national highways

Lower Thames Crossing

6.7 Outline Landscape and Ecology Management Plan (Tracked changes version)

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Lower Thames Crossing

6.7 Outline Landscape and Ecology Management Plan (Tracked changes version)

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1 Executive summary

1.1.1 This outline Landscape and Ecology Management Plan (oLEMP) describes the proposed management of the landscape and ecological elements of the A122 Lower Thames Crossing (the Project).

1.1.2 The outline LEMP sets out the requirements for the development of a LEMP to cover all of the areas identified within this document, to the specifications detailed, and all other areas of the soft estate. It outlines the proposed management and monitoring of the parcels of land, that perform landscape and ecological mitigation functions to mitigate impacts of the Project. The outline LEMP supplements existing requirements for the management of the landscape and ecology set out in National Highways' Design Manual for Roads and Bridges (DMRB) standards.

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1.1.3 The outline LEMP is secured via a Schedule 2 Development Consent Order (DCO) requirement (5) of the draft DCO (Application Document 3.1).

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1.1.4 This document has broken the Project into a number of management areas, outlining the specific management requirements of the area in terms of landscape integration, visual screening and habitat creation.

1.1.5 The management areas contain a list of the various planting typologies that are contained within. For each planting typology, there are outline management requirements and outline establishment regimes.

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2 Introduction

2.1 Scope of this document

2.1.1 This outline Landscape and Ecology Management Plan (LEMP) outlines the proposed management of the landscape and ecological elements of the A122 Lower Thames Crossing (the Project).

2.1.2 This outline LEMP focuses on management requirements for the land parcels within the Order Limits, subject to permanent acquisition powers, that perform specific landscape and ecological mitigation and compensation functions for the Project. It details the management regimes, management expectations and monitoring requirements for each of those land parcels and the typologies contained within. It should be read in conjunction with the Environmental Masterplan (Application Document 6.2, Figure 2.4).

2.1.3 The Environmental Masterplan secures the spatial extent and location of landscape and ecology elements required for mitigation and compensation. Reference to the specific Environmental Masterplan sheets can be found for each management area described in sections 5, 6 and 7.

2.1.4 This outline LEMP does not focus on the land parcels within the Order Limits (subject to permanent acquisition powers) that do not perform landscape and ecological mitigation and compensation functions, such as highways verges, drainage ditches, attenuation ponds and earthworks. These areas will be subject to Highways England's Design Manual for Roads and Bridges (DMRB) standards GM 701 Series 3000 (Highways England, 2020a) and GS 801 Series 3000 (Highways England, 2020b) which establish the general maintenance and inspection requirements for motorways and all-purpose trunk roads.

2.1.5 The LEMP shall be further developed by the Contractor, and future iterations of the document will include details of management regimes, management expectations and monitoring requirements for each part of the authorised development, not just those outlined in this document. The LEMP is a requirement under Requirement 5 of the current draft DCO as below.

(1) Each part of the authorised development must be landscaped in accordance with a LEMP which sets out details of all proposed hard and soft landscaping works for that part and which has been submitted to and approved in writing by the Secretary of State prior to the opening of that part, following consultation by the undertaker with the bodies listed in Table 2.1 of the outline LEMP on matters related to their respective functions.

(2) A LEMP prepared under sub-paragraph (1) must be substantially in accordance with the outline LEMP and must—

(a) reflect the design principles document and the mitigation measures set out in the REAC;

(b) be based on the environmental masterplan annexed to the environmental statement; and

(c) include details of—

(i) location, number, species mix, size and planting density of any proposed planting;

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(ii) cultivation, importing of materials and other operations to ensure plant establishment;

(iii) existing trees and vegetation to be retained, with measures for their protection during the construction period;

(iv) proposed finished ground levels;

(v) implementation timetables for landscaping works;

(vi) commitments to aftercare, monitoring and maintenance activities relating to the landscaping and ecological features; and

(vii) measures for the replacement, in the first available planting season, of any tree or shrub planted as part of the LEMP that, within a period of 5 years or such period as may be specified in the LEMP after the completion of the part of the authorised development to which the relevant LEMP relates, dies, becomes seriously diseased or is seriously damaged in the construction of the authorised development.

(3) The undertaker must carry out, and maintain, each relevant part of the authorised development in accordance with the LEMP approved for that part under paragraph (1).
(4) All landscaping works must be carried out to a reasonable standard in accordance with the relevant recommendations of appropriate British Standards or other recognised codes of good practice.

2.1.6 This outline LEMP is based on the preliminary design submitted as part of the DCO Application. The LEMP will be further developed by the Contractor for approval by the Secretary of State (SoS) in consultation with relevant stakeholders as shown in Table 2.1 below.

2.1.7 In Table 2.1, Emergency Services refers to Kent Police, Kent Fire and Rescue, Essex Police, Essex Ambulance, Essex County Fire and Rescue, South East Coast Ambulance Service, Metropolitan Police, London Fire Brigade and London Ambulance Service.

Table 2.1 Relevant stakeholders

	Local planning authority	Local highway authority	Other body
Brentwood Borough Council	X	-	-
Emergency Services	-	-	X
Environment Agency	-	-	X
Essex County Council	-	X	-
Gravesham Borough Council	X	-	-
Historic England	-	-	X
Kent County Council	-	X	-
Kent Downs Area of Outstanding Natural Beauty	-	-	X
London Borough of Havering	X	X	-

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	Local planning authority	Local highway authority	Other body
London Gateway	-	-	X
Maidstone Borough Council	X	X	-
Medway Council	X	X	-
Natural England	-	-	X
Thurrock Council	X	X	-
Tonbridge and Malling Borough Council	X	X	-
Transport for London	-	-	X

2.1.8 The LEMP submitted to the SoS for approval, under Requirement 5 of the DCO, must be in accordance with the outline LEMP, including the habitat management requirements, targets and prescriptions set out in the outline LEMP. The final version of the LEMP created by the Contractor will provide more detail for each of the management areas as the detailed design emerges and information develops on the underlying geology, soils and drainage that will inform the detailed establishment, management, and maintenance regimes.

2.1.9 Detailed landscape and ecology design, schedules and specifications will be produced for all works during detailed design stage.

2.1.10 This outline LEMP is to provide confidence that the key landscape and ecological measures identified within the Environmental Masterplan will function as intended and will receive the appropriate management and maintenance as required.

2.1.11 This outline LEMP sets out the long-term goals and the outline landscape and ecology management practices for the Project. The key objectives of this outline LEMP are to provide details of the habitat creation, ecological enhancement, visual screening, and landscape integration of the Project for those parcels subject to permanent acquisition powers identified within the Order Limits, that require a bespoke approach from the management practices already identified within the DMRB standards GM 701 Series 3000 and GS 801 Series 3000 documents. Therefore, this outline LEMP does not include routine vegetation management activities required for safety, such as maintaining visibility splays; or routine maintenance tasks such as rubbish removal, repair to fences, or reinstatement of habitat following incidents or incursions to the verge.

2.1.12 All landscaping/planting and ecological mitigation proposed in relation to the Project, as set out in within this Outline LEMP will adhere to the standard safety distances as set out in the Electricity Safety, Quality and Continuity Regulations (ESQCR) and accord with any planting policies and easement restrictive covenants associated with the utility networks.

2.1.13 The landscape design has gone through an iterative process to include input from the Biodiversity Net Gain (BNG) assessment. In order to achieve this, each Landscape Element (LE) code has been translated to a UK Habitat metric code which is used within the BNG assessment.

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2.1.14 Taking into consideration the purpose of each landscape element and the feasible potential in terms of habitat quality, a target condition value was assigned to each habitat type. The monitoring targets within the oLEMP reflect the condition criteria requirement for each habitat type, ensuring that the habitat is managed appropriately and providing a measure of success to make certain that the biodiversity units are delivered.

2.1.15 Within section 8 of the oLEMP each Landscape Element is clearly aligned to the associated UK Habitat Metric code and includes time to target condition.

2.2 Context of this document

2.2.1 The Project is a Nationally Significant Infrastructure Project (NSIP). This outline LEMP has been developed in support of National Highways' application for a DCO.

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2.2.2 An Environmental Impact Assessment (EIA) has been carried out for the Project and is reported in the Environmental Statement (ES) (Application Document 6.1). The Environmental Statement [Document References 6.1, 6.2 and 6.3] has been updated, and should be read with reference to the latest version of the Environmental Statement Addendum [Document Reference 9.8]. A Habitats Regulations Assessment (HRA) (Application Document 6.5) has also been carried out for the Project.

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2.2.3 Mitigation and compensation measures are provided in the ES and HRA to reduce and alleviate significant effects of the Project. These include creation of new habitats and natural features such as woodland, grassland and open mosaic habitat, and improvements to existing habitats. The outline LEMP is part of a suite of documents that capture the Project's landscape and ecology design and environmental commitments. These documents are referred to as 'control documents' and include commitments to achieve the mitigation detailed in the ES and HRA. The control documents are legally secured through Requirements set out in Schedule 2 of the DCO. The following Control Documents work with the oLEMP to set out the framework for the delivery of mitigation and compensation (relating to ecology and landscape):

a. The ES (Application Document 6.1), including:

   i. The Environmental Masterplan (Application Document 6.2, Figure 2.4), which defines the spatial layout of physical mitigation proposals.

   ii. The Code of Construction Practice (CoCP) (Application Document 6.3) which covers commitments pertaining to the processes of construction only. The CoCP also include the Register of Environmental Actions and Commitments (REAC) (Application Document 6.3, ES Appendix 2.2), which defines commitments on the processes that need to be used in the delivery, management, monitoring and maintenance of the works.

b. The Design Principles (Application Document 7.5) that capture the key principles that have shaped the design thus far and make a commitment that these will be maintained and developed in the future detailed design and delivery phases of the Project.

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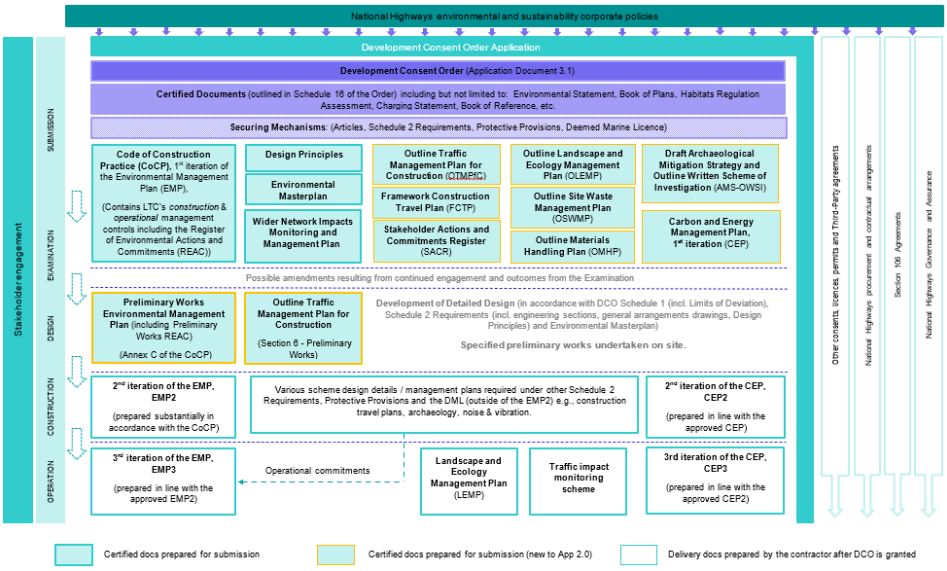
2.2.4 The interaction of the control documents is set out below in the Control Plan (Plate 2.1).

Plate 2.1 The Control Plan



2.3 Structure of this document

2.3.1 This document is structured as follows:

a. **Section 2** – Introduces the outline LEMP.

b. **Section 3** – Describes the high-level design objectives and vision for the Project. These are National Highways' overarching objectives for the design of permanent works.

c. **Section 4** – Provides an overview of how the outline LEMP will be implemented, including identifying roles and responsibilities of identified parties.

d. **Sections 5, 6 and 7** – Describes each of the identified management areas along the Project route. Each area contains the outline management requirements, lists the habitat typologies contained within that area, and describes any potential management and access issues.

e. **Section 8** – Describes the outline management prescriptions for habitat creation and/or management actions, timescales and measures of success for each of the proposed typologies contained within the management areas.

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f. **Section 9** – Contains the list of guidance documents and material referenced in the outline LEMP.

g. **Section 10** – Contains a glossary of the technical terms and acronyms used within this outline LEMP.

2.4 How to read this document

2.4.1 Due to the large-scale nature of the Project, the structure of this outline LEMP has been broken down geographically into three regional areas. The three regional areas are:

a. South of the River Thames (section 5)

b. North of the River Thames to the A13 junction (section 6)

c. North of the A13 junction to the M25 junction 29 (section 7)

2.4.2 The regional areas are illustrated in Plate 2.2 below.

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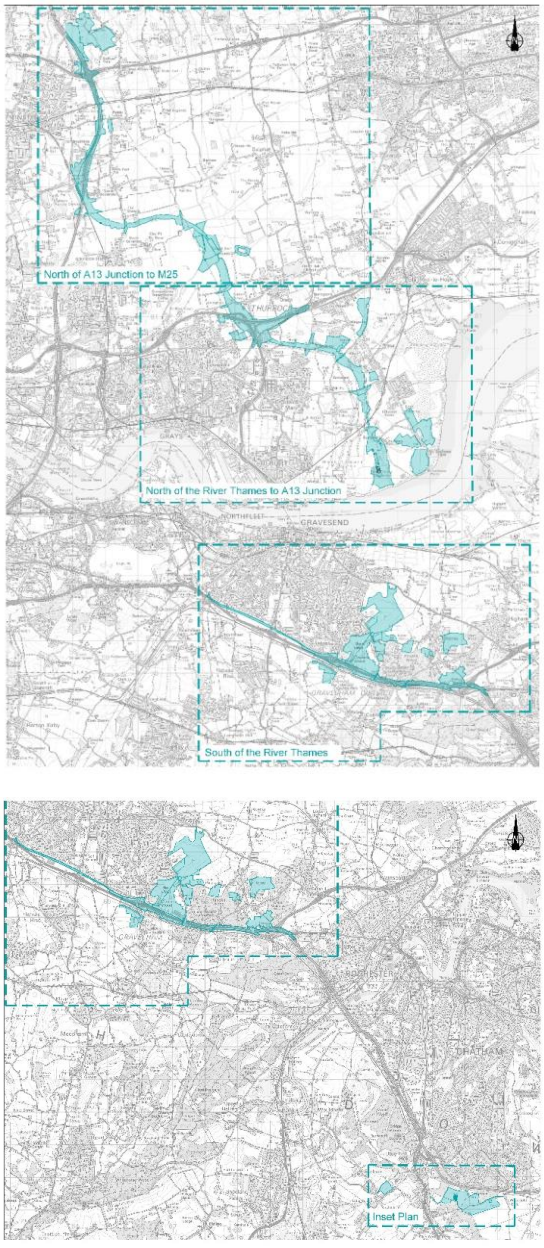
Plate 2.2 Location of regional areas



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2.4.3 Each regional area has been further broken down into a number of smaller management areas. These management areas comprise land parcels within the Order Limits, subject to permanent acquisition powers, that have been grouped into areas that perform similar landscape and ecological functions.

2.4.4 A number of management areas describe the sectional areas of the route (as described in Application Document 6.1, ES Chapter 2: Project Description). These management areas focus on the landscape parcels located adjacent to, or within the Project route and the junctions. As such, the management and inspections of these areas will be covered by DMRB standards GM 701 Series 3000 and GS801 Series 3000 documents. For completeness, the outline management requirements, and a list of typologies for these management areas are included for each of these management areas. This is to provide context for further iterations of the LEMP.

2.4.5 Section 8 provides a description of each of the individual typologies that form the proposed Environmental Masterplan (Application Document 6.2, Figure 2.4). Each individual typology has been assigned a relevant LE code contained within DMRB Standard LD 117 Landscape Design (Highways England, 2020c).

2.4.6 Landscape elements are defined in LD 117 as broad classification types of component parts of the landscape with specific requirements or management needs to achieve their longer-term objectives. Where appropriate some of the landscape elements have been sub-divided according to their detailed design or management needs relating to their function. For the oLEMP new LE codes have been used in some instances to identify areas which will be subject to further refinement at detailed design, whilst ensuring there are no material changes to the function these habitats provide as mitigation or compensation for the scheme. For these areas the subsequent LEMP will be updated to align with the codes in LD 117.

2.4.7 As a number of the planting typologies can be found in various locations along the Project route, to avoid repetition and duplication, each management area contains a list of the typologies contained within them. These typologies are further described in section 8. This has been summarised in the management matrix table (Appendix 3).

2.4.8 This enables the document to be structured in a way that allows the document to be subdivided in the future to reflect different contractors/land management agents. The management matrix in Appendix 3 will assist in extracting the relevant typologies needed for either an individual management area or regional areas.

2.4.9 Where relevant, section 8 includes references to relevant priority habitats. These habitats are listed in accordance with the provisions of section 41 of the Natural Environment and Rural Communities Act 2006, as being of principal importance for the conservation of biodiversity in England. They are therefore considered to be a sound basis for developing habitat objectives within typologies and the wider management areas. Where a priority habitat is referenced, a link to the relevant priority habitat description document published by the Joint Nature Conservation Committee (JNCC), is provided. These provide additional information such as the National Vegetation Classifications (NVC) that the bulk of a given priority habitat may align with.

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2.4.10 The oLEMP has been developed alongside the Biodiversity Metrics Calculations presented in Appendix 8.21 of the ES (Application Document 6.1)). Within section 8 each LE code is aligned with the corresponding UKHab metric code.

2.4.11 The outline prescriptions in section 8 do not describe ground preparation or similar works required to the site prior to the creation of the landscape / ecology element. These works will be developed during the detailed LEMP and will be based upon the current site condition, soils, underlying geology, and drainage.

2.4.12 All future management proposals would be cognisant of relevant legislation and, where appropriate, the relevant licensing requirements would be secured prior to works commencing.

2.4.13 Where protected species are to be relocated, specific conditions for the translocation will be detailed in relevant protected species licences. Draft protected species licence applications have been submitted with the DCO application (Appendix 8.16: Draft European Protected Species mitigation licence application with respect to bats; Appendix 8.17: Draft European Protected Species mitigation licence application with respect to great crested newts; Appendix 8.18: Draft European Protected Species mitigation licence application with respect to dormouse; Appendix 8.19: Draft development licence application for badgers; Appendix 8.20: Draft conservation licence application with respect to water vole (Application Document 6.3)). The methodologies employed for creating the proposed habitat, including the detailed requirements for site preparation prior to any planting, would follow published guidance including but not limited to, the following:

a. CIRIA Habitat Translocation – A Best Practice Guide: C600 (Anderson and Groutage, 2003)

b. Grassland Restoration and Management (Blakesley et al., 2016)

c. Great Crested Newt Mitigation Guidelines (English Nature, 2001)

d. Habitat Creation and Repair (Gilbert and Anderson, 1998)

e. Major Project Instruction: Low Nutrient Grasslands. MPI-85-102020 (Highways England, 2020d)

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3 Project aims and objectives

3.1 Project Description

3.1.1 The Project is a proposed new road connecting Kent, Thurrock and Essex through a tunnel beneath the River Thames. It would provide much-needed new road capacity across the Thames east of London and deliver the other Scheme Objectives set out below.

3.1.2 On the south side of the River Thames, the new road would link to the A2 and M2 in Kent. On the north side, it would link to the A13 in Thurrock and the M25 in Essex and the London Borough of Havering.

3.1.3 The Project proposals include the following:

a. Approximately 23km of new roads connecting the tunnel to the existing road network

b. Three lanes in both directions, apart from the southbound connection between the M25 and A13, and around junctions, where it would be two lanes

c. Technology providing lane control and variable speed limits up to 70mph

d. Upgrades to the M25, A2 and A13 where it connects to those roads

e. New structures and changes to existing ones including bridges, viaducts, and utilities such as electricity pylons

f. Two 4.25km tunnels crossing beneath the river, one for southbound traffic, one for northbound traffic

g. A free-flow charging system, where drivers do not need to stop but pay remotely, similar to that at the Dartford Crossing

h. Traffic regulation measures that include prohibiting use by pedestrians, low-powered motorcycles, cyclists, horse riders and agricultural vehicles

i. Provision of environmental mitigation and replacement of special category land.

3.2 Scheme Objectives

3.2.1 National Highways has worked with the Department for Transport to agree the following objectives that the Project is to achieve (further information on the Scheme Objectives is set out in Need for the Project (Application Document 7.1)):

a. To support sustainable local development and regional economic growth in the medium to long term

b. To be affordable to government and users

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c. To achieve value for money

d. To minimise adverse impacts on health and the environment

e. To relieve the congested Dartford Crossing and approach roads, and improve their performance by providing free-flowing, north-south capacity

f. To improve resilience of the Thames crossings and the major road network

g. To improve safety

3.2.2 In addition to the objectives above, the Project is being developed in line with the National Policy Statement for National Networks (NPSNN) (Department for Transport, 2014), which sets out government policies for road NSIPs for England.

3.2.3 As the Project includes both gas pipeline and overhead electric line NSIPs, the Overarching National Policy Statement for Energy (EN-1) (NPS EN-1) (Department of Energy and Climate Change (DECC), 2011a), National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (NPS EN-4) (DECC, 2011b) and National Policy Statement for Electricity Networks Infrastructure (EN-5) (NPS EN-5) (DECC, 2011c) have effect and have therefore also been considered.

3.3 Design Principles

3.3.1 This outline LEMP has been created to help ensure the Project can achieve and is in keeping with principles set out in the Design Principles (Application Document 7.5).

3.3.2 In addition to the Design Principles, this outline LEMP has been produced to ensure the new features meet the following broad objectives:

a. Nature conservation and biodiversity – to provide new biodiverse habitats throughout the Project which connect to each other and to existing retained habitat at a landscape level, forming a green corridor along the length of the Project and within specified areas of interest outside the length of the Project to offset the effects of air quality on designated sites

b. Landscape integration – to reflect the surrounding landscape character that the Project route passes through and in areas outside of the Project route, where it has been identified that air quality effects from the Project will have an impact upon designated sites.

c. Visual screening – to screen views of the Project route and infrastructure from existing (and future) visual receptors

3.3.3 Further to the above, this outline LEMP has been produced in line with DMRB Standards GG 103 – Introduction and general requirements for sustainable development and design (Highways England, 2019) and LD 117 – Landscape design (Highways England, 2020c).

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4 Implementation of the Landscape and Ecology Management Plan

4.1 Roles and responsibilities

National Highways

4.1.1 National Highways maintains the responsibility to ensure that the landscape and ecological mitigation as described in the outline LEMP can be successfully delivered, managed and maintained and that the necessary monitoring is undertaken. Establishment of the mitigation and compensation would be undertaken on behalf of National Highways by the Contractor. Ongoing management, maintenance and monitoring, beyond initial establishment periods, would be delivered by National Highways' Operational and Maintenance teams or through agreement with third parties (to be confirmed). These details will be discussed with all stakeholders in the development of the detailed LEMP in accordance with DCO Requirement 5.

4.1.2 National Highways would, through the DCO, have the powers to deliver the measures set out in this oLEMP. National Highways will be responsible for the management of plots outside of the operational highways.

4.1.3 National Highways will continue to be responsible for carrying out routine maintenance of any highways assets within the highways operational boundaries, such as road verges and drainage systems as part of their routine asset management programme this would be undertaken in line with National Highways standards to ensure that the primary function of areas of drainage are maintained.

Contractor

4.1.4 The appointed Contractor will be responsible for the carrying out of all works detailed in the draft DCO (Application Document 3.1) on behalf of National Highways.

4.1.5 The Contractor will be responsible for:

a. restoration and reinstatement of existing habitats and creating the intended habitats in accordance National Highways standards and with the Environmental Masterplan (Application Document 6.2, Figure 2.4) in any temporary or permanent land take areas and compensation areas.

b. constructing any new structures or features.

c. monitoring the establishment of new planting and seeding as set out in Table 4.1 and in line with the detailed landscape scheme specification.

d. replacing planting defects during the contracted establishment periods, provided in Table 4.1, and any other management prescriptions that are scheduled to be undertaken during the establishment period.

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4.1.6 The Contractor will appoint an appropriately experienced and qualified landscaping contractor. The contractor is to be competent at identifying plant species, including those proposed as part of seeded and planted mixes, as well as any undesirable species, and experienced in the various habitat creation and enhancement works required on this Project. Specialist work (such as pond creation, fenland restoration and ancient woodland compensation) may be carried out by specialist sub-contractors appointed by the Contractor where particular specific skills, equipment and/or experience are required.

Stakeholders and other landowners

4.1.7 Land parcels outside of the highways operational boundary may be managed by agreement with third-party stakeholders or adjacent landowners for the permanent management of the habitats and landscape created within. Any agreement would not remove National Highways responsibility under the oLEMP, as secured by Requirement 5 of the DCO. The timing of land hand over would depend on the management capabilities of the identified partner organisation (e.g. third-party stakeholder or adjacent landowner). National Highways will retain the ultimate responsibility for the management and maintenance of all land parcels identified in the oLEMP.

Monitoring party

4.1.8 Monitoring the measures of success is critical. National Highways will appoint a monitoring party to work collaboratively with the advisory group (see further details below) and monitor the outcomes of the works carried out at set intervals during the agreed management/monitoring period (as set out in Table 4.1). The monitoring party will include suitably qualified and experienced ecologists and landscape architects. The ultimate responsibility for the monitoring sits with National Highways.

4.1.9 An annual monitoring report will be prepared by the monitoring party (both during site establishment and up to and including the 'design year') and presented to the advisory group highlighting major works carried out and/or achievements met. This will include detail on:

a. whether measures have been implemented as agreed

b. the relative success / effectiveness of the measures and progress towards target condition (as set out in section 8 Typologies)

c. how to remedy the situation if any of the measures fail

d. whether further consultation / approvals are required in the instance that the proposed measures are not proving effective

4.1.10 Outline 'measures of success' have been provided for relevant habitat typology types shown within section 8 of this document.

Secretary of State

4.1.11 Changes to the specific management objectives or habitat types presented in the LEMP may be proposed by the Contractor(s), third parties or landowners with land management responsibility. These would need to be submitted to the

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SoS on behalf of National Highways. Changes may be approved by the SoS under Schedule 2 to the DCO.

4.1.12 As mentioned, Requirement 5 of the draft DCO requires the LEMP to be developed substantially in accordance with this oLEMP. There is a distinction between matters which are to be included as part of the LEMP which is submitted to the SoS for approval and matters which are required under or pursuant to the LEMP and which will be implemented following approval of the LEMP. This document non-exhaustively uses the phrase “LEMP will require” to refer to the latter circumstance.

Advisory group

4.1.13 An advisory group will be set up to help inform decision making throughout the duration of this LEMP, which would be to the point of establishment of habitat (or such shorter time as the advisory group may agree). The requirement for an advisory group is secured via the outline LEMP (this document), which is secured under Requirement 5 of the DCO. The advisory group will assure LEMP related targets and commitments made to stakeholders. It shall meet regularly and will include a representative from National Highways, local planning and highway authorities listed in Table 2.1, Natural England, Kent Downs Area of Outstanding Natural Beauty (AONB) and local statutory environmental bodies, National Highways’ Contractor and detailed design ecological consultant, and other appropriate parties.

4.1.14 The remit of this advisory group will be to:

a. Oversee the establishment of the habitats (during the establishment monitoring period in line with Table 4.1) or such period as National Highways and the advisory group agree.

b. Provide advice and input in relation to habitat typology, mentioned in Section 8, which would conclude upon the end of the relevant establishment monitoring period or such period as National Highways and the advisory group agree.

c. Advise National Highways on the setting up of a post establishment monitoring and management plan to secure the ecological integrity of the sites in perpetuity (as per National Highways’ in perpetuity management of the soft estate). In perpetuity, in this context, means a minimum period of 125 years (note: this definition is being included at the request of, and has been provided by, Natural England).

d. Oversee the implementation of the oLEMP and subsequent LEMP as approved under Schedule 2 Requirement 5 of the DCO.

e. Review the monitoring outputs.

f. Provide a mechanism to agree matters which are required under or pursuant to the LEMP and which will be implemented following the approval of LEMP.

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g. Provide lines of communication to amend the LEMP should an unforeseen circumstance occur meaning the approved LEMP objectives could not be achieved, following Schedule 2 Paragraph 17 of the Draft DCO.

h. Agree changes to the LEMP (and/or its prescribed management activities) when they are required, or when successful achievements of targets have been met.

4.1.15 Draft terms of reference for the advisory group are included in Appendix 1 and define details such as the meeting chair, the frequency of meetings, how meetings will be administered, how any conflicts will be resolved and the process for any applications in relation to areas identified within this oLEMP which may require modification during the detailed design of areas of habitat.

4.2 Habitat establishment monitoring period

4.2.1 Table 4.1 below describes the duration of establishment monitoring required for each of the landscape/ecology habitat types provided within this outline LEMP.

Table 4.1 Establishment monitoring period

Habitat type	Establishment monitoring period
Grassland management	20 years
Rock and scree	Five years
Woodland (created)	20 years
Amenity tree planting	20 years
Shrub and tree planting	Five years
Hedgerow planting	Five years
Water bodies and marginal / emergent planting	Five years
Wetland habitat	Five years
HRA mitigation at Coalhouse Point	10 years
Ancient woodland compensation areas including soil and material salvage	25 years
Open mosaic habitat Areas	20 years
Acidic grassland soil salvage	20 years
Nitrogen deposition compensation areas (N-Deposition – wildlife rich mosaic habitats, predominantly woodland)	25 years

4.2.2 Outline measures of success and monitoring frequency and methods are provided in Section 8 for each planting typology for the establishment monitoring period shown in Table 4.1.

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4.2.3 In addition to the habitat establishment, the in-perpetuity management and monitoring is important to the success of the mitigation planting areas. The outline measures of success will be refined during detailed design with consideration of key species groups, where necessary, to target ecosystems functionality.

4.3 Securing mechanism

4.3.1 This outline LEMP describes the management requirements for the identified landscape and ecological typologies identified in each management area as described in sections 5, 6 and 7. When the LEMP is developed in accordance with the outline LEMP, the management requirements will develop for each area in discussion with appropriate stakeholders.

4.3.2 The LEMP would be secured through Schedule 2 Requirement 5 of the draft DCO (Application Document 3.1). The LEMP must be prepared substantially in accordance with this outline LEMP, submitted as part of the application.

4.3.3 The LEMP would be submitted for approval by the SoS, following consultation by National Highways with the relevant planning authority and Natural England. Commitments in the LEMP that apply during operation of the Project (such as long-term management and maintenance of landscape/ecology typologies specified in the LEMP) would be retained by National Highways once the contractor has fulfilled their contractual obligations.

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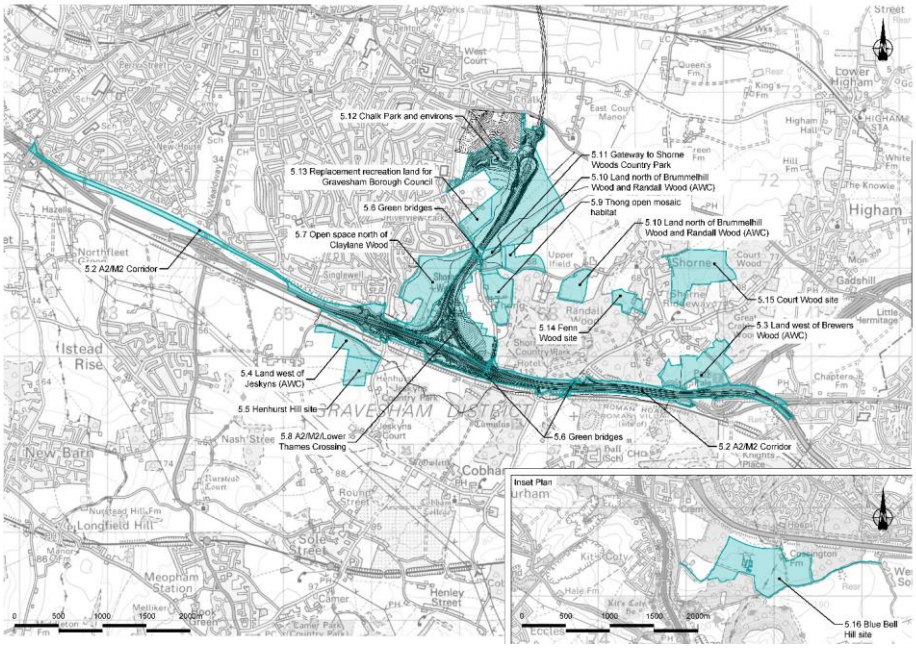
5 Management Areas – South of the River Thames

5.1 Overview

5.1.1 The management areas within the South of the River Thames regional area are shown in Plate 5.1. This section provides a description of the management area, and the outline management requirements for each area.

Plate 5.1 Location of management areas within the South of the River Thames regional area



5.1.2 Management areas 4.2 A2/M2 Corridor and 4.8 A2/M2/Lower Thames Crossing junction, focus on the landscape parcels located adjacent to or within the Project route and the junctions. As such, the management and inspections of these areas will be covered by DMRB standards GM 701 Series 3000 and GS801 Series 3000 documents. However, for completeness, the outline management requirements, and a list of typologies for these management areas are included herein.

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5.2 A2/M2 corridor

Plate 5.2 A2/M2 corridor

Description of management area

5.2.1 This management area is located along the existing A2/M2 corridor, extending from the A2/M2 junction in the east to the Pepper Hill junction in the west. The corridor passes through the Kent Downs AONB and has a heavily wooded character, particularly in the eastern extents of the management area.

5.2.2 The existing A2 dual carriageway is heavily trafficked and is a dominant feature in the landscape, and the separation it creates is reinforced by the High Speed 1 (HS1) corridor that lies to the south of the road. The corridor has woodland planting along the edge, with more recent woodland mitigation planting adjacent to the HS1 corridor.

5.2.3 A Site of Special Scientific Interest (SSSI) designation covers much of the woodland east of Thong with an ecology that includes species of fungi, lichens and bryophytes vulnerable to increased levels of pollution. Protected species are also present. The area forms Shorne Woods Country Park, a popular and well used area of public open space. Shorne Woods Country Park also contains areas of ancient woodland.

5.2.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4) Section 1, Sheets 1-3 and Section 2, Sheets 1-4 and Sheets 15-17.

Management requirements

5.2.5 The management requirements of this area are as follows:

a. To provide appropriate native woodland to screen views from within the Kent Downs AONB. Proposed woodland shall not detract from the existing landscape character of the Kent Downs AONB

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b. To provide appropriate native woodland to offset the loss of woodland along the northern and southern edge of the corridor and extend the range of protected and notable species supported by retained adjacent woodland

c. To provide woodland, scrub and hedgerow planting that reflects the surrounding landscape character in terms of the existing deciduous woodland surrounding arable fields, thick deciduous shaws and hedgerows

d. To establish a diverse palette of local provenance native tree and shrub species that will be reflective of the key characteristics of the West Kent Downs character area

e. To provide woodland edge where woodland has been removed and where other constraints, such as the presence of diverted utilities and lack of space, means woodland planting cannot be achieved. Woodland edge to be managed to retain character of the woodland

f. To ensure inclusion of species with prominent flowering and fruiting within the woodland edge mix, and to dominate the woodland edge, creating a visually diverse roadside and a long season food source for invertebrates, birds and small mammals

Typologies present

5.2.6 The planting and habitat typologies present within this area are listed below:

a. LE1.3 Species-rich grassland

b. LE2.1 Woodland

c. LE2.2 Woodland edge

d. LE2.4 Linear belt of shrubs and trees

e. LE2.5 Shrubs with intermittent trees

f. LE2.7 Scattered trees

g. LE4.4 Native hedgerow with trees

h. LE6.4 Wet grassland

5.2.7 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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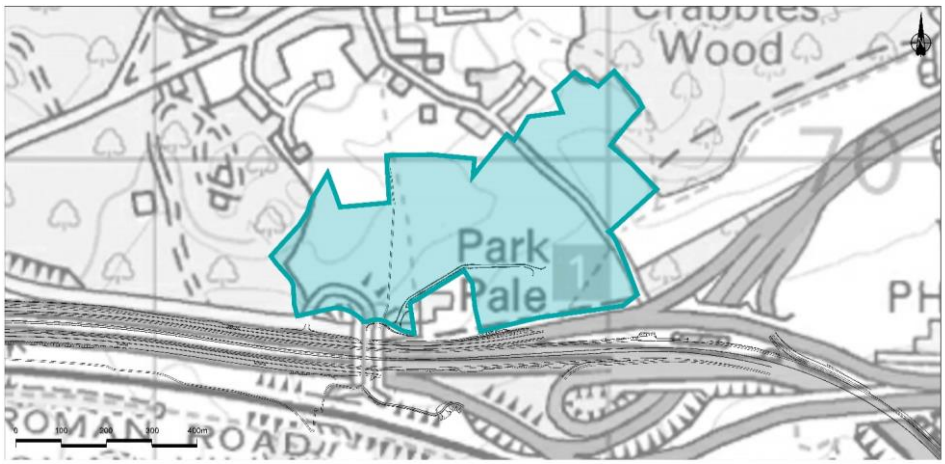
5.3 Land east of Brewers Wood (ancient woodland compensation)

Plate 5.3 Land east of Brewers Wood



Description of management area

5.3.1 This management area is located north of the existing A2/M2 corridor and is located between Brewers Wood to the west and Great Crabbles Wood to the east. The management area is approximately 27ha in size.

5.3.2 The existing landscape is predominantly open grassland with several individual mature trees located on the sloping ground down to the A2 corridor.

5.3.3 This management area is shown in the Environmental Masterplan (Application Document 6.1, Figure 2.4), Section 1, Sheets 1, 2 and 4.

Management requirements

5.3.4 The management requirements of this area are:

a. to provide compensation planting for the loss of ancient woodland, along the A2/M2 corridor and within Shorne Woods Country Park

b. to ensure replacement open space for that lost within Shorne Woods Country Park would be landscaped to complement the existing site and use, linking together and functioning as one. The open space would be limited to the walking, cycling and horse riding (WCH) routes and the open ride and glades, to allow the ancient woodland time to mature

c. to protect new woodland by means of appropriate fencing until established

d. to provide woodland linking Shorne Woods SSSI with Great Crabbles Wood SSSI. This would provide strong connectivity between two areas of ancient woodland, and provide shelter and foraging for woodland fauna, specifically

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for dormouse, although beneficial to great crested newt (GCN) and bat species too. The NVC community recorded in Shorne Woods was W10 (*Quercus robur – Pteridium aquilinum – Rubus fruticosus* woodland), so this newly planted management area should develop into that NVC community.

e. to provide woodland for screening of the Project route whilst retaining key views from the upper slopes of new woodland across to the Darnley Mausoleum

f. to establish open rides and glades along utility diversion routes and along the proposed footpath routes for public access

g. to provide a structurally diverse and graduated woodland edge to the rides

h. to establish and maintain wildlife ponds with a range of depths, macrophyte cover, and shading, in line with published guidance such as the GCN mitigation guidelines (English Nature, 2001)

i. to manage understorey and groundcover planting to deter public access from the formal routes into the woodland, to protect the establishment of the ancient woodland and provide security to neighbouring land and properties

Typologies present

5.3.5 The planting and habitat typologies present within this area are listed below:

a. LE1.3 Species-rich grassland

b. LE8.2 Ancient woodland compensation

c. LE8.5 Ecological ponds

5.3.6 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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5.4 Land west of Jeskyns (ancient woodland compensation)

Plate 5.4 Land west of Jeskyns (ancient woodland compensation)

Description of management area

5.4.1 This management area is located to the west of Jeskyns Community Woodland. The area lies to the south of the A2/M2 corridor and HS1 corridor and adjacent to Church Road. The management area is approximately 10.7ha in size.

