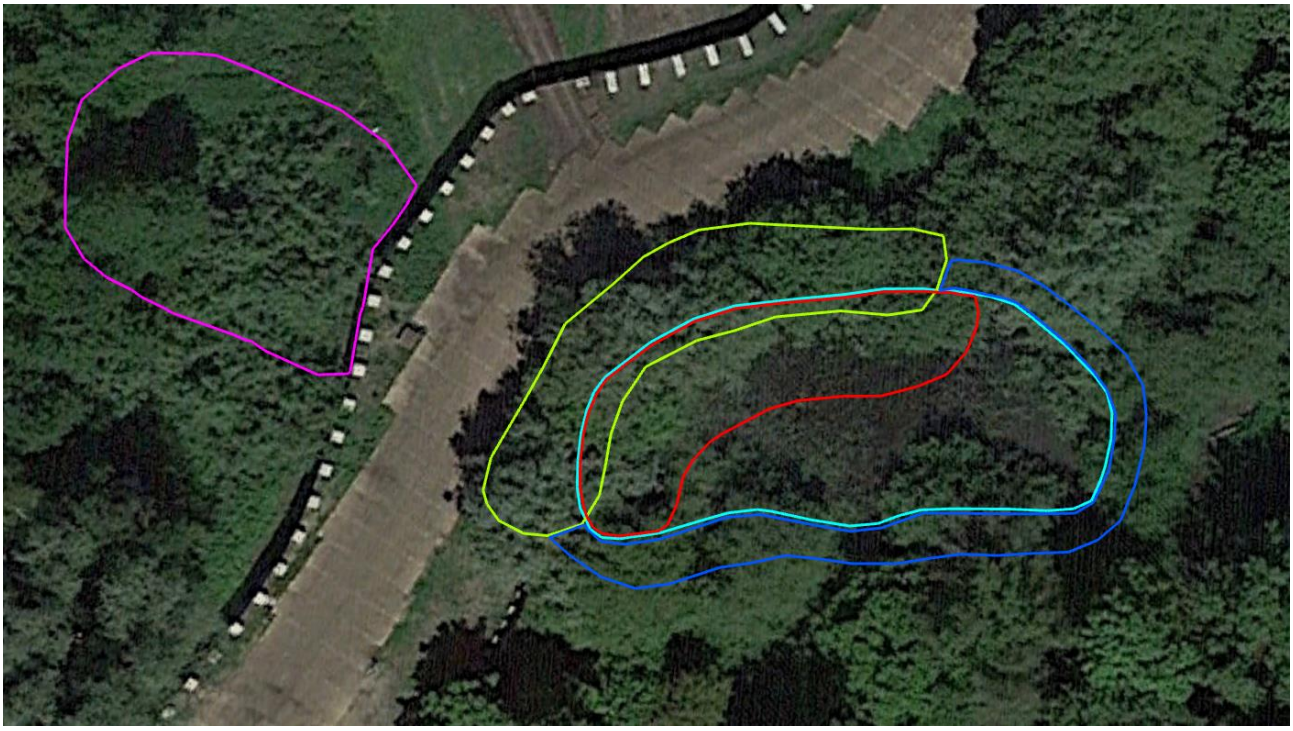


Drawing from Great Crested Newt Mitigation Guidelines (English Nature, 2001)[3].

[3] English Nature (now Natural England) (2001). Great Crested Newt Mitigation Guidelines.

1.4 POND ENHANCEMENTS FOR GREAT CRESTED NEWTS

The figure below shows the areas within and around the pond where the habitat enhancements are required that are described in **Table 1-1**, and located at points **5** and **6** on **Figure 1**.



	Indicative pond margin.
	Removal of band immature/semi-mature trees around pond margin, consisting mainly of willow and alder which are overhanging/overshading the pond.
	Removal of dense bulrush, reeds and encroaching willow scrub vegetation from within pond. Removal should be undertaken using a 360 excavator with a long reach boom and a skilled operator. Vegetation should be removed to a minimum of 5m from the bankside (and further if the boom reach allows). The excavator should be fitted with either a ditching bucket with drain holes or a grab bucket to enable water to be drained from material as it is lifted from the pond, and ideally the bucked will be fitted with a tilting coupler to enable the bucket to be positioned to conform with the contours of the pond bed.
	Hand pruning of overhaning tree limbs where accessible.
	Indicative area for disposal of arrisings from pond vegetation removal, to be agreed with the supervising ecologist.