5.4.2 Saint Margaret's Church is located approximately 275m to the west of the management area.

5.4.3 The existing area comprises mainly arable fields with a vegetated boundary to Church Road.

5.4.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 2, Sheets 3 and 13.

Management requirements

5.4.5 The management requirements of this area are:

a. to provide compensation planting for the loss of ancient woodland along the A2/M2 corridor, extending the woodland present in Jeskyns Country Park, and providing additional habitat for dormouse, bats and GCN present in habitats south of HS1

b. to create habitat communities which develop into those of local woodlands. Surveys identified local woodlands as NVC communities W10, and W8b (*Fraxinus excelsior – Acer campestre – Mercurialis perennis* woodland) However, given the ongoing prevalence of ash dieback (*Hymenoscyphus fraxineus*), woodland communities with ash present will change as ash trees are lost. Ash trees are not proposed to be planted as part of the Project's

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planting palette so the woodland created in this area would be designed to align with the adjacent W10 community.

c. to retain the existing footpaths that run through the management area

d. to reinstate the historic field patterns by use of hedgerow boundary planting

e. to retain the setting of St Margaret's Church

f. to establish and maintain wildlife ponds with a range of depths, macrophyte cover, and shading, in line with published guidance

g. to integrate the new and upgraded WCH route alongside Church Road

Typologies present

5.4.6 The planting and habitat typologies present within this area are as follows:

a. LE1.3 Species-rich grassland

b. LE4.4 Native hedgerow with trees

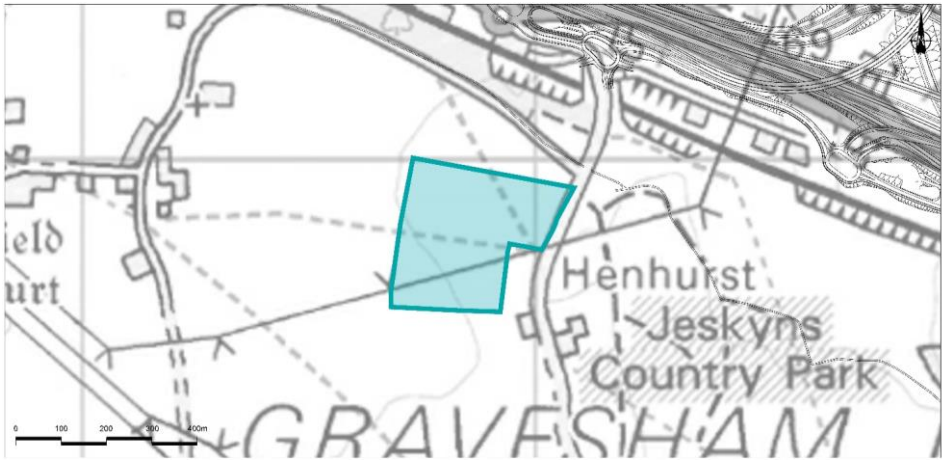
c. LE.8.2 Ancient woodland compensation

d. LE8.5 Ecological ponds

5.4.7 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

5.5 Henhurst Hill site

Plate 5.5 Henhurst Hill site



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Description of management area

5.5.1 This management area is located near to Jeskyns Community Woodland. The area is adjacent to the south of Land west of Jeskyns (Section 4.4 in the outline LEMP).

5.5.2 The existing landscape comprises agricultural fields with hedgerow/ trees/ scrub to the south.

5.5.3 The management area is approximately 9.1ha in size

5.5.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 2, Sheet 13.

Management requirements

5.5.5 The management requirements for this area are:

a. Provide permanent wildlife-rich habitat

b. Primarily woodland at a landscape scale

c. Providing similar or more diverse habitats in recognition of habitats significantly affected by the Project operational N-Deposition effects

d. Providing most ecologically appropriate mosaics of habitats / features for the site

e. Integrating objectives with local nature conservation plans and emerging local nature recovery strategy

f. Assess current condition of sites to identify valuable features to retain and build on as well as remedial actions such as nutrient removal and invasive species management

g. Preferentially achieve habitat creation through natural regeneration wherever possible

h. Integrate biodiversity objectives with other objectives wherever feasible and not undermining the biodiversity objective

   i. Existing interests such as the Community Forest, Landscape, Conservation areas, Heritage assets

   ii. Potential additional benefits such as community benefits e.g. enhanced access

   iii. Avoid significant effects on other receptors

   iv. Ensure security and avoidance of unwanted activities

5.5.6 Further detailed management requirements will be provided during the detailed design phase of the Project, including ongoing consultation with stakeholders including Natural England, Forestry England and Local Authorities.

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Typologies present

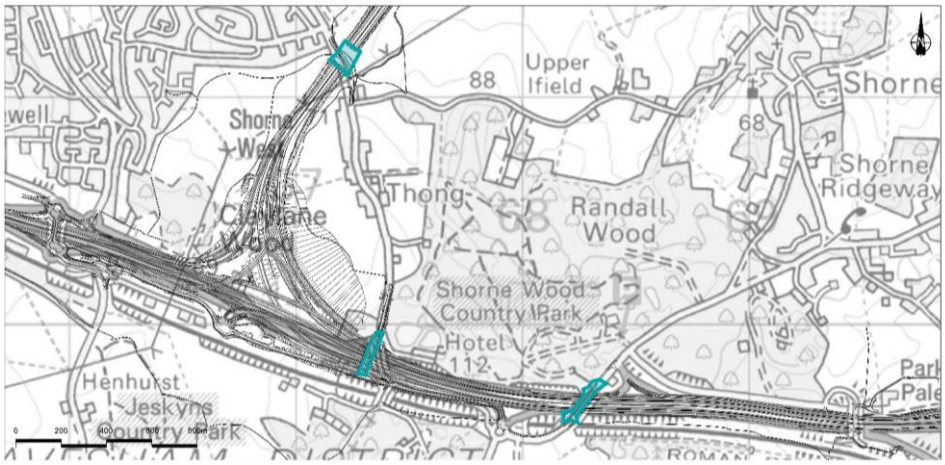
5.5.7 The planting and typologies present within this area are:

a. LE8.7 N-Deposition compensation habitat

5.5.8 The outline management prescriptions and programmes for the typologies listed above are detailed in Section 8 of this document.

5.6 Green bridges (Brewers Road, Thong Lane over A2, Thong Lane over Lower Thames Crossing)

Plate 5.6 Green bridges



Description of management area

5.6.1 This management area contains the green bridges located at Brewers Road bridge and Thong Lane bridge over the existing A2 and the proposed green bridge at Thong Lane over the Project Route.

5.6.2 The green bridges at Brewers Road and Thong Lane over the existing A2 are proposed as ‘lightweight’ green bridges, with the green bridge at Thong Lane over the A122 defined as a ‘heavyweight’ green bridge with tree planting.

5.6.3 Brewers Road green bridge is shown in the Environmental Masterplan (Application Document 6.1, Figure 2.4), Section 1, Sheet 3.

5.6.4 Thong Lane green bridge over the existing A2 Road green bridge is shown in the Environmental Masterplan (Application Document 6.1, Figure 2.4), Section 2, Sheet 1.

5.6.5 Thong Lane green bridge over the Project Route is shown in the Environmental Masterplan (Application Document 6.1, Figure 2.4), Section 2, Sheet 6.

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Management requirements

5.6.6 The management requirements for the green bridges in this management area are:

a. to provide habitat connectivity for species including a range of protected and notable species between Shorne Woods and Ashenbank Woods, Jeskyns and Cobham Park. Key species are dormice, bats, GCN and reptiles, and a range of terrestrial invertebrates. Habitat would be managed to provide strong green corridors providing shelter, foraging in the form of plants which fruit and offer a nectar supply for dormice and invertebrates, and linear features allowing easy detection within the landscape, offering bats strong flight lines across the road. The green corridors would also mitigate habitat severance impacts for badgers and other notable mammals such as hedgehogs, and offer food source for them in the form of invertebrates. The Thong Lane green bridge over the Project Route would mitigate new habitat fragmentation impacts, with the two other bridges over the A2 Road would provide a stronger link north-south between adjacent woodland blocks, notably the two SSSI woodlands of Shorne Wood and Ashenbank Wood.

b. to provide a high-quality experience for users crossing the bridge through vegetation and woodland planting. The green bridge should improve recreation access across the A2/M2/Lower Thames Crossing corridor, locating WCH routes away from the alignment of Thong Lane.

c. to provide a visual connection between the woodlands north and south of the A2/M2/Lower Thames Crossing corridor through planting on, and adjacent to, the green bridge to retain and reinforce the wooded character of the landscape as far as reasonably practicable.

d. to provide tree planting on the green bridge that links into woodland planting to the edge of Gravesend in the west and the gateway to Shorne Woods Country Park in the east as part of a wider ‘wooded circle’ connecting Shorne Woods and Claylane Wood. Woodland should be managed to retain a sense of openness and intervisibility at eye level to make people feel safe when crossing the bridge, and not fully enclosed.

e. to provide focal points on the Project route for road users and act as local landmarks, creating a wooded skyline, visually linking either side of the bridge.

f. to manage shrub and tree planting towards the edge of the bridge structure to ensure branches and trees do not fall onto the carriageway below but retain a connection into habitats adjacent to the ends of each bridge. Tree planting and vegetation to be managed to retain the character of a

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vegetated rural land over the green bridge and tie into the existing Thong Lane character.

g. to establish and manage species that are suitable to the constrained growing conditions and soil depth on the green bridge. Variations in soil depth on the bridge can provide diversity in planting species and heights.

h. to consider a drought-tolerant species make-up which leads to a diverse grassland and shrub mix to resemble a woodland edge crossing the bridge.

i. to provide open grassland areas managed to provide a sheltered corridor across the Project route.

j. To provide a closed canopy over the highway crossing the green bridge at Brewers Road and Thong Lane South as far as reasonably practicable.

Typologies present

5.6.7 The planting and habitat typologies present within this area are:

a. LE1.3 Species-rich grassland

b. LE2.1 Woodland – including non-native species

c. LE2.2 Woodland edge

d. LE2.5 Shrubs with intermittent trees

e. LE2.7 Scattered trees

f. LE4.4 Native hedgerow with trees

5.6.8 The outline management prescriptions and programmes for the typologies listed above are detailed in Section 8 of this document.

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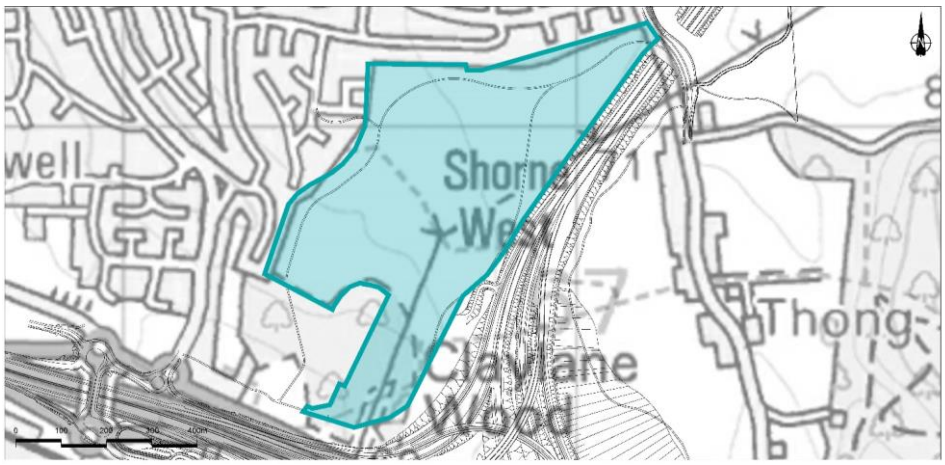
5.7 Open space north of Claylane Wood

Plate 5.7 Open space north of Claylane Wood



Description of management area

5.7.1 This management area is located to the north-west of the A2/M2/Lower Thames Crossing junction, between the Project route and the edge of Gravesend. The area extends from the edge of the existing Claylane Wood in the south up to the new Thong Lane green bridge over the A122 in the north. The management area is approximately 32ha in size.

5.7.2 The land is currently used for agriculture, with overhead high voltage powerlines running through the middle of the area. A hard-surfaced track (NS169) runs through the management area, from Michael Gardens play area on the eastern edge of Gravesend, connecting to footpath NGS167.

5.7.3 The existing land adjoins the village of Thong to the west, which is designated as a Conservation Area, and is characterised by its open, rural setting.

5.7.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 2, Sheets 2-3, 5-6 and Sheet 18.

Management requirements

5.7.5 The management requirements of this area are:

a. to provide woodland planting to the eastern edge of Gravesend, to compensate for the loss of ancient woodland within Claylane Wood. Woodland planting would link into the NVC community W8b at Claylane Wood, It is not proposed to plant ash given the ongoing prevalence of ash dieback (*Hymenoscyphus fraxineus*), so the woodland community that would develop in this area would not align with the adjacent W8b woodlands. However, the proportion of other species proposed would align with those within that community. The woodland planting would mature into

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good quality habitat to offset to the loss of woodland habitat for dormice in the area. The woodland would also support a range of other species present in surrounding woodlands, such as bats, as well as invertebrate assemblages which are present in woodland habitats.

b. to salvage soil and other material where appropriate from the affected ancient woodland areas, and redistribute at the receptor sites that would have been prepared in advance to offer similar ground conditions to that of the donor site.

c. to provide woodland planting on the eastern edge of Gravesend to link Claylane Wood and the proposed planting over Thong Lane green bridge over the A122 as part of a wider 'wooded circle' around the A2/M2/Lower Thames Crossing junction. This would strengthen connectivity between existing and retained blocks of woodland, providing shelter, foraging and commuting habitats for a range of species, particularly dormice and bats. Badgers and amphibians would also utilise the new woodland habitat.

d. to provide woodland planting of suitable depth and quality to provide visual screening for receptors at the eastern edge of Gravesend.

e. to provide woodland edge and shrubs with intermittent tree planting adjacent to Claylane Wood where woodland has been removed and where the presence of diverted utilities, both overhead and underground means woodland planting cannot be achieved. Woodland edge planting would be used by reptiles for cover and hibernation. Bats also forage and commute along woodland edges.

f. to retain an open aspect around the village of Thong, as far as reasonably practicable, by the use of species-rich chalk grassland and wildflower meadow planting. The creation of a diverse grassland sward would provide resource for pollinating insects and the range of bird, amphibian, reptile and bat species which prey on them. This area, together with Chalk Park North, also links the marshes along the banks of the Thames with the woodlands along the A2/M2 corridor which reach further east and south into the wider landscape. The provision of wildlife ponds will further enhance this management area.

g. to manage the open grassland areas so that they reference the historic layout and runways of the former Royal Air Force (RAF) Gravesend.

h. Avoid historic ditch alignment to the north of Claylane Wood and provide demarcation of alignment with wildflower planting and woodland edge

i. To provide public access to areas designated as replacement land

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Typologies present

5.7.6 The planting and habitat typologies present within this area are listed below:

a. LE1.3 Species-rich chalk grassland

b. LE1.32 Species-rich – annual wildflower grassland

c. LE2.2 Woodland edge

d. LE2.8 Scrub / scattered scrub

e. LE4.3 Native species hedge – untrimmed

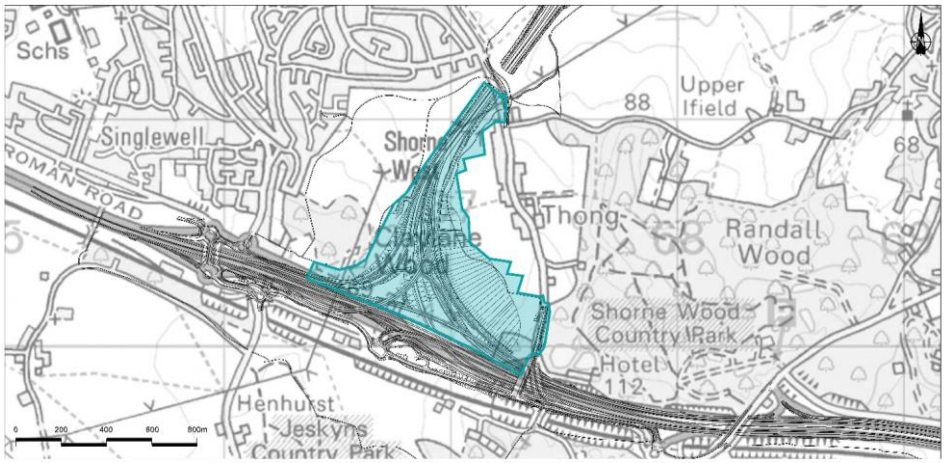
f. LE8.2 Ancient woodland compensation

g. LE8.5 Ecological ponds

5.7.7 The outline management prescriptions and programmes for the typologies listed above are detailed in Section 8 of this document.

5.8 A2/M2/Lower Thames Crossing junction

Plate 5.8 A2/M2/Lower Thames Crossing junction



Description of management area

5.8.1 This management area is located to the north of the existing A2/M2 corridor, between the eastern edge of Gravesend and the village of Thong.

5.8.2 The existing landscape mainly comprises existing arable fields, with some vegetation adjacent to the existing A2 carriageway and paddocks and vegetation around the edge of the village of Thong. The management area is approximately 48ha in size and includes the proposed A2/M2/Lower Thames Crossing and associated structures.

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5.8.3 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 2, Sheets 1-2, Sheets 5-6 and Sheet 19.

Management requirements

5.8.4 The management requirements of this area are:

a. to provide woodland planting within the junction and adjacent slip roads, to provide connectivity between Claylane Woods and Shorne Woods as part of the 'wooded loop' around the junction, enhancing habitat connectivity for a range of species. The woodland being removed from Claylane Wood is NVC community W8b, and the woodland from Shorne Woods Country Park is W10, so planting would be representative, but would not accurately align, with these NVC communities. This is due to the absence of ash within the planting proposals in response to the ongoing prevalence of ash dieback (*Hymenoscyphus fraxineus*), in the area.

b. the woodland planting shall be managed to screen views of the junction, vehicles, and associated structures, including gantries, bridges and overpasses from the wider landscape. Enclosing the junction within woodland planting shall also help ensure views out of the junction are limited and allow drivers to focus on navigating the complex junction.

c. drainage ponds within the junction to be designed and managed with suitable planting and species and layout to integrate into the surrounding landscape.

d. woodland planting between the junction and the village of Thong on false cut earthworks to provide visual screening for residents as well as softening the appearance of the earthworks.

e. reinstatement of woodland planting, and vegetation lost, to integrate the new realigned Thong Lane into the surrounding landscape, replace features lost during construction and to re-establish the woodland edge along the road.

f. no woodland or scrub planting to be planted within visibility splays within the junction. Nearby woodland and scrub planting to be managed to ensure there is no impact on visibility splays.

Typologies present

5.8.5 The planting and habitat typologies present within this area are listed below:

a. LE1.3 Species-rich grassland

b. LE2.1 Woodland

c. LE2.2 Woodland edge

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d. LE2.7 Scattered trees

e. LE2.8 Scrub / scattered trees

f. LE4.4 Native species hedgerow with trees

g. LE6.4 Wet grassland

5.8.6 The outline management prescriptions and programmes for the typologies listed above are detailed in Section 8 of this document.

5.9 Thong open mosaic habitat

Plate 5.9 Thong open mosaic habitat

Description of management area

5.9.1 This management area is located between the village of Thong and the western extents of Shorne Woods Country Park. The existing land is predominantly used for grazing and paddock enclosure, with fencing and small trees and scrub at boundaries.

5.9.2 The management area is approximately 13 ha in size.

5.9.3 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 2, Sheets 19-20.

Management requirements

5.9.4 The management requirements of this area are:

a. to establish a mosaic of open habitat which would provide suitable habitat for the translocation of species including amphibians (notably GCN present in the adjacent SSSI), and reptiles. The relevant typology's planting would also support a range of invertebrates which would form a food source for

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amphibians, reptiles, bats present in adjacent woodland, as well as badgers and other notable mammals.

b. habitat present would be rough grassland, ponds, and patches of bare earth, with scrub blending into the adjacent woodland of Shorne Wood. Habitat would be planted as a patchwork rather than large areas of similar habitat.

c. provision around the site, of hibernacula and refuges for translocated species, based on good practice guidance designs (English Nature, 2001).

Typologies present

5.9.5 The planting and habitat typologies present within this area are listed below:

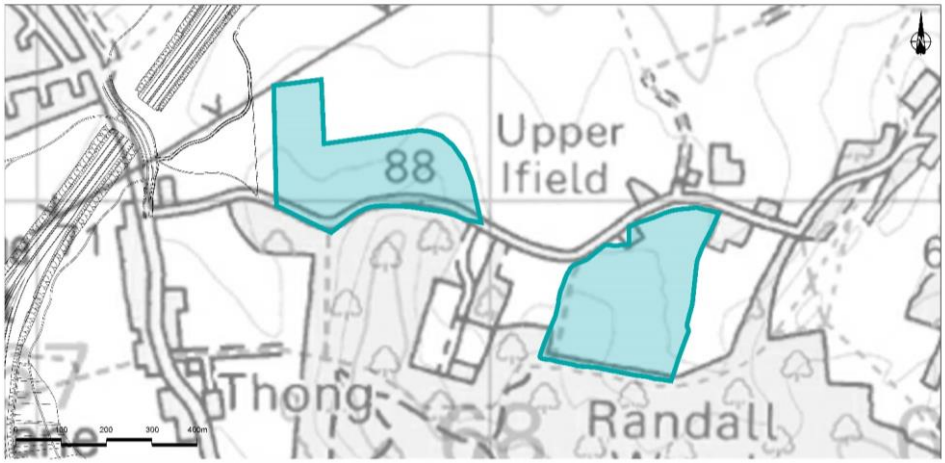
a. LE8.1 Open mosaic habitat

b. LE8.5 Ecological ponds

5.9.6 The outline management prescriptions and programmes for the typologies listed above are detailed in Section 8 of this document.

5.10 Land north of Brummelhill Wood and Randall Wood (ancient woodland compensation)

Plate 5.10 Land north of Brummelhill Wood and Randall Wood (ancient woodland compensation)



Description of management area

5.10.1 This management area is located within two land parcels to the north of Shorne Ifield Road and the existing Brummelhill Wood, and one parcel of land to the south of Shorne Ifield Road adjoining Randall Wood.

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5.10.2 The existing land parcel north of Brummelhill Wood is currently used for agriculture, with intermittent scrub and tree planting along the boundary to Shorne Ifield Way. This management area is approximately 8.5ha in size.

5.10.3 The existing land parcel north of Randall Wood is comprised of agricultural fields, with intermittent scrub and tree planting along the boundary. The management area is approximately 9.2 ha in size.

5.10.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 2, Sheets 20-21.

Management requirements

5.10.5 The management requirements of this area are:

a. to provide woodland planting to the eastern edge of Gravesend, to compensate for the loss of ancient woodland along the A2/M2 corridor and within Shorne Woods Country Park. Woodland planting will link into the NVC community W10 at Shorne Woods, so new habitat should develop into this community. Woodland planting, once established, would provide shelter and foraging for woodland fauna, specifically for dormouse, although beneficial to GCN and bat species too. Wildlife ponds would be provided which would further enhance the biodiversity value of the area. The woodland planting would mature into good quality habitat to increase the provision of woodland habitat for dormice in the area. The woodland would also support a range of other species present in surrounding woodlands, such as bats, as well as invertebrate assemblages which are present in woodland habitats.

b. to create native woodland of appropriate species mix suitable to the locale, with a variable light environment to benefit ground flora species.

c. to retain and enhance the existing wooded character of Shorne Woods, the woodland has been designed to be on the upper slopes, reflective of the surrounding landscape character.

d. The management of woodland required is to not disturb potential underground archaeology.

Typologies present

5.10.6 The planting and habitat typologies present within this area are listed below:

a. LE1.3 Species-rich grassland

b. LE4.4 Native hedgerow with trees

c. LE8.2 Ancient woodland compensation

d. LE8.5 Ecological ponds

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5.10.7 The outline management prescriptions and programmes for the typologies listed above are detailed in Section 8 of this document.

5.11 Gateway to Shorne Woods Country Park

Plate 5.11 Gateway to Shorne Woods Country Park

Deleted: County

Description of management area

5.11.1 This management area is located to the north-east of the village of Thong and north of Shorne Ifield Road.

5.11.2 The existing land is currently utilised as a landscaping/nursery business with outbuildings and areas used to grow nursery stock. The business would be extinguished to accommodate the construction of the Thong Lane over A122 Lower Thames Crossing green bridge, Thong Lane realignment and utilities diversions taking place on the land.

5.11.3 A number of proposed and existing utilities run through the management area, including high voltage overhead powerline diversions and underground high-pressure gas diversions, constraining the planting within this area.

5.11.4 The management area is approximately 7.5ha in size.

5.11.5 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 2, Sheet 6 and Sheet 20.

Management requirements

5.11.6 The management requirements of this area are:

a. to maximise woodland planting between the existing Shorne Woods and the proposed woodland planting on, and adjacent to, Thong Lane green bridge over A122. The woodland from Shorne Woods Country Park is W10, so planting would be representative of this NVC community.

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b. to strengthen the habitat connectivity across the new Thong Lane green bridge and into the newly created and retained habitats east and west of this, including the new planting with the open space north of Claylane Wood and the existing Shorne Wood. This would mitigate habitat fragmentation impacts on ecological receptors such as bats, reptiles, dormice, badgers and other notable mammals.

c. to provide woodland edge planting and open grassland ride and glades where the presence of diverted utilities, both overhead and underground means woodland planting cannot be achieved.

d. to manage open grassland areas to provide formal and informal WCH routes connecting to the wider WCH network.

Typologies present

5.11.7 The planting and habitat typologies present within this area are listed below:

a. LE1.3 Species-rich grassland

b. LE2.1 Woodland

c. LE2.11 Woodland including non-native species

d. LE2.2 Woodland edge

e. LE4.4 Native hedgerow with trees

5.11.8 The outline management prescriptions and programmes for the typologies listed above are detailed in Section 8 of this document.

5.12 Chalk Park and environs

Plate 5.12 Chalk Park and environs

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Description of management area

5.12.1 This management area is located to the north of the proposed green bridge at Thong Lane over the A122 Lower Thames Crossing and extends towards the A226 Gravesend Road.

5.12.2 The management area adjoins the back of existing properties along Thong Lane on the eastern extents as well as adjoining the existing recreational facilities at Cascades Leisure Centre and football pitches adjacent to Thamesview School.

5.12.3 To the south of the management area and located just off Thong Lane is an existing 18-hole golf course named Southern Valley Golf Club. The golf course has been designed in the manner of a traditional links style with undulating topography and areas of open rough grassland, gorse, broom, and scrub planting.

5.12.4 The remaining land within this management area is used for agriculture, with vegetated boundaries and occasional trees. The Project route passes through the centre of the management area and is designed to be in deep cutting, within the underlying chalk geology.

5.12.5 The Project route enters the portal structure within this management area. The portal structure has been designed to accommodate the Tunnel Services Building, located within the cutting of the South Portal, to screen views of the structure from the surrounding landscape.

5.12.6 The Tunnel Services Building has been designed with an extensive green roof to blend seamlessly into the adjacent grassed earthworks, integrating the structure into the landscape.

5.12.7 An access road has been designed to connect the South Portal to the A226. The alignment and character of the access road have been designed to replicate that of a country lane, similar to those found within the local area.

5.12.8 A substation and rendezvous point have been designed off the access road, located near the vicinity of existing barns and farm buildings. The substation and rendezvous point will be integrated and screened from the wider landscape by a mixture of earthworks and woodland planting.

5.12.9 Within this management area, there are several historical boundaries, including the Parish boundary to the east of the South Portal. The boundaries contain gappy hedgerows and remnant hedgerow trees.

5.12.10 The management area is approximately 89ha in size, including the Project route, cutting and South Portal structure.

5.12.11 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 3, Sheets 1-7.

Management requirements

5.12.12 The management requirements of this area are:

a. to provide a semi-natural green space accessible to residents of Gravesend. A catchment gap has been identified for semi-natural green

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spaces within the area. The semi-natural space has been designed to contain a mixture of woodland creation, species-rich grassland and scrub.

b. to provide a wooded hilltop, utilising excavated material from the portal and cutting in keeping with the character of nearby woodlands close to settlements. Woodland to be appropriate to the underlying excavated material used in the creation of the hilltop.

c. to soften the appearance of the excavated material hill with woodland planting, and to create a desirable separation between the edge of Gravesend and the South Portal.

d. to manage the woodland and the top of the hill to include open areas to provide long distance views across the estuary from the summit. Views to be focused towards the River Thames.

e. to provide open species-rich grassland, including chalk grassland where appropriate over the underlying geology. Management of grassland to retain the open views current experienced within this management area, especially on the Public Right of Way (PRoW) network. The creation of a diverse grassland sward, together with scattered scrub and woodland blocks, would provide resources for pollinating insects and the range of bird, amphibian, reptile and bat species which prey on them. This area, together with Chalk Park South, also links the marshes along the banks of the Thames with the woodlands along the A2/M2 corridor which reach further east and south into the wider landscape. The provision of wildlife ponds, established and maintained with a range of depths, macrophyte cover and shading, would further enhance this management area.

f. to follow historic patterns in planting. Small blocks of scrub and woodland planting to screen views of the portal from footpaths and elevated areas where appropriate.

g. to retain the sense of openness, the chalk cutting to be designed and managed to grade back at the top of the cutting to where it meets existing ground levels to allow a natural establishment of chalk grassland on the exposed chalk. Area to be managed to reduce views of bare chalk face and to blend the cutting into the surrounding landscape.

h. to provide new hedgerows to reflect historic patterns and link into existing remnant groups of hedgerow trees. Hedgerow planting to reverse appearance of field aggregation and to screen and integrate the Project into the surrounding landscape. Hedgerow planting would link into adjacent habitats and provide green corridors as flight lines for bats as well as shelter and foraging habitat for dormice. Strengthening links between existing

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woodland habitats also builds resilience into the wider habitat network against pressures such as climate change.

i. to provide woodland planting on earth bunds screening the proposed substation. Woodland planting to soften the appearance of the woodland, blend into existing woodland surrounding the farmstead and to further screen the substation building and security fencing.

j. to integrate the portal structure into the landscape. The portal building would have an extensive green roof of species similar to those within the surrounding landscape.

k. to provide hedgerow and hedgerow tree planting along the emergency access road from the A226 and the South Portal. The access road should appear as typical country land found throughout the local area. Access road follows an historic field boundary and planting should tie into existing remnant hedgerows along the route of the proposed access road.

l. to locate drainage attenuation ponds to the east of the proposed alignment within species-rich grasslands and/or chalk grasslands as appropriate to the underlying geology.

Typologies present

5.12.13 The planting and habitat typologies present within this area are listed below:

a. LE1.3 Species-rich grassland

b. LE1.31 Species-rich grassland chalk grassland

c. LE1.4 Rock and scree

d. LE2.1 Woodland – inc non-native species

e. LE2.2 Woodland edge

f. LE2.8 Scrub / scattered scrub

g. LE4.4 Native hedgerow with trees

h. LE 6.2 Banks and ditches

i. LE6.4 Wet grassland

j. LE7.2 Green roofs

5.12.14 The outline management prescriptions and programmes for the typologies listed above are detailed in Section 8 of this document.

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5.13 Replacement recreation land for Gravesham Borough Council

Plate 5.13 Replacement recreation land for Gravesham Borough Council

Description of management area

5.13.1 This management area is located to the north-west of the proposed Thong Lane green bridge over the A122 Lower Thames Crossing and adjoins the eastern boundary of the Cascades Leisure Centre site.

5.13.2 The management area is located on the existing Southern Valley Golf Club, and the golf course has been designed in the manner of a traditional links style with undulating topography and areas of open rough grassland, gorse, broom, and scrub planting.

5.13.3 The management area includes the existing clubhouse of Southern Valley Golf Club and the access road to the club from Thong Lane.

5.13.4 The management area includes the existing clubhouse of Southern Valley Golf Club and the access road to the club from Thong Lane. The area has been identified as an appropriate site for the relocation of the existing par 3 golf course located to the north of Cascades leisure centre, which is proposed to be permanently acquired in order to form part of the proposed area of public recreational land, known as Chalk Park and environs (see section 5.12 of this document).

5.13.5 However, the Applicant recognises that there are broader proposals for the redevelopment of Cascades Leisure Centre and that Gravesham Borough Council, who own that site, has been exploring the feasibility of alternative locations for the par 3 course in order to maximise the future potential of the site. The Applicant is engaging with Gravesham Borough Council in this regard and is willing to support it in relation to any feasibility work. If an alternative location for the par 3 course were identified and progressed as a result, it would be delivered separately to the Project.

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5.13.6 As a result, the management prescriptions and planting and habitat typologies identified below would only apply in circumstances where the par 3 golf course is sited within this management area. The management area is approximately 8.1ha in size.

5.13.7 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 3, Sheets 1-2.

Management requirements

5.13.8 The management requirements of this area are:

a. alignment of par 3 golf course to allow space between the course and the Project route, to facilitate public access to Chalk Park for users from Thong Lane.

b. a native hedgerow with trees to provide a boundary to par 3 course, and to reflect the existing rural boundaries within that area.

Typologies present

5.13.9 The planting and habitat typologies present within this area are:

a. LE4.4 Native hedgerow with trees

5.13.10 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

5.14 Fenn Wood site

Plate 5.14 Fenn Wood site

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Description of management area

5.14.1 This management area is located to the south of Shorne and to the west of Woodlands Lane. The site lies partly within the Kent Downs AONB.

5.14.2 The existing landscape comprises agricultural fields bordered by hedgerows.

5.14.3 The management area is approximately 5.8ha in size

5.14.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 1, Sheet 5 and Section 2, Sheet 21.

Management requirements

5.14.5 The management requirements for this area are:

a. Provide permanent wildlife-rich habitat

b. Primarily woodland at a landscape scale

c. Providing other habitats in recognition of habitats significantly affected by the Project operational N-Deposition effects

d. Providing most ecologically appropriate mosaics of habitats / features for the site

e. Integrating objectives with local nature conservation plans and emerging local nature recovery strategy and the Kent Downs AONB Management Plan principles and relevant landscape character assessment guidelines

f. Assess current condition of sites to identify valuable features to retain and build on as well as remedial actions such as nutrient removal and invasive species management

g. Preferentially achieve habitat creation through natural regeneration wherever possible

h. Integrate biodiversity objectives with other objectives wherever feasible and not undermining the biodiversity objective

i. Existing interests such as AONB / Landscape, Conservation areas and Heritage assets

j. Potential additional benefits such as community benefits e.g. enhanced access such as improved surfacing, increased connectivity with the surrounding PRoW network, artwork and benches, visitor/ public Information/ education boards and signage in relation to biodiversity, the benefits of natural regeneration and the Kent Downs AONB

k. Habitat creation shall be designed to:

   i. conserve and enhance the existing landscape character of the Kent Downs AONB

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ii. reflect the historic landscape characteristics of the Blue Bell Hill site where appropriate, such as historic field boundaries, recreation of shaws

iii. take opportunities to screen existing visual detractors, for example, overhead power lines and telecommunications masts, in particular those from public rights of way within the site and surrounding landscape (existing and any newly created paths)

iv. maintain any key views and vistas from the Blue Bell Hill site identified through site appraisal

v. ensure new habitats and subsequent management adjacent to public rights of way, including North Downs Way, shall be designed for variety of user interest and to incorporate glimpsed views and vistas

vi. Avoid significant effects on other receptors

vii. Ensure security and avoidance of unwanted activities

5.14.6 Further detailed management requirements will be provided during the detailed design phase of the Project, including ongoing consultation with stakeholders including Natural England and Local Authorities.

Typologies present

5.14.7 The planting and typologies present within this area are:

a. LE8.7 N-Deposition compensation habitat

5.14.8 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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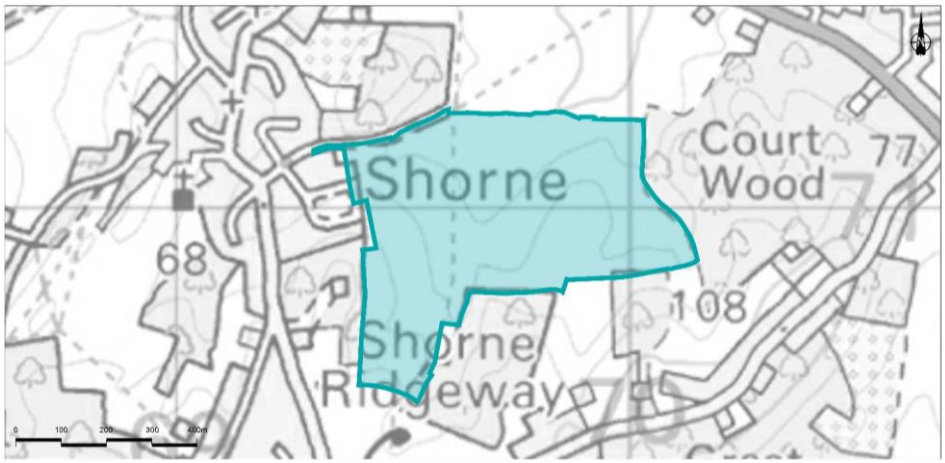
5.15 Court Wood site

Plate 5.15 Court Wood site



Description of management area

5.15.1 This management area is located to the north east of Shorne Ridgeway and lies south of The Warren Local Wildlife Site (LWS) and west of Court Wood ancient woodland and LWS. The existing landscape comprises agricultural fields bordered by hedgerows, scrub and trees.

5.15.2 The management area is approximately 27.7ha in size

5.15.3 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 1, Sheets 6 and 8

Management requirements

5.15.4 The management requirements for this area are:

a. Provide permanent wildlife-rich habitat

b. Primarily woodland at a landscape scale

c. Providing other habitats in recognition of habitats significantly affected by the Project operational N-Deposition effects

d. Providing most ecologically appropriate mosaics of habitats / features for the site

e. Integrating objectives with local nature conservation plans and emerging local nature recovery strategy

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f. Assess current condition of sites to identify valuable features to retain and build on as well as remedial actions such as nutrient removal and invasive species management

g. Preferentially achieve habitat creation through natural regeneration wherever possible

h. Integrate biodiversity objectives with other objectives wherever feasible and not undermining the biodiversity objective

i. Existing interests such as the nearby AONB, Landscape, Conservation areas, Heritage assets

ii. Potential additional benefits such as community benefits e.g. enhanced access

iii. Avoid significant effects on other receptors

iv. Ensure security and avoidance of unwanted activities

5.15.5 Further detailed management requirements will be provided during the detailed design phase of the Project, including ongoing consultation with stakeholders including Natural England and Local Authorities.

Typologies present

5.15.6 The planting and typologies present within this area are:

a. LE8.7 N-Deposition compensation habitat

5.15.7 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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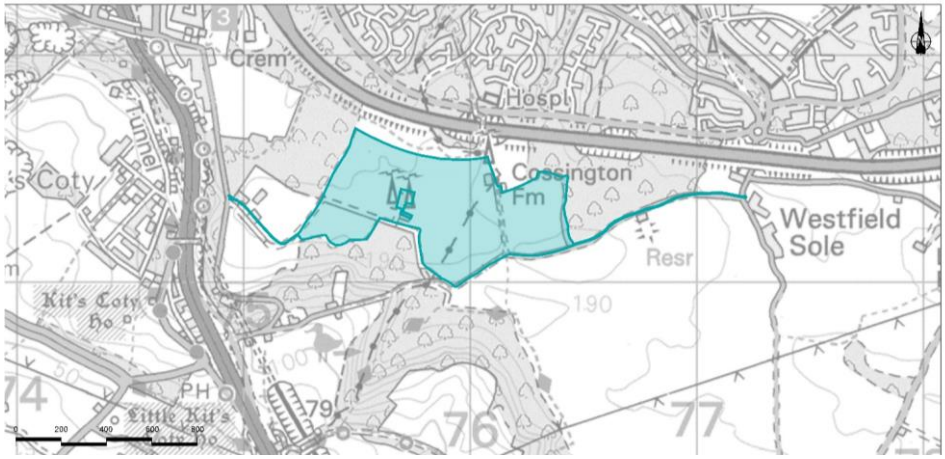
5.16 Blue Bell Hill site

Plate 5.16 Blue Bell Hill site



Description of management area

5.16.1 This management area is located to the south of the M2 between junctions 3 and 4. The site is between Wouldham to Detling Escarpment SSSI to the south west and Malling Wood ancient woodland to the north east. The site is within the Kent Downs AONB,

5.16.2 The existing landscape comprises agricultural fields with associated hedgerows.

5.16.3 The management area is approximately 44.1ha in size

5.16.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 1A, Sheets 1-2.

Management requirements

5.16.5 The management requirements for this area are:

a. Provide permanent wildlife-rich habitat

   i. Primarily woodland at a landscape scale

   ii. Providing other habitats in recognition of habitats significantly affected by the Project operational N-Deposition effects

   iii. Providing most ecologically appropriate mosaics of habitats / features for the site

   iv. Integrating objectives with local nature conservation plans and emerging local nature recovery strategy and the Kent Downs AONB Management Plan principles and relevant landscape character assessment guidelines

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b. Assess current condition of sites to identify valuable features to retain and build on as well as remedial actions such as nutrient removal and invasive species management

c. Preferentially achieve habitat creation through natural regeneration wherever possible

d. Integrate biodiversity objectives with other objectives wherever feasible and not undermining the biodiversity objective

   i. Existing interests such as AONB / Landscape, Conservation areas and Heritage assets

   ii. Potential additional benefits such as community benefits e.g. enhanced access such as improved surfacing, increased connectivity with the surrounding PRoW network, artwork and benches, visitor/ public Information/ education boards and signage in relation to biodiversity, the benefits of natural regeneration and the Kent Downs AONB

   iii. Habitat creation shall be designed to conserve and enhance the existing landscape character of the Kent Downs AONB

e. reflect the historic landscape characteristics of the Blue Bell Hill site where appropriate, such as historic field boundaries, recreation of shaws

f. take opportunities to screen existing visual detractors, for example, overhead power lines and telecommunications masts, in particular those from public rights of way within the site and surrounding landscape (existing and any newly created paths)

g. maintain any key views and vistas from the Blue Bell Hill site identified through site appraisal

h. ensure new habitats and subsequent management adjacent to public rights of way, including North Downs Way, shall be designed for variety of user interest and to incorporate glimpsed views and vistas

i. Avoid significant effects on other receptors

j. Ensure security and avoidance of unwanted activities

5.16.6 Further detailed management requirements will be provided during the detailed design phase of the Project, including ongoing consultation with stakeholders including Natural England, The AONB and Local Authorities.

Typologies present

5.16.7 The planting and typologies present within this area are:

a. LE8.7 N-Deposition compensation habitat

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5.16.8 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

5.17 Shorne and Ashenbank Woods SSSI compensation area

Plate 5.17 Shorne and Ashenbank Woods SSSI compensation area

Description of management area

5.17.1 This management area is a composite of a number of other management areas which, together, provide habitat creation to compensate for the adverse effects of the Project through habitat loss on Shorne and Ashenbank Woods SSSI.

5.17.2 The management area covers areas to the north and west of Shorne and Ashenbank Woods SSSI and includes four individual land parcels within the following management areas. Full details of each management area are provided in the relevant sections above. The areas provided in brackets show the extent of each management area contributing to this Shorne and Ashenbank Woods SSSI compensation area.

a. Section 5.8: A2/M2/Lower Thames Crossing junction (10.0ha)

b. Section 5.9: Thong Open Mosaic Habitat (12.9ha)

c. Section 5.10: Land north of Brummelhill Wood and Randall Wood (9.2ha)

d. Section 5.11: Gateway to Shorne Woods Country Park (0.7ha)

5.17.3 The existing landscape within the Shorne and Ashenbank Woods SSSI compensation area mainly comprises arable fields and horse paddocks with intermittent areas of scrub and trees along the boundaries of these sites.

5.17.4 In total, the four land parcels which comprise this management area cover an area of 32.8ha. They are shown in the ES Figure 2.4: Environmental

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Masterplan, Section 2, Sheets 1, 2, 15, 19, 20 and 21 [**Document Reference 6.1 ES Chapter 7 (2)**].

Deleted: [REP7-116].

Management requirements

5.17.5 Requirements for woodland planting:

a. To provide woodland planting adjacent to Shorne and Ashenbank Woods SSSI, to compensate for the loss woodland habitat within the SSSI. The SSSI supports NVC community W10, so new woodland planting should be managed to develop into this community. Woodland planting, once established, would provide shelter and foraging for woodland fauna, specifically for dormouse, although beneficial to GCN and bat species too. Wildlife ponds would be provided which would further enhance the biodiversity value of the area. The woodland planting would mature into good quality habitat to increase the provision of woodland habitat for dormice in the area. The woodland would also support a range of other species present in surrounding woodlands, such as bats, as well as invertebrate assemblages which are present in woodland habitats.

b. To create native woodland of appropriate species mix suitable to the locale, with a variable light environment to benefit ground flora species.

c. No non-native species would be planted as part of the compensation proposals for this management area.

d. To retain and enhance the existing wooded character of Shorne Woods, the woodland north of Randall Wood has been designed to be on the upper slopes, reflective of the surrounding landscape character.

e. The management of woodland required is to not disturb potential underground archaeology.

5.17.6 Requirements for open mosaic habitat planting:

a. To establish a mosaic of open habitats which would provide suitable habitat for the translocation of species including amphibians (notably GCN present in the adjacent SSSI) and reptiles, and offset the loss of similar habitats from within the boundary of the SSSI. The planting would also support a range of invertebrates which would form a food source for amphibians, reptiles and bats present in adjacent woodland, as well as badgers and other notable mammals.

b. Habitat present would be rough grassland, ponds, and patches of bare earth, with scrub blending into the adjacent woodland of Shorne Wood. Habitat would be planted as a patchwork rather than large areas of similar habitat.

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c. Provision around the site, of hibernacula and refuges for translocated species, based on good practice guidance designs (English Nature, 2001).

Typologies present

5.17.7 The planting and habitat typologies present within this area are listed below:

a. LE2.1 Woodland

b. LE2.2 Woodland edge

c. LE8.1 Open mosaic habitat

d. LE8.2 Ancient woodland compensation

e. LE8.5 Ecological ponds

5.17.8 The outline management prescriptions and programmes for the typologies listed above are detailed in Section 8 of this document.

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6 Management Areas – North of the River Thames to A13 junction

6.1 Overview

6.1.1 The management areas within the North of the River Thames to the A13 junction regional area are shown in Plate 6.1. This section provides a description of the management area, and the outline management requirements for each area.

Plate 6.1 Location of management areas within the North of the River Thames to the A13 junction regional area

6.1.2 Management areas 5.4 Tilbury link, 5.5 Chadwell link and 5.11 A13 junction focus on the landscape parcels located adjacent to, or within the Project route and the junctions. As such the management and inspections of these areas will be covered by DMRB standards GM 701 Series 3000 and GS801 Series 3000 documents. However, for completeness, the outline management requirements and a list of typologies for these management areas are included herein.

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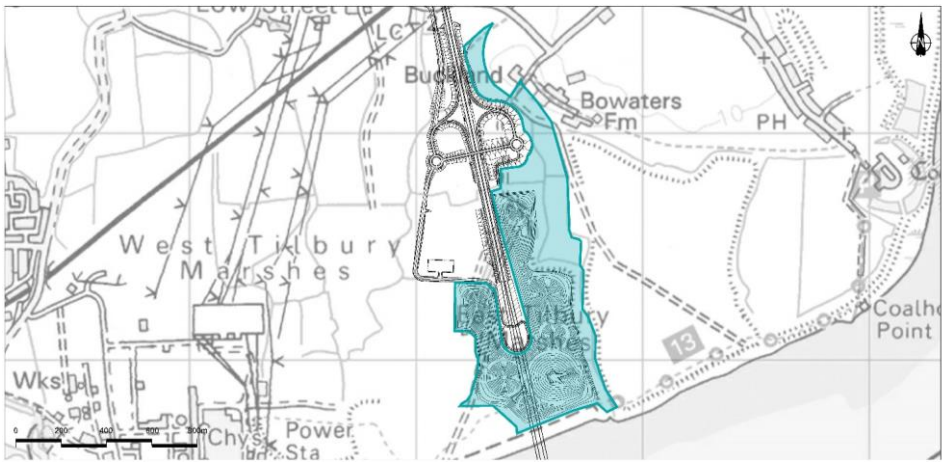
6.2 Tilbury Fields

Plate 6.2 Tilbury Fields



Description of management area

6.2.1 This management area is located on the low-lying Tilbury marshes to the north of the River Thames and is located within the existing Goshems Farm land parcel.

6.2.2 The management area extends to the proposed Thames Freeport area to the west, and East Tilbury landfill to the east.

6.2.3 The northern boundary of the management area is adjacent to the proposed portal and Tunnel Services Building as the Project route emerges from the tunnel.

6.2.4 Goshems Farm is currently undergoing landfill and spoil placement activities and is a constantly evolving landscape. The spoil placement and landfill activities have resulted in the landscape being elevated several metres above existing and this contrasts with the existing retained marshland within the surrounding landscape.

6.2.5 Located to the west of the Tilbury Fields management area, is Tilbury 2. Tilbury 2 is a NSIP and it will be a newly constructed terminal at the Port of Tilbury (PoT) on part of the former Tilbury Power Station site in Thurrock. The development consists of a Roll-on, Roll-off (RoRO) terminal and a Construction Materials and Aggregates terminal (CMAT), and associated infrastructure including rail and road facilities and revisions to the existing marine infrastructure.

6.2.6 Adjacent to the Tilbury Fields management area to the west is the proposed Thames Freeport. The proposed Thames Freeport is an economic zone that benefits from tax reliefs and simplified customs procedures, including Ford's Dagenham plant in the west (the Ford Dagenham Freeport tax site), to DP

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World London Gateway in the east, including the PoT and land to the east of the port in south Thurrock (the Port of Tilbury Freeport Tax Site)

6.2.7 In addition to the ongoing landfill and spoil placement activities, Goshems Farm has been designed to accommodate the excavated material from the tunnel and portal. The proposed design has been provisionally named as Tilbury Fields.

6.2.8 A new public park at Tilbury Fields is proposed to the south and east of the Project route and north portal. Proposed landscaping would provide accessible footpaths to the top of the proposed landform, which connects into the local footpath network.

6.2.9 The proposed design would improve habitat connectivity and new areas of habitat creation within Tilbury Fields would link established ecological habitats to the west, with new habitats further to the east at Mucking Flats and Marshes landfill restoration and Thameside Nature Reserve. The proposed design would also link to other new habitats proposed at Linford (Management Area 5.8) to the north.

6.2.10 The proposed design for the landscape earthworks that utilise the excavated material have drawn inspiration from the landform and geometry of the nearby heritage assets such as Coalhouse Fort and Tilbury Fort, as well as the forts south of the River Thames.

6.2.11 The earthworks have been designed to create targeted views towards these nearby heritage assets, providing a vantage point above the surrounding raised landfill areas.

6.2.12 The existing landscape character within this management area comprises of a low-lying level marshland landscape and areas of land subjected to land raising and landfilling activities. The proposed design seeks to retain the distinction between the natural existing landform and the land filling areas, and to not blend the two. Therefore, the excavated material for the earthworks has been designed to be placed on the Goshem's Farm land parcel already subjected to landfilling activities. Two arable land parcels located between the Project route and East Tilbury landfill have been designed to retain their existing natural low-lying landform, and not subject to earthwork proposals.

6.2.13 In response to the Thames Freeport proposals, the extent of Tilbury Fields has been redesigned to the east of the Project Route, extending from the River Thames Foreshore in the south, to the reinstated Low Street Pits LWS in the north.

6.2.14 The management area is approximately 52ha in size.

6.2.15 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 9, Sheets 1-4, Sheets 16-17 and Sheet 23.

Management requirements

6.2.16 The management aim and objectives of this area are:

a. to establish a mosaic of open habitat which would provide high quality habitat for a range of invertebrate assemblages. This area along the northern edge of the Thames Estuary supports nationally important assemblages of terrestrial invertebrates including key species such as

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the shrill carder bee. The creation of high quality habitat in this area would strengthen links between existing high quality habitats in this area. The relevant typology planting proposals include species specifically to support these invertebrate assemblages.

b. habitat present would be rough grassland, and patches of bare earth, with scrub. Habitat would be planted as a patchwork rather than large areas of similar habitat.

c. to provide hibernacula and refuges for invertebrates, reptiles and amphibians around the site, based on good practice guidance designs (English Nature, 2001).

d. to utilise the varying substrates from the excavated material from the tunnels to create a patchwork of various habitat types.

e. to manage areas within Tilbury Fields on a rotational basis to encourage diversity in the habitats and to create a dynamic, changing landscape, reflective of the surrounding area.

f. to avoid the grassland turning into ‘rank’ grassland, the grassland areas and slopes to be mown in a ‘random’ manner and not a clear annual cut.

g. to avoid large homogenous grass plains.

h. to provide uneven slope profiles on the circular mounds, and provide differing levels of insolation.

i. Appropriate slope faces to be designed with steps and deploying fill materials at varying depths to keep the sward height down and avoid turning into ‘rank grassland’.

j. to include series of 30cm hillocks to increase biodiversity value.

k. to provide signage and interpretation boards to allow public to learn and understand the importance and value of Open Mosaic Habitat. The habitat itself can appear unsightly and can often appear ‘neglected’.

l. To provide signage and interpretation boards to inform public to sensitivity of overwintering birds on the Thames Foreshore to human disturbance.

m. To ensure signage and interpretation boards are suitably robust to minimise need for frequent replacement.

n. Scrub planting to be managed to help strengthen the geometric form of the earthworks.

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Typologies present

6.2.17 The planting and habitat typologies present within this area are:

a. LE6.2 Banks & ditches

b. LE8.1 Open mosaic habitat

6.2.18 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

6.3 Coalhouse Point

Plate 6.3 Coalhouse Point

Description of management area

6.3.1 This management area is located to the west of Coalhouse Fort just to the north of the River Thames.

6.3.2 The management area extends west to a drainage ditch on the boundary of the East Tilbury landfill.

6.3.3 The existing landscape comprises arable, agricultural land, and is low-lying at its natural level in contrast to the surrounding land which has been raised as part of landfill activities.

6.3.4 An existing ditch runs through the middle of the management area, bisecting the area as it runs in a north-south alignment.

6.3.5 The management area is approximately 34.4ha in size.

6.3.6 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4) Section 9, Sheets 15-16, and Sheets 19-20.

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Management requirements

6.3.7 The management aim and objectives of this area are:

a. To provide a series of shallow scrape habitats, high tide roost features and coastal grazing marsh habitat suitable for use for feeding and roosting by the wintering and migrating birds that the Thames Estuary and Marshes Special Protection Area (SPA)/Ramsar is designated for.

b. To provide habitats similar to those immediately north of Tilbury Fort that currently support foraging and roosting qualifying features of the SPA/Ramsar and in line with guidance from Natural England.

c. To create a habitat mosaic that will include provision for shallow brackish water, brackish water edge and (saltmarsh) grassland for feeding waterbirds.

d. To provide water bodies suitable for roosting and islands surrounded by water suitable for roosting.

e. To reinstate partially the former watercourse and ditch network to offset the loss of similar ditches during the Project construction. The ditches would have similar water quality and chemistry to those lost due to the same hydrological connection with the Thames. The newly created ditches would support the range of aquatic macroinvertebrates and macrophytes, and terrestrial invertebrates within the wetland and riparian habitats, as elsewhere within the ditch network.

Typologies present

6.3.8 The planting and habitat typologies present within this area are:

a. LE6.12 Water bodies and associated plants – shallow scrape habitat

b. LE6.13 Water bodies and associated plants – HRA ditch habitat

c. LE6.21 Banks and ditches – high tide roost features

d. LE6.41 Marsh and wet grassland – coastal grazing marsh

6.3.9 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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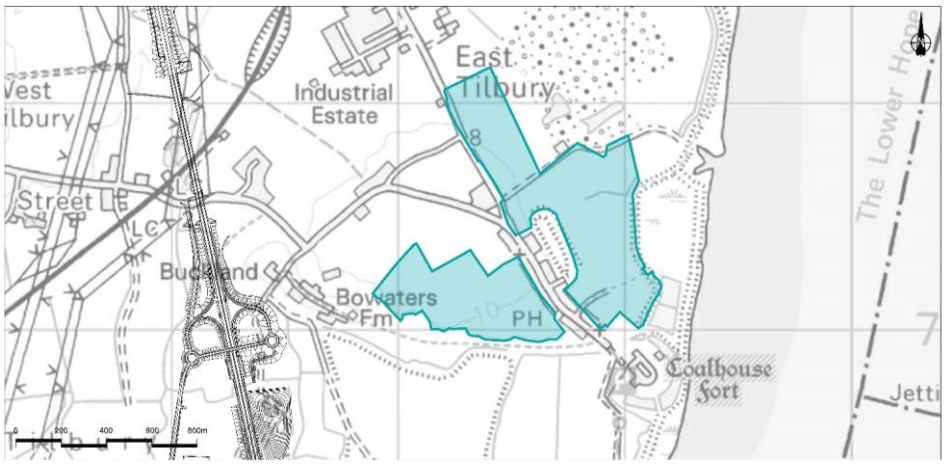
6.4 Coalhouse Fort open mosaic habitat

Plate 6.4 Coalhouse Fort open mosaic habitat area



Description of management area

6.4.1 This management area is located to the north of Coalhouse Fort and comprises nine fields, totalling approximately 63ha in size.

6.4.2 The fields lie both to the east and west of Princes Margaret Road, and on the eastern side, a number of fields adjoin onto the Coalhouse Battery Scheduled Monument that lies outside the Order Limits.

6.4.3 The land is currently used for agriculture with a number of vegetated field boundaries.

6.4.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 9, Sheets 17-18 and Sheets 21-22.

Management requirements

6.4.5 The management requirements of this area are:

a. to act as replacement habitat and a receptor site for translocated species including amphibians (notably GCN), and reptiles. This would also provide optimum invertebrate habitat to offset that lost as a result of the Project, notably around Low Street Pit LWS. As with the Tilbury Fields management area, these areas would strengthen links along the northern edge of the Thames Estuary which supports nationally important assemblages of terrestrial invertebrates including key species such as the shrill carder bee. The relevant typology planting proposals include species specifically to support these invertebrate assemblages.

b. to translocate acid grassland from Low Street Pit LWS to the southern section of the eastern parcel, as identified in the Environmental Masterplan

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(Application Document 6.2, Figure 2.4), Section 9, Sheet 21. Translocation would follow published good practice guidance such as the CIRIA publication (Anderson and Groutage, 2003), and Blakesley et al. (2016).

c. to establish grassland habitat which develops into NVC community U1 (*Festuca ovina – Agrostis capillaris – Rumex acetosella* grassland), currently present within Low Street Pit LWS; and to establish an open mosaic habitat within all other areas of land within this management area, as identified in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 9, Sheets 16-18 and 20-22. The western land parcel area is designed primarily for GCN habitat and, following discussion with Natural England, the ratio of habitats in this area would be 70% grassland, 10% woodland, 10% bare ground and 10% scrub.

d. to manage the open mosaic habitat to be sensitive to the setting of the adjacent scheduled monuments at East Tilbury Battery and Bowaters Battery.

e. to provide active travel routes as part of a heritage trail connecting into the local footpath network.

Typologies present

6.4.6 The planting and habitat typologies present within this area are:

a. LE8.1 Open mosaic habitat

b. LE8.5 Ecological Ponds

c. LE8.6 Translocated acidic grassland

6.4.7 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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6.5 Tilbury link

Plate 6.5 Tilbury link

Description of management area

6.5.1 This management area is located to the north of the River Thames and Goshems Farm. The area extends from the portal and Tunnel Services Building in the south and to Muckingford Road in the north.

6.5.2 The Tilbury Loop railway line passes through the middle of the management area running approximately in an east-west alignment.

6.5.3 The current landscape to the south of the Tilbury Loop railway line mainly comprises existing arable agricultural land, within a long rectilinear field pattern with ditches and watercourses forming the field boundaries. The watercourses are aligned mainly north-south and follow historic drove routes towards the river. Further south the land is currently being used for spoil placement activities and pulverised fuel ash extraction activities.

6.5.4 North of the Tilbury Loop railway line, the existing landscape is used for agriculture, but with a more regular field pattern and vegetated boundaries.

6.5.5 Low Street Pit LWS is located to the east of the proposed Tilbury viaduct as it rises over the Tilbury Loop railway line.

6.5.6 Within this management area the Project route emerges from tunnel in the south and the tunnel ramp continues to embankment so that the proposed carriageway can cross above the Tilbury Loop railway line.

6.5.7 Due to the low-lying ground, a flood protection bund (+7.83m Above Ordnance Datum (AOD)) has been designed around the Tunnel Service Building (TSB) integrated with the Tilbury Fields latest landscape design and along the length of the Project route to the north and south. An operational access on and off the mainline with two roundabouts linked by an over-structure has been designed to facilitate egress and ingress in case of emergency or maintenance purpose.

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The operational access has been designed above flood level and, where required, flood bunds have been included.

6.5.8 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 9, Sheets 1-4 and Section 10 Sheet 1.

Management requirements

6.5.9 The management requirements of this area are:

a. to reinstate the watercourses to the south of the Tilbury Loop railway line, in their former alignment with appropriate bank and ditch vegetation, including wetland trees and scrub. Bank profiles, and bankside and marginal planting would be designed to provide suitable water vole habitat.

b. proposed drainage attenuation basins shall be designed within the operational access junction and be managed to soften the appearance of the engineered pond with woodland planting and be in keeping with the wooded ridge landscape character.

c. Woodland planting within the operational access junction is to be managed to ensure visibility splays are retained, and allow maintenance access to the drainage attenuation basins.

d. to reinstate the character of Low Street Pit for land lost to construction activities with suitable scrub, grassland and scattered trees reflective of the existing condition.

e. to manage woodland planting so it follows the existing wooded ridge in order not to align with the Project route as the proposed carriageway rises above the Tilbury Loop railway line. The woodland shall be managed to create a contrast against the flat marshland landscape and accentuate the ridgeline.

f. to manage woodland planting on the embankment to the north of the Tilbury Loop railway line, to provide visual screening of gantries and infrastructure on the Project route for views from nearby residential properties.

g. to create species-rich grassland along the road verge where a diverse sward would provide resource for pollinating insects and the range of birds, amphibians and reptiles which prey on them. This would also provide a strong green corridor running north-south through the landscape, linking existing and retained habitats present along the route alignment.

h. to manage ditches at the base of proposed embankment and false cut earthworks.

i. To minimise the impact on the landscape of required tunnel operations and facilities buildings

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j. To manage Open Mosaic Habitat, adjacent the project route, to link into existing and proposed habitat sites adjacent to, and further north of the Tilbury Loop line and extending to the new Open Mosaic habitat creation at Linford.

Typologies present

6.5.10 The planting and habitat typologies present within this area are listed below:

a. LE1.3 Species-rich grassland

b. LE2.1 Woodland

c. LE2.2 Woodland edge

d. LE2.4 Linear belt of shrub and trees

e. LE2.5 Shrubs with intermittent trees

f. LE2.7 Scattered trees

g. LE2.8 Scrub / scattered scrub

h. LE6.2 Banks and ditches

i. LE6.4 Wet grassland

j. LE7.2 Green Roofs

k. LE8.1 Open Mosaic Habitat

6.5.11 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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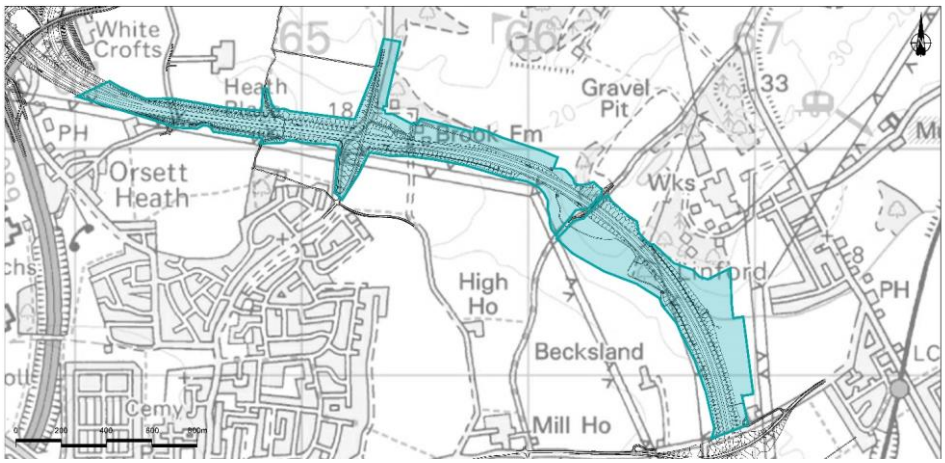
6.6 Chadwell link

Plate 6.6 Chadwell link



Description of management area

6.6.1 This management area extends from Muckingford Road in the south to the A13 junction in the north. The existing landscape mainly comprises arable agricultural fields in a medium-sized irregular pattern. Field boundaries comprise hedgerows with occasional woodland blocks.

6.6.2 Five lines of high voltage overhead powerlines traverse the management area and are dominant vertical features.

6.6.3 The Project route mainly follows the natural valley within the landscape running north and north-west from the Tilbury Marshes. In the base of the valley are several watercourses and water bodies including an existing irrigation reservoir with vegetated and wooded banks.

6.6.4 The Project route is within cutting as it passes beneath Hoford Road and within false cut earthworks through the rest of the management area to provide visual screening.

6.6.5 To the north of the Project route and management area, and west of the Orsett Golf Course, are buried archaeological remains and a Scheduled Monument of a Neolithic causewayed enclosure and an Anglo-Saxon Cemetery.

6.6.6 Woodland areas are mainly located on the upper slopes of the valley and around the Orsett Golf Course and edge of the cement works.

6.6.7 The management area is approximately 65ha in size.

6.6.8 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 10, Sheets 1-5.

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Management requirements

6.6.9 The management requirements of this area are as follows:

a. Woodland planting to be designed and managed to follow the alignment of the natural valley and not to follow the Project route. Woodland shall follow the current pattern and link into existing woodland areas.

b. Woodland planting within the valley shall be managed so as not to obscure views of the existing woodland on the upper slopes from the opposite slopes and should create a layered effect of woodland areas.

c. Areas of grassland shall follow the existing pattern on the lower portions of the slopes.

d. Species-rich grassland along the road verge would create a diverse sward, which would provide resource for pollinating insects and the range of bird, amphibian, and reptile which prey on them. This would also provide a strong green corridor running north-south through the landscape, linking existing and retained habitats present along the route alignment.

e. Banks and ditches to be managed at the toe of the proposed earthworks and hedgerow planting should form a natural boundary and soften the base of the earthworks into the surrounding landscape.

f. Woodland planting between Hoford Road and the Orsett Golf Course to be designed and managed to provide visual screening for users of the PRoW network north, and users of the golf course itself.

g. The proposed woodland shall link into existing woodland around the Orsett Golf Course and the woodland around the cement works.

h. Shrubs with intermittent tree planting shall be designed and managed around the embankments and approaches to the overbridges crossing the Project route. The planting would be managed so it does not obscure views to the woodland on the upper slopes from the opposite slope, and in order to be viewed as a series of layered vegetated areas.

Typologies present

6.6.10 The planting and habitat typologies present within this area are listed below:

a. LE1.3 Species-rich grassland

b. LE2.1 Woodland

c. LE2.2 Woodland edge

d. LE2.22 Scrub woodland

e. LE2.5 Shrubs with intermittent trees

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f. LE2.7 Scattered trees

g. LE2.8 Scrub / scattered scrub

h. LE4.4 Native hedgerow with trees

i. LE6.2 Banks and ditches

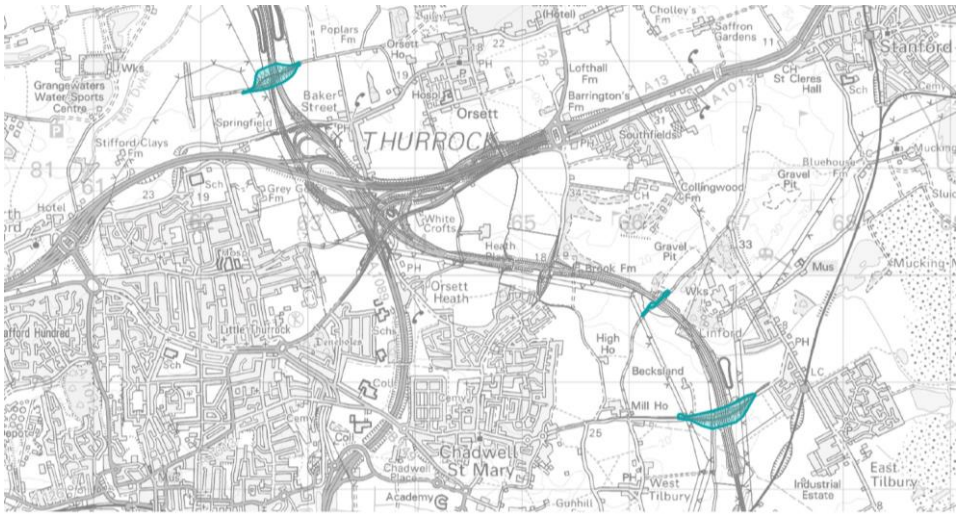
j. LE6.4 Wet grassland

k. LE8.5 Ecological ponds

6.6.11 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

6.7 Green bridges (Muckingford Road, Hoford Road and Green Lane)

Plate 6.7 Green bridges



Description of management area

6.7.1 This management area contains the proposed green bridges over the A122 Lower Thames Crossing at Muckingford Road, Hoford Road and Green Lane.

6.7.2 Muckingford Road green bridge is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 10, Sheet 2.

6.7.3 Hoford Road green bridge is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 10, Sheet 4.

Deleted: Horford

6.7.4 Muckingford Road green bridge is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 11, Sheet 8.

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Management requirements

6.7.5 The management aim and requirements for all of the bridges is:

a. to provide habitat connectivity across the Project route for a variety of protected and notable species including bats, to existing habitats either side of the road alignment. This would mitigate potential fragmentation impacts on species within the area and already using these routes to commute and forage. Habitats on the bridges would be managed to provide strong green corridors providing shelter and foraging opportunities for invertebrates, reptiles and amphibians, and small mammals, and tie into existing habitats allowing easy detection and links out into the wider landscape.

b. to manage shrub and tree planting towards the edge of the bridge structures to ensure branches and trees do not fall onto the carriageway below

c. to establish and manage species that are suited to the constrained growing conditions and soil depth on the green bridges. Variations in soil depth on the bridges can provide diversity in planting species and heights.

6.7.6 The individual management requirements for each bridge are as follows:

Muckingford Road

a. To manage a continuous hedgerow adjacent to Muckingford Road on both sides, to connect the landscape either side of the Project route.

b. Hedgerow planting to be managed to provide suitable wildlife connectivity. Embankments and earthworks to the green bridge to be managed as grassland and a suitable foraging habitat for terrestrial mammals, reptiles, amphibians, and bats.

c. To provide open grassland areas, 7m wide on Muckingford Road green bridge, to be managed to provide a sheltered corridor across the Project route.

Hoford Road

a. To manage a continuous hedgerow and tree planting along both sides of the alignment of Hoford Road to retain the existing character of the road which is designated as a protected lane by Thurrock Council in their Local Plan.

b. Hedgerow planting to be managed to accommodate terrestrial mammals and as a bat commuting corridor from the woodlands to the north of the Project to foraging areas south of the Project.

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Green Lane

a. To design and manage a continuous hedgerow and tree planting that connects the landscape either side of the Project route.

b. The alignment of Green Lane to reflect the existing character of a rural lane.

c. Hedgerow planting to be managed to provide a strong wildlife corridor for terrestrial mammals and particularly bats, following an existing bat commuting route.

d. Shrubs and intermittent tree planting on the southern embankment slopes to the green bridge to be managed to provide visual screening to gantries and infrastructure on the Project route from nearby receptors.

e. Open grassland areas to be managed to provide a sheltered corridor across the Project route.

Typologies present

6.7.7 The planting and habitat typologies present within this area are listed below:

a. LE1.3 Species-rich grassland

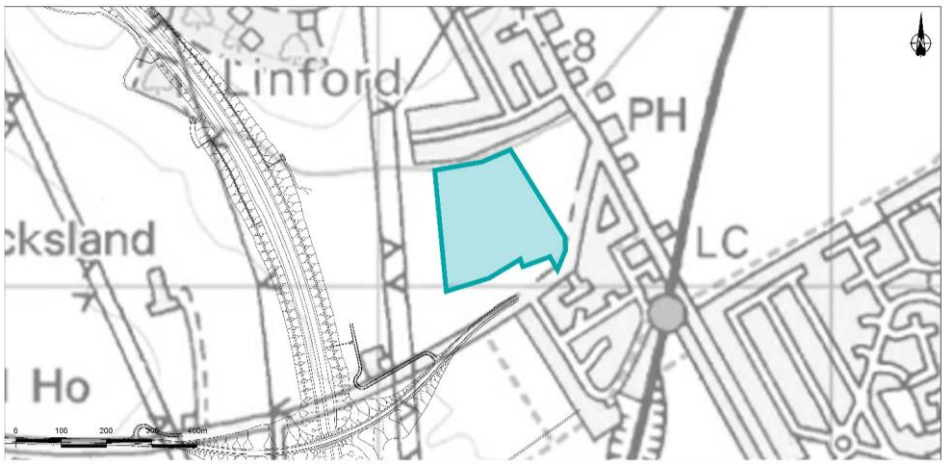
b. LE2.5 Shrubs and intermittent trees

c. LE4.4 Native hedgerow with trees

6.7.8 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

6.8 Linford open mosaic habitat

Plate 6.8 Linford open mosaic habitat



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Description of management area

6.8.1 This management area is located between the residential area of Linford and Muckingford Road, east of the Project route. King George V playing field lies adjacent to the management area on the eastern boundary.

6.8.2 The existing landscape comprises an arable agricultural field with vegetated boundaries on the northern, western and eastern sides of the field.

6.8.3 The management area is approximately 6ha in size.

6.8.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 10, Sheet 2 and Sheets 11-12.

Management requirements

6.8.5 The management requirements of this area are as follows:

a. to establish an area of open mosaic habitat would act as replacement habitat and a receptor site for translocated species including amphibians and reptiles, as well as the invertebrate population present within the grassland habitat currently found in this area. The location of the habitat would create a stepping stone of similar supportive habitats along the route of the Project which would add connectivity between existing isolated pockets of semi-natural habitat within the predominantly arable landscape; habitats such as the grassland, scrub, woodland and hedgerows along the Tilbury and Chadwell links.

b. Habitat present would be rough grassland, scrub, ponds and patches of bare earth, planted as a patchwork rather than large areas of similar habitat.

c. Hibernacula and refuges for translocated species would also be provided around the site, based on good practice guidance designs (English Nature, 2001).

Typologies present

6.8.6 The planting and habitat typologies present within this area are:

a. LE8.1 Open mosaic habitat

b. LE8.5 Ecological ponds

6.8.7 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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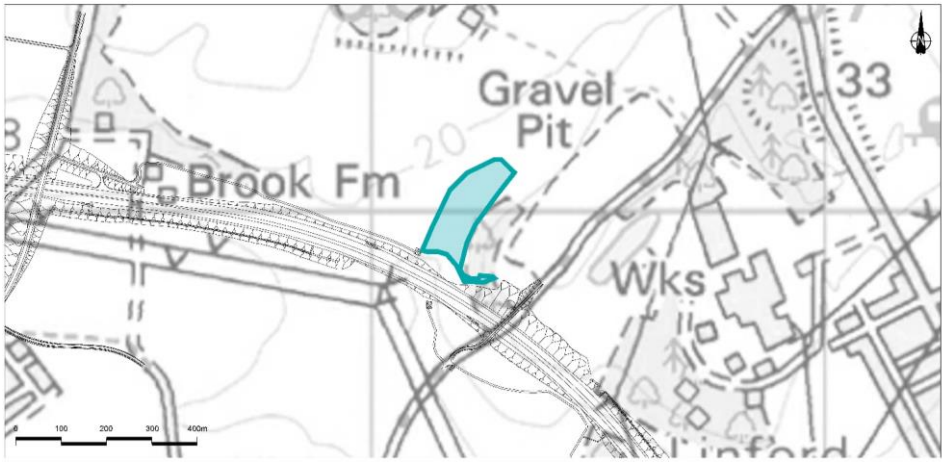
6.9 Rainbow Shaw (ancient woodland compensation)

Plate 6.9 Rainbow Shaw (ancient woodland compensation)



Description of management area

6.9.1 This management area is located to the north of Hoford Road and the Project Road, and lies adjacent to the existing, retained woodland at Rainbow Shaw.

Deleted: Holford

6.9.2 The existing landscape comprises arable agricultural fields.

6.9.3 The management area is approximately 2.1ha in size.

6.9.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 10, Sheet 4.

Management requirements

6.9.5 The management requirements of this area are:

a. To provide woodland planting to offset the loss of ancient woodland and vegetation removal from Rainbow Shaw. The NVC communities recorded in Rainbow Shaw were W8 and W10. Given the ongoing prevalence of ash dieback (*Hymenoscyphus fraxineus*), woodland communities with ash present will change as ash trees are lost. Ash trees are not proposed to be planted as part of the Project's planting palette so the woodland created in this area would be designed to align with the adjacent W10 community.

b. To create a habitat which ties into the retained areas of Rainbow Shaw and provides a variable light environment to benefit ground flora species.

c. To provide a woodland connection between the existing woodland around the cement works and the woodland surrounding Orsett Golf Course in addition to the woodland mitigation planting along the Chadwell link.

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d. Soil and other material where appropriate will be salvaged from the affected ancient woodland areas and redistributed at the receptor sites that would have been prepared in advance to offer similar ground conditions to that of the donor site.

Typologies present

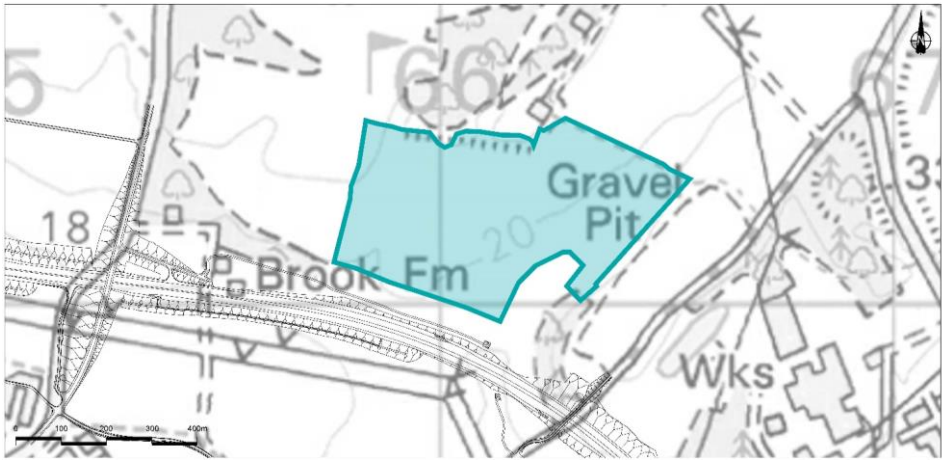
6.9.6 The planting and habitat typologies present within this area are:

a. LE8.2 Ancient woodland compensation

6.9.7 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

6.10 Hoford Road Site

Plate 6.10 Hoford Road site



Description of management area

6.10.1 This management area is located to the north-east of Hoford Road and the Project Road. The area is located to the west of the Buckingham Hill LWS, separated by Hoford Road. The area lies within the Nature Improvement Area (NIA) of the Greater Thames Marshes.

6.10.2 The existing landscape comprises rough grassland, scrub, trees, and woodland.

6.10.3 The management area is approximately 21.6ha in size

6.10.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 10, Sheet 4, Sheets 14-15 and Sheet 17.

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Management requirements

6.10.5 The management requirements for this area are:

a. Provide permanent wildlife-rich habitat:

i. Primarily woodland at a landscape scale

ii. Providing other habitats in recognition of habitats significantly affected by the Project operational N-Deposition effects

iii. Providing most ecologically appropriate mosaics of habitats / features for the site

iv. Integrating objectives with local nature conservation plans and emerging local nature recovery strategy

b. Assess current condition of sites to identify valuable features to retain and build on as well as remedial actions such as nutrient removal and invasive species management

c. Preferentially achieve habitat creation through natural regeneration wherever possible

d. Integrate biodiversity objectives with other objectives wherever feasible and not undermining the biodiversity objective:

i. Existing interests such as Landscape, Conservation areas, Heritage assets

ii. Potential additional benefits such as community benefits e.g. enhanced access

iii. Avoid significant effects on other receptors

iv. Ensure security and avoidance of unwanted activities

6.10.6 Further detailed management requirements will be provided during the detailed design phase of the Project, including ongoing consultation with stakeholders including Natural England and Local Authorities.

Typologies present

6.10.7 The planting and typologies present within this area are:

a. LE8.7 N-Deposition compensation habitat

6.10.8 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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6.11 Buckingham Hill Site

Plate 6.11 Buckingham Hill site

Description of management area

6.11.1 This management area is located to the west of Buckingham Hill Road, north of the junction with Hoford Road. The area an historic landfill site adjacent to Linford Civic Amenity Site.

The existing landscape comprises rough grassland with scrub developing on the historic landfill site.

6.11.3 The management area is approximately 24.4ha in size

This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 10, Sheet 15 and Sheets 18-21.

Management requirements

The management requirements for this area are:

a. Provide permanent wildlife-rich habitat

   i. Primarily woodland at a landscape scale

   ii. Providing other habitats in recognition of habitats significantly affected by the Project operational N-Deposition effects

   iii. Providing most ecologically appropriate mosaics of habitats / features for the site

b. Integrating objectives with local nature conservation plans and emerging local nature recovery strategy

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c. Assess current condition of sites to identify valuable features to retain and build on as well as remedial actions such as nutrient removal and invasive species management

d. Preferentially achieve habitat creation through natural regeneration wherever possible

e. Integrate biodiversity objectives with other objectives wherever feasible and not undermining the biodiversity objective

   i. Existing interests such as Landscape, Conservation areas, Heritage assets

   ii. Potential additional benefits such as community benefits e.g. enhanced access

   iii. Avoid significant effects on other receptors, including any implications of the historical use as a landfill

   iv. Ensure security and avoidance of unwanted activities

6.11.6 Further detailed management requirements will be provided during the detailed design phase of the Project, including ongoing consultation with stakeholders including Natural England and Local Authorities.

Typologies present

6.11.7 The planting and typologies present within this area are:

a. LE8.7 N-Deposition compensation habitat

6.11.8 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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6.12 Ron Evans Memorial replacement land

Plate 6.12 Ron Evans Memorial replacement land

Description of management area

6.12.1 This management area is located to the south-west of the existing A13 junction between the existing Ron Evans Memorial land (also known as Blackshots Nature Reserve) and the edge of Chadwell St Mary.

6.12.2 The current landscape comprises arable, agricultural land with vegetated boundaries to the existing Ron Evans Memorial land.

6.12.3 A number of high voltage overhead powerlines cross the management area.

6.12.4 To the north of the management area lies a crop mark complex, designated as a scheduled monument and listed on the Heritage at Risk Register.

6.12.5 The management area is approximately 14ha in size across both sites.

6.12.6 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 11, Sheet 2, Sheets 5-7 and Sheet 12.

Management requirements

6.12.7 The management requirements of this area are as follows:

a. To provide suitable open space replacement for areas of existing open space to be acquired at the proposed A13 junction.

b. Replacement open space areas to be of a similar character to the existing landscape and to comprise a mixture of rough grassland, scrub and scattered ponds and tree planting. This habitat replacement would provide replacement habitat for the GCN, reptiles and invertebrates found within this area and would link directly into the retained habitat and wider landscape.

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c. Proposed tree and scrub planting and location of ponds towards the north of the management area to consider the impacts on the buried archaeology and be managed so as not to cause disturbance to the heritage assets, as far as reasonably practicable.

d. To ensure that the replacement open space is interlinked and functions as one space which is as accessible to the wider community and users as the existing space.

Typologies present

6.12.8 The planting and habitat typologies present within this area are listed below:

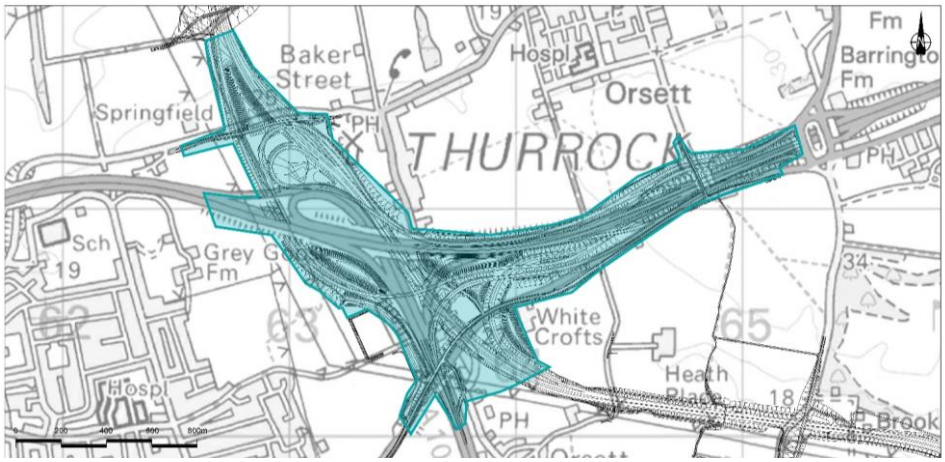
a. LE8.1 Open mosaic habitat

b. LE8.5 Ecological ponds

6.12.9 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

6.13 A13 junction

Plate 6.13 A13 junction



Description of management area

6.13.1 This management area is located within and around the existing A13 junction with the A1089.

6.13.2 The existing landscape comprises mainly arable agricultural fields within the northern, eastern and southern extents of the management area.

6.13.3 There are existing wooded areas associated with, and on the embankments to, the A13 junction and slip roads. The wooded planting on the raised earthworks gives the appearance of a wooded ridge viewed from the north and the south.

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6.13.4 To the north-east of the management lies Baker Street and the village of Orsett which has a Conservation Area designation. Within Baker Street, and adjacent to the Project route is Baker Street Windmill, a Grade II listed building.

6.13.5 The management area also includes the existing A13 alignment as it heads east towards the Orsett Cock Roundabout, the A1013 road from the roundabout towards Chadwell St Mary and the A1089 as it heads south towards Tilbury.

6.13.6 Stifford Clays Road is located within the northern extents of the management area and is proposed to cross an overbridge structure as it crossed the Project route.

6.13.7 The management area is approximately 128ha in size.

6.13.8 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 11, Sheets 1-10 and Sheets 16-17.

Management requirements

6.13.9 The management requirements of this area are as follows:

a. The junction shall focus on woodland planting within the islands, and around the junction and associated earthworks itself.

b. The woodland planting shall be managed to screen views of the A13 junction, vehicles, and associated structures, including gantries, bridges and overpasses from the wider landscape. Enclosing the junction within woodland planting shall also help ensure views out of the junction are limited and allow drivers to focus on navigating the complex junction.

c. Woodland planting on earthworks to be managed to be reflective of the existing wooded ridgeline character.

d. Woodland planting to be managed to soften the appearance of any engineered earthworks associated within the A13 junction and slip roads.

e. No woodland or scrub planting to be planted within visibility splays at the junction. Nearby woodland and scrub planting to be managed to ensure there is no impact on visibility splays.

f. Planting within the ‘islanded’ parcels to require lower frequency of maintenance as there would be limitations on safe access to these parcels of land to manage them.

g. Native hedgerow planting with trees to form boundary to the earthworks of the A13 junction and slip roads and the surrounding landscape.

Typologies present

6.13.10 The planting and habitat typologies present within this area are listed below:

a. LE1.3 Species-rich grassland

b. LE2.1 Woodland – including non-native species

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c. LE2.2 Woodland edge

d. LE2.4 Linear belt of shrubs and trees

e. LE2.5 Shrubs with intermittent trees

f. LE4.4 Native hedgerow with trees

g. LE6.2 Banks and ditches

h. LE6.4 Wet grassland

6.13.11 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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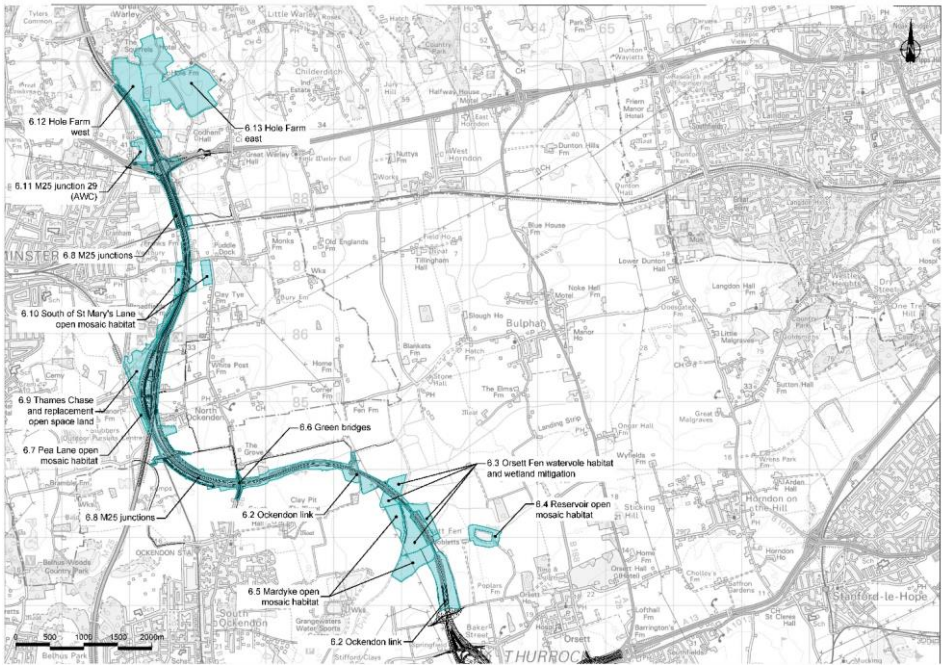
7 Management Areas – North of A13 junction to M25

7.1 Overview

7.1.1 The management areas within the north of the A13 junction to the M25 junction 29 regional area are shown in Plate 7.1. This section provides a description of the management area and the outline management requirements for each area.

Plate 7.1 Location of management areas within the north of the A13 junction to the M25 junction 29 regional area



7.1.2 Management areas 6.1 Ockendon link and 6.5 M25 junction focus on the landscape parcels located adjacent to, or within the Project route and the junctions. As such the management and inspections of these areas will be covered by DMRB standards GM701 3000 and GS801 3000 documents. However, for completeness, the outline management requirements, and a list of typologies for these management areas are included herein.

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7.2 Ockendon link

Plate 7.2 Ockendon link

Description of management area

7.2.1 This management area extends from the A13 junction, north and north-west towards the proposed junction with the M25.

7.2.2 The existing landscape within the management area is predominantly flat and open and comprises areas of former fenland as a result of its low-lying topography and being located within a natural bowl surrounded by higher land.

7.2.3 The majority of the existing landscape is arable, agricultural land of large rectilinear fields with sparse hedgerows and occasional small woodland blocks.

7.2.4 The Mardyke traverses the middle of the management area from the north-east to the south-west where it eventually discharges into the River Thames.

7.2.5 The management area contains Orsett Fen, an area designated as common land. The landscape at Orsett Fen is within Flood Zone 2 and 3 and comprises agricultural land, with PRoWs though the area designated as common land.

7.2.6 Towards the western extent of the management area, the landscape borders with areas of landfill, the landscape of which has been raised as a result.

7.2.7 Further west, the management area passes through an area of woodland planting known as The Wilderness.

7.2.8 The Project route from the south of the management area is mainly within cutting as it passes beneath Green Lane, before it starts to rise on embankment towards Orsett Fen. Within Orsett Fen the Project route is on a combination of viaduct and embankment within the flood zone.

7.2.9 As the Project route moves west beyond the Mardyke, the vertical alignment falls gradually until it is within cutting to provide a suitable clearance beneath North Road green bridge.

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7.2.10 A number of proposed and existing utilities run through the management area, including high voltage overhead powerline diversions and underground high-pressure gas diversions, constraining the planting within this area. The management area is approximately 70ha in size.

7.2.11 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 12, Sheets 1-6.

Management requirements

7.2.12 The management requirements of this area are as follows:

a. Between Green Lane and Orsett Fen, hedgerow planting to reinforce the existing field pattern and replanting and strengthening the existing gappy hedgerows within the area. The hedgerows to be managed to provide visual screening of the Project route.

b. Water bodies in this area to be designed and managed to be located within the existing field patterns and be integrated into the surrounding landscape and not appear engineered.

c. As the Project route rises on embankment, blocks of woodland designed and managed to soften the appearance of engineered earthworks within the flat open landscape. Woodland blocks to comprise species and forms of the local woodland patterns found within the area.

d. Woodland blocks of appropriate species mix to the local character, local provenance and ground conditions to be managed to break up long distance views throughout the open landscape. Management to ensure the woodland block pattern is retained and does not encroach further along the embankment slopes, further exacerbating the Project route.

e. Suitable species to be used and managed on the earthwork slopes and the existing wetter land on and around the proposed Mardyke embankment.

f. Between the Mardyke and North Road, woodland planting to the south of the Project route to be designed and managed to appear as a woodland following the existing and realigned watercourse.

g. On embankments and earthworks to overbridges, shrub and intermittent tree planting to soften the appearance of earthworks and integrate the structures into adjacent landscape.

h. Hedgerows to the north of the Project route, between the Mardyke and North road to follow existing field patterns and be managed to provide visual screening for users of the PRoW network to the north.

i. Hedgerows to be managed to create strong green corridors, providing shelter, foraging and commuting opportunities for a variety of reptile, bird,

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invertebrate, amphibian and mammal species, and linking into the North Road green bridge and the landfill site.

j. Replacement woodland and woodland edge planting within the Wilderness to be managed to reflect the species, form and pattern found within the existing woodland.

k. To maintain public access in accordance with article 54 of the draft Development Consent Order (Application Document 3.1).

Typologies present

7.2.13 The planting and habitat typologies present within this area are:

a. LE1.3 Species-rich grassland

b. LE2.1 Woodland – including non-native species

c. LE2.14 Wet / carr woodland

d. LE2.2 Woodland edge

e. LE2.5 Shrubs with intermittent trees

f. LE4.4 Native hedgerow with trees

g. LE6.2 Banks and ditches

h. LE6.4 Wet grassland

7.2.14 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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7.3 Orsett Fen Water vole habitat and wetland mitigation

Plate 7.3 Orsett Fen Water vole habitat and wetland mitigation

Description of management area

7.3.1 This management area is located within Orsett Fen, which is designated as common land and is former fenland. The management area is within Flood Zones 2 and 3.

7.3.2 The current landscape comprises arable agricultural fields, with gappy hedgerows and ditches forming the boundaries. On the western boundary, the management area borders the Mardyke and Mardyke trail.

7.3.3 The Project route within this management area is a combination of embankment and viaduct as the Project crosses over the flood zones.

7.3.4 The management area is approximately 29.5ha in size.

7.3.5 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 12, Sheets 2-3 and Sheets 15-16.

Management requirements

7.3.6 The management requirements of this area are:

a. to restore the former wetland/fenland character as far as reasonably practicable to integrate the built structure into the wider fenland landscape.

b. to complement the existing character and proposed Orsett Fen open space compensation land through appropriate design and species choice

c. to create a mosaic of wet grassland, dry grassland, marginal and aquatic planting areas alongside a series of ditches and water bodies.

d. to provide 3,000m of watercourses and water bodies designed for colonisation of water vole from the Mardyke and adjacent watercourses.

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This forms an integral part of the water vole mitigation strategy, to offset the loss of habitat predominantly around the north portal.

e. to locate woodland blocks to the south of the management area between water-vole ditches, to help break up long distance views towards the built structures.

f. to retain long distance views beneath the viaduct structure to the surrounding landscape and retain the open landscape character.

g. to reflect the existing hydrological character in use of appropriate planting to the conditions.

Typologies present

7.3.7 The planting and habitat typologies present within this area are:

a. LE1.3 Species-rich grassland

b. LE2.1 Woodland – wet

c. LE2.2 Woodland edge

d. LE2.5 Shrubs with intermittent trees

e. LE2.7 Scattered trees

f. LE4.4 Native hedgerow with trees

g. LE6.2 Banks and ditches

h. LE6.4 Marsh and wet grassland

i. LE8.5 Ecological ponds

7.3.8 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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7.4 Reservoir open mosaic habitat

Plate 7.4 Reservoir open mosaic habitat

Description of management area

7.4.1 This management area is located to the east of Orsett Fen, on an existing reservoir.

7.4.2 The existing reservoir is located within embankments and the existing landscape comprises a mixture of woodland and scrub planting.

7.4.3 The management area is approximately 8.2ha in size.

7.4.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 12, Sheet 14.

Management requirements

7.4.5 The management requirements of this area are as follows:

a. to establish an area of open mosaic habitat would act as replacement habitat and a receptor site for translocated species including amphibians and reptiles, as well as invertebrates. The location of the habitat would create a stepping stone of similar supportive habitats along the route of the Project which would add connectivity between existing isolated pockets of semi-natural habitat within the predominantly arable landscape; habitats such as the grassland, scrub, woodland and hedgerows along the Ockendon Link.

b. Habitat present would be rough grassland, scrub, and patches of bare earth, planted as a patchwork rather than large areas of similar habitat. Hibernacula and refuges for translocated species would also be provided around the site, based on good practice guidance designs (English Nature, 2001).

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Typologies present

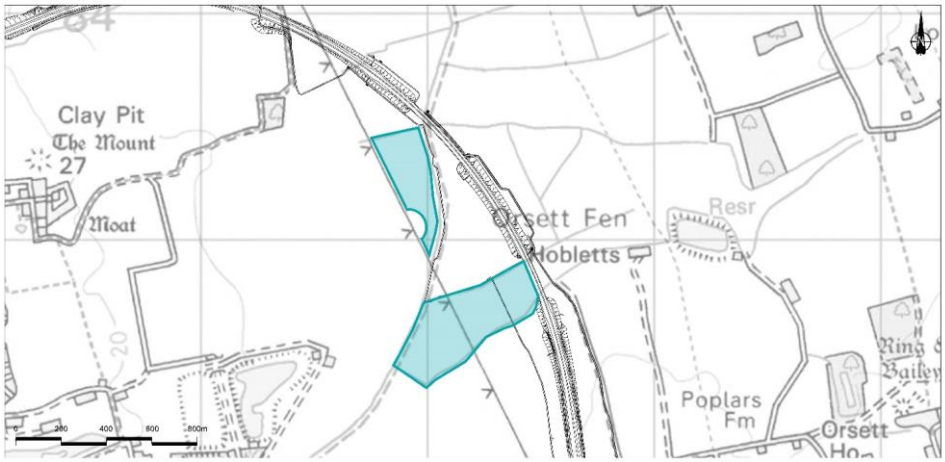
7.4.6 The planting and habitat typologies present within this area are:

a. LE8.1 Open mosaic habitat

7.4.7 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

7.5 Mardyke open mosaic habitat

Plate 7.5 Mardyke open mosaic habitat



Description of management area

7.5.1 This management area comprises two land parcels located either side of the Mardyke. The land parcel east of the Mardyke lies adjacent to the southern boundary of Orsett Fen.

7.5.2 The existing landscape for both parcels comprises medium to large-sized agricultural fields.

7.5.3 The western parcel contains woodland blocks on the eastern boundary adjacent to the Mardyke and associated riparian habitats.

7.5.4 The eastern parcel contains gappy hedgerows to the southern boundary, and small watercourses or ditches form the northern boundary. The Mardyke and the Mardyke Trail form the western boundary.

7.5.5 Both parcels contain overhead power lines running north-south through the management area.

7.5.6 The Project route passes through the eastern land parcel on embankment and viaduct as it crosses the watercourses in this area.

7.5.7 The management area is approximately 23ha in total size.

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7.5.8 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 12, Sheets 1-3 and Sheets 7.

Management requirements

7.5.9 The management requirements of this area are as follows:

a. to establish an area of open mosaic habitat that would act as replacement habitat and a receptor site for translocated species including amphibians and reptiles, as well as invertebrates. The location of the habitat would create a stepping stone of similar supportive habitats along the route of the Project which would add connectivity between existing isolated pockets of semi-natural habitat within the predominantly arable landscape; habitats such as the grassland, scrub, woodland and hedgerows along the Ockendon Link, and complement the adjacent wetland habitat creation at Orsett Fen.

b. Habitat present would be rough grassland, scrub, and patches of bare earth, planted as a patchwork rather than large areas of similar habitat. Hibernacula and refuges for translocated species would also be provided around the site, based on good practice guidance designs (English Nature, 2001).

Typologies present

7.5.10 The planting and habitat typologies present within this area are:

a. LE8.1 Open mosaic habitat

b. LE8.5 Ecological ponds

7.5.11 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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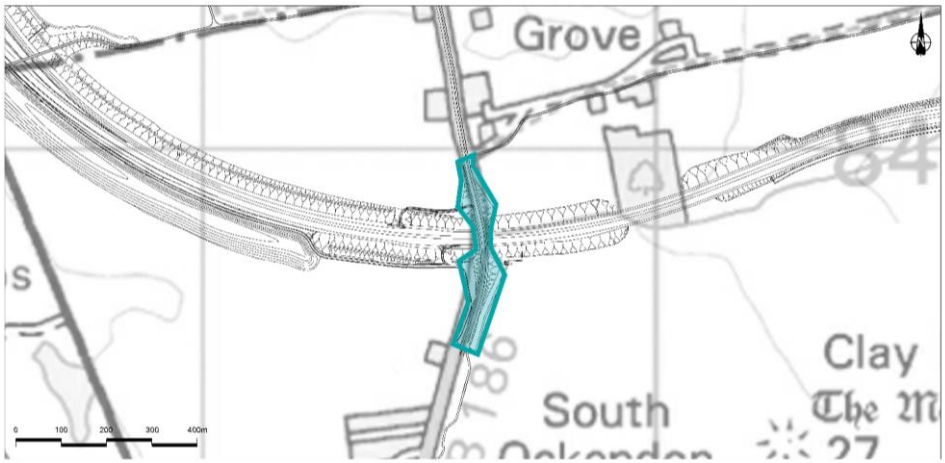
7.6 Green bridges (North Road)

Plate 7.6 Green bridges



Description of management area

7.6.1 This management area is located on the alignment of North Road, between South Ockendon and North Ockendon.

7.6.2 The current character of North Road comprises a rural road with hedgerow planting adjacent, with a small grass verge. The road currently has no safe provision for pedestrians with no footpath or hardstanding running adjacent to the road.

7.6.3 Beyond the hedgerows, North Road is located with existing arable, agricultural fields.

7.6.4 The Project route passes beneath North Road in this location. The proposals include raising North Road above the Project route on a green bridge, with the inclusion of pedestrian and cycle routes connecting North and South Ockendon within the Order Limits.

7.6.5 The management area is approximately 2.5ha in size.

7.6.6 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 12, Sheet 6.

Management requirements

7.6.7 The management requirements of this area are as follows:

a. To design and manage a continuous hedgerow and planting, connecting the landscape either side of the Project route.

b. The alignment of North Road to reflect the existing character of a rural road by replicating hedgerow planting either side of the road and connecting to the existing hedgerows.

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c. Hedgerow planting to be managed to provide a wildlife corridor for invertebrates, reptiles and amphibians, birds, bats and other mammals including badgers, following an existing bat commuting route. This would help mitigate fragmentation impacts as a result of the construction and operation of the Project. Hedgerow planting would provide a strong connection into the wider landscape to facilitate the use of this cross by these species.

d. Open grassland areas, 7m wide, to be managed to provide a sheltered corridor across the Project route.

e. To manage shrub and tree planting towards the edge of the bridge structures to ensure branches and trees do not fall onto the carriageway below but retain a connection into habitats adjacent to the ends of each bridge.

f. Establish and manage species that are suitable to the constrained growing conditions and soil depth on the green bridge. Variations in soil depth on the bridge can provide diversity in planting species and heights.

g. Shrubs with intermittent tree planting on the embankments to the green bridge to be managed to soften the appearance of the earthworks and integrate the structure into the surrounding landscape.

Typologies present

7.6.8 The planting and habitat typologies present within this area are:

a. LE1.3 Species-rich grassland

b. LE2.5 Shrubs with intermittent trees

c. LE4.4 Native hedgerow with trees

7.6.9 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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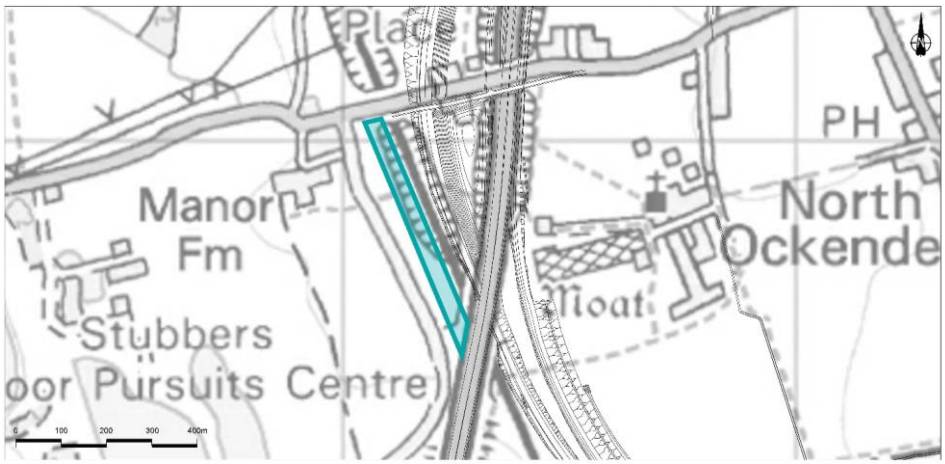
7.7 Pea Lane open mosaic habitat

Plate 7.7 West of Mardyke open mosaic habitat



Description of management area

7.7.1 This management area comprises a land parcel to the west of the M25.

7.7.2 The existing landscape comprises agricultural fields with gappy hedgerows and hedgerow trees.

7.7.3 The land parcel is located between Pea Lane and the London, Tilbury and Southend rail line. The existing landscape comprises agricultural fields with a woodland belt forming the eastern boundary to the existing rail line.

7.7.4 The management area is approximately 2.0ha in size.

7.7.5 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 13, Sheets 2-3.

Management requirements

7.7.6 The management requirements of this area are as follows:

a. to establish an area of open mosaic habitat that would act as replacement habitat and a receptor site for translocated species including amphibians and reptiles, as well as invertebrates. The location of the habitat would create a stepping stone of similar supportive habitats along the route of the Project which would add connectivity between existing isolated pockets of semi-natural habitat within the predominantly arable landscape; habitats such as the grassland, scrub, woodland and hedgerows along the Ockendon Link and M25 junctions.

b. Habitat present would be rough grassland, scrub, and patches of bare earth, planted as a patchwork rather than large areas of similar habitat. Hibernacula and refuges for translocated species would also be provided

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around the site, based on good practice guidance designs (English Nature, 2001).

Typologies present

7.7.7 The planting and habitat typologies present within this area are:

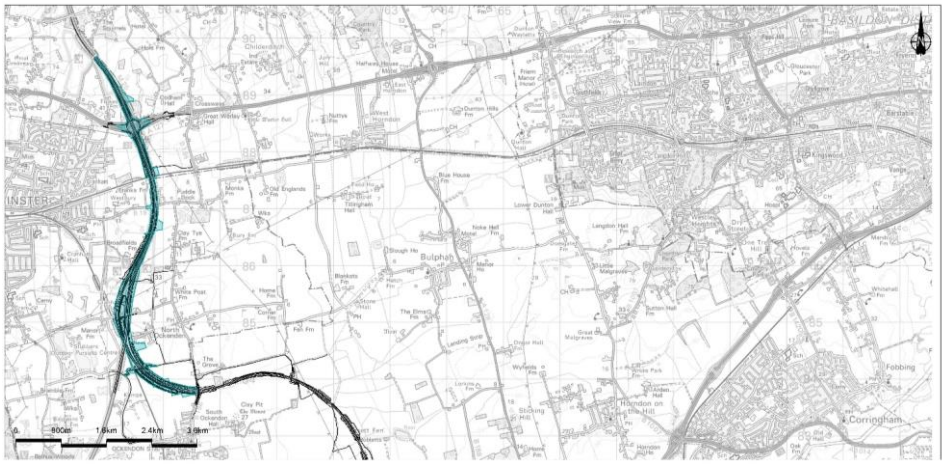
a. LE8.1 Open mosaic habitat

b. LE8.5 Ecological ponds

7.7.8 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

7.8 M25 junctions

Plate 7.8 M25 junctions



Description of management area

7.8.1 This management area extends from North Road green bridge in the south on the Project route, north towards the Folkes Lane overbridge on the M25.

7.8.2 The management area includes the proposed junction and slip roads between the Project route and the M25 and the existing M25 corridor including junction 29.

7.8.3 The varied topography within this management area results in the Project route and M25 passing through a series of cuttings and embankments.

7.8.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 13, Sheets 1-5 and Section 14 Sheets 1-10.

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Management requirements

7.8.5 The management requirements of this area are as follows:

a. To provide suitable planting along the M25 to replace vegetation which has been removed to widen the M25 corridor.

b. Woodland planting to be created and managed within 'islanded' parcels within the proposed junction of Lower Thames Crossing and the M25, and the parcels of land located between the Project route and the railway line.

c. To establish areas of open mosaic habitat to act as replacement habitat and receptor sites for translocated species including amphibians (notably GCN) and reptiles. These areas would be positioned along the Project route so they were in proximity to existing species populations and to provide 'stepping stones' of habitat joining up retained habitats running along the north-south orientation of the Project (Refer to 6.7 Pea Lane – open mosaic habitat and 6.10 South of St Mary's Lane – open mosaic habitat).

d. A land parcel north of Ockendon Road is to be reinstated to agriculture, with woodland planting to perimeter of land parcel permanently acquired by the Project to be managed so as to provide visual screening and to reinforce the wooded character of the junction.

e. The woodland planting shall be managed to screen views of the junction, vehicles and associated structures, including gantries, bridges and overpasses from the wider landscape. Enclosing the junction within woodland planting will also help ensure views out of the junction are limited and allow drivers to focus on navigating the complex junction.

f. Woodland planting to be managed to soften the appearance of any engineered earthworks associated within the junction and slip roads.

g. Woodland planting to the south of the nurseries at Hall Farm to be managed to provide visual screening from the Conservation Area at North Ockendon.

h. No woodland or scrub planting to be planted within visibility splays within the proposed Lower Thames Crossing and M25 junction. Adjacent woodland and scrub planting to be managed to ensure there is no encroachment and impact into visibility splays.

i. Planting within the 'islanded' parcels to be low-maintenance, as there would be limitations on gaining safe access to these parcels of land to manage them.

j. Woodland edge and scrub planting to embankments to overbridges to be managed to soften the appearance of the structure and provide integration into the surrounding landscape.

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k. Woodland planting around the proposed A127 pedestrian bridge west of Junction 29 to be managed to include larger stock trees to replace those lost within the Tree Preservation Order area grouping.

Typologies present

7.8.6 The planting and habitat typologies present within this area are:

a. LE1.3 Species-rich grassland

b. LE2.1 Woodland

c. LE2.1 Woodland – including non-native species

d. LE2.2 Woodland edge

e. LE2.5 Shrubs with intermittent trees

f. LE4.4 Native hedgerow with trees

g. LE6.2 Banks and ditches

h. LE6.4 Wet grassland

7.8.7 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

7.9 Thames Chase and replacement open space land

Plate 7.9 Thames Chase and replacement open space land

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Description of management area

7.9.1 This management area is located to the south of the existing Thames Chase site, between the proposed Lower Thames Crossing to M25 slip road and the existing Upminster and Grays branch rail line.

7.9.2 In addition to the replacement open space land provided to the south of Thames Chase, this management area also includes the land reinstated within Thames Chase itself, adjacent to the proposed slip road.

7.9.3 The existing landscape to the south of Thames Chase comprises arable, agricultural land and has a vegetated boundary to the railway line.

7.9.4 Within the existing Thames Chase site, the landscape is a mixture of maturing woodland planting, open grassland, and formal and informal footpaths as part of the Thames Chase Community Forest.

7.9.5 The management area is approximately 18.5ha in size.

7.9.6 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 13, Sheets 3-5.

Management requirements

7.9.7 The management requirements of this area are as follows:

a. To the south of Thames Chase, the management area is to be designed as replacement land for open space to be acquired within the existing Thames Chase Community Forest.

b. The landscape shall be a mosaic of woodland, woodland edge and open grassland, designed in the same character as the existing Thames Chase site.

c. The replacement open space would be landscaped to complement the existing site and use, linking together and functioning as one.

d. To act as replacement habitat and a receptor site for translocated species including amphibians, particularly GCN. Hibernacula and refuges for translocated species would also be provided around the site, based on good practice guidance designs (English Nature, 2001).

e. Woodland planting on the embankment within the existing Thames Chase area to be managed to provide visual screening of the proposed slip road which is located to the top of the embankment.

f. Species selection, form and pattern of planting within the Thames Chase area to be reflective of the existing character.

Typologies present

7.9.8 The planting and habitat typologies present within this area are:

a. LE8.3 Woodland mitigation

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7.9.9 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

7.10 South of St Mary's Lane open mosaic habitat

Plate 7.10 South of St Mary's Lane open mosaic habitat

Description of management area

7.10.1 This management area comprises two land parcels south of St Mary's Lane, to the east and west of the existing M25.

7.10.2 The western land parcel comprises an existing solar farm and associated infrastructure. The solar farm is to be extinguished as part of the mitigation proposals. The western boundary comprises woodland block planting that forms part of the adjacent Cranham Golf Course. The eastern boundary contains existing scrub planting on the embankment to the M25.

7.10.3 The northern boundary is formed by St Mary's Lane and overgrown hedgerow planting. The southern boundary is formed by woodland and riparian habitats along the existing watercourse. Thames Chase Community Forest lies to the south of this parcel.

7.10.4 The eastern land parcel is existing agricultural fields with dense hedgerow planting forming the field boundaries.

7.10.5 The management area is approximately 8.5ha in size.

7.10.6 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 14, Sheet 1.

Management requirements

7.10.7 The management requirements of this area are:

a. to create and establish an open mosaic habitat to the south of St Mary's Lane. This area is designed primarily as habitat to support GCN. Following

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discussion with Natural England, the ratio of habitat types in this area should be 70% grassland, 10% woodland, 10% bare ground and 10% scrub.

b. to establish a strip of species-rich grassland along the western boundary in the former solar farm parcel, connecting St Mary's Lane and Thames Chase Community Forest.

c. to manage the area of land within the former solar farm designated as replacement open space suitable for public access.

Typologies present

7.10.8 The planting and habitat typologies present within this area are:

a. LE8.1 Open mosaic habitat

b. LE8.5 Ecological ponds

7.10.9 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

7.11 M25 Junction 29 (ancient woodland compensation)

Plate 7.11 M25 Junction 29 (ancient woodland compensation)

Description of management area

7.11.1 This management area is located to the north-west of Junction 29 of the M25. The management area comprises three land parcels located between Folkes Lane and the M25.

7.11.2 The existing landscape is rough grassland with mature hedgerows on the western boundary along Folkes Lane. Woodland block planting is located between the management area and the M25 Junction 29.

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7.11.3 The management area is approximately 5.5ha in size.

7.11.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 14, Sheets 4-5.

Management requirements

7.11.5 The management requirements of this area are:

a. to provide woodland planting to offset the loss of ancient woodland and vegetation removal from the surrounding area. The NVC communities recorded nearby were W8 and W10. Given the ongoing prevalence of ash dieback (*Hymenoscyphus fraxineus*), woodland communities with ash present will change as ash trees are lost. Ash trees are not proposed to be planted as part of the Project's planting palette so the woodland created in this area would be designed to align with the adjacent W10 community.

b. to create a habitat which ties into the retained areas of ancient woodland and provides a variable light environment to benefit ground flora species.

Typologies present

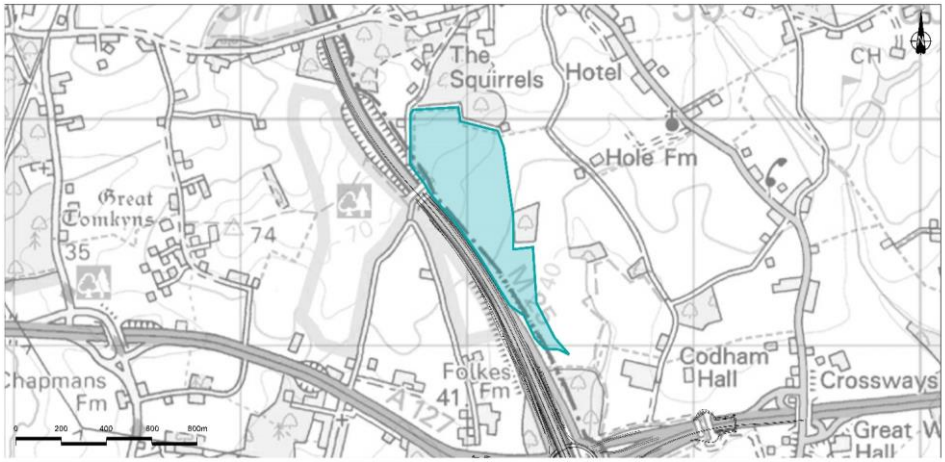
7.11.6 The planting and habitat typologies present within this area are:

a. LE8.2 Ancient woodland compensation

7.11.7 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

7.12 Hole Farm West

Plate 7.12 Hole Farm West



Description of management area

7.12.1 This management area is located to the north-east of the M25.

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7.12.2 The existing landscape comprises agricultural fields that form part of the wider Hole Farm estate. Hole Farm was acquired by National Highways. The management area is approximately 26.0ha in size.

7.12.3 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 14, Sheets 5-6.