1.5 CREATION OF VETERANISED FEATURES FOR ROOSTING BATS

As mature trees sustain damage with age such as fallen branches, splits and damaged bark, the associated rot holes, crevices and cavities that may form can provide suitable features for roosting bats. 'Veteranisation' of trees is a process of artificially aging trees to replicate natural features of aging such as these, which are beneficial to bats and other wildlife.

Table 1-2 shows various methods that are designed to create initial wounds on trees which are intended to develop into potential bat roost features over time. These methods are intended to be used either on living trees, or where monoliths have been created (e.g. by removing the crown from a living tree, as described in **Table 1**), and a combination of these methods shall be used to create a variety of features on veteranised trees and monoliths.

For veteranisation of trees, features shall be created on trees which are located away from footpaths and highly-trafficked areas, and not on branches which overhang paths and tracks. Suitable trees shall be agreed with the relevant stakeholder (e.g. Denham Country Park).

Table 1-2 - Tree veteranisation methods to promote establishment of potential roost features for bats

Method 1: removal of bark	A wound is created by using a chainsaw to remove a patch or strip of bark from a tree trunk or the side or underside of a main tree limb. A slither of the underlying timber is also removed. The wound can be supplemented with a shallow slit(s) or hole(s) (up to 100mm deep) to expedite the onset of decay, created using a chainsaw blade or a 40mm diameter auger drill bit respectively.
Method 2: creation of linear slit	A linear slit is created using a chainsaw running up a tree trunk or along the underside of a main tree limb. The slit shall be approximately 100mm deep with a V-shaped opening and at least 1m long.
Method 3: creation of hole/cavity	A cavity is created within a tree trunk or large limb using a 40mm diameter auger drill bit. The hole shall extend a minimum of 300mm into the timber, and shall be drilled angled upwards into the trunk/limb from the opening. Using the same opening, a second hole shall then be drilled angled downwards to approximately 150-300mm (to help prevent sap and debris accumulating in and around the entrance hole). To minimise use by non-target species such as birds, half of the entrance hole shall be covered to reduce its size. A rectangle of 9mm thick marine ply shall be attached to the outside of the entrance hole using galvanised nails, **covering the upper half of the entrance hole only** (leaving an opening slit approximately 20mm high).

1.6 TREE, SHRUB AND HEDGEROW PLANTING AND AFTERCARE

Tree and shrub planting shall use native species of local provenance[4]. Stock shall be sourced and planted in accordance with relevant standards, such as:

- BS 3936 – Nursery stock; Parts 1, 4 and 5; and
- BS 4428:1989 – Code of practice for general landscape operations;
- BS 8545:2014 – Trees: from nursery to independence in the landscape – Recommendations; and
- The National Plant Specification.

Specific tree, shrub and hedgerow plant specifications are provided in the following sections, and species mixes are identified for specific areas of reinstatement in **Table 1-1**, with the corresponding locations shown on **Figure 1**.

Planting shall take place between November to March (inclusive) with a preference for completion prior to the end of December in any one year, when the ground is free from frost and snow, when there is no drought and in the absence of severe water-logging.

1.6.1 TREE AND SHRUB PLANTING SPECIFICATION

Trees and shrub stock shall be 60-80cm transplants, transplanted at least once. All nursery stock shall be sturdy plants, true to size, age and species, with a good fibrous root system and in accordance with the relevant British Standards and the National Plant Specification.

Trees and shrubs shall be planted in a mosaic of single-species groups, each consisting of 3-15 plants per group, planted at random ~1.5m spacing of individual plants.

1.6.2 AFTERCARE

Beating up shall be carried out to replace failed tree/shrub plants on a one for one basis throughout the establishment period (usually 3-5 years).

All plants shall be provided with a tree shelter, fixed to a suitable sized stake. Regular checking of tree shelters shall be undertaken to pull out any grass and weeds growing inside and to ensure trees/shrubs are not compromised from excessive weed growth. Tree shelters to be removed after the establishment period; 3-5 years after planting as appropriate and dependent on the size of the tree and rate of growth.