Management requirements

7.12.4 The management requirements of this area are:

a. to provide woodland planting to offset the loss of ancient woodland and vegetation removal from the surrounding area. The NVC communities recorded nearby were W8 and W10. Given the ongoing prevalence of ash dieback (*Hymenoscyphus fraxineus*), woodland communities with ash present will change as ash trees are lost. Ash trees are not proposed to be planted as part of the Project's planting palette so the woodland created in this area would be designed to align with the adjacent W10 community.

b. to create a habitat which ties into the retained areas of ancient woodland and provides a variable light environment to benefit ground flora species.

c. To ensure replacement open space for that lost nearby would be landscaped to complement the existing site and use, linking together and functioning as one.

d. To protect new woodland by means of appropriate fencing until established.

e. To provide woodland for screening of the Project Route, whilst retaining key views.

f. To establish open rides and glades along utility and footpath routes for public access.

g. To provide a structurally diverse and graduated woodland edge to the rides.

h. To manage understorey and groundcover planting to deter public access from the formal routes into the woodland. To protect the establishment of the ancient woodland compensation and provide security to the neighbouring land and properties.

Typologies present

7.12.5 The planting and habitat typologies present within this area are:

a. LE8.2 Ancient woodland compensation

7.12.6 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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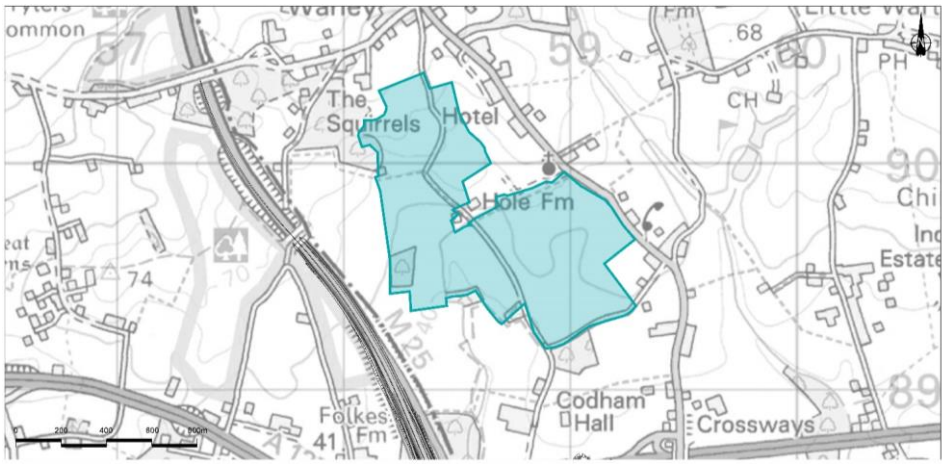
7.13 Hole Farm East Site

Plate 7.13 Hole Farm East



Description of management area

7.13.1 This management area is located to the north-east of the M25.

7.13.2 The existing landscape comprises agricultural fields that form part of the wider Hole Farm estate. Hole Farm was acquired by National Highways

7.13.3 The management area is approximately 75.2ha in size

7.13.4 This management area is shown in the Environmental Masterplan (Application Document 6.2, Figure 2.4), Section 14, Sheets 5-6 and Sheets 14-16.

Management requirements

7.13.5 The management requirements for this area are:

a. Provide permanent wildlife-rich habitat:

   i. Primarily woodland at a landscape scale

   ii. Providing other habitats in recognition of habitats significantly affected by the Project operational N-Deposition effects

   iii. Providing most ecologically appropriate mosaics of habitats / features for the site

   iv. Integrating objectives with local nature conservation plans and emerging local nature recovery strategy

b. Assess current condition of sites to identify valuable features to retain and build on as well as remedial actions such as nutrient removal and invasive species management

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c. Preferentially achieve habitat creation through natural regeneration wherever possible

d. Integrate biodiversity objectives with other objectives wherever feasible and not undermining the biodiversity objective

   i. Existing interests such as AONB / Landscape, Conservation areas, Heritage assets

   ii. Potential additional benefits such as community benefits e.g. enhanced access

   iii. Avoid significant effects on other receptors

   iv. Ensure security and avoidance of unwanted activities

7.13.6 Further detailed management requirements will be provided during the detailed design phase of the Project, including ongoing consultation with stakeholders including Natural England, Forestry England and Local Authorities.

Typologies present

7.13.7 The planting and typologies present within this area are:

a. LE8.7 N-Deposition compensation habitat

7.13.8 The outline management prescriptions and programmes for the typologies listed above are detailed in section 8 of this document.

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8 Habitat typologies

8.1 LE1.3 Species-rich grassland

Description

8.1.1 Species-rich grassland is proposed throughout the Project route, on grass verges, embankments and cutting edges adjacent to the carriageway.

8.1.2 Species-rich grasslands are an integral part of the landscape mitigation, softening the edge of the Project route and integrating it within the surrounding landscape.

8.1.3 LE1.3 Species-rich grassland corresponds to other neutral grassland in good condition within the biodiversity net gain metric v3.1. The time to target condition following habitat creation is 10 years.

Outline requirements

8.1.4 The following outline requirements are for all areas of species-rich grassland and should align with MPI-85-102020 (Highways England, 2020d), and Highways England's Design Manual for Roads and Bridges (DMRB) standards GM 701 Series 3000 (Highways England, 2020a) and GS 801 Series 3000 (Highways England, 2020b)

a. Species-rich grassland to provide a robust and easily managed ground cover for the soft estate around the Project route.

b. Species-rich grassland where possible shall replicate the existing grassland communities within the surrounding landscape or existing on site.

c. Grass species to be appropriate to the location and underlying geology, with a species composition and diversity capable of being maintained by one cut per year.

d. The grassland would be managed to increase biodiversity by providing a diverse range of plant species, which would then support a range of animal species, such as invertebrates, amphibians and reptiles, birds and small mammals.

e. To enhance the biodiversity value of the Project route.

f. To ensure successful establishment of the proposed species.

8.1.5 A list of potential native species planting for LE1.3 species-rich grassland is shown in the appendix to the Design Principles (Application Document 7.5). Species mix shall be developed during the detailed design stage to be tolerant of the roadside verge environment and underlying substrate used in the creation of earthworks.

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Outline prescriptions

8.1.6 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.1.7 Table 8.1 below describes the programme of work for the initial establishment and maintenance (first five years). The text which follows Table 8.1 then outlines the management prescriptions proposed to be implemented for species-rich grassland in perpetuity.

Table 8.1 Outline initial establishment regime

Action			**Years 0-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
It is anticipated that a flush of annual weeds will be present in the soil within the first growing season. Weed growth is to be controlled by topping or mowing monthly. All plant growth (sown grasses and weeds) is to be mown regularly to 40-60mm throughout the first growing season to prevent weeds smothering the slower-growing grasses; cuttings to be removed if dense.	Specialist contractor appointed by National Highways	Monthly during the growing season	Y	N	N	N	N
Planting to be managed according to the location – along verges, planting will require regular mowing to maintain the required visibility splay. Cuttings are to be raked off and removed.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Planting to be managed according to the location – where visibility splay requirements are not required, planting is to be managed as a meadow, allowing the grasses to grow tall, flower and seed from May through to July/August. The grass meadow should be cut in late summer/early autumn and cuttings removed from site.	Specialist contractor appointed by National Highways	Late autumn	N	Y	Y	Y	Y
Injurious weeds are to be eradicated, removed and disposed of offsite, as per the latest Defra/Natural England guidance. Grass swards that do not contain wildflowers can be selectively sprayed. Hand weeding will be required in areas of wildflower.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
In areas where seed has not taken, re-prepare ground and re-seed in autumn.	Specialist contractor appointed by National Highways	In autumn where required	Y	Y	Y	Y	Y

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8.1.8 Following initial establishment, the following management prescriptions are proposed in perpetuity, subject to further discussion with the advisory group during the establishment monitoring period:

a. Species-rich grassland shall be mown annually

b. Species-rich grassland areas that are adjacent to other habitat will be mown less frequently than the main grassland areas.

Outline measure of success

8.1.9 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. The appearance and composition of the vegetation shall closely match the characteristics of other neutral grassland, as described within the UK Habitat classification definitions (Butcher, B., et. Al., 2020).

b. Rotational management will ensure a varied sward height. At least 20% of the sward will be less than 7cm and at least 20% will be more than 7cm in order to successfully create microclimates for insects, birds and small mammals.

c. Cover of bare ground to be between 1% and 5%.

d. Cover of bracken to be less than 20% and cover of scrub less than 5%.

e. There shall be an absence of invasive non-native species (as listed on Schedule 9 of Wildlife and Countryside Act, 1981 as amended).

f. Combined cover of species indicative of sub-optimal condition and physical damage shall account for less than 5% of the total area. Sub-optimal species for this habitat type include creeping thistle (*Cirsium arvense*), spear thistle (*Cirsium vulgare*), curled dock (*Rumex crispus*), broad-leaved dock (*Rumus obtusifolius*), common nettle (*Urtica dioica*), creeping buttercup (*Ranunculus repens*), greater plantain (*Plantago major*), white clover (*Trifolium repens*), cow parsley (*Anthriscus sylvestris*).

g. The sward shall cover at least 90% of the area to be managed to ensure this typology fulfils the environmental function required.

h. Species-rich grassland to support at least 12 or more plant species per m^2, managed to prevent natural succession to scrub and woodland and retain the open grassland character.

i. Target species numbers to be met by Year 5.

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Outline monitoring frequency and methods

8.1.10 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.1.11 After the five-year establishment period, monitoring would be undertaken to assess the success of the grassland in terms of developing into the relevant target priority habitat. This would include surveys following Common Standards Monitoring Guidance for Lowland Grassland Habitats (JNCC, 2004a), and Natural England guidance on the creation of priority grassland habitat (Natural England, 2012). UKHab surveys and condition assessments would also be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a).

8.1.12 These would continue once every five years during the establishment period with the detailed monitoring approach being refined over this period as part of the advisory group discussions. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.1.13 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.2 LE1.31 Species-rich chalk grassland

Overarching aims

8.2.1 Species-rich chalk grassland is proposed within Chalk Park and appropriate areas around the A2/M2/Lower Thames Crossing junction to retain and enhance the existing landscape character and provide biodiversity benefits.

Description

8.2.2 Species-rich chalk grassland are areas of meadow comprising a diverse selection of native perennial wildflowers and grasses that thrive on chalky soil.

8.2.3 This typology is proposed as an integral component of the landscape mitigation design. The specific methodology for the establishment of species-rich chalk grassland will be developed during detailed design and form part of the final LEMP.

8.2.4 Species are to be appropriate to the location or are to reflect existing species already on site, with a composition and diversity capable of being maintained by an annual cut, so that in time, biodiversity interest is developed.

8.2.5 A list of potential species mix is shown for LE1.31 species-rich chalk grassland in the Appendix to the Design Principles (Application Document 7.5) and should be appropriate to the underlying geology and aspect.

8.2.6 LE1.31 Species-rich chalk grassland corresponds to lowland calcareous grassland in good condition within the biodiversity net gain metric. The time to target condition following habitat creation is 20 years.

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Outline requirements

8.2.7 The following outline requirements are for all areas of species-rich chalk grassland and should align with MPI-85-102020 (Highways England, 2020d).

a. To provide visual interest within Chalk Park and the setting of the park with the rolling topography accentuated by the rich flora found within chalk grassland.

b. The chalk grassland would be managed to increase biodiversity by providing a diverse range of plant species, which would support a range of animal species such as invertebrates, amphibians and reptiles, birds and small mammals.

c. The sward shall cover at least 90% of the area to be managed to ensure this typology fulfils the environmental function required.

d. The area shall contain no more than 5% cover of competitive or problem species such as creeping thistle (*Cirsium arvense*), spear thistle (*Cirsium vulgare*), curled dock (*Rumex crispus*), broad-leaved dock (*Rumus obtusifolius*), common nettle (*Urtica dioica*), creeping buttercup (*Ranunculus repens*), greater plantain (*Plantago major*), white clover (*Trifolium repens*), and cow parsley (*Anthriscus sylvestris*).

e. Species-rich grassland to support at least 12 or more plant species per m^2, managed to prevent natural succession to scrub and woodland, and retain the open grassland character.

f. Target species numbers to be met by Year 5.

g. To create grassland habitats that follow the priority habitat descriptions for lowland calcareous grassland (JNCC, 2008a).

Outline prescriptions

8.2.8 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.2.9 Table 8.2 below describes the programme of work for initial establishment and maintenance (first five years).The text which follows Table 8.2 then outlines the management prescriptions proposed to be implemented for species-rich chalk grassland in perpetuity.

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Table 8.2 Outline initial establishment regime

Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
It is anticipated that a flush of annual weeds will be present in the soil within the first growing season. Weed growth is to be controlled by topping or mowing monthly. All plant growth (sown grasses and weeds) is to be mown regularly to 40-60mm throughout the first growing season to prevent weeds smothering the slower-growing grasses. Cuttings to be removed if dense.	Specialist contractor appointed by National Highways	Monthly during the growing season	Y	N	N	N	N
Planting to be managed according to the location – along verges planting will require regular mowing to maintain the required visibility splay. Cuttings are to be raked off and removed.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Planting to be managed according to the location – where visibility splay requirements are not required, planting is to be managed as a meadow, allowing the grasses to grow tall, flower and seed from May through to July/August. The grass meadow should be cut in late summer/early autumn and cuttings should be removed from site.	Specialist contractor appointed by National Highways	Late Autumn	N	Y	Y	Y	Y
Injurious weeds are to be eradicated, removed and disposed of offsite, as per the latest Defra/Natural England guidance. Grass swards that do not contain wildflowers can be selectively sprayed. Hand weeding will be required in areas of wildflower.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
In areas where seed has not taken, re-prepare ground and re-seed in autumn.	Specialist contractor appointed by National Highways	In autumn where required	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y

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8.2.10 Following initial establishment, the following management prescription is proposed in perpetuity subject to further discussion with the advisory group during the establishment monitoring period:

a. Species-rich chalk grassland shall be mown annually

Outline measure of success

8.2.11 To ensure that the management requirements outlined above are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. The appearance and composition of the vegetation shall closely match the characteristics of lowland calcareous grassland, as described within the UK Habitat classification definitions (Butcher, B., et. Al., 2020).

b. Rotational management will ensure a varied sward height. At least 20% of the sward shall be less than 7cm and at least 20% shall be more than 7cm in order to successfully create microclimates for insects, birds and small mammals.

c. Cover of bare ground to be between 1% and 5%.

d. Cover of bracken to be less than 20% and cover of scrub to be less than 5%.

e. There shall be an absence of invasive non-native species (as listed on Schedule 9 of the Wildlife and Countryside Act, 1981 as amended).

f. Combined cover of species indicative of sub-optimal condition and physical damage shall account for less than 5% of the total area. Sub-optimal species for this habitat type include creeping thistle (*Cirsium arvense*), spear thistle (*Cirsium vulgare*), curled dock (*Rumex crispus*), broad-leaved dock (*Rumus obtusifolius*), common nettle (*Urtica dioica*), creeping buttercup (*Ranunculus repens*), greater plantain (*Plantago major*), white clover (*Trifolium repens*), cow parsley (*Anthriscus sylvestris*).

g. The sward shall cover at least 80% of the area to be managed where necessary to ensure this typology fulfils the environmental function required.

h. Species-rich chalk grassland to support 12 or more species of plants capable of thriving even under frequent mowing.

i. Target species numbers to be met by Year 3.

Outline monitoring frequency and methods

8.2.12 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

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8.2.13 After the five-year establishment period, monitoring would be undertaken to assess the success of the grassland in terms of developing into the relevant target priority habitat. This would include surveys following Common Standards Monitoring Guidance for Lowland Grassland Habitats (JNCC, 2004a), and Natural England guidance on the creation of priority grassland habitat (Natural England, 2012). UKHab surveys and condition assessments would also be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). These would continue once every five years during the establishment period with the detailed monitoring approach being refined over this period as part of the advisory group discussions. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.2.14 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.3 LE1.32 Species-rich annual wildflower grassland

Overarching aims

8.3.1 To provide visually vibrant and exciting meadow areas using native species of perennial and annual wildflower and grasses. The annual wildflower meadow is to be managed to reflect the former RAF Gravesend runways within Chalk Park South and provide heritage interest.

Description

8.3.2 Species-rich annual wildflower grassland is an area of meadow comprising a diverse selection of native annual wildflowers and grasses. The meadow area is based on plants completing a one-year life cycle and setting seed for the following year's growth.

8.3.3 This typology is proposed as an integral component of the landscape mitigation design. The specific methodology for the establishment of annual wildflower grassland will be developed during detailed design and form part of the final LEMP.

8.3.4 Species selection is to be appropriate to the location or as exists already onsite, with a species composition and diversity capable of being maintained by one cut per year, so that in time, biodiversity interest is developed.

8.3.5 LE1.32 Species-rich annual wildflower grassland corresponds to Lowland meadows in good condition within the biodiversity net gain metric. The time to target condition following habitat creation is 15 years.

Outline requirements

8.3.6 The following outline requirements are for all areas of species-rich annual wildflower grassland:

a. To provide a visually interesting component to the landscape while establishing and maintaining species-rich swards of differing character,

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including plants that support invertebrate larvae and flowers that attract pollinators at different times of year.

b. The wildflower grassland would be managed to increase biodiversity by providing a diverse range of plant species, which would then support a range of animal species such as invertebrates, amphibians and reptiles, birds and small mammals.

c. To maintain a colourful and species-rich meadow by allowing the more desirable species to flourish; and reduce the vigour of the more extensive species.

d. To create grassland habitats that follow the priority habitat descriptions for lowland meadows.

Outline prescriptions

8.3.7 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.3.8 Table 8.3 below describes the programme of work for initial establishment and maintenance (first five years). The text which follows Table 8.3 then outlines the management prescriptions proposed to be implemented for species-rich annual wildflower grassland in perpetuity.

Table 8.3 Outline initial establishment regime

Action			**Years 0-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect.	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
It is anticipated that a flush of annual weeds will be controlled by the rapid growth of the annual plants so no mowing will be necessary in Year 1. Where visibility splay requirements are not required, planting is to be managed as an annual meadow, allowing the plants to grow tall, flower and seed from May through to July/August. The annual meadow should be cut back in late summer, cleared, and cultivated. An annual cultivation is essential for re-establishment from self-sown seed.	Specialist contractor appointed by National Highways	Early autumn	N	Y	Y	Y	Y
Planting to be managed according to the location – along verges planting will require regular mowing to maintain the required visibility splay. Cuttings are to be raked off and removed.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y

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Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Injurious weeds are to be eradicated, removed, and disposed of offsite, as per the latest Defra/Natural England guidance. Grass swards that do not contain wildflowers can be selectively sprayed. Hand weeding will be required in areas of wildflower.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
In areas where seed has not taken, re-prepare ground and re-seed in autumn.	Specialist contractor appointed by National Highways	In autumn where required	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y

8.3.9 Following initial establishment, the following management prescriptions are proposed in perpetuity subject to further discussion with the advisory group during the establishment monitoring period:

a. Species-rich annual wildflower grassland shall be mown annually.

Outline measure of success

8.3.10 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. The appearance and composition of the vegetation will closely match the characteristics of Lowland meadows, as described within the UK Habitat classification definitions (Butcher, B., et. al., 2020).

b. Rotational management will ensure the sward height will be varied. At least 20% of the sward will be less that 7cm and at least 20% will be more than 7cm in order to successfully create microclimates for insects, birds and small mammals.

c. Cover of bare ground will be between 1% and 5%. This can include localised areas such as rabbit warrens.

d. There will be an absence of invasive non-native species (as listed on Schedule 9 of Wildlife and Countryside Act, 1981 as amended).

e. Combined cover of species indicative of sub-optimal condition and physical damage will account for less than 5% of the total area. Sub-optimal species include creeping thistle (*Cirsium arvense*), spear thistle (*Cirsium vulgare*), curled dock (*Rumex crispus*), broad-leaved dock (*Rumus obtusifolius*), common nettle (*Urtica dioica*), creeping buttercup (*Ranunculus repens*),

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greater plantain (*Plantago major*), white clover (*Trifolium repens*), cow parsley (*Anthriscus sylvestris*).

f. The sward shall cover at least 90% of the area to be managed to ensure this typology fulfils the environmental function required.

g. Species-rich grassland to support at least 12 or more plant species per m^2, managed to prevent natural succession to scrub and woodland, and retain the open grassland character.

h. Target species numbers to be met by Year 5.

Outline monitoring frequency and methods

8.3.11 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.3.12 After the five-year establishment period, monitoring would be undertaken to assess the success of the grassland in terms of developing into the relevant target priority habitat. This would include surveys following Common Standards Monitoring Guidance for Lowland Grassland Habitats (JNCC, 2004a), and Natural England guidance on the creation of priority grassland habitat (Natural England, 2012). UKHab surveys and condition assessments would also be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). These would continue once every five years during the establishment period with the detailed monitoring approach being refined over this period as part of the advisory group discussions. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.3.13 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.4 LE1.4 Rock and scree

Description

8.4.1 Rock and scree are areas of free and loose rock and scree material.

8.4.2 This typology is proposed on the approach to the South Portal, where the Project route is within a deep cutting through the underlying chalk geology. The cutting has steep gradients on the cutting faces to limit the amount of land take within this section of the Project route.

8.4.3 Rock and scree are proposed on the cutting faces and will be allowed to be naturally colonised by grass, herb and scrub species, suited to the underlying geology.

8.4.4 LE1.4 Rock and scree corresponds to inland rock outcrop and scree in good condition within the biodiversity net gain metric. The time to target condition following habitat creation is over 30 years.

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Outline requirements

8.4.5 The following outline requirements are for all areas of rock and scree:

a. To create species interest by creation of small ledges and pockets of nutrient-poor fine material on the cutting face.

b. Natural colonisation to be encouraged on the chalk face, to visually soften the bare faces of the chalk cutting.

c. Control of tree seedlings and scrub to prevent encroachment over the ground flora.

d. To create grassland habitats that follow the priority habitat descriptions for inland rock outcrop and scree habitats (JNCC, 2010a).

Outline prescriptions

8.4.6 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.4.7 Table 8.4 below describes the programme of work for initial establishment and maintenance (first five years). The text which follows Table 8.4 then outlines the management prescriptions proposed to be implemented for rock and scree in perpetuity.

Table 8.4 Outline initial establishment regime

Action			**Years 0-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Injurious weeds are to be eradicated, removed and disposed of offsite, as per the latest Defra/Natural England guidance.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y

8.4.8 Following initial establishment, the following management prescription is proposed in perpetuity subject to further discussion with the advisory group during the establishment monitoring period:

a. Removal of scrub encroachment every three years.

Outline measure of success

8.4.9 To ensure that the management requirements outlined previously are achieved, the following monitoring target has been devised to measure the success of the management requirements:

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a. Indicator species for inland rock outcrop and scree habitats as defined within the UK habitat classification are very clearly and easily visible.

b. Cover of bracken, scrub and trees less than 25%.

c. There will be an absence of invasive non-native species (as listed on Schedule 9 of Wildlife and Countryside Act, 1981 as amended).

d. Combined cover of species indicative of sub-optimal condition will account for less than 5% of the total area. Sub-optimal species include creeping thistle (*Cirsium arvense*), spear thistle (*Cirsium vulgare*), curled dock (*Rumex crispus*), broad-leaved dock (*Rumex obtusifolius*), common nettle (*Urtica dioica*), and brambles (*Rubus spp*.), and ragwort (*Jacobaea vulgaris*).

e. Vegetation cover of vascular and non-vascular plants shall be between 5% and 50%.

f. Obvious natural colonisation on face edges by Year 3

Outline monitoring frequency and methods

8.4.10 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.4.11 After the five-year establishment period, monitoring visits every five years would be undertaken in the summer to ensure that the measures of success are being met and maintained. UKHab surveys and condition assessments would be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). If necessary, the findings of the monitoring may result in corrective actions or the prescriptions for the management or measures of success may need to be modified. Any modifications to the requirements would be agreed in consultation with the advisory group. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.4.12 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.5 LE2.1 Woodland

Description

8.5.1 Planting areas comprising lowland, mixed, mainly native deciduous woodland with native/commonly naturalised ground flora, shrub edge planting and tall herb edge planting (grass/forb mix).

8.5.2 Woodland creation consisting of a mix of native trees and shrubs is provided throughout the Project to mitigate loss of vegetation associated with the Project,

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to provide visual screening of the road from nearby receptors and to integrate the road into the surrounding landscape.

8.5.3 Proposed woodland would also provide biodiversity benefit as well as delivering the mitigation described above.

8.5.4 A list of potential species for consideration for the inner stand woodland planting species mix is shown in the Appendix to the Design Principles (Application Document 7.5). Species selection should be appropriate to the underlying geology and substrate.

8.5.5 LE2.1 Woodland corresponds to other woodland; broadleaved in moderate condition within the biodiversity net gain metric. The time to target condition following habitat creation is 15 years.

Outline requirements

8.5.6 The following outline requirements apply to all areas of woodland planting:

a. To create the form and pattern of native woodlands of the same character found in the neighbouring areas. Species mix and selection shall comprise local provenance stock, and species mixes shall be adapted to reflect the local character. Woodland habitats would follow the priority habitat descriptions for lowland mixed deciduous woodland (JNCC, 2011).

b. To create thick woodland to screen views towards roads in areas as defined in the Environmental Masterplan.

c. Woodland planting to be designed and managed to create seasonal variety and visual interest.

d. Woodland planting to be designed and managed to create structure in the landscape, replicating the existing vegetation communities and patterns of woodland found locally and where possible, link to existing woodland areas.

e. Woodland to be managed to create a diversity of woodland habitat, comprising a mix of age classes, species, and structure, and to provide increases in biodiversity value. This includes containing open areas, variation in canopy structure and a healthy ground flora and understorey.

f. Where appropriate, woodland to incorporate open rides and glades within the woodland structure to add biodiversity benefit.

Outline prescriptions

8.5.7 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.5.8 Table 8.5 below describes the programme of work for initial establishment and maintenance (first five years). The text which follows Table 8.5 then outlines the management prescriptions proposed to be implemented for woodland in perpetuity.

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Table 8.5 Outline initial establishment regime

Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Provide irrigation during the establishment period (year 1) and growing season (April-September) as required. As required during Years 2 – 5.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Adjust any guy fixings, stakes and ties at the start and end of growing season or at any other time as necessary to avoid chafing and maintain firm support.	Specialist contractor appointed by National Highways	Twice yearly - April and November	Y	Y	Y	Y	Y
General pruning. Prune dead, dying, crossing, rubbing and damaged branches and encourage new leader if necessary.	Specialist contractor appointed by National Highways	Once yearly - November to February	Y	Y	Y	Y	Y
Thorough formative prune of the developing trees (reaching heights between 1-2.5m) to prevent formation of co-dominant leading stems that would result in smaller, weaker and potentially hazardous trees.	Specialist contractor appointed by National Highways	As required	N	Y	N	N	N
Any dead or damaged plants should be replaced annually with matching species of the same size during the next planting season after failure. To be undertaken once yearly during November and February.	Specialist contractor appointed by National Highways	Once yearly - November to February	N	Y	Y	Y	Y
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Hand weed control to be undertaken three times during the year (spring, summer and winter).	Specialist contractor appointed by National Highways	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds.	Specialist contractor appointed by National Highways	Twice yearly - May and September	Y	Y	Y	Y	Y
Removal of all tree guards, stakes	Specialist contractor appointed by National Highways	As required	N	N	N	N	Y

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8.5.9 Following initial establishment, the following management prescriptions are proposed in perpetuity subject to further discussion with the advisory group during the establishment monitoring period:

a. Selected removal of planted trees shall take place to retain the best specimens and contribute to the development of the woodland canopy structure. This should take place between years 8-10 but is to be agreed in the final LEMP.

b. Removal of deadwood/individual trees undertaken as necessary to maintain health and safety every five years throughout the management period.

c. Thinning to maintain and promote a healthy woodland structure every five years throughout the management period.

Outline measure of success

8.5.10 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. Two recognisable age classes comprising young (0 to 20 years) and intermediate (21 to 150 years) shall be present.

b. No evidence of significant browsing will be present within at least 60% of the woodland.

c. No invasive species recorded. Invasive species are defined as species populations or communities not considered likely to appreciably enrich the habitat resource within the local context including features of importance for migration, dispersal, or genetic exchange.

d. At least three native tree and shrub species found across the woodland.

e. Over 80% of canopy trees and over 80% of understorey shrubs shall be native.

f. Temporary open space recorded across 21% to 40% of the woodland.

g. Indication of regeneration present with at least one class recorded within the woodland. Classes include seedlings; saplings; and young trees of 4cm to 7cm diameter at breast height (DBH).

h. Tree mortality is less than 10%, with no pests or diseases, and no crown dieback recorded.

i. A recognisable NVC plant community shall be present.

j. Varied vertical structure with at least two storeys recorded.

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k. At least 25% of the woodland parcels have standing deadwood, large dead branches/stems and stumps, or a high abundance of smaller cavities.

l. Less than 1ha in total of nutrient enrichment across the woodland area recorded and less than 20% of woodland area has damaged ground.

m. Years 1-2: 80% establishment of planting

n. Year 5: All plant failures to have been replaced and replanted, with a 95% success rate of new planting by the end of Year 5.

o. Long-term (post five years):

   i. The woodland shall form or be clearly capable of forming groups of similar species, form and height to existing woodlands within the vicinity, and reflect local planting patterns, structure and nature conservation value.

   ii. Native ground flora have developed.

Outline monitoring frequency and methods

8.5.11 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.5.12 After the five-year establishment period, monitoring would be undertaken to assess the success of the woodland in terms of developing into the relevant target priority habitat. This would include fixed point or aerial photography to record overall habitat development within any given management area, as well as surveys following Common Standards Monitoring Guidance for Woodland Habitats (JNCC, 2004b). UKHab surveys and condition assessments would also be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). These would continue once every five years during the establishment period with the detailed monitoring approach being refined over this period as part of the advisory group discussions. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.5.13 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.6 LE2.11 Woodland including non-native species

Description

8.6.1 Planting areas comprising lowland, mixed, native deciduous woodland containing a significant proportion of non-native species for climate change resilience. This also comprises native/commonly naturalised ground flora, shrub edge planting and tall herb edge planting (grass/forb mix).

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8.6.2 Woodland including non-native species is predominantly used for large areas of woodland creation that do not adjoin existing woodland, particularly around junctions. Exceptions are within Thames Chase and the Thames Chase compensation land.

8.6.3 Woodland with non-native species performs the same function as LE2.1 woodland in terms of providing replacement woodland planting, screening functions for visual mitigation and to integrate the Project route into the surrounding landscape.

8.6.4 The inclusion of non-native species shall provide additional diversity in the woodland mix to provide resilience against disease and predicted climate change.

8.6.5 A list of potential species for consideration as the species mix for inner stand woodland, including non-native species, is shown in the Appendix to the Design Principles (Application Document 7.5). Species selection should consider the local underlying geology and substrate within the new planting areas. A planting palette for woodland including non-native species on land that has been heavily impacted by construction i.e. construction compounds, embankment earthworks and false cuttings has been included in the Appendix to the Design Principles.

8.6.6 For woodland including non-native species for use on heavyweight green bridges, a planting palette is shown in the Appendix to the Design Principles

8.6.7 LE2.11 Woodland including non-native species corresponds to other woodland; mixed in moderate condition within the biodiversity net gain metric. The time to target condition following habitat creation is 30 years.

Outline requirements

8.6.8 The following outline requirements are for all areas of woodland planting including non-native species:

a. To create the form and pattern of native woodlands of the same character found in the neighbouring areas. The species mix and selection shall largely comprise local provenance stock and species mixes shall be adapted to reflect the local character.

b. To create thick woodland to screen views towards roads in areas as defined in the Environmental Masterplan.

c. Woodland mix to comprise an inclusion of non-native stock, to provide resilience to disease and future climate change. Non-native stock to comprise species suitable for predicted impacts of climate change and look to replicate species mixes found at lower latitude levels.

d. Woodland planting to be designed and managed to create seasonal variety and visual interest.

e. Woodland planting to be designed and managed to create structure in the landscape, replicating the existing pattern of woodland found locally and where possible link into existing woodland areas.

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f. Woodland to be managed to create a diversity of woodland habitat, comprising a mix of age classes, species, and structure, and to provide increases in biodiversity value. This includes containing open areas, variation in canopy structure and a healthy ground flora and understorey.

Outline prescriptions

8.6.9 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.6.10 Table 8.6 below describes the programme of work for initial establishment and maintenance (first five years). The text which follows Table 8.6 then outlines the management prescriptions proposed to be implemented for woodland including non-native species in perpetuity.

Table 8.6 Outline initial establishment regime

Action			**Years 0-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Provide irrigation during the establishment period (Year 1) and growing season (April-September) as required. As required during Years 2 – 5.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Adjust any guy fixings, stakes and ties at the start and end of growing season or at any other time as necessary to avoid chafing and maintain firm support	Specialist contractor appointed by National Highways	Twice yearly - April and November	Y	Y	Y	Y	Y
Prune weak plants in Year 1 and 2 to encourage new growth development	Specialist contractor appointed by National Highways	Once yearly - November to February	Y	Y	N	N	N
General pruning. Prune dead, dying, crossing, rubbing and damaged branches and encourage new leader if necessary.	Specialist contractor appointed by National Highways	Once yearly - November to February	Y	Y	Y	Y	Y
Thorough formative prune of the developing trees (reaching heights between 1-2.5m) to prevent formation of co-dominant leading stems that would result in smaller, weaker and potentially hazardous trees.	Specialist contractor appointed by National Highways	As required	N	N	Y	N	N

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Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Any dead or damaged plants should be replaced annually with matching species of the same size during the next planting season after failure. To be undertaken once yearly during November to February.	Specialist contractor appointed by National Highways	Once yearly - November to February	N	Y	Y	Y	Y
All guards should be checked and adjusted, repaired or replaced as necessary twice yearly in October and March.	Specialist contractor appointed by National Highways	Twice yearly - October and March	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Hand weed control to be undertaken three times during the year (spring, summer and winter).	Specialist contractor appointed by National Highways	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds.	Specialist contractor appointed by National Highways	Twice yearly - May and September	Y	Y	Y	Y	Y
Removal of all tree guards, stakes	Specialist contractor appointed by National Highways	As required	N	N	N	N	Y

8.6.11 Following initial establishment, the following management prescriptions are proposed in perpetuity subject to further discussion with the advisory group during the establishment monitoring period:

a. Selected removal of planted trees shall take place to retain the best specimens and contribute to the development of the woodland canopy structure. This should take place between years 8-10 but is to be agreed in the final LEMP.

b. Removal of deadwood/individual trees undertaken as necessary to maintain health and safety every five years throughout the management period.

c. Thinning to maintain and promote a healthy woodland structure every 10 years throughout the management period.

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Outline measure of success

8.6.12 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. Two recognisable age classes comprising young (0 to 20 years) and intermediate (21 to 150 years) shall be present.

b. No evidence of significant browsing will be present within at least 60% of the woodland.

c. No invasive species recorded.

d. At least three native tree and shrub species found across the woodland.

e. Over 80% of canopy trees and over 80% of understorey shrubs shall be native.

f. Temporary open space recorded across 21% to 40% of the woodland.

g. Indication of regeneration present with at least one class recorded within the woodland. Classes include seedlings; saplings; and young trees of 4cm to 7cm DBH.

h. Tree mortality is less than 10%, with no pests or diseases, and no crown dieback recorded.

i. A recognisable NVC plant community shall be present.

j. Varied vertical structure with at least two storeys recorded.

k. At least 25% of the woodland parcels have standing deadwood, large dead branches/stems and stumps, or a high abundance of smaller cavities.

l. Less than 1ha in total of nutrient enrichment across the woodland area recorded and less than 20% of woodland area has damaged ground.

m. Years 1-2: 80% establishment of planting

n. Year 5: All plant failures to have been replaced and replanted.

o. Long-term

    i. The woodland shall form or be clearly capable of forming groups of similar species, form, and height to existing woodlands within the vicinity and reflect local planting patterns, structure and nature conservation value.

    ii. Invasive weeds kept to less than 20% ground cover.

    iii. Native ground flora have developed.

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Outline monitoring frequency and methods

8.6.13 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.6.14 After the five-year establishment period, monitoring would be undertaken to assess the success of the woodland in terms of developing into the relevant target priority habitat. This would include fixed point or aerial photography to record overall habitat development within any given management area, as well as surveys following Common Standards Monitoring Guidance for Woodland Habitats (JNCC, 2004b). UKHab surveys and condition assessments would also be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). These would continue once every five years during the establishment period with the detailed monitoring approach being refined over this period as part of the advisory group discussions. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.6.15 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.7 LE2.14 Wet/carr woodland

Description

8.7.1 Wet/carr woodland is characterised by tree species such as alder and willow that can tolerate and thrive within seasonally inundated and wet soils, particularly in areas such as fens, bogs and adjacent ponds and rivers.

8.7.2 LE2.14 Wet/Carr Woodland corresponds to wet woodland in moderate condition within the biodiversity net gain metric. The time to target condition following habitat creation is 15 years.

Outline requirements

8.7.3 The following outline requirements are for all areas of woodland planting including edible species:

a. Pockets of wet/carr woodland to be designed where woodland has been proposed as part of the mitigation proposals and located in soils that are likely to be seasonally inundated.

b. Pockets of wet/carr woodland to be designed to break up views towards the built elements within Orsett Fen, whilst still allowing long-distance views out to the surrounding landscape and skyline.

c. Pockets of wet/carr woodland to be rectangular blocks and to follow existing woodland block patterns in the surrounding landscape

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Outline prescriptions

8.7.4 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.7.5 Table 8.7 below describes the programme of work for initial establishment and maintenance (first five years). The text which follows Table 8.7 then outlines the management prescriptions proposed to be implemented for wet/carr woodland in perpetuity.

Table 8.7 Outline initial establishment regime

Action			**Years 0-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Provide irrigation during the establishment period (year 1) and growing season (April-September) as required. As required during Years 2 – 5.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Adjust any guy fixings, stakes and ties at the start and end of growing season or at any other time as necessary to avoid chafing and maintain firm support	Specialist contractor appointed by National Highways	Twice yearly - April and November	Y	Y	Y	Y	Y
Prune weak plants in Year 1 and 2 to encourage new growth development	Specialist contractor appointed by National Highways	Once yearly – November to February	Y	Y	N	N	N
General pruning. Prune dead, dying, crossing, rubbing and damaged branches and encourage new leader if necessary. Prune to encourage production of fruit to normal good horticultural standards.	Specialist contractor appointed by National Highways	Once yearly – November to February	Y	Y	Y	Y	Y
Thorough formative prune of the developing trees (reaching heights between 1-2.5m) to prevent formation of co-dominant leading stems that would result in smaller, weaker and potentially hazardous trees.	Specialist contractor appointed by National Highways	As required	N	N	Y	N	N
Any dead or damaged plants should be replaced annually with matching species of the	Specialist contractor appointed by National Highways	Once yearly – November	N	Y	Y	Y	Y

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Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
same size during the next planting season after failure. To be undertaken once yearly during November to February.		to February					
All guards should be checked and adjusted, repaired or replaced as necessary twice yearly in October and March.	Specialist contractor appointed by National Highways	Twice yearly – October and March	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Hand weed control to be undertaken three times during the year (spring, summer and winter).	Specialist contractor appointed by National Highways	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds.	Specialist contractor appointed by National Highways	Twice yearly – May and September	Y	Y	Y	Y	Y
Removal of all tree guards, stakes.	Specialist contractor appointed by National Highways	As required	N	N	N	N	Y

8.7.6 Following establishment, the following management prescriptions are proposed in perpetuity subject to further discussion with the advisory group during the establishment monitoring period:

a. Selected removal of planted trees shall take place to retain the best specimens and contribute to the development of the woodland canopy structure. This should take place between years 8-10 but is to be agreed in the final LEMP and with any potential management agent/landowner.

b. Removal of deadwood/individual trees undertaken as necessary to maintain health and safety every five years throughout the management period.

c. Thinning to maintain and promote a healthy woodland structure every five years throughout the management period.

Outline measure of success

8.7.7 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. Two recognisable age classes comprising young (0 to 20 years) and intermediate (21 to 150 years) shall be present.

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b. No evidence of significant browsing will be present within at least 60% of the woodland.

c. No invasive species recorded.

d. At least three native tree and shrub species found across the woodland.

e. Over 80% of canopy trees and over 80% of understorey shrubs shall be native.

f. Temporary open space recorded across 21% to 40% of the woodland.

g. Indication of regeneration present with at least one class recorded within the woodland. Classes include seedlings; saplings; and young trees of 4cm to 7cm DBH.

h. Tree mortality is less than 10%, with no pests or diseases, and no crown dieback recorded.

i. A recognisable NVC plant community shall be present.

j. Varied vertical structure with at least two storeys recorded.

k. At least 25% of the woodland parcels have standing deadwood, large dead branches/stems and stumps, or a high abundance of smaller cavities.

l. Less than 1ha in total of nutrient enrichment across the woodland area recorded and less than 20% of woodland area has damaged ground.

m. Years 1-2: 80% establishment of planting

n. Year 5: All plant failures to have been replaced and replanted, with a 95% success rate of new planting by the end of Year 5.

o. Long-term:

   i. The woodland shall form or be clearly capable of forming groups of similar species, form and height to existing woodlands within the vicinity and reflect local planting patterns, structure and nature conservation value.

   ii. Invasive weeds kept to less than 20% ground cover

   iii. Native ground flora have developed.

Outline monitoring frequency and methods

8.7.8 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

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8.7.9 After the five-year establishment period, monitoring would be undertaken to assess the success of the woodland in terms of developing into the relevant target priority habitat. This would include fixed point or aerial photography to record overall habitat development within any given management area, as well as surveys following Common Standards Monitoring Guidance for Woodland Habitats (JNCC, 2004b). UKHab surveys and condition assessments would also be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). These would continue once every five years during the establishment period with the detailed monitoring approach being refined over this period as part of the advisory group discussions. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.7.10 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the annual monitoring reporting.

8.8 LE2.2 Woodland edge

Description

8.8.1 Area of lowland, mixed, mainly native deciduous woodland shrubs on the edge of the main woodland. This typology is a transitional zone between main woodland and adjacent grasslands providing a biodiverse continuous range of structure, shelter, and food sources.

8.8.2 Woodland edge is proposed throughout the Project and to all areas of woodland creation.

8.8.3 Woodland edge is also proposed in mitigation areas where there are constraints to achieving traditional woodland planting, such as areas of proximity to underground and overground utilities and areas where there is insufficient space to achieve a thick woodland block.

8.8.4 Woodland edge can be managed to appear as more traditional woodland in longer views and can provide visual screening of the Project, as well as integrating the Project route into the surrounding landscape.

8.8.5 A list of potential species to be considered for the species mix for woodland edge species is shown in the Appendix to the Design Principles (Application Document 7.5). Species selection should consider the underlying geology and substrate used within the planting areas.

8.8.6 The Appendix to the Design Principles also includes a planting palette developed for woodland edge planting located on green bridges.

8.8.7 LE2.2 Woodland edge corresponds to other woodland; broadleaved in moderate condition within the biodiversity net gain metric. The time to target condition following habitat creation is 15 years.

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Outline requirements

8.8.8 The following outline requirements apply to all areas of woodland edge:

a. Woodland edge planting to be designed and managed to create seasonal variety and visual interest.

b. Where used for visual screening, woodland edge to be managed to provide a thick and scalloped edge to avoid funnelling wind and allowing micro-climates to develop which will benefit invertebrate species and the range of animals which prey upon them, notably bats along woodland edges.

c. Woodland edge when used in proximity to underground/overhead utilities to be managed in accordance with guidance from the relevant statutory utility provider. Heights and spread shall be managed so they do not encroach into utility providers' easements or exceed safety area.

Outline prescriptions

8.8.9 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.8.10 Table 8.8 below describes the programme of work for initial establishment and maintenance (first five years).

Table 8.8 Outline initial establishment regime

Action			**Years 0-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Provide irrigation during the establishment period (year 1) and growing season (April-September) as required. As required during Years 2 – 5.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Prune weak plants in Year 1 and 2 to encourage new growth development	Specialist contractor appointed by National Highways	Once yearly – November to February	Y	Y	N	N	N
General pruning in order to provide a structurally diverse and graduated woodland edge. Prune dead, dying, crossing, rubbing and damaged branches and encourage new leader if necessary.	Specialist contractor appointed by National Highways	Once yearly – November to February	Y	Y	Y	Y	Y
Any dead or damaged plants should be replaced annually with matching species of the same size during the next	Specialist contractor appointed by National Highways	Once yearly – November to February	N	Y	Y	Y	Y

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Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
planting season after failure. To be undertaken once yearly during November to February.							
All guards should be checked and adjusted, repaired or replaced as necessary twice yearly in October and March.	Specialist contractor appointed by National Highways	Twice yearly – October and March	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Hand weed control to be undertaken three times during the year (spring, summer and winter).	Specialist contractor appointed by National Highways	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds.	Specialist contractor appointed by National Highways	Twice yearly – May and September	Y	Y	Y	Y	Y
Removal of all tree guards, stakes	Specialist contractor appointed by National Highways	As required	N	N	N	N	Y

Outline measure of success

8.8.11 To ensure that the management aims and requirements outlined above are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. Two recognisable age classes comprising young (0 to 20 years) and intermediate (21 to 150 years) shall be present.

b. No evidence of significant browsing will be present within at least 60% of the woodland.

c. No invasive species recorded.

d. At least three native tree and shrub species found across the woodland.

e. Over 80% of canopy trees and over 80% of understorey shrubs shall be native.

f. Temporary open space recorded across 21% to 40% of the woodland.

g. Indication of regeneration present with at least one class recorded within the woodland. Classes include seedlings; saplings; and young trees of 4cm to 7cm DBH.

h. Tree mortality is less than 10%, with no pests or diseases, and no crown dieback recorded.

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i. A recognisable NVC plant community shall be present.

j. Varied vertical structure with at least two storeys recorded.

k. At least 25% of the woodland parcels have standing deadwood, large dead branches/stems and stumps, or a high abundance of smaller cavities.

l. Less than 1ha in total of nutrient enrichment across the woodland area recorded and less than 20% of woodland area has damaged ground.

m. Years 1-2: 80% establishment of planting

n. Year 5: all plant failures to have been replaced and replanted, with a 95% success rate of new planting by the end of Year 5.

o. Long-term:

   i. The woodland edge shall form or be clearly capable of forming groups of similar species, forming edges to existing woodlands within the vicinity and reflect local planting patterns, structure, and nature conservation value.

   ii. Biodiverse woodland edge providing a continuous range of structure, shelter, and food sources (nectar, berries etc).

   iii. Invasive weeds kept to less than 20% of ground cover.

   iv. Native ground flora have developed.

Outline monitoring frequency and methods

8.8.12 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.8.13 After the five-year establishment period, monitoring would be undertaken to assess the success of the woodland in terms of developing into the relevant target priority habitat. This would include fixed point or aerial photography to record overall habitat development within any given management area, as well as surveys following Common Standards Monitoring Guidance for Woodland Habitats (JNCC, 2004b). UKHab surveys and condition assessments would also be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). These would continue once every five years during the establishment period with the detailed monitoring approach being refined over this period as part of the advisory group discussions. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.8.14 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

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8.9 LE2.22 Scrub woodland

Description

8.9.1 Mixed, mainly native deciduous shrubs with intermittent larger tree planting with native/commonly naturalised ground flora.

8.9.2 Predominantly low-height growing shrub and trees species used.

8.9.3 Scrub woodland planting is proposed to screen and integrate the Project into the surrounding landscape, whilst still retaining long-distance views to the surrounding woodland ridge.

8.9.4 A list of potential species to be considered for the species mix for scrub woodland species is shown in the Appendix to the Design Principles (Application Document 7.5). Species selection should consider the underlying geology and substrate used within the planting areas.

8.9.5 LE2.22 Scrub Woodland corresponds to Scrub in moderate condition within the biodiversity net gain metric. The time to target condition following habitat creation is five years.

Outline requirements

8.9.6 The following outline requirements are for all areas of scrub woodland.

a. Scrub woodland planting to be designed along the low-lying valley areas within the Chadwell Link.

b. Scrub woodland to be designed to screen views of the Project from elevated viewpoints higher up the valley. Lower-height species to be used to ensure the existing long-distance views to the wooded ridgeline are retained.

c. Suitable species to be selected within the dry valley areas. Slight variations in species selection to those on top of the wooded ridgeline to create a contrast of views between the proposed woodland in foreground views and existing woodland in the background.

d. Where established in proximity to underground and overhead utilities, planting to be managed to retain safety distances and heights as agreed with the statutory stakeholder.

Outline prescriptions

8.9.7 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.9.8 Table 8.9 below describes the programme of work for initial establishment and maintenance (first five years).

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Table 8.9 Outline initial establishment regime

Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Provide irrigation during the establishment period (year 1) and growing season (April-September) as required. As required during Years 2 – 5.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Adjust any guy fixings, stakes and ties at the start and end of growing season or at any other time as necessary to avoid chafing and maintain firm support	Specialist contractor appointed by National Highways	Twice yearly – April and November	Y	Y	Y	Y	Y
Prune weak plants in Year 1 and 2 to encourage new growth development.	Specialist contractor appointed by National Highways	Once yearly – November to February	Y	Y	N	N	N
General pruning. Prune dead, dying, crossing, rubbing and damaged branches and encourage new leader if necessary. Special attention should be given to ensure intermittent trees are healthy and strong growing	Specialist contractor appointed by National Highways	Once yearly – November to February	Y	Y	Y	Y	Y
Thorough formative prune of the developing trees (reaching heights between 1-2.5m) to prevent against formation of co-dominant leading stems that would result in smaller, weaker and potentially hazardous trees.	Specialist contractor appointed by National Highways	As required	N	N	Y	N	N
Any dead or damaged plants should be replaced annually with matching species of the same size during the next planting season after failure. To be undertaken once yearly during November to February.	Specialist contractor appointed by National Highways	Once yearly – November to February	N	Y	Y	Y	Y
All guards should be checked and adjusted, repaired or replaced as necessary twice yearly in October and March.	Specialist contractor appointed by National Highways	Twice yearly – October and March	Y	Y	Y	Y	Y

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Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Hand weed control to be undertaken three times during the year (spring, summer and winter).	Specialist contractor appointed by National Highways	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds.	Specialist contractor appointed by National Highways	Twice yearly – May and September	Y	Y	Y	Y	Y
Removal of all tree guards, stakes	Specialist contractor appointed by National Highways	As required	N	N	N	N	Y

Outline measure of success

8.9.9 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. The habitat meets the appropriate characteristics as described within the UK Habitat classification definitions (Butcher, B., et al., 2020).

b. Three woody species are present with no one species comprising more than 75% of the cover.

c. There is evidence of a good age range with seedings, young shrubs and mature shrubs present.

d. There will be an absence of invasive non-native species (as listed on Schedule 9 of Wildlife and Countryside Act, 1981 as amended).

e. Combined cover of species indicative of sub-optimal condition will account for less than 5% of the total area. Sub-optimal species include tree-of-heaven (*Alianthus altissima*), holm oak (*Quercus ilex*), turkey oak (*Quercus cerris*), creeping thistle (*Cirsium arvense*), common nettle (*Urtica dioica*), chery laurel (*Prunus laurocerasus*), snowberry (*Symphoricarpos spp*.), buddleia (*Buddleja spp*.), cotoneaster (*Cotoneaster spp*.), Spanish bluebell (*Hyacinthoides hispanica*) including hybrids.

f. The scrub has a well-developed edge with scattered scrub and tall grassland and/or herbs present between the scrub and adjacent habitat(s).

g. Years 1-2: 80% establishment of planting

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h. Year 5: All plant failures to have been replaced and replanted, with a 95% success rate of new planting by the end of Year 5.

i. Long-term:

i. The shrubs with trees typology shall form or be clearly capable of forming groups of similar species and reflect local planting patterns, structure, and nature conservation value.

ii. Biodiverse shrub area providing a continuous range of structure, shelter, and food sources (nectar, berries etc).

iii. Invasive weeds kept to less than 20% of ground cover.

iv. Native ground flora have developed.

Outline monitoring frequency and methods

8.9.10 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.9.11 After the five-year establishment period, monitoring visits every five years would be undertaken in the summer to ensure that the measures of success are being met and maintained. UKHab surveys and condition assessments would be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). If necessary, the findings of the monitoring may result in corrective actions or the prescriptions for the management or measures of success may need to be modified. Any modifications to the requirements would be agreed in consultation with the advisory group. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.9.12 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.10 LE2.4 Linear belt of shrubs and trees

Description

8.10.1 Mixed, native trees and shrubs with native/commonly naturalised ground flora. Similar in nature to the woodland typology but forming narrow belts of woodland (wider than hedgerows) creating barriers between differing typologies.

8.10.2 Linear belts of shrubs and trees are proposed to provide visual screening and landscape integration where there are constraints in land availability within the Order Limits, or overhead and underground utilities that mean more traditional woodland planting cannot be achieved.

8.10.3 Linear belts of shrubs and trees are also proposed to replace existing belts of trees that have been lost due to construction works.

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8.10.4 A list of potential species to be considered for the species mix for linear belt of shrubs and trees is shown in the Appendix to the Design Principles (Application Document 7.5). Species selection should consider the underlying geology and substrate used within the planting areas.

8.10.5 LE2.4 Linear Belts of Shrubs and Trees corresponds to other woodland; broadleaved in moderate condition within the biodiversity net gain metric. The time to target condition following habitat creation is 15 years.

Outline requirements

8.10.6 The following outline requirements apply to all areas of linear belts of shrubs and trees:

a. To provide appropriate visual screening and landscape integration at locations defined in the Environmental Masterplan where space is constrained.

b. To create the form and pattern of woodlands of the same character found in the neighbouring areas. Species mix and selection shall comprise local provenance stock and species mixes shall be adapted to reflect the local character.

c. To create belts of woodland to screen views towards roads in areas as defined in the Environmental Masterplan.

d. Woodland planting to be designed and managed to create seasonal variety and visual interest.

e. Woodland planting to be designed and managed to create structure in the landscape, replicating the existing pattern of woodland found locally and where possible link into existing woodland areas.

f. Woodland to be managed to create a diversity of habitat within it, comprising a mix of age classes, species, and structure, and to provide increases in biodiversity value. This includes containing open areas, variation in canopy structure and a healthy ground flora and understorey.

g. Where established in proximity to underground and overhead utilities, woodland planting to be managed to retain safety distances and heights as agreed with the statutory stakeholder.

Outline prescriptions

8.10.7 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.10.8 Table 8.10 below describes the programme of work for initial establishment and maintenance (first five years).

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Table 8.10 Outline initial establishment regime

Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Provide irrigation during the establishment period (year 1) and growing season (April-September) as required. As required during Years 2 – 5.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Adjust any guy fixings, stakes and ties at the start and end of growing season or at any other time as necessary to avoid chafing and maintain firm support	Specialist contractor appointed by National Highways	Twice yearly, April and November	Y	Y	Y	Y	Y
Prune weak plants in Year 1 and 2 to encourage new growth development.	Specialist contractor appointed by National Highways	Once yearly – November to February	Y	Y	N	N	N
General pruning. Prune dead, dying, crossing, rubbing and damaged branches and encourage new leader if necessary. Pruning should take into account and reinforce linear form of planting.	Specialist contractor appointed by National Highways	Once yearly – November to February	Y	Y	Y	Y	Y
Thorough formative prune of the developing trees (reaching heights between 1-2.5m) to prevent formation of co-dominant leading stems that would result in smaller, weaker and potentially hazardous trees.	Specialist contractor appointed by National Highways	As required	N	N	Y	N	N
Any dead or damaged plants should be replaced annually with matching species of the same size during the next planting season after failure. To be undertaken once yearly during November to February.	Specialist contractor appointed by National Highways	Once yearly – November to February	N	Y	Y	Y	Y
All guards should be checked and adjusted, repaired or replaced as necessary twice yearly in October and March.	Specialist contractor appointed by National Highways	Twice yearly, October and March	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y

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Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Hand weed control to be undertaken three times during the year (spring, summer and winter).	Specialist contractor appointed by National Highways	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds.	Specialist contractor appointed by National Highways	Twice yearly, May and September	Y	Y	Y	Y	Y
Removal of all tree guards, stakes	Specialist contractor appointed by National Highways	As required	N	N	N	N	Y

Outline measure of success

8.10.9 To ensure that the management requirements outlined above are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. Two recognisable age classes comprising young (0 to 20 years) and intermediate (21 to 150 years) shall be present.

b. No evidence of significant browsing will be present within at least 60% of the woodland.

c. No invasive species recorded.

d. At least three native tree and shrub species found across the woodland.

e. Over 80% of canopy trees and over 80% of understorey shrubs shall be native.

f. Temporary open space recorded across 21% to 40% of the woodland.

g. Indication of regeneration present with at least one class recorded within the woodland. Classes include seedlings; saplings; and young trees of 4cm to 7cm DBH.

h. Tree mortality is less than 10%, with no pests or diseases, and no crown dieback recorded.

i. A recognisable NVC plant community shall be present.

j. Varied vertical structure with at least two storeys recorded.

k. At least 25% of the woodland parcels have standing deadwood, large dead branches/stems and stumps, or a high abundance of smaller cavities.

l. Less than 1ha in total of nutrient enrichment across the woodland area recorded and less than 20% of woodland area has damaged ground.

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m. Years 1-2: 80% establishment of planting.

n. Year 5: All plant failures to have been replaced and replanted, with a 95% success rate of new planting by the end of Year 5.

o. Long-term: Native ground flora have developed.

Outline monitoring frequency and methods

8.10.10 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.10.11 After the five-year establishment period, monitoring visits every five years would be undertaken in the summer to ensure that the measures of success are being met and maintained. UKHab surveys and condition assessments would be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). If necessary, the findings of the monitoring may result in corrective actions or the prescriptions for the management or measures of success may need to be modified. Any modifications to the requirements would be agreed in consultation with the advisory group. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.10.12 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.11 LE2.5 Shrubs with intermittent trees

Description

8.11.1 Mixed, mainly native deciduous shrubs with intermittent larger tree planting with native/commonly naturalised ground flora.

8.11.2 Shrubs with intermittent tree planting are proposed throughout the Project where constraints caused by land availability, overhead and underground utilities and local constraints that mean that traditional woodland planting cannot be achieved, but some tree cover is required.

8.11.3 Shrubs with intermittent tree planting are proposed on embankments to structures to soften the appearance of the engineered structures and to tie the earthworks into the adjacent landscape.

8.11.4 Shrubs with intermittent tree planting are proposed adjacent to or directly under/over utilities, where constraints mean that larger tree planting cannot be achieved. The species mix allows for suitable species to be planted within agreed distances of the utilities following guidance and agreement with the relevant statutory undertaker, but still aim to achieve a scrubby/woodland character, particularly adjacent to existing woodland areas, where the intermittent trees can be located to the periphery of the planting area to transition from woodland to smaller shrubs.

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8.11.5 A list of potential species to be considered for the species mix for shrubs with intermittent trees is shown in the Appendix to the Design Principles (Application Document 7.5). Species selection should consider the underlying geology and substrate used within the planting areas.

8.11.6 LE2.5 Shrubs with intermittent trees corresponds to scrub in moderate condition within the biodiversity net gain metric. The time to target condition following habitat creation is five years.

Outline requirements

8.11.7 The following outline requirements are for all areas of shrubs with intermittent trees.

a. To provide appropriate visual screening and landscape integration at locations defined in the Environmental Masterplan.

b. To create the form and pattern of woodlands/shrub planting of the same character found in the neighbouring areas. Species mix and selection shall comprise local provenance stock and species mixes shall be adapted to reflect the local character.

c. Shrubs with intermittent trees to be designed and managed to create seasonal variety and visual interest.

d. Shrubs with intermittent trees to be designed and managed to create structure in the landscape, replicating the existing pattern of planting found locally and where possible link into existing woodland/shrub areas.

e. Shrubs with intermittent trees to be managed to create a diversity of habitat within the woodland, comprising a mix of age classes, species, and structure.

f. Shrubs with intermittent trees managed to provide increased biodiversity value.

g. Where established in proximity to underground and overhead utilities, planting to be managed to retain safety distances and heights as agreed with the statutory stakeholder.

Outline prescriptions

8.11.8 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.11.9 Table 8.11 below describes the programme of work for initial establishment and maintenance (first five years).

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Table 8.11 Outline initial establishment regime

Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Provide irrigation during the establishment period (Year 1) and growing season (April-September) as required. As required during Years 2 – 5.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Adjust any guy fixings, stakes and ties at the start and end of growing season or at any other time as necessary to avoid chafing and maintain firm support.	Specialist contractor appointed by National Highways	Twice yearly – April and November	Y	Y	Y	Y	Y
Prune weak plants in Years 1 and 2 to encourage new growth development.	Specialist contractor appointed by National Highways	Once yearly, November to February	Y	Y	N	N	N
General pruning. Prune dead, dying, crossing, rubbing and damaged branches and encourage new leader if necessary. Special attention should be given to ensure intermittent trees are healthy and strong growing.	Specialist contractor appointed by National Highways	Once yearly, November to February	Y	Y	Y	Y	Y
Thorough formative prune of the developing trees (reaching heights between 1-2.5m) to prevent formation of co-dominant leading stems that would result in smaller, weaker and potentially hazardous trees.	Specialist contractor appointed by National Highways	As required	N	N	Y	N	N
Any dead or damaged plants should be replaced annually with matching species of the same size during the next planting season after failure. To be undertaken once yearly during November to February.	Specialist contractor appointed by National Highways	Once yearly, November to February	N	Y	Y	Y	Y
All guards should be checked and adjusted, repaired or replaced as necessary twice yearly in October and March.	Specialist contractor appointed by National Highways	Twice yearly – October and March	Y	Y	Y	Y	Y

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Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Hand weed control to be undertaken three times during the year (spring, summer and winter).	Specialist contractor appointed by National Highways	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds.	Specialist contractor appointed by National Highways	Twice yearly – May and September	Y	Y	Y	Y	Y
Removal of all tree guards, stakes	Specialist contractor appointed by National Highways	As required	N	N	N	N	Y

Outline measure of success

8.11.10 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. The habitat meets the appropriate characteristics as described within the UK Habitat classification definitions (Butcher, B., et al., 2020).

b. Three woody species are present with no one species comprising more than 75% of the cover.

c. There is evidence of a good age range with seedings, young shrubs and mature shrubs present.

d. There will be an absence of invasive non-native species (as listed on Schedule 9 of Wildlife and Countryside Act, 1981 as amended).

e. Combined cover of species indicative of sub-optimal condition will account for less than 5% of the total area. Sub-optimal species include tree-of-heaven (*Alianthus altissima*), holm oak (*Quercus ilex*), turkey oak (*Quercus cerris*), creeping thistle (*Cirsium arvense*), common nettle (*Urtica dioica*), chery laurel (*Prunus laurocerasus*), snowberry (*Symphoricarpos spp*.), buddleia (*Buddleja spp*.), cotoneaster (*Cotoneaster spp*.), Spanish bluebell (*Hyacinthoides hispanica*) including hybrids.

f. The scrub has a well-developed edge with scattered scrub and tall grassland and/or herbs present between the scrub and adjacent habitat(s).

g. Years 1-2: 80% establishment of planting

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h. Year 5: All plant failures to have been replaced and replanted, with a 95% success rate of new planting by the end of Year 5.

i. Long-term:

i. The shrubs with intermittent trees typology shall form or be clearly capable of forming groups of similar species and reflect local planting patterns, structure, and nature conservation value.

ii. Biodiverse shrub area providing a continuous range of structure, shelter, and food sources (nectar, berries etc).

iii. Invasive weeds kept to less than 20% of ground cover.

iv. Native ground flora have developed.

Outline monitoring frequency and methods

8.11.11 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.11.12 After the five-year establishment period, monitoring visits every five years would be undertaken in the summer to ensure that the measures of success are being met and maintained. UKHab surveys and condition assessments would be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). If necessary, the findings of the monitoring may result in corrective actions or the prescriptions for the management or measures of success may need to be modified. Any modifications to the requirements would be agreed in consultation with the advisory group. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.11.13 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.12 LE2.7 Scattered trees; & LE5.1 Individual trees

Description

8.12.1 Comprising either specimen/feature trees and large shrubs or small groups, scattered trees are an integral part of the landscape structure, reflecting the changing character of the landscape. Scattered specimen trees provide seasonal interest, create habitat and biodiversity, and provide shade.

8.12.2 Scattered trees are proposed throughout the Project to replace existing features lost in the landscape due to construction works.

8.12.3 Scattered trees are proposed around drainage attenuation ponds, to soften the appearance of the water bodies and to integrate the ponds into the surrounding landscape.

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8.12.4 Scattered trees are proposed in open grassland areas, adjacent to the Project route where appropriate to break up long distance views and to provide structure in the landscape.

8.12.5 Scattered trees and individual trees are also proposed to link areas of woodland planting.

8.12.6 A list of potential species to be considered for the species mix scattered trees is shown in the Appendix to the Design Principles (Application Document 7.5). Species selection should consider the underlying geology and substrate used within the planting areas.

Outline requirements

8.12.7 The following outline requirements apply to all areas of scattered trees and individual trees:

a. To provide appropriate landscape integration at locations defined in the Environmental Masterplan.

b. Species mix and selection shall comprise local provenance stock and species mixes shall be adapted to reflect the local character.

c. Scattered and individual trees to be designed and managed to create seasonal variety and visual interest.

d. Scattered and individual trees to be designed and managed to create structure in the landscape, replicating the existing pattern of planting found locally and where possible, link to existing woodland/shrub areas.

e. Where appropriate, management of individual trees to create veteran features in the landscape.

Outline prescriptions

8.12.8 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.12.9 Table 8.12 below describes the programme of work for initial establishment and maintenance (first five years).

Table 8.12 Outline initial establishment regime

Action			**Years 0-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Provide irrigation during the establishment period (year 1) and growing season (April-September) as required. As required during Years 2 – 5.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y

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Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Adjust any guy fixings, stakes and ties at the start and end of growing season or at any other time as necessary to avoid chafing and maintain firm support	Specialist contractor appointed by National Highways	Twice yearly – April and November	Y	Y	Y	Y	Y
Prune weak plants in Year 1 and 2 to encourage new growth development.	Specialist contractor appointed by National Highways	Once yearly, November to February	Y	Y	N	N	N
General pruning. Prune dead, dying, crossing, rubbing and damaged branches and encourage new leader if necessary.	Specialist contractor appointed by National Highways	Once yearly, November to February	Y	Y	Y	Y	Y
Any dead or damaged plants should be replaced annually with matching species of the same size during the next planting season after failure. To be undertaken once yearly during Nov and Feb.	Specialist contractor appointed by National Highways	Once yearly – November to February	N	Y	Y	Y	Y
All guards should be checked and adjusted, repaired or replaced as necessary twice yearly in October and March.	Specialist contractor appointed by National Highways	Twice yearly – October and March	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Hand weed control to be undertaken twice during the year (spring and summer).	Specialist contractor appointed by National Highways	April, August	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds.	Specialist contractor appointed by National Highways	Twice yearly – May and September	Y	Y	Y	Y	Y
Maintain mulch where required by topping up twice a year (spring and autumn), 500mm either side of tree.	Specialist contractor appointed by National Highways	Twice yearly – May and September	Y	Y	Y	Y	Y
Removal of all tree guards, stakes	Specialist contractor appointed by National Highways	As required	N	N	N	N	Y

Outline measure of success

8.12.10 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. Years 1-2: 80% establishment of planting.

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b. Year 5: All plant failures to have been replaced and replanted, with a 95% success rate of new planting by the end of Year 5.

c. Long-term:

i. Invasive weeds kept to less than 10% of ground cover.

ii. The area shall contain no more than 10% scrub cover.

Outline monitoring frequency and methods

8.12.11 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.12.12 After the five-year establishment period, monitoring visits every five years would be undertaken in the summer to ensure that the measures of success are being met and maintained. If necessary, the findings of the monitoring may result in corrective actions or the prescriptions for the management or measures of success may need to be modified. Any modifications to the requirements would be agreed in consultation with the advisory group. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.12.13 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.13 LE2.8 Scrub / scattered scrub

Overarching aims

8.13.1 Scrub planting is used throughout the Project to replace vegetation loss, provide visual screening and to provide wildlife and landscape connectivity where appropriate.

Description

8.13.2 Native scrub planting, comprising low-growing native scrub mixes, understorey scrub and wetland scrub. Scrub provides excellent habitat, seasonal interest and is the main component of woodland edge and woodland understorey.

8.13.3 Scrub planting is proposed as an integral component of the landscape mitigation design as scrub can provide vegetated links between areas of woodland where constraints such as overhead and/or underground utilities constrain larger tree planting.

8.13.4 Scrub planting can provide visual and habitat links, and also provide visual screening in constrained areas where it is not possible to achieve a woodland block.

8.13.5 The specific methodology for scrub planting will be developed during detailed design. Species mixes for scrub planting are to be appropriate to the location or as exist already on site.

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8.13.6 A list of potential species mix for areas of scrub / scattered scrub planting is shown in the Appendix to the Design Principles (Application Document 7.5).

8.13.7 LE2.5 Scrub/scattered scrub corresponds to scrub in moderate condition within the biodiversity net gain metric. The time to target condition following habitat creation is five years.

Outline requirements

8.13.8 The following outline requirements apply to all areas of scrub planting:

a. Scrub species to be managed to grow to their natural shape and height (where practicable) to increase habitat potential and visual interest from flower, fruit, and autumn colour.

b. Some coppicing of species such as dogwood, hazel and willow will add to these requirements. Coppicing to be undertaken in a rotational programme every ten years for scrub adjacent to grasslands and every 15 years for inner areas of scrub. This will allow species such as hazel to become mature enough to provide fruit for species like dormice.

c. To provide structure in the landscape.

d. Where established in proximity to underground and overhead utilities, scrub to be managed to retain safety distances and heights as agreed with the relevant statutory stakeholder.

e. To provide suitable shelter, foraging, nesting and commuting habitat for a range of species including amphibians and reptiles, birds dormice, and other small mammals.

Outline prescriptions

8.13.9 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP

8.13.10 Table 8.13 below describes the programme of work for initial establishment and maintenance (first five years). The text which follows Table 8.13 then outlines the management prescriptions proposed to be implemented for scrub / scattered scrub in perpetuity.

Table 8.13 Outline initial establishment regime

Action			**Years 0-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Provide irrigation during the establishment period (Year 1) and growing season (April-	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y

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Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
September) as required. As required during Years 2 – 5.							
Prune weak plants in Years 1 and 2 to encourage new growth development.	Specialist contractor appointed by National Highways	Once yearly – November to February	Y	Y	N	N	N
General pruning. Prune dead, dying, crossing, rubbing and damaged branches and encourage new leader if necessary.	Specialist contractor appointed by National Highways	Once yearly – November to February	Y	Y	Y	Y	Y
Any dead or damaged plants should be replaced annually with matching species of the same size during the next planting season after failure. To be undertaken once yearly during November to February.	Specialist contractor appointed by National Highways	Once yearly – November to February	N	Y	Y	Y	Y
Scrub should be managed to provide areas of dense and less densely spaced plants. Long-term coppicing will be required after Year 5, areas should be cut in rotation in a cyclical programme every five to seven years.	Specialist contractor appointed by National Highways	Five to seven-year rotation from Year 5 – November to February	N	N	N	N	Y
All guards should be checked and adjusted, repaired or replaced as necessary twice yearly in October and March.	Specialist contractor appointed by National Highways	Twice yearly – October and March	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Hand weed control to be undertaken three times during the year (spring, summer and winter).	Specialist contractor appointed by National Highways	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds.	Specialist contractor appointed by National Highways	Twice yearly – May and September	Y	Y	Y	Y	Y
Maintain mulch where required by topping up twice a year (spring and autumn), 500mm either side of tree.	Specialist contractor appointed by National Highways	Twice yearly – May and September	Y	Y	Y	Y	Y
Removal of all tree guards, stakes.	Specialist contractor appointed by National Highways	As required N	N	N	N	Y	

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8.13.11 Following initial establishment, the following management prescriptions are proposed in perpetuity subject to further discussion with the advisory group during the establishment monitoring period:

a. Coppice scrub to encourage regrowth.

b. Cut areas of scrub in a rotation, aiming to retain all ages.

c. Leave berry-bearing scrub cutting until after December so the resource remains available for birds and mammals.

d. Coppicing to be undertaken in a rotational programme every ten years for scrub adjacent grasslands and every 15 years for inner areas of scrub. This will allow species such as hazel to become mature enough to provide fruit for species like dormice.

Outline measure of success

8.13.12 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. The habitat meets the appropriate characteristics as described within the UK Habitat classification definitions (Butcher, B., et al., 2020).

b. Three woody species are present with no one species comprising more than 75% of the cover.

c. There is evidence of a good age range with seedings, young shrubs and mature shrubs present.

d. There will be an absence of invasive non-native species (as listed on Schedule 9 of Wildlife and Countryside Act, 1981 as amended).

e. Combined cover of species indicative of sub-optimal condition will account for less than 5% of the total area. Sub-optimal species include tree-of-heaven (*Alianthus altissima*), holm oak (*Quercus ilex*), turkey oak (*Quercus cerris*), creeping thistle (*Cirsium arvense*), common nettle (*Urtica dioica*), chery laurel (*Prunus laurocerasus*), snowberry (*Symphoricarpos* spp.), buddleia (*Buddleja* spp.), cotoneaster (*Cotoneaster* spp.), Spanish bluebell (*Hyacinthoides hispanica*) including hybrids.

f. The scrub has a well-developed edge with scattered scrub and tall grassland and/or herbs present between the scrub and adjacent habitat(s).

g. Years 1-2: 80% establishment of planting.

h. Year 5: All plant failures to have been replaced and replanted, with a 95% success rate of new planting by the end of Year 5.

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i. Long-term:

i. Areas of scrub shall form or be clearly capable of forming groups of similar species, reflect local planting patterns, structure, and nature conservation value.

ii. Provide biodiverse scrub areas providing a continuous range of structure, shelter, and food sources (nectar, berries, etc).

iii. Native ground flora have developed.

Outline monitoring frequency and methods

8.13.13 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.13.14 After the five-year establishment period, monitoring visits every five years would be undertaken in the summer to ensure that the measures of success are being met and maintained. UKHab surveys and condition assessments would be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). If necessary, the findings of the monitoring may result in corrective actions or the prescriptions for the management or measures of success may need to be modified. Any modifications to the requirements would be agreed in consultation with the advisory group. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.13.15 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.14 LE4.3 Native species hedge (untrimmed)

Overarching aims

8.14.1 Native species hedges (untrimmed) provide wildlife corridors and habitat connectivity throughout the Project and integrate the Project route into the adjacent landscape.

Description

8.14.2 Native species-rich hedgerows comprise native scrub species providing containment, significant wildlife habitat and an ecological corridor. No annual hedge trimming is required; hedge can be left to develop naturally.

8.14.3 These hedgerows are proposed as an integral component of the landscape mitigation design, linking habitat areas, and providing natural boundaries to the Project.

8.14.4 Hedge species are to be appropriate to the location or as exist already on site.

8.14.5 A list of potential native species hedge planting is shown in the Appendix to the Design Principles (Application Document 7.5).

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8.14.6 The Appendix to the Design Principles includes a planting palette developed for native species hedge (untrimmed) for land that has been heavily compacted by construction, i.e construction compounds, embankment earthworks and false cuttings.

8.14.7 The Appendix to the Design Principles also includes a planting palette developed for native species hedge (untrimmed) for use on green bridges.

8.14.8 LE4.3 Native species hedge corresponds to native species rich hedgerow in good condition within the biodiversity net gain metric. The time to target condition following habitat creation is 12 years.

Outline requirements

8.14.9 The following outline requirements are for all areas of native species-rich hedgerow:

a. To integrate the highway with the character of the existing landscape by retaining, enhancing the existing field patterns, or restoring historic patterns.

b. Species-diverse hedgerow planting to form part of a matrix of biodiverse habitats aiding wildlife movement through areas of intensive arable land.

c. Neatly trimmed hedgerows have less value in this respect and free-growing hedges should be managed.

d. Hedgerow planting to comprise a diverse mix of native species, with a proportion of fruiting species such as hazel (*Corylus avellana*), hawthorn (*Crataegus monogyna*), blackthorn (*Prunus spinosa*), and wayfaring tree (*Viburnum lantana*), as well as other plants such as bramble (*Rubus fruticosus*) and honeysuckle (*Lonicera periclymenum*), to provide foraging opportunities for animals such as birds and dormice.

e. Hedgerow planting, where appropriate and in keeping with local character, to be established at the toe of earthworks or beyond to soften the earthworks and integrate into the surrounding landscape.

f. Hedgerow planting to be combined with fencing along the highways boundary to integrate fencing into the landscape.

g. Hedgerow planting should create visual interest and seasonal variety.

h. To provide strong green corridors which provide shelter, nesting, foraging and commuting opportunities for a range of species, notably dormice and bats moving between woodland blocks. Hedgerow habitats would follow the priority habitat descriptions for hedgerows (JNCC, 2008b).

Outline prescription

8.14.10 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

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8.14.11 Table 8.14 below describes the programme of work for initial establishment and maintenance (first five years). The text which follows Table 8.14 then outlines the management prescriptions proposed to be implemented for native species hedge (untrimmed) in perpetuity.

Table 8.14 Outline initial establishment regime

Action			**Years 0-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Provide irrigation during the establishment period (year 1) and growing season (April-September) as required. As required during Years 2 – 5.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Formative pruning in Years 1 – 3. Prune immediately after planting in autumn to 150mm above ground level. If planted late in season, leave to grow on for a year before cutting back to 150mm the following winter. In the second winter, cut back previous season's growth by about one half. In the third winter, trim laterals and leaders to create an even shape. Do not prune in frosty weather. Once established (after Year 3) no trimming/ pruning of hedge will be required.	Specialist contractor appointed by National Highways	Once yearly – November to February	Y	Y	Y	N	N
Any dead or damaged trees should be replaced annually with matching species of the same size during the next planting season after failure. To be undertaken once yearly during November to February.	Specialist contractor appointed by National Highways	Once yearly – November to February	N	Y	Y	Y	Y
All guards should be checked, adjusted, repaired or replaced as necessary twice yearly in October and March.	Specialist contractor appointed by National Highways	Twice yearly, October and March	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Hand weed control to be undertaken three times during the year (spring, summer and winter).	Specialist contractor appointed by National Highways	April, August and January	Y	Y	Y	Y	Y

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Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Selective spot treatment of herbicide as required for larger pernicious weeds.	Specialist contractor appointed by National Highways	Twice yearly, May and September	Y	Y	Y	Y	Y
Maintain mulch where required by topping up twice a year (spring and autumn), 500mm either side of hedge.	Specialist contractor appointed by National Highways	Twice yearly, May and September	Y	Y	Y	Y	Y
Removal of all tree guards, stakes	Specialist contractor appointed by National Highways	As required	N	N	N	N	Y

8.14.12 Following initial establishment, the following management prescriptions are proposed in perpetuity:

a. Trim to required height and width with a mechanical flail, every three years between October to February on a rotational basis so that some hedges always have at least three years' growth. Approximately one third of hedgerows would be left uncut for up to 10 years where this did not compromise road safety. Hedgerow height should be between 3m and 4m.

Outline measure of success

8.14.13 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. The average height of the hedgerow, from base of the stem to the top of the shoots measures over 1.5m.

b. The average width of the hedgerow is over 1.5m.

c. The gap between ground and base of canopy is under 0.5m for over 90% of the length.

d. Gaps make up under 10% of the total length, with no canopy gaps over 5m.

e. Undisturbed ground and perennial vegetation is present with over 1m width of undisturbed ground with perennial herbaceous vegetation for over 90% of the length. Present on at least one side of the hedge.

f. Over 90% of the hedgerow and undisturbed ground is free of invasive non-native and neophyte species.

g. Over 90% of the hedgerow or undisturbed ground is free of damage caused by human activities.

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h. The native hedge shall form a continuous structure and a biodiverse habitat providing shelter and food sources (nectar, berries, etc).

i. Invasive weeds and undesirable species are removed.

j. Native ground flora has developed.

Outline monitoring frequency and methods

8.14.14 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.14.15 After the five-year establishment period, monitoring visits every five years would be undertaken to ensure that the measures of success are being met and maintained, with the habitat developing into the target priority habitat. UKHab surveys and condition assessments would be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). If necessary, the findings of the monitoring may result in corrective actions or the prescriptions for the management or measures of success may need to be modified. Any modifications to the requirements would be agreed in consultation with the advisory group. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.14.16 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.15 LE4.4 Native hedgerow with trees

Description

8.15.1 Native species-rich hedgerows comprise native scrub species providing containment, significant wildlife habitat and an ecological corridor. Hedge interspersed with standard trees which are allowed to grow to maturity.

8.15.2 Hedge species are to be appropriate to the location or as exist already on site.

8.15.3 A list of potential native species hedgerow with trees planting is shown in the Appendix to the Design Principles (Application Document 7.5).

8.15.4 The Appendix to the Design Principles also includes a planting palette developed for native species hedge with trees for land that has been heavily compacted by construction, i.e construction compounds, embankment earthworks and false cuttings.

8.15.5 LE4.4 Native hedgerow with trees corresponds to native species rich hedgerow with trees in good condition within the biodiversity net gain metric. The time to target condition following habitat creation is 20 years.

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Outline requirements

8.15.6 The following outline requirements are for all areas of native species-rich hedgerow with trees:

a. To integrate the highway with the character of the existing landscape by retaining, enhancing the existing field patterns or restoring historic patterns.

b. Species-diverse hedgerow planting to form part of a matrix of biodiverse habitats aiding wildlife movement through areas of intensive arable land.

c. Neatly trimmed hedgerows have less value in this respect and free-growing hedges should be managed.

d. Hedgerow planting to comprise a diverse mix of native species, with a proportion of fruiting species such as hazel, hawthorn, blackthorn and wayfaring tree as well as other plants such as bramble and honeysuckle, to provide foraging opportunities for animals such as birds and dormice. Tree species which offer good foraging opportunities for dormice include oak (*Quercus robur*), and hornbeam (*Carpinus betulus*).

e. Hedgerow planting, where appropriate and in keeping with local character, to be established at the toe of earthworks or beyond to soften the earthworks and integrate into the surrounding landscape.

f. Hedgerow planting to be combined with fencing along the highways boundary to integrate fencing into the landscape.

g. To create visual interest and seasonal variety.

h. To provide strong green corridors which provide shelter, nesting, foraging and commuting opportunities for a range of species, notably dormice and bats moving between woodland blocks. Hedgerow habitats would follow the priority habitat descriptions for hedgerows (JNCC, 2008b).

Outline prescriptions

8.15.7 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.15.8 Table 8.15 below describes the programme of work for initial establishment and maintenance (first five years). The text which follows Table 8.15 then outlines the management prescriptions proposed to be implemented for native hedgerow with trees in perpetuity.

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Table 8.15 Outline initial establishment regime

Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Provide irrigation during the establishment period (year 1) and growing season (April-September) as required. As required during Years 2 – 5.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Adjust any guy fixings, stakes and ties at the start and end of growing season or at any other time as necessary to avoid chafing and maintain firm support.	Specialist contractor appointed by National Highways	Twice yearly - April and November	Y	Y	Y	Y	Y
Formative pruning of hedge plants only, in Years 1 – 3. Prune immediately after planting in autumn to 150mm above ground level. If planted late in season leave to grow on for a year before cutting back to 150mm the following winter. In the second winter cut back previous season's growth by about one half. In the third winter trim laterals and leaders to create an even shape. Do not prune in frosty weather.	Specialist contractor appointed by National Highways	Once yearly - November to February	Y	Y	Y	N	N
General pruning for larger trees - do not prune as hedge. Prune dead, dying, crossing, rubbing and damaged branches and encourage new leader if necessary.	Specialist contractor appointed by National Highways	Once yearly - November to February	Y	Y	Y	Y	Y
Any dead or damaged plants should be replaced annually with matching species of the same size during the next planting season after failure. To be undertaken once yearly during November to February.	Specialist contractor appointed by National Highways	Once yearly - November to February	N	Y	Y	Y	Y
All guards should be checked and adjusted, repaired or replaced as necessary twice yearly in October and March.	Specialist contractor appointed by National Highways	Twice yearly - October and March	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y

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Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Hand weed control to be undertaken three times during the year (spring, summer and winter).	Specialist contractor appointed by National Highways	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds.	Specialist contractor appointed by National Highways	Twice yearly - May and September	Y	Y	Y	Y	Y
Maintain mulch where required by topping up twice a year (spring and autumn), 500mm either side of hedge.	Specialist contractor appointed by National Highways	Twice yearly - May and September	Y	Y	Y	Y	Y
Removal of all tree guards, stakes.	Specialist contractor appointed by National Highways	As required	N	N	N	N	Y

8.15.9 Following initial establishment, the following management prescriptions are proposed in perpetuity subject to further discussion with the advisory group during the establishment monitoring period:

a. Maintain habitat integrity and remove undesirable species.

Outline measure of success

8.15.10 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. The average height of the hedgerow, from base of the stem to the top of the shoots measures over 1.5m.

b. The average width of the hedgerow is over 1.5m.

c. The gap between ground and base of canopy is under 0.5m for over 90% of the length.

d. Gaps make up under 10% of the total length, with no canopy gaps over 5m.

e. Undisturbed ground and perennial vegetation is present with over 1m width of undisturbed ground with perennial herbaceous vegetation for over 90% of the length. Present on at least one side of the hedge.

f. Over 90% of the hedgerow and undisturbed ground is free of invasive non-native and neophyte species.

g. Over 90% of the hedgerow or undisturbed ground is free of damage caused by human activities.

h. At least one mature tree per 30m stretch of hedgerow.

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i. At least 95% of hedgerow trees are in a healthy condition (excluding veteran features valuable for wildlife). There is little or no evidence of an adverse impact on tree health by damage from livestock or wild animals, pests or diseases, or human activity.

j. The native hedge shall form a continuous structure and shall be fit for purpose.

k. Hedge shall form a biodiverse habitat providing shelter and food sources (nectar, berries, etc).

l. Invasive weeds and undesirable species shall be removed.

m. Native ground flora have developed.

n. Intermittent individual plants of suitable tree species shall have been allowed to reach maturity and not managed as a hedge.

Outline monitoring frequency and methods

8.15.11 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.15.12 After the five-year establishment period, monitoring visits every five years would be undertaken to ensure that the measures of success are being met and maintained, with the habitat developing into the target priority habitat. UKHab surveys and condition assessments would be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). If necessary, the findings of the monitoring may result in corrective actions or the prescriptions for the management or measures of success may need to be modified. Any modifications to the requirements would be agreed in consultation with the advisory group. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.15.13 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.16 LE6.12 Water bodies and associated plants – shallow scrape habitat

Description

8.16.1 Shallow scrape habitats are proposed within the Project design, their primary function being to maintain the functionality of functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar. They do not form part of the Project drainage design and would be designed to maximise their value to the wintering and migrating birds that the SPA/Ramsar is designated for, following good practice guidance such as RSPB's 'Scrape creation for wildlife'

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and 'Creating wader scrapes and flashes on farmland' (2003). Evidence of efficacy can be found at https://www.conservationevidence.com/actions/369.

8.16.2 LE6.12 Water bodies and associated plants – shallow scrape corresponds to Temporary lakes, ponds, and pools in poor condition within the biodiversity net gain metric. The time to target condition following habitat creation is one year.

Outline aims and objectives

8.16.3 The following outline aims and objectives are for all shallow scrape habitats:

a. To provide enhanced functionality within functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar by providing foraging habitat for a range of bird qualifying features of the SPA/Ramsar.

b. Scrapes to be managed to provide optimum habitat for foraging waterbirds.

c. Provide a series of water level control structures (e.g. weirs or sluices) to maintain a range of water depths in different scrapes to support the range of species for which the mitigation is targeted.

Outline prescriptions

8.16.4 The work activities to complete the enhancement of the land adjacent to Coalhouse Fort will be completed before the northern tunnel entrance compound is set up.

8.16.5 The exact details of the work activities will be developed between all parties during the development of the LEMP and subsequent work-specific method statements.

8.16.6 Table 8.16 below describes the programme of work for initial establishment and maintenance (first five years).

Table 8.16 Outline initial establishment regime

Action			**Years 1-5 of the Construction Period**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Excavation of wet scrape habitats for foraging waterbirds features of the Thames Estuary and Marshes SPA/Ramsar Excavated material to be used for construction of high tide roost features.	Contractor	Summer	Y	N	N	N	N
Removal of all trees, shrubs, fencing posts, etc. that could act as predator observation points within 300m of scrapes.	Contractor	Summer	Y	N	N	N	N
Enable grazing management of the surrounding coastal grazing marsh and high tide roost	Contractor	Summer	Y	Y	Y	Y	Y

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Action			Years 1-5 of the Construction Period				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
features to include scrape edges / margins							
Attendance of quarterly site inspections with the Ecological Clerk of Works (ECoW)	ECoW appointed by Contractor	Quarterly	Y	Y	Y	Y	Y
Removal from scrapes of floating litter, debris, or other contaminants – weekly as part of general litter maintenance	ECoW appointed by Contractor	As required	Y	Y	Y	Y	Y
Annual removal of unwanted vegetation from scrapes including edges / margins	ECoW appointed by Contractor	Summer	Y	Y	Y	Y	Y
Annual removal of shrubs within 300m of scrapes that could act as predator observation points and reduce overall sightlines for foraging waterbirds.	ECoW appointed by Contractor	Summer	Y	Y	Y	Y	Y

Outline measure of success

8.16.7 To ensure that the management objectives are achieved, the following monitoring targets have been devised to measure success:

a. There is semi-natural habitat (i.e. moderate distinctiveness or above) for at least 10m from the scrape edge present.

b. Less than 10% of the scrape is covered with duckweed or filamentous algae.

c. Scrape water levels should be managed to fluctuate throughout the year to provide a range of foraging opportunities for waterbirds across the site at all times.

d. The scrape is not artificially stocked with fish.

e. Shallow water and exposed mud habitats available for foraging by qualifying waterbirds features of the Thames Estuary and Marshes SPA/Ramsar.

f. Vegetation largely absent from waterbodies and their margins and not interfering with foraging of waterbirds.

g. Absence of obstructions to sightlines of waterbirds or predator observation points within 300m of scrapes.

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Outline monitoring frequency and methods

8.16.8 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved.

8.16.9 The monitoring will commence in the first year after the habitats are created and will comprise:

a. habitat establishment and suitability

b. bird use

8.16.10 Frequency of monitoring visits to record the habitat establishment and suitability will be determined by the success of establishment and the frequency of monitoring adjusted accordingly to ensure relevant follow up operations are undertaken. At this stage an annual visit for the first five years following creation is proposed and carried out in late summer.

8.16.11 During construction and for five years post construction, annual surveys will be undertaken of use of scrapes by passage and wintering waterbirds, with monthly visits August to April inclusive. Surveys will record:

a. waterbirds species and numbers at both low and high tide during daylight.

b. waterbirds species and numbers at high tide nocturnally.

c. distribution of waterbirds in relation to the scrape habitats.

d. disturbing stimuli and waterbirds behaviours in response to them (including where no response).

e. management requirements such as vegetation removal.

8.16.12 UKHab surveys and condition assessments would also be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a).

8.16.13 National Highways' appointed monitoring party will carry out the monitoring visits as outlined in Table 8.17 below and feed back to the advisory group as part of annual monitoring reporting. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

Table 8.17 Outline monitoring

Action			**All construction years and post construction years 1-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Annual check of habitat suitability	National Highways' appointed monitoring party	Late summer	Y	Y	Y	Y	Y

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Action			All construction years and post construction years 1-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Annual survey of waterbirds	National Highways' appointed monitoring party	August to April	Y	Y	Y	Y	Y

8.17 LE6.13 Waterbodies and associated plants – HRA ditch habitat

Description

8.17.1 HRA ditch habitats are proposed within the Project design at Coalhouse Point, their primary function being to maintain the functionality of functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar. They do not form part of the Project drainage design and would be designed to maximise their value to the over wintering and passage birds that the SPA/Ramsar is designated for.

8.17.2 LE6.13 Waterbodies and associated plants – HRA ditch habitat corresponds to ditches in moderate condition within the biodiversity net gain metric. The time to target condition following habitat creation is five years.

Outline aims and objectives

8.17.3 The following outline aims and objectives are for all HRA ditch habitats:

a. To provide enhanced functionality within functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar by providing foraging habitat for a range of bird qualifying features of the SPA/Ramsar.

b. Ditches to be managed to provide optimum habitat for foraging waterbirds.

c. Provide a series of water level control structures (e.g. weirs or sluices) to maintain a range of water depths in the ditch system to support the range of species for which the mitigation is targeted.

Outline prescriptions

8.17.4 The work activities to complete the enhancement of the land adjacent to Coalhouse Fort will be completed before the northern tunnel entrance compound is set up.

8.17.5 The exact details of the work activities will be developed between all parties during the development of the LEMP and subsequent work-specific method statements.

8.17.6 Table 8.18 below describes the programme of work for initial establishment and maintenance (first five years).

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Table 8.18 Outline initial establishment regime

Action			**Years 1-5 of the Construction Period**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Excavation of HRA ditch habitats for foraging waterbirds features of the Thames Estuary and Marshes SPA/Ramsar Excavated material to be used for construction of high tide roost features	Contractor	Summer	Y	N	N	N	N
Construction of the water inlet in accordance with HR010 and HR011	Contractor	Summer	Y	N	N	N	N
Removal of all trees, shrubs, fencing posts, etc. that could act as predator observation points within 300m of ditches	Contractor	Summer	Y	N	N	N	N
Enable grazing management of the surrounding coastal grazing marsh and high tide roost features to include ditch edges / margins	Contractor	Summer	Y	Y	Y	Y	Y
Clear one side of one fifth of ditches and reprofile banks to shallow gradient	Contractor	Spring / summer	Y	Y	Y	Y	Y
Attendance of quarterly site inspections with the Ecological Clerk of Works (ECoW)	ECoW appointed by Contractor	Quarterly	Y	Y	Y	Y	Y
Removal from ditches of floating litter, debris, or other contaminants – weekly as part of general litter maintenance	ECoW appointed by Contractor	As required	Y	Y	Y	Y	Y
Annual removal of unwanted vegetation from ditches including edges / margins	ECoW appointed by Contractor	Summer	Y	Y	Y	Y	Y
Annual removal of shrubs within 300m of ditches that could act as predator observation points and reduce overall sightlines for foraging waterbirds	ECoW appointed by Contractor	Summer	Y	Y	Y	Y	Y

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Outline measure of success

8.17.7 To ensure that the management objectives are achieved, the following monitoring targets have been devised to measure success:

a. There is semi-natural habitat (i.e. moderate distinctiveness or above) for at least 10m from the ditch edge present.

b. Less than 10% of the ditch is covered with duckweed or filamentous algae.

c. Ditch water levels should be managed to fluctuate throughout the year to provide a range of foraging opportunities for waterbirds across the site at all times.

d. The ditches are not artificially stocked with fish.

e. The ditch network is available for foraging by qualifying waterbirds features of the Thames Estuary and Marshes SPA/Ramsar.

f. Vegetation largely absent from waterbodies and their margins and not interfering with foraging of waterbirds.

g. Absence of obstructions to sightlines of waterbirds or predator observation points within 300m of ditches.

h. Ditch habitats to provide diversity of habitat without interfering with foraging waterbirds.

i. The water supplies (tidal water, surface water and/or rainwater) to the wetland are of good water quality, with clear water (low turbidity) indicating no obvious signs of pollution.

j. There is an absence of invasive non-native species (as listed on Schedule 9 of WCA, 1981).

Outline monitoring frequency and methods

8.17.8 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved.

8.17.9 The monitoring will commence in the first year after the habitats are created and will comprise:

a. Habitat establishment and suitability

b. Bird use

8.17.10 Frequency of monitoring visits to record the habitat establishment and suitability will be determined by the success of establishment and the frequency of monitoring adjusted accordingly to ensure relevant follow up operations are undertaken. At this stage an annual visit for the first five years following creation is proposed and carried out in late summer.

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8.17.11 During construction and for five years post construction, annual surveys will be undertaken of use of ditches by passage and wintering waterbirds, with monthly visits August to April inclusive. Surveys will record:

a. Waterbirds species and numbers at both low and high tide during daylight

b. Waterbirds species and numbers at high tide nocturnally

c. Distribution of waterbirds in relation to the scrape habitats

d. Disturbing stimuli and waterbirds behaviours in response to them (including where no response)

e. Management requirements such as vegetation removal

8.17.12 National Highways' appointed monitoring party will carry out the monitoring visits as outlined in Table 8.19 below and feed back to the advisory group as part of annual monitoring reporting. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

Table 8.19 Outline monitoring

Action			**All construction years and post construction years 1-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Annual check of habitat suitability	National Highways' appointed monitoring party	Late summer	Y	Y	Y	Y	Y
Annual survey of waterbirds	National Highways' appointed monitoring party	August to April	Y	Y	Y	Y	Y

8.18 LE6.2 Banks and ditches

Description

8.18.1 This typology covers the creation of new ditches to offset the loss of watercourses and water vole habitat as a result of construction of the Project. Ditches would be designed to offer water vole foraging and burrowing opportunities with bank profiles at 45° angles above water level to provide burrowing sites, and a diverse range of native riparian vegetation to give foraging opportunities throughout the year. The design would follow good practice guidance such as Dean *et al*. (2016).

8.18.2 A list of potential native species planting for banks and ditches is shown in the appendix to the Design Principles (Application Document 7.5). Species mix shall be developed during the detailed design stage to be tolerant of the roadside verge environment and underlying substrate used in the creation of the ditches.

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8.18.3 LE6.2 Banks and Ditches is represented by other neutral grassland in good condition and ditches in moderate condition within the biodiversity net gain metric. The time to target condition following habitat creation is 10 years for other neutral grassland, and five years for ditches.

Outline requirements

8.18.4 The following requirements are for all areas of banks and ditches.

a. To profile ditches to provide burrow opportunities for water vole (Water Vole Conservation Handbook. (2011)) and areas for abundant and diverse riparian habitat to establish. This offers both foraging and shelter opportunities for water voles as well as a range of other wildlife including invertebrates, amphibians and reptiles, birds and small mammals.

b. To create strong green corridors which animals would use to commute through the landscape.

c. To include emergent rush, sedge and reed planting, together with wider margins of tall grasses and ruderals such as rosebay willowherb (*Chamerion angustifolium*), purple loosestrife (*Lythrum salicaria*), meadowsweet (*Filipendula ulmaria*). Brambles and nettles will also add to the cover and foraging opportunities.

Outline prescriptions

8.18.5 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP

8.18.6 Table 8.20 below describes the programme of work for initial establishment and maintenance (first five years).

Table 8.20 Outline initial establishment regime

Action			**Years 0-5 and year 10**					
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**	**10**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y	Y
For water vole ditches, cutting bankside vegetation to a height approximately 100-150mm above ground level. Cut alternate banks in alternate years.	Specialist contractor appointed by National Highways	Mid-July to mid-September	-	-	Y	-	Y	Y
For water vole ditches, de-silt every three to five years working in an up-stream direction.	Specialist contractor appointed by National Highways	Autumn/ winter	-	-	-	-	Y	Y

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Action			Years 0-5 and year 10					
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**	**10**
For water vole ditches, riparian vegetation cutting in a three to five years rotation.	Specialist contractor appointed by National Highways	August - September	-	-	-	-	Y	Y
Annual monitoring of the area for colonisation of water vole and the non-native American mink which presents significant predation pressure on water vole. Should signs of mink be recorded, control measures should be installed within newly created ditches and any tributaries they flow into.	Specialist contractor appointed by National Highways	February - April	Y	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from ditches and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y	Y

Outline measure of success

8.18.7 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. Retain sufficient vegetation to provide sufficient cover and foraging opportunities and prevent scour and washout at times of water inundation.

b. Maintain species diversity and structure where appropriate and prevention of scrubbing over or blocking of watercourse.

c. The appearance and composition of the vegetation will closely match the characteristics of other neutral grassland, as described within the UK Habitat classification definitions (Butcher, B., et. al., 2020).

d. Rotational management will ensure the sward height will be varied. At least 20% of the sward will be less that 7cm and at least 20% will be more than 7cm in order to successfully create microclimates for insects, birds and small mammals.

e. Cover of bare ground will be between 1% and 5%. This can include localised areas such as rabbit warrens.

f. Cover of bracken will be less than 20% and cover of scrub will be less than 5%.

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g. There will be an absence of invasive non-native species (as listed on Schedule 9 of Wildlife and Countryside Act, 1981 as amended).

h. Combined cover of species indicative of sub-optimal condition and physical damage will account for less than 5% of the total area. Sub-optimal species include creeping thistle (*Cirsium arvense*), spear thistle (*Cirsium vulgare*), curled dock (*Rumex crispus*), broad-leaved dock (*Rumus obtusifolius*), common nettle (*Urtica dioica*), creeping buttercup (*Ranunculus repens*), greater plantain (*Plantago major*), white clover (*Trifolium repens*), cow parsley (*Anthriscus sylvestris*).

i. Control of the non-native American mink to remove resident family groups and record no more than transitory adults moving through the catchment.

Outline monitoring frequency and methods

8.18.8 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.18.9 After the five-year establishment period, monitoring visits every three years would be undertaken to ensure that the measures of success are being met and maintained. UKHab surveys and condition assessments would be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). If necessary, the findings of the monitoring may result in corrective actions or the prescriptions for the management or measures of success may need to be modified. Any modifications to the requirements would be agreed in consultation with the advisory group. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.18.10 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.19 LE6.21 Banks and ditches – high tide roost features

Description

8.19.1 This typology is located at Coalhouse Point and includes raised ground or bank features within or adjacent to wet scrape habitats that are suitable for roosting of waterbirds of the Thames Estuary and Marshes SPA / Ramsar during high tides.

8.19.2 The form of high tide roost features may vary, but vegetation would be absent or short / sparse between August and March inclusive, to facilitate roosting by waterbirds.

8.19.3 LE6.21 Banks and ditches – high tide roost features correspond to Sparsely Vegetated Land – Ruderal/Ephemeral in poor condition within the biodiversity net gain metric. The time to target condition following habitat creation is one year.

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Outline aims and objectives

8.19.4 The following outline aims and objectives are for all high tide roost features.

a. To provide enhanced functionality within functionally linked land associated with the Thames Estuary and Marshes SPA/Ramsar by providing high tide roosting habitat for a range of bird qualifying features of the SPA/Ramsar.

b. Areas to be managed to provide optimum habitat for roosting waterbirds.

Outline prescriptions

8.19.5 The work activities to complete the enhancement of the land adjacent to Coalhouse Fort will be completed before the northern tunnel entrance compound is set up.

8.19.6 The exact details of the work activities will be developed between all parties during the development of the LEMP and subsequent work-specific method statements.

8.19.7 Table 8.21 below describes the programme of work for initial establishment and maintenance (first five years).

Table 8.21 Outline initial establishment regime

Action			**Years 1-5 of the Construction Period**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Spreading of material excavated during creation of wet scrape habitats to form raised ground and banks suitable for roosting waterbirds.	Contractor	Summer	Y	-	-	-	-
Attendance of quarterly site inspections with the Project ECoW.	ECoW appointed by Contractor	Quarterly	Y	Y	Y	Y	Y
High tide roost features to be grazed during the summer and mown / strimmed in late summer where necessary to provide a short / sparse vegetation between August and March.	Contractor	Summer	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds.	ECoW appointed by Contractor	Twice yearly - May and September	Y	Y	Y	Y	Y
Injurious weeds are to be eradicated, removed and disposed of off-site, as per	ECoW appointed by Contractor	As required	Y	Y	Y	Y	Y

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Action			Years 1-5 of the Construction Period				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
the latest DEFRA / Natural England guidance.							
All litter / foreign debris to be removed and taken off site.	ECoW appointed by Contractor	As required	Y	Y	Y	Y	Y

Outline Measure of Success

8.19.8 To ensure that the management objectives outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management objectives:

a. Cover of bracken, scrub and trees is less than 25%.

b. Cover of bare ground more than 50%.

c. There is an absence of invasive non-native species (as listed on Schedule 9 of WCA, 1981) and species indicative of sub-optimal condition make up less than 5% of ground cover.

d. High tide roosting features available for roosting qualifying waterbirds features of the Thames Estuary and Marshes SPA/Ramsar.

e. High tide roost features sufficiently elevated, so they are available for roosting waterbirds at spring high tides.

f. Vegetation of high tide roost features sufficiently low / sparse between August and March inclusive to not deter roosting by waterbirds.

g. Absence of obstructions to sightlines of waterbirds or predator observation points within 300m of high tide roost features.

Outline Monitoring Frequency and Methods

8.19.9 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved.

8.19.10 Monitoring will commence in the first year after the habitats are created and will comprise:

a. habitat establishment and suitability

b. bird use

8.19.11 Frequency of monitoring visits to record the habitat establishment and suitability will be determined by the success of establishment and the frequency of monitoring adjusted accordingly to ensure relevant follow up operations are undertaken. At this stage an annual visit for the first five years following creation is proposed and carried out in late summer.

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8.19.12 During construction and for five years post construction, annual surveys will be undertaken of use of high tide roosting features by passage and wintering waterbirds, with monthly visits August to April inclusive. Surveys will record:

a. Waterbirds species and numbers at both low and high tide during daylight.

b. Waterbirds species and numbers at high tide nocturnally.

c. Distribution of waterbirds in relation to the high tide roost features.

d. Disturbing stimuli and waterbirds behaviours in response to them (including where no response.

e. Management requirements such as vegetation removal.

8.19.13 UKHab surveys and condition assessments would also be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a).

8.19.14 National Highways' appointed monitoring party will carry out the monitoring visits as outlined in Table 8.22 below and feed back to the advisory group as part of annual monitoring reporting. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

Table 8.22 Outline monitoring

Action			**All construction years and post construction years 1-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Annual check of habitat suitability	National Highways' appointed monitoring party	Late summer	Y	Y	Y	Y	Y
Annual survey of waterbirds	National Highways' appointed monitoring party	August to April	Y	Y	Y	Y	Y

8.20 LE6.4 Wet grassland

Description

8.20.1 Areas of grassland planting containing moisture-loving grass and wildflower species situated around the periphery of water bodies or in grassland areas prone to be seasonally inundated with water.

8.20.2 LE6.4 Wet Grassland corresponds to other neutral grassland in good condition within the biodiversity net gain metric. The time to target condition following habitat creation is 10 years.

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Outline requirements

a. To create a diverse grassland which would develop into NVC community MG8 and provide habitat appropriate for wetland species including invertebrates, birds, water vole, otter, amphibians and grass snake.

b. To assist with water attenuation and water quality when adjacent or within attenuation basins.

Outline prescriptions

8.20.3 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.20.4 Table 8.23 below describes the programme of work for initial establishment and maintenance (first five years).

Table 8.23 Outline initial establishment regime

Action			**Years 0-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
It is anticipated that a flush of annual weeds will be present in the soil within the first growing season. Weed growth is to be controlled by topping or mowing monthly. All plant growth (sown grasses and weeds) is to be mown regularly to 40-60mm throughout the first growing season to prevent weeds smothering the slower-growing grasses, removing cuttings if dense.	Specialist contractor appointed by National Highways	Monthly during the growing season	Y	N	N	N	N
Planting to be managed according to the location. Where visibility splay requirements are not required, planting is to be managed as a wet meadow, allowing the grasses to grow tall, flower and seed from May through to July/August. The wet meadow should be cut in late summer/early autumn in dry conditions and cuttings removed from site.	Specialist contractor appointed by National Highways	Late autumn	N	Y	Y	Y	Y
Areas within 4m of ditches to be left uncut for five years (potentially cut every three years if required to avoid ditches becoming blocked with vegetation). This is in line with typology 7.17 above.	Specialist contractor appointed by National Highways	Late autumn	N	N	(Y)	N	Y
Injurious weeds are to be eradicated and disposed of off-site, as per the latest Defra/Natural England guidance. Grass	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y

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Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
swards that do not contain wildflowers can be selectively sprayed. Hand weeding will be required in areas of wildflower.							
In areas where seed has not taken, re-prepare ground and re-seed in autumn before ground becomes saturated.	Specialist contractor appointed by National Highways	In autumn where required	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from planted areas and taken off site.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y

Outline measure of success

8.20.5 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. The appearance and composition of the vegetation will closely match the characteristics of other neutral grassland, as described within the UK Habitat classification definitions (Butcher, B., et. al., 2020).

b. Rotational management will ensure the sward height will be varied. At least 20% of the sward will be less that 7cm and at least 20% will be more than 7cm in order to successfully create microclimates for insects, birds and small mammals.

c. Cover of bare ground will be between 1% and 5%. This can include localised areas such as rabbit warrens.

d. Cover of bracken will be less than 20% and cover of scrub will be less than 5%.

e. There will be an absence of invasive non-native species (as listed on Schedule 9 of Wildlife and Countryside Act, 1981 as amended).

f. Combined cover of species indicative of sub-optimal condition and physical damage will account for less than 5% of the total area. Sub-optimal species include creeping thistle (*Cirsium arvense*), spear thistle (*Cirsium vulgare*), curled dock (*Rumex crispus*), broad-leaved dock (*Rumus obtusifolius*), common nettle (*Urtica dioica*), creeping buttercup (*Ranunculus repens*), greater plantain (*Plantago major*), white clover (*Trifolium repens*), cow parsley (*Anthriscus sylvestris*).

g. The sward shall cover at least 80% of the area to be managed where necessary to ensure this typology fulfils the environmental function required.

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h. Wet grassland to support at least 12 or more plant species per m^2, managed to prevent natural succession to scrub and woodland and retain the open grassland character.

i. Target species numbers to be met by Year 3.

Outline monitoring frequency and methods

8.20.6 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.20.7 After the five-year establishment period, monitoring visits every five years would be undertaken in the summer to ensure that the measures of success are being met and maintained. UKHab surveys and condition assessments would be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). If necessary, the findings of the monitoring may result in corrective actions or the prescriptions for the management or measures of success may need to be modified. Any modifications to the requirements would be agreed in consultation with the advisory group. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.20.8 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.21 LE6.41 Marsh and wet grassland – coastal grazing marsh

Description

8.21.1 The coastal grazing marsh typology is located at Coalhouse Point and includes areas of seasonally wet grassland and shallow edged ditches.

8.21.2 LE6.41 Marsh and wet grassland – coastal grazing marsh corresponds to Floodplain wetland mosaic (CFGM) in moderate condition within the biodiversity net gain metric. The time to target condition following habitat creation is over 10 years.

Outline aims and objectives

8.21.3 The following outline aims and objectives are for all areas of coastal grazing marsh:

a. To create and maintain coastal grazing marsh habitat suitable for foraging of passage and wintering waterbirds features of the Thames Estuary and Marshes SPA/Ramsar.

b. To maintain a grassland sward year-round at a height of approximately 10cm or below through summer grazing and late summer mowing where necessary.

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Outline prescriptions

8.21.4 The work activities to complete the enhancement of the land adjacent to Coalhouse Fort will be completed before the northern tunnel entrance compound is set up.

8.21.5 The exact details of the work activities will be developed between all parties during the development of the LEMP and subsequent work-specific method statements.

8.21.6 Table 8.24 below describes the programme of work for initial establishment and maintenance (first five years).

Table 8.24 Outline initial establishment regime

Action			**Years 1-5 of the Construction Period**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Sow suitable coastal grazing marsh grassland mix.	Contractor	Spring / summer	Y	-	-	-	-
Instigate grazing regime and late summer mowing where required to maintain sward height of approximately 10cm or below year-round.	Contractor	Summer	Y	Y	Y	Y	Y
Rotivate / shallow plough some areas to generate annual weed seeds for duck and create added value breeding habitat for waders (including lapwing and avocet)	Contractor	As required	Y	Y	Y	Y	Y
Erect and maintain anti-predator fence	Contractor	As required	Y	Y	Y	Y	Y
Attendance of quarterly site inspections with the Project Ecological Clerk of Works (ECoW)	ECoW appointed by Contractor	Quarterly	Y	Y	Y	Y	Y
Removal of litter, debris, fly tipping, surface weeds, contaminants and animal carcasses – weekly as part of general litter maintenance.	ECoW appointed by Contractor	As required	Y	Y	Y	Y	Y
Any unsuccessful grassland sowing to be replaced annually.	ECoW appointed by Contractor	Spring / summer	N	Y	Y	Y	Y
Injurious weeds are to be eradicated, removed and	ECoW appointed by Contractor	As required	Y	Y	Y	Y	Y

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Action			Years 1-5 of the Construction Period				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
disposed of off-site, as per the latest DEFRA / Natural England guidance.							

Outline measure of success

8.21.7 To ensure that the management objectives outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management objectives:

a. The water table is at or near the surface throughout the year, this could be open water (periodic shallow flooding in places) or saturation of soil at the surface where topography allows. There is no artificial drainage, unless specifically to maintain water levels as specified in LE6.12 and LE6.13.

b. The appearance and composition of the vegetation closely matches characteristics of the specific wetland habitat type (see UKHab definition linked above). Indicator species for the specific wetland habitat type are very clearly and easily visible.

c. Cover of scrub and scattered trees is less than 10%.

d. Cover of bare ground less than 5%.

e. There is an absence of invasive non-native species (as listed on Schedule 9 of WCA, 1981) and species indicative of sub-optimal condition make up less than 5% of ground cover.

f. Coastal grazing marsh available for foraging by qualifying waterbirds features of the Thames Estuary and Marshes SPA/Ramsar.

g. Management of recreational disturbance.

h. The sward height is maintained at approximately 10cm or below year-round.

i. The grassland supports species typical of coastal grazing marsh with no scrub.

j. Absence of obstructions to sightlines of waterbirds or predator observation points.

Outline monitoring frequency and methods

8.21.8 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved.

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8.21.9 Monitoring will commence in the first year after the habitats are created and will comprise:

a. habitat establishment and suitability

b. bird use

8.21.10 Frequency of monitoring visits to record the habitat establishment and suitability will be determined by the success of establishment and the frequency of monitoring adjusted accordingly to ensure relevant follow up operations are undertaken. At this stage an annual visit for the first five years following creation is proposed and carried out in late summer.

8.21.11 During construction and for five years post construction, annual surveys will be undertaken of use of coastal grazing marsh created through the Project by passage and wintering waterbirds, with monthly visits August to April inclusive. Surveys will record:

a. Waterbirds species and numbers at both low and high tide during daylight.

b. Waterbirds species and numbers at high tide nocturnally.

c. Distribution of waterbirds in relation to the coastal grazing marsh habitats.

d. Disturbing stimuli and waterbirds behaviours in response to them (including where no response).

e. Management requirements such as vegetation mowing or weed eradication.

8.21.12 UKHab surveys and condition assessments would also be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a).

8.21.13 National Highways' appointed monitoring party will carry out the monitoring visits as outlined in Table 8.25 below and feed back to the advisory group as part of annual monitoring reporting. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

Table 8.25 Outline monitoring

Action			**All construction years and post construction Years 1-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Annual check of habitat suitability	National Highways' appointed monitoring party	Late summer	Y	Y	Y	Y	Y
Annual survey of waterbirds	National Highways' appointed monitoring party	August to April	Y	Y	Y	Y	Y

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8.22 LE7.2 Green roofs

Description

8.22.1 Green roofs are areas on roofs of buildings with suitable and tolerant perennial low-growing species. Green roofs will have a layer of suitable substrate and drainage systems.

8.22.2 Green roofs are proposed at both the North Portal and South Portal. Both roofs are designed to be extensive green roofs and require low maintenance.

8.22.3 The green roof at the South Portal shall reflect the surrounding chalk grassland character.

8.22.4 The green roof at the North Portal shall reflect the surrounding marshland character.

8.22.5 LE7.2 Green roofs corresponds to biodiverse green roof in good condition within the biodiversity net gain metric. The time to target condition following habitat creation is 10 years.

Outline requirements

8.22.6 The following outline requirements are for all green roofs:

a. To provide a visually interesting, planted roof that requires low maintenance.

b. Species mix shall be reflective of the surrounding landscape and comprise local species which provide food sources for both larval and adult stage invertebrates.

c. Green roof shall fulfil its purpose to provide sustainable drainage and insulation.

d. Green roof shall be designed and managed so that it flows seamlessly into the adjacent grassland.

Outline prescriptions

8.22.7 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP

8.22.8 Table 8.26 below describes the programme of work for initial establishment and maintenance (first five years).

Table 8.26 Outline initial establishment regime

Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect. Ensure safe access can be gained to the roof and that relevant Health and	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y

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Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Safety procedures are followed when working at roof level.							
Water in dry periods as required. This is especially pertinent during the first 12 months.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from roof as required.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Any dead or damaged plants should be replaced annually with matching species of the same size during the next planting season after failure. To be undertaken once yearly during November to February. Advice should be sought from green roof system installer.	Specialist contractor appointed by National Highways	Once yearly November to February	N	Y	Y	Y	Y
Remove the lids of all inspection chambers, ensure drainage outlets remain clear from blockages and free from vegetation.	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Injurious weeds are to be eradicated, removed and disposed of off-site, as per the latest Defra/Natural England guidance. Grass swards that do not contain wildflowers can be selectively sprayed. Hand weeding will be required in areas of wildflower.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Annual removal of excess vegetation and invasive weeds (including any gravel margins).	Specialist contractor appointed by National Highways	Summer	Y	Y	Y	Y	Y

Outline measure of success

8.22.9 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. Varied vegetation structure, with a single structural habitat component or vegetation type not accounting for more than 80% of the total habitat area.

b. A diverse range of flowering plant species are present which include native, non-native but beneficial to wildlife or non-native sedum plants.

c. Invasive non-native species cover less than 5% of the total vegetated area.

d. A varied depth of 80 to 50mm is present with over 50% at 150mm and is planted and seeded with wildflowers and sedums.

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e. Habitat features are present, such as sand piles, logs etc.

f. Retain sufficient vegetation to prevent scour and washout at times of water inundation.

g. Maintain species diversity and structure.

h. Target species numbers to be met by Year 3.

i. Creation of a diverse floral assemblage which supports a broad range of invertebrate species.

j. Invasive weeds kept to less than 10% of ground cover.

Outline monitoring frequency and methods

8.22.10 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.22.11 After the five-year establishment period, monitoring visits every five years would be undertaken in the summer to ensure that the measures of success are being met and maintained. UKHab surveys and condition assessments would be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). If necessary, the findings of the monitoring may result in corrective actions or the prescriptions for the management or measures of success may need to be modified. Any modifications to the requirements would be agreed in consultation with the advisory group. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.22.12 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.23 LE8.1 Open mosaic habitat

Overarching requirements

8.23.1 To provide open mosaic habitat that incorporates a structural diversity of bare, sandy flat areas and south-facing slopes and banks. Species-rich habitats of native grasses and wildflowers should transition into more dense scrub habitats where adjacent to dense scrub or woodland.

Description

8.23.2 Open mosaic habitat is proposed as essential component of the landscape mitigation design and will provide biodiversity and nature conservation value.

8.23.3 Open mosaic habitat is a dynamic habitat, the value of which is generated through regular disturbance, avoiding habitat succession, and retaining structural diversity.

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8.23.4 Various differing elements make up an open mosaic habitat. They are associated with brownfield or previously developed/disturbed land. Open mosaic consists of a variety of different habitats at different stages of transition.

8.23.5 Open mosaic habitat can include varied microtopography to incorporate south-facing banks which can be created using inert material such as pulverised fuel ash, sands and gravels.

8.23.6 LE8.1 Open mosaic habitat is an overarching landscape typology which is shown on the Environmental Masterplan (Application Document 6.2, Figure 2.4). It has been assigned its own unique Landscape element code further to LD 117. These areas will be developed and detailed further to the appropriate landscape element codes in future iterations of this document.

8.23.7 The proposed make-up of the open mosaic habitat is broadly as follows but would be refined for each management area to optimise habitats for target species groups:

a. Scrub: no greater than 10% coverage

b. Bare ground: approximately 10% coverage (small patches spread across site rather than single areas)

c. Rough grassland: approximately 30% coverage

d. Low-nutrient, free-draining grassland: approximately 50% coverage (pulverised fuel ash to provide a minimum 20% overall area substrate, together with sands and gravels generated by the construction work, shall be used to mimic the substrate in areas where the habitat is currently found and left to regenerate naturally)

e. Wildlife ponds, hibernacula and refuges to be created in line with good practice guidance (English Nature, 2001).

8.23.8 LE8.1 Open mosaic habitat corresponds to open mosaic habitat on previously developed land in good condition within the biodiversity net gain metric. The time to target condition following habitat creation is 10 years.

Outline requirements

8.23.9 The following outline requirements are for all areas of open mosaic habitat.

a. To provide replacement habitat for reptiles, amphibians, invertebrates, and other fauna.

b. To be a receptor site for translocated species including amphibians and reptiles.

c. To be managed to avoid natural succession and retaining the mosaic character of the habitat.

d. To create grassland habitats that follow the priority habitat descriptions for open mosaic habitats (JNCC, 2010b).

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8.23.10 This will be agreed between National Highways and the identified management agent.

Outline prescriptions

8.23.11 The exact details of the work activities will be developed between all parties during the development of the LEMP and subsequent work-specific method statements.

8.23.12 The list below describes the outline programme for initial establishment, initial maintenance and then goes on to explain the management prescriptions proposed to be implemented for open mosaic habitat in perpetuity.

a. To plant the open mosaic habitat areas to ensure the ratio of habitats as described above.

b. For the first few years after initial planting, habitat maintenance will be minimal to allow areas to establish naturally.

c. Botanical and protected-species surveys will be carried out to ensure the habitat developed as anticipated and that there are healthy populations of species that have been translocated to these sites.

d. Where issues arise, such as over dominance of a particular species or habitat, then appropriate reactive responses will be undertaken to ensure the diversity of the habitats.

e. Habitats will be managed to ensure that the structure and diversity of habitats is retained. Open mosaic habitats are dynamic areas which respond well to regular disturbance. Management through a range of measures including mowing, flailing and grazing would be employed to control natural succession and create the disturbed conditions which this broad habitat benefits from.

f. Planting of habitats will be with species that are found locally to tie in with the surrounding areas.

Outline measure of success

8.23.13 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. Varied vegetation structure, with a single structural habitat component or vegetation type not accounting for more than 80% of the total habitat area.

b. A diverse range of flowering plant species are present which include native, non-native but beneficial to wildlife or non-native sedum plants.

c. Invasive non-native species cover less than 5% of the total vegetated area.

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d. The site shows spatial variation, forming a mosaic of at least four early successional communities (a) to (h) plus bare substrate and pools. (a) annuals; (b) mosses/liverworts; (c) lichens; (d) ruderals; (e) inundation species; (f) open grassland; (g) flower-rich grassland; (h) heathland.

e. Establishment of open mosaic habitat in accordance with the structural composition specified within the Design Principles.

f. Establishment of floral species composition in line with planting palette set out within Design Principles.

g. Colonisation by diverse invertebrate species assemblage typical of open mosaic habitat along the Greater Thames Estuary National Character Area

h. Pond creation in line with design approach in Great Crested Newt Mitigation Guidelines (English Nature, 2001).

Outline monitoring frequency and methods

8.23.14 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.23.15 After the five-year establishment period, monitoring would be undertaken to assess the success of the grassland in terms of developing into the relevant target priority habitat. This would include fixed point or aerial photography to record overall habitat development within any given management area. UKHab surveys and condition assessments would also be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). These would continue once every five years during the establishment period with the detailed monitoring approach being refined over this period as part of the advisory group discussions. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.23.16 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.24 LE8.2 Ancient woodland compensation planting

Overarching aims

8.24.1 This typology builds on that for woodland (LE2.1 in Section 8.5), aiming to develop broad-leaved native species woodland which develops into the NVC communities of adjacent woodland blocks (predominantly W10 and W8). No non-native species would be planted in areas of ancient woodland compensation planting.

8.24.2 Where practicable, the aim is to utilise as much of the existing soil resource as possible from existing ancient woodland areas directly affected by the Project as shown in Environmental Statement Figure 8.33: Ancient Woodland Impacts [**APP-294**]. This would aid habitat development in terms of its speed of

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establishment and diversity. A Soils Management Plan (SMP) is required under the Code of Construction Practice (Appendix 2.2, Application Document 6.3); this will detail the approach to soil handling and reuse for all proposed end uses, including the reuse of salvaged ancient woodland soils.

8.24.3 It is not currently possible to define the exact extent of soil salvage that will be delivered. Soils would be considered unsuitable for salvage and reuse if:

a. There is extensive growth of weed species or the presence of invasive non-native species (INNS)

b. The presence of contamination is confirmed (for example asbestos)

8.24.4 This suitability for salvage and reuse will be determined through:

a. Pre-construction botanical survey to specifically map the extent of weed species or INNS

b. Pre-construction soil survey to confirm initial presence / potential presence of contaminating materials (soil survey to be undertaken across both donor and receptor areas)

8.24.5 The results of the surveys/testing and the delineation of the area where it is perceived soil salvage and reuse is appropriate will be made available to the advisory group prior to finalising the detailed specification. It should be noted that the watching brief (as committed to in GS028 in REAC) may identify previously unknown contamination; any changes to the approach as a result would be presented to and discussed with the advisory group.

8.24.6 In addition, as set out in commitment GS006 within the REAC, suitability for reuse will be confirmed for all materials.

Description of salvaging ancient woodland soil and material

8.24.7 Soil and material would, where practicable, be salvaged to retain soil microbes, fungal rhizomes, seed bank, and invertebrate fauna contained within. The operation would also include the salvage of coppice stools and deadwood from the areas affected by the Project.

8.24.8 Soil and other material would be salvaged from the affected ancient woodland areas and redistributed at receptor sites that would have been prepared in advance to offer similar ground conditions to that of the donor site, increasing the likelihood that the value of the material would be maintained and would establish at the donor site. This process would follow good practice guidance such as:

a. Anderson and Groutage (2003)

b. English Nature (2006)

c. High Speed 2 (2022)

8.24.9 Once this movement of materials was complete, woodland planting would be undertaken.

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Outline requirements

8.24.10 The following outline requirements are for all areas of ancient woodland compensation.

a. To establish woodland that is closely aligned to the type of woodland that occurs in the vicinity of the new woodland creation areas. The NVC communities of these adjacent woodlands have been identified in sections 5, 6 and 7.

Outline prescriptions

8.24.11 The exact details of the work activities will be developed between all parties during the development of the LEMP and subsequent work-specific method statements. An advisory group would provide guidance on the detailed specification of ancient woodland soil and material salvage, including receptor site preparation.

8.24.12 Set out below is a high-level description of the steps involved, and not a detailed methodology which will be developed during detailed design using best practice guidance. The specification and detailed method statements will be submitted to the advisory group for comment prior to being finalised for use.

Approach to ancient woodland soil translocation:

a. Carry out pre-construction botanical surveys to update the baseline for the donor and receptor sites, identifying the presence of weeds or INNS as well as the presence of species which would require specific approaches to soil salvage (for example bluebells which would require soil to be stripped such that bulbs were not damaged as a result).

b. Carry out soil survey and sampling across both donor and receptor sites to assess their compatibility. The soil survey would report on, but not be limited to, site characteristics (such as slope, aspect and drainage), descriptions of soil profiles, thicknesses of soil horizons (in particular litter and topsoil layers), extent of rooting (which may affect the approach required to soil salvage) and the presence of any foreign materials. Topsoil and subsoil would be tested for key characteristics to include, but not be limited to, pH, plant available nutrients, soil organic carbon, microbial community composition and contaminants.

c. Produce a detailed specification for ancient woodland soil salvage and reuse in consultation with the advisory group – to include stringent soil protection measures and new tree-planting plans. This would include detailed landscape design with, for example, areas identified for soil translocation separated by rides. As an outline this would comprise, but not be limited to, the following:

    i. Donor area vegetation clearance, ensuring soil conditions are kept as favourable as possible (i.e. limiting disturbance and compaction from

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plant). Felled timber will be removed but deadwood present within the areas will be left to be salvaged alongside the soils. Stools from individual specimens which will regrow will be identified clearly so they can be salvaged as soils are stripped from around them.

ii. Within receptor areas install tree protection around any existing trees and boundary fencing. Areas which will receive salvaged soil materials will be stripped of their topsoil. Any requirement to strip subsoil will be identified from the soil survey and testing results. Topsoil will be stripped sequentially as areas are required to receive salvaged soils to minimise the extent of bare ground (which may be at risk of erosion). As topsoil is stripped any microtopographical variation required (based on the specific characteristics of the donor area from which soils will be used) will be formed in the exposed subsoil surface to ensure in particular a similar drainage regime as far as is practicable.

iii. Topsoil will be stripped from the donor areas working in from the boundary to ensure *in situ* soils are not tracked over. Each soil layer required to be moved will be carefully stripped by excavator with a non-toothed bucket from around the tree stumps. Salvaged soil materials will be placed directly into transport vehicles and moved directly to the receptor site. Any deadwood material present will be salvaged and moved at the same time.

iv. As stools to be salvaged are cleared of soil from around them they will be lifted with as large a root ball as practicable and transported to the receptor site.

v. Stools will be planted in the receptor areas on the same day as they are lifted.

vi. Prior to planting the exposed subsoil surface will be checked by a suitable qualified soil scientist to assess the presence of any compaction. Should compaction be identified this will be removed through the use of suitable measures (such as deep ripping or subsoiling).

vii. Salvaged soil materials will then be spread around the planted stools, with soils respread on the same day as they are stripped. Each salvaged soil layer will be spread to the same thickness as it was stripped, with an allowance made for post-spreading settlement (i.e. the area coverage for respread soils will equate approximately to the area from which soil salvage was deemed possible).

viii. All soil handling will be undertaken in accordance with the requirements of the SMP to ensure that all layers of the profile have the required

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structural formation. All works will be supervised by a suitably qualified and experienced soil scientist in accordance with the requirements of the SMP, along with all other environmental supervision and protected species licensing requirements.

ix. Tree planting within receptor area will then be undertaken, ensuring this does not result in compaction or damage to the soils. Trees planted will be native species recorded in the donor areas and locally sourced.

Outline measure of success

8.24.13 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. Vegetation within ancient woodland compensation area to develop into the relevant NVC community from adjacent existing woodland – W8 and/or W10 depending on location.

b. Native ground flora to have developed through provision of a variable light environment including shaded areas beneath a closed canopy at Year 25.

Outline monitoring frequency and methods

8.24.14 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.24.15 After the five-year establishment period, monitoring would be undertaken to assess the success of the woodland in terms of developing into the relevant target priority habitat. This would include fixed point or aerial photography to record overall habitat development within any given management area, as well as surveys following Common Standards Monitoring Guidance for Woodland Habitats (JNCC, 2004b). These would continue once every five years with the detailed monitoring approach being refined over this period as part of the advisory group discussions. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.24.16 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.25 LE8.3 Woodland mitigation planting

Description

8.25.1 Woodland mitigation planting has been proposed within the management areas for Thames Chase compensation land (section 7.9) and Hole Farm (section 7.12).

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8.25.2 These management areas provide woodland replacement for woodland loss as a result of the Project and to provide visual screening, landscape integration and biodiversity benefits.

8.25.3 LE8.3 Woodland mitigation planting is an overarching landscape typology which is shown on the Environmental Masterplan (Application Document 6.2, Figure 2.4). It has been assigned its own unique Landscape element code further to LD 117. These areas will be developed and detailed further to the appropriate landscape element codes in future iterations of this document.

8.25.4 Currently, LE8.3 Woodland mitigation planting is represented by Other woodland; broadleaved in moderate condition within the biodiversity net gain metric. However, this will be developed further within the detailed design stages of the project. The woodland mitigation planting areas are intended to be a mixture of, but not limited to the following typologies;

a. LE1.3 Species-rich grassland

b. LE2.1 Woodland

c. LE2.11 Woodland including non-native species

d. LE2.2 Woodland edge

e. LE2.7 Scattered trees & LE5.1 Individual trees

f. LE2.8 Scrub / scattered scrub

g. LE4.4 Native hedgerow with trees

h. LE8.5 Ecological ponds

8.26 LE8.4 Wetland / fenland creation

Description

8.26.1 The marsh and wet grassland – fen typology is located within the Orsett Fen Management area and includes a mosaic of blocks of wet woodland, wet grassland, dry grassland, water bodies, ditches, reed and marginal planting.

8.26.2 Areas of meadow that are prone to prolonged periods of flooding. Plants consist of moisture-loving and flood-tolerant grass and wildflower species, mainly situated around the periphery of water bodies and in lower areas. To be specifically managed as fen.

8.26.3 LE8.4 Wetland/fen creation corresponds to Floodplain wetland mosaic (CFGM) in moderate condition within the biodiversity net gain metric. The time to target condition following habitat creation is over 10 years.

Outline requirements

a. To manage the existing Orsett Fen area to recreate the wetland character of the former fenland.

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b. The restored fenland character shall create a visually interesting setting to the Mardyke viaduct and the associated embankments.

c. To create the pattern and form of small native wet woodland blocks that are typical of poor draining and seasonally wet soils.

d. Maintain key views through Orsett Fen.

e. Wet woodland to integrate and soften the appearance of the Mardyke embankments and abutments, vertical elements within a flat open landscape.

f. Any proposed reedbeds to soften and green edges of water bodies, and to strengthen the structure of the wetland habitat.

g. Create seasonal interest and variety in terms of trees, shrubs, marginal and grassland species.

h. Create a diversity of habitat, species and structure reflecting the range of dry, seasonally wet, or permanently wet substrates.

i. To create habitat appropriate for wetland species including invertebrates, birds, water vole, otter (*Lutra lutra*), amphibians and grass snake (*Natrix natrix*).

Outline prescriptions

8.26.4 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.26.5 Table 8.27 below describes the programme of work for initial establishment and maintenance (first five years).

Table 8.27 Outline initial establishment regime

Action			**Years 0-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Removal from water bodies of floating litter, debris, fly tipping, surface weeds, contaminants and animal carcasses – weekly as part of general litter maintenance.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Any dead or damaged plug plants should be replaced annually with matching species of the same size during the next planting season after failure. To be	Specialist contractor appointed by National Highways	Once yearly – November to February	N	Y	Y	Y	Y

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Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
undertaken once yearly during November to February.							
Injurious weeds are to be eradicated and disposed of off-site, as per the latest Defra/Natural England guidance. Grass swards that do not contain wildflowers can be selectively sprayed. Hand weeding will be required in areas of wildflower.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Annual removal of excess vegetation and invasive and non-native weeds from edges/margins.	Specialist contractor appointed by National Highways	Summer	Y	Y	Y	Y	Y
Cutting back of vegetation on a rotational basis once yearly to prevent scrub build up and maintain open fen typology.	Specialist contractor appointed by National Highways	Once yearly - early autumn	N	Y	Y	Y	Y

Outline measure of success

8.26.6 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. The water table is at or near the surface throughout the year, this could be open water or saturation of soil at the surface. There is no artificial drainage, unless specifically to maintain water levels as specified above.

b. The appearance and composition of the vegetation closely matches characteristics of the specific wetland habitat type (see UKHab definition linked above). Indicator species for the specific wetland habitat type are very clearly and easily visible.

c. Cover of bare ground less than 5%.

d. There is an absence of invasive non-native species (as listed on Schedule 9 of WCA, 1981) and species indicative of sub-optimal condition1 make up less than 5% of ground cover.

e. The sward shall cover at least 80% of the area to be managed where necessary to ensure this typology fulfils the environmental function required.

f. The area shall contain no more than 10% scrub cover.

g. Wet grassland to support 12 or more species plants capable of thriving in wet conditions.

h. Target species numbers to be met by Year 3

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Outline monitoring frequency and methods

8.26.7 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.26.8 After the five-year establishment period, monitoring visits once every five years would be undertaken to ensure that the measures of success are being met and maintained. UKHab surveys and condition assessments would be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a).

8.26.9 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.27 LE8.5 Ecological ponds

Description

8.27.1 Ecological ponds are proposed within the Project design, their primary function being to offset the loss of existing water bodies, and to provide links between retained habitat. They do not form part of the Project drainage design, and would be designed to maximise their biodiversity value, following good practice guidance such as English Nature (2001): ponds would have a range of depths; native species of submergent and marginal vegetation and an absence of fish.

8.27.2 LE8.5 Ecological ponds corresponds to ponds (priority habitat) in good condition within the biodiversity net gain metric. The time to target condition following habitat creation is five years.

Outline requirements

8.27.3 The following outline requirements are for all ecological ponds:

a. To integrate the water bodies into the surrounding landscape by ensuring pond shape reflects local field and vegetation patterns.

b. To plant the edge of water bodies with marginal and emergent planting.

c. Water bodies to be managed to provide biodiversity and landscape amenity value. Habitats would follow the priority habitat descriptions for ponds (JNCC, 2008c).

Outline prescriptions

8.27.4 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP.

8.27.5 Table 8.28 below describes the programme of work for initial establishment and maintenance (first five years).

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Table 8.28 Outline initial establishment regime

Action			Years 0-5				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of annual site inspections with the Project Landscape Architect	Specialist contractor appointed by National Highways	Annual	Y	Y	Y	Y	Y
Removal from water bodies of floating litter, debris, fly tipping, surface weeds, contaminants and animal carcasses – weekly as part of general litter maintenance.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Annual removal of excess vegetation and invasive weeds from edges/margins (non-reeds).	Specialist contractor appointed by National Highways	Summer	Y	Y	Y	Y	Y
Annual removal of excessive submergent and marginal vegetation in wildlife ponds. Macrophyte cover would be managed at around 70% of pond surface.	Specialist contractor appointed by National Highways	Summer	Y	Y	Y	Y	Y
Biennial management of surrounding woodland/ scrub vegetation which may shade the wildlife pond. Southern aspect of pond edge to be kept free from shading plants.	Specialist contractor appointed by National Highways	Autumn/ winter	-	Y	-	Y	-
Biennial survey for the presence of fish species. Control of fish should they be recorded as present.	Specialist contractor appointed by National Highways	Autumn	-	Y	-	Y	-
Annual jet washing of any markers/mooring piles and other water-related structures	Specialist contractor appointed by National Highways	Early spring	Y	Y	Y	Y	Y
Additional checks after extreme weather events	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y

Outline measure of success

8.27.6 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. The pond is of good water quality, with clear water (low turbidity) indicating no obvious signs of pollution.

b. Semi-natural habitat (i.e. moderate distinctiveness or above) for at least 10m from the pond edge is present.

c. Less than 10% of the pond is covered with duckweed or filamentous algae.

d. The pond is not artificially connected to other waterbodies, via streams, ditches or artificial pipework.

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e. Pond water levels should fluctuate naturally throughout the year. No obvious dams, pumps or pipework present.

f. There is an absence of non-native plant and animal species.

g. The pond is not artificially stocked with fish.

h. In non-woodland ponds, plants, be they emergent, submerged or floating (excluding duckweeds), should cover at least 50% of the pond area that is less than 3m deep.

i. The surface of non-woodland ponds is no more than 50% shaded by woody bankside species.

j. To establish and maintain marginal/emergent planting areas.

k. Years 1-2:

   i. Good macrophyte cover achieved. Approximately 70% coverage in wildlife ponds.

   ii. No single species has become dominant.

l. Year 2-3: Injurious weeds total no more than 20% of the area coverage.

m. Long-term:

   i. A diversity of species occurring with injurious weeds totalling no more than 10% of the area coverage.

   ii. The area shall contain no more than 10% scrub cover on banks of drainage ponds.

   iii. Shading species (trees and shrubs/scrub) to be cleared around the southern edges of the wildlife ponds.

   iv. Fish species absent from wildlife ponds.

Outline monitoring frequency and methods

8.27.7 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.27.8 After the five-year establishment period, biennial monitoring visits would be undertaken to ensure that the measures of success are being met and maintained, with the habitat developing into the target priority habitat. UKHab surveys and condition assessments would be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). If necessary, the findings of the monitoring may result in corrective actions or the prescriptions for the management or measures of success may need to be modified. Any modifications to the requirements would be agreed in consultation

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with the advisory group. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.27.9 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.28 LE8.6 Acid grassland soil salvage

Description

8.28.1 Acid grassland soil salvage is proposed from Low Street Pit LWS which would be lost as a result of the Project's construction, to be moved to a receptor site on land close to Coalhouse Fort (Section 6.4). Acid grassland occurs on nutrient-poor and free-draining soils of acidic pH. Characteristic floral species can support a diverse assemblage of invertebrate species.

8.28.2 LE8.6 Acid grassland soil salvage corresponds to Lowland dry acid grassland in good condition within the biodiversity net gain metric. The time to target condition following habitat creation is over 30 years.

Outline requirements

8.28.3 The following outline requirement is for all areas of translocated acidic grassland:

a. To maintain and promote structural and botanical diversity and prevent the grassland scrubbing over.

8.28.4 This will be agreed between National Highways and the identified management agent.

Outline prescriptions

8.28.5 The exact details of the work activities will be developed between all parties during the development of the LEMP. An advisory group would provide guidance on the detailed specification of acid grassland translocation, including receptor site preparation. Methodologies would follow good practice guidance such as Anderson and Groutage (2003).

a. The acid grassland would be managed to replicate the structure and diversity of that found at the donor site. This would lead to a sward which developed into NVC community U1 and followed the priority habitat description for lowland dry acid grassland (JNCC, 2008d).

b. The sward would cover at least 90% of the receptor site with no more than 10% cover of competitive or problem species.

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Outline measure of success

8.28.6 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements:

a. Unlike the species-rich grassland typologies, acid grassland can be less species-diverse (less than five species per $4m^2$) but can exceed 25 species per $4m^2$. Given the donor grassland site supports the NVC U1 community, key species development at the receptor site will be the presence of sheep's fescue (*Festuca ovina*), common bent (*Agrostis capillaris*), and wavy hair-grass (*Deschampsia flexuosa*).

b. The appearance and composition of the vegetation shall closely match the characteristics of Lowland dry acid grassland, as described within the UK Habitat classification definitions (Butcher, B., et. Al., 2020).

c. Rotational management will ensure a varied sward height. At least 20% of the sward will be less than 7cm and at least 20% will be more than 7cm in order to successfully create microclimates for insects, birds and small mammals.

d. Cover of bare ground to be between 1% and 5%.

e. Cover of bracken to be less than 20% and cover of scrub less than 5%.

f. There shall be an absence of invasive non-native species (as listed on Schedule 9 of Wildlife and Countryside Act, 1981 as amended).

g. Combined cover of species indicative of sub-optimal condition and physical damage shall account for less than 5% of the total area. Sub-optimal species for this habitat type include creeping thistle (*Cirsium arvense*), spear thistle (*Cirsium vulgare*), curled dock (*Rumex crispus*), broad-leaved dock (*Rumus obtusifolius*), common nettle (*Urtica dioica*), creeping buttercup (*Ranunculus repens*), greater plantain (*Plantago major*), white clover (*Trifolium repens*), and cow parsley (*Anthriscus sylvestris*).

Outline monitoring frequency and methods

8.28.7 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required.

8.28.8 After the five-year establishment period, monitoring would be undertaken to assess the success of the grassland in terms of developing into the relevant target priority habitat. This would include surveys following Common Standards Monitoring Guidance for Lowland Grassland Habitats (JNCC, 2004a), and Natural England guidance on the creation of priority grassland habitat (Natural England, 2012). UKHab surveys and condition assessments would also be undertaken to inform progress and confirm target habitat and condition is

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achieved (Panks et al., 2022a). These would continue once every five years during the establishment period with the detailed monitoring approach being refined over this period as part of the advisory group discussions. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.28.9 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

8.29 LE8.7 Nitrogen deposition compensation habitat (N-Deposition)

Overarching aims

8.29.1 This typology aims to develop a mosaic of wildlife-rich habitats appropriate to the site that achieves the function required to compensate for effects of nitrogen deposition on a number of sites within the wider woodland network. The mosaic of habitats is expected to achieve a ratio of approximately 70% woodland to 30% other associated habitats at a landscape scale. Each site may have a different ratio of habitats that is appropriate to that site, but the expectation across all N-Deposition compensation sites would be to provide a 70/30 split overall.

8.29.2 LE8.7 Nitrogen deposition compensation habitat is an overarching landscape typology which is shown on the Environmental Masterplan (Application Document 6.2, Figure 2.4). It has been assigned its own unique Landscape element code further to LD 117. These areas will be developed and detailed further to the appropriate landscape element codes in future iterations of this document.

8.29.3 The woodland habitats should develop into NVC communities appropriate to the site's conditions, such as soils and aspect, as well as appropriate to provide ecological connectivity with existing adjacent woodland habitats i.e. providing similar communities to adjacent habitat where that is appropriate in the context of the site conditions. Further details on the appropriate NVC habitat to be delivered will be developed in future iterations of this document once survey data has been obtained.

8.29.4 The associated habitats could include a range of habitats forming woodland edge and transitional ecosystems such as scrub, grasslands, heathland, wetlands and open mosaic habitat. These should develop into NVC communities appropriate to the site conditions and adjacent existing habitats to enhance ecological connectivity.

8.29.5 Habitats should be created preferentially using natural regeneration, although each site would require consultation with stakeholders to establish the appropriateness for each site and each area within each site.

8.29.6 The development of the detail design will be carried out in consultation with stakeholders and wherever possible delivering against local nature conservation strategies. The detailed design will provide a desired habitat mosaic and how that will be created and then maintained in the long term.

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8.29.7 Long term management will be prescribed in the LEMP as appropriate for each element of the habitat mosaic. Currently, LE8.7 Nitrogen Deposition (N-DEPOSITION) compensation area is represented by 70% priority habitat woodland and 30% priority habitat grassland. The biodiversity net gain assessment will be further refined during the more detailed design stages.

Outline requirements

8.29.8 The following outline requirements are for all areas of nitrogen deposition compensation:

a. To establish a habitats mosaic including woodland and associated habitat that is closely aligned to the type of habitats that occur in the vicinity of the new habitat creation areas and is appropriate to the site conditions.

b. To establish habitats preferentially through natura regeneration in consultation with stakeholders on appropriateness of this technique on a site by site basis.

c. To establish the habitats whilst:

   i. avoiding significant effects on other receptors

   ii. taking opportunities to enhance public access and landscape

Outline prescriptions

8.29.9 The exact details of the work activities will be developed between all parties during the development of the LEMP and subsequent work-specific method statements. Ongoing consultation with stakeholders will develop the desired outcomes in terms of target habitat mosaic and long term management for inclusion in the detailed design and LEMP. The environmental advisory group will provide guidance on the detailed specifications.

8.29.10 This is a high-level description of the basic steps involved, and not a detailed methodology which will be developed during detailed design using best practice guidance:

a. Carry out pre-construction surveys to produce a baseline for the habitat creation including ecological and environmental information to ensure detailed design can avoid significant effects and breaches of environmental legislation, as well as build on existing features to provide additional benefits wherever possible.

b. Secure the site to avoid unwanted / antisocial activities and ensure success of habitat creation as far as reasonably practicable.

c. Produce a detailed specification for the creation of the desired mosaic of habitats in consultation with stakeholders on the desired outcomes in terms of habitat mosaic and long term management

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d. Undertake any remedial action required to provide best possible site for habitat creation, including potentially soil remediation and management of invasive non-native species.

e. Undertake habitat creation actions as far as reasonably practicable.

8.29.11 Table 8.23 below describes the programme of work for initial establishment and maintenance (first five years).

Table 8.29 Outline initial establishment regime

Action			**Years 0-5**				
Task	**Responsibility**	**Season**	**1**	**2**	**3**	**4**	**5**
Attendance of quarterly site inspections with the Project Landscape Architect and Ecologist	Specialist contractor appointed by National Highways	Quarterly	Y	Y	Y	Y	Y
Removal from water bodies of floating litter, debris, fly tipping, surface weeds, contaminants and animal carcasses – weekly as part of general litter maintenance.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Any dead or damaged plug plants should be replaced annually with matching species of the same size during the next planting season after failure. To be undertaken once yearly at appropriate season for the species concerned.	Specialist contractor appointed by National Highways	Once yearly – November to February	N	Y	Y	Y	Y
Injurious weeds are to be eradicated and disposed of off-site, as per the latest Defra/Natural England guidance. Grass swards that do not contain wildflowers can be selectively sprayed. Hand weeding will be required in areas of wildflower.	Specialist contractor appointed by National Highways	As required	Y	Y	Y	Y	Y
Annual removal of excess vegetation and invasive and non-native weeds from edges/margins.	Specialist contractor appointed by National Highways	Summer	Y	Y	Y	Y	Y

Outline measure of success

8.29.12 To ensure that the management requirements outlined previously are achieved, the following monitoring targets have been devised to measure the success of the management requirements (after establishing a detailed monitoring plan in consultation with stakeholders):

a. Vegetation within the desired habitat mosaic to develop into the identified NVC communities determined from adjacent existing habitats and survey results of existing site conditions.

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Outline monitoring frequency and methods

8.29.13 The aim of the suggested monitoring programme is to ascertain whether the outline measures of success listed above have been achieved, and whether maintenance operations or remedial actions are required following consultation with the environmental advisory group.

8.29.14 After the five-year establishment period, monitoring would be undertaken to assess the success of the habitat mosaic in terms of developing into the relevant target priority habitat and success of management in maintaining the habitats in target condition.

8.29.15 This would include fixed point or aerial photography to record overall habitat development within any given management area, as well as surveys following JNCC Common Standards Monitoring Guidance. UKHab surveys and condition assessments would also be undertaken to inform progress and confirm target habitat and condition is achieved (Panks et al., 2022a). These would continue once every five years during the establishment period with the detailed monitoring approach being refined over this period as part of the environmental advisory group discussions. Once the establishment monitoring period has ended National Highways would develop and implement an appropriate management regime for this habitat typology in perpetuity, following discussion with the advisory group during the establishment period.

8.29.16 National Highways' appointed monitoring party will carry out the monitoring visits and feed back to the advisory group as part of the monitoring report.

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Glossary

Term	Abbreviation	Explanation
A122 Lower Thames Crossing	**Project**	A proposed new crossing of the Thames Estuary linking the county of Kent with the county of Essex, at or east of the existing Dartford Crossing.
A122 Lower Thames Crossing/M25 junction	**-**	New junction with north-facing slip roads on the M25 between M25 junctions 29 and 30, near North Ockendon.
A13/A1089/A122 Lower Thames Crossing junction	**-**	Alteration of the existing junction between the A13 and the A1089, and construction of a new junction between the A122 Lower Thames Crossing and the A13 and A1089, comprising the following link roads: • Improved A13 westbound to A122 Lower Thames Crossing southbound • Improved A13 westbound to A122 Lower Thames Crossing northbound • Improved A13 westbound to A1089 southbound • A122 Lower Thames Crossing southbound to improved A13 eastbound and Orsett Cock roundabout • A122 Lower Thames Crossing northbound to improved A13 eastbound and Orsett Cock roundabout • Orsett Cock roundabout to the improved A13 westbound • Improved A13 eastbound to Orsett Cock roundabout • Improved A1089 northbound to A122 Lower Thames Crossing northbound • Improved A1089 northbound to A122 Lower Thames Crossing southbound
Above ordnance datum	**AOD**	Vertical datum used by the Ordnance Survey as the basis for deriving altitudes on maps.
Alignment	**-**	The horizontal (lateral) or vertical (height) position of a road. It can be defined by a series of horizontal tangents and curves or vertical crest and sag curves, and the gradients connecting them.
Ancient woodland	**-**	Designated land that has been continuously wooded since at least 1600AD. Ancient woodland is regarded as irreplaceable habitat and is protected by the National Planning Policy Framework.
Area of Outstanding Natural Beauty	**AONB**	Statutory designation intended to conserve and enhance the ecology, natural heritage and landscape value of an area of countryside.
Arboriculturist	**-**	A professional in the practice of arboriculture, which involves the cultivation, management and study of shrubs, vines and other woody plants.
Attenuation pond	**-**	A pond designed to slow the passage of water from surface runoff to the ground/drainage system.
Brentwood Road	**-**	The Project includes realignment of Brentwood Road and construction of a new bridge to carry the realigned Brentwood Road over the new A122 Lower Thames Crossing.
Brewers Road green bridge	**-**	Existing Brewers Road bridge over the A2 would be replaced with a green bridge as part of the Project.
Chadwell St Mary link	**-**	Proposed section of the Project between the Tilbury Loop railway line and A13 junction.

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Term	Abbreviation	Explanation
Code of Construction Practice	**CoCP**	Contains control measures and standards to be implemented by the Project, including those to avoid or reduce environmental effects.
Common land	**-**	Land owned collectively by a number of persons, or by one person, but over which other people have certain traditional rights of use.
Conservation of Habitats and Species Regulations 2010 (as amended)	**Habs Regs**	Conservation of Habitats and Species Regulations 2010 (as amended)
Construction Environmental Management Plan	**CEMP**	The primary environmental management document that defines the procedures for achieving the objectives set out in the environmental policy. It incorporates environmental performance targets set for the Project.
Construction Materials Management Plan	**CMMP**	
Cutting	**-**	In road construction, where the route is cut into the ground such that its vertical alignment is lower than the surrounding ground level. Often used on hilly terrain and to achieve safe gradients for roads.
DCO		Development Consent Order
Design Manual for Roads and Bridges	**DMRB**	A comprehensive manual which contains requirements, advice and other published documents relating to works on motorway and all-purpose trunk roads for which one of the Overseeing Organisations (National Highways, Transport Scotland, the Welsh Government or the Department for Regional Development (Northern Ireland)) is the highway authority. For the A122 Lower Thames Crossing, the Overseeing Organisation is National Highways.
Environmental Impact Assessment	**EIA**	A process by which information about environmental effects of a proposed development is collected, assessed and used to inform decision making. For certain projects, EIA is a statutory requirement, reported an Environmental Statement.
Environmental Management Plan	**EMP**	For the Project, a plan setting out the conclusions and actions needed to manage environmental effects as defined by the Design Manual for Roads and Bridges standard LA 120. The CoCP is the equivalent of the first iteration of the EMP (EMP1). The contractor's EMP would be EMP2 and the end of construction EMP would be EMP3.
Environmental Masterplan	**-**	A package of information on existing and future environmental commitments and objectives, ongoing actions and risks to be managed, handed over to those responsible for future management and operation of the asset. The Environmental Masterplan for the Project is provided as Figure 2.4 (Application Document 6.2) of the ES.
Environmental Statement	**ES**	A document produced to support an application for development consent that is subject to Environmental Impact Assessment (EIA), which sets out the likely impacts on the environment arising from the proposed development.
Essential mitigation	**-**	Any Project-specific measures proposed in the ES to avoid, reduce or offset potential impacts that could otherwise result in effects considered to be significant in the context of the EIA Regulations. Essential mitigation is additional to the measures incorporated into the Project design ('embedded mitigation') and good practice mitigation.

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Term	Abbreviation	Explanation
False cutting	**-**	A means of screening a linear feature such as a road or railway by forming embankments on both sides of the feature.
Fauna	**-**	The animals of a particular region and/or habitat.
Flood Zone 1	**FZ1**	Land having a less than 1 in 1,000 (<0.1%) annual probability of river or sea flooding.
Flood Zone 2	**FZ2**	Land categorised by the Environment Agency as having between a 1 in 100 (1%) and 1 in 1,000 (0.1%) annual probability of river flooding; or land having between a 1 in 200 (0.5%) and 1 in 1,000 (0.1%) annual probability of sea flooding.
Flood Zone 3	**FZ3**	Land categorised by the Environment Agency. Split into two separate sub-categories by local planning authorities: 3a and 3b. However, the Environment Agency does not use these sub-categories on its mapping: Flood Zone 3a: Land having a 1 in 100 (1%) or greater annual probability of river flooding; or land having a 1 in 200 (0.5%) or greater annual probability of sea flooding. Flood Zone 3b: Land where water has to flow or be stored in times of flood, classified as 'functional floodplain'. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.
Floodplain	**-**	A floodplain is flat or nearly flat land adjacent to a stream or river, stretching from the banks of its channel to the base of the enclosing valley walls and (under natural conditions) experiences flooding periods of high discharge.
Footpath	**FP**	
Good practice	**-**	In the context of the Project, standard approaches and actions commonly used to avoid or reduce environmental impacts of infrastructure development. These are typically applicable across the whole Project.
Green bridge	-	Bridges over linear infrastructure projects like roads and railways, constructed to enable safe crossing by animals, reducing severance.
Green Lane	-	Green Lane is a bridleway and private means of access. Realignment is proposed northwards of Green Lane and construction of a new green bridge as part of the Project to carry the realigned Green Lane over the new A122 Lower Thames Crossing road.
Habitat	-	The natural home or environment of an animal, plant, or other organism.
Habitats Regulations Assessment	**HRA**	A tool developed by the European Commission to help competent authorities (as defined in the Habitats Regulations) to carry out assessment to ensure that a project, plan or policy will not have an adverse effect on the integrity of any Natura 2000 or European sites (Special Areas of Conservation, Special Protection Areas and Ramsar sites), either in isolation or in combination with other plans and projects, and to begin to identify appropriate mitigation strategies where such effects were identified.
Hectare	**Ha**	The hectare is an SI unit of area primarily used in the measurement of land as a metric replacement for the imperial acre. An acre is about 0.405ha and 1ha is about 2.47 acres.
High Speed 1	**HS1**	A 109km high-speed railway between London and the UK end of the Channel Tunnel. The line carries international passenger traffic between the UK and continental Europe; it also carries

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Term	Abbreviation	Explanation
		domestic passenger traffic to and from stations in Kent and east London, as well as Berne gauge freight traffic.
Hoford Road	**-**	Hoford Road is a road that is subject to a prohibition of driving order. As part of the Project, Hoford Road would be realigned southwards, with a new green bridge provided to carry the realigned Hoford Road over the new A122 Lower Thames Crossing.
Ingrebourne Valley Ltd	**IVL**	A leading land reclamation and restoration company in the south-east of England
Land use	**-**	The purpose that land is used for, based on broad categories of functional land cover, such as urban and industrial use and the different types of agriculture and forestry.
Landfill	**-**	A site for the disposal of waste materials.
Landform	**-**	The shape and form of the land surface which has resulted from combinations of geology, geomorphology, slope, elevation and physical processes.
Landscape and Ecology Management Plan	**LEMP**	A document which provides details on the delivery and management of the landscape and ecology elements identified in the Environmental Masterplan for the Project, including their success criteria.
Landscape character	**-**	A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another, rather than better or worse (source of definition: GLVIA3).
Landscape element	**-**	Individual parts of the landscape include physical influences (geology, soils, landform, drainage, and water bodies); land cover (different types of vegetation, patterns, and types of tree cover); and human influences (land use and management, character of settlements of buildings