Weed control shall be undertaken by the application of an approved herbicide (e.g. glyphosate) to maintain a weed-free area of a 1m diameter around each tree/shrub plant. This should normally be applied in May to provide maximum benefit to the tree/shrub plants and necessary precautions shall be followed, taking care that the herbicide does not contact the trees/shrubs. Weed control shall be maintained until such times as the trees/shrubs are suitably established[5] (usually 3-5 years).

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[4] The scheme is within tree provenance zone 40. For guidance on provenance zones see Forestry Commission Information Note: Choosing Provenance in Broadleaved Trees – https://www.forestresearch.gov.uk/documents/967/fcin082.pdf

[5] The use of herbicides should be avoided in or near water.

Watering should be undertaken as and when necessary to ensure establishment and continued thriving of planting. Water to full depth of topsoil. The application of water should be even without damage or displacement of stock or soil.

1.6.3 HEDGEROW PLANTING SPECIFICATION

Hedgerow stock shall be 40-60cm transplants. All nursery stock shall be sturdy plants, true to size, age and species, with a good fibrous root system and in accordance with the relevant British Standards and National Plant Specification.

Hedgerow shrubs shall be planted in double staggered rows (rows approximately 25cm apart, with plants spaced approximately 30cm apart in each row) at a density of seven plants per metre to achieve a dense hedge. Species shall be divided roughly so that there are three plants of hawthorn and two of other species per metre.

1.6.4 AFTERCARE

Beating up shall be carried out to replace failed shrub plants on a one for one basis, for two years following planting (after which failures are unlikely).

Each plant shall be protected by a spiral tree guard. Guards shall be removed once plant stock is established or no later than five years after planting.

Weed control shall be undertaken by the application of an approved herbicide (e.g. glyphosate) to maintain a weed-free area of 0.6m either side of the hedgerow. This should normally be applied in May to provide maximum benefit to the shrub plants and necessary precautions shall followed taking care that the herbicide does not contact the hedgerow shrubs. Weed control shall be maintained until such times as the shrubs are suitably established (usually 3-5 years).

Watering should be undertaken as and when necessary to ensure establishment and continued thriving of planting. Water to full depth of topsoil. The application of water should be even without damage or displacement of stock or soil.

The hedgerow plants should be trimmed during the establishment period, usually after 2 -3 growing seasons, to encourage dense growth. Cutting will be undertaken in late January or February to avoid the nesting bird season.

2 AFTERCARE MANAGEMENT AND MONITORING

As outlined in **Table 1-1**, certain areas of habitat reinstatement and creation require a period of aftercare and maintenance to aid establishment and maximise the condition of the new habitat. These areas would be subject to an aftercare period of five years.

Table 2-1 outlines a timetable of management activities and monitoring that are required during the aftercare period.

The areas of habitat reinstatement and creation will be subject to monitoring, to inform the on-going management and application of the aftercare prescriptions, and ensure the habitat is establishing as intended. Monitoring should be undertaken by an ecologist or an appropriately qualified and experienced vegetation management operative.

Management should be undertaken by an appropriately qualified and experienced vegetation management operative.

Table 2-1 - Habitat management and monitoring timetable

Management activity	Years post creation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pond creation													
Clear litter/debris	1-5												
Strim margin vegetation to maintain bare muddy margins around half of the pond	1-5												
Monitoring	1, 2 and 5												
Ditch creation													
Clear litter	1-5												
Monitoring	1, 2 and 5												
Channel restoration													
Clear litter/debris	1-5												
Monitoring	1, 2 and 5												

Management activity	Years post creation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Meadow reinstatement													
Weed control	1, 2, 3 and when required after monitoring												
Cutting regime	Every year												
Monitoring	1, 2, and 5												
Trees and shrubs													
Weed control	1, 2, 3 and when required after monitoring												
Firming in	1												
Removal of encroaching vegetation from tree shelters	1, 2, 3 and when required after monitoring												
Beating up	1, 2, 3 and when required after monitoring												
Removal of tree shelters	3-5 as confirmed after monitoring (i.e. once established)												
Monitoring	1, 2, 3 and 5												

Management activity	Years post creation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hedgerow													
Weed control	1, 2, 3 and when required after monitoring												
Cutting to promote dense growth	2, 3 and when required after monitoring												
Beating up	1, 2, 3 and when required after monitoring												
Removal of tree guards	3-5 as confirmed after monitoring (i.e. once established)												
Monitoring	1, 2, 3 and 5												
General haul road route													
Monitoring	1												

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Management systems

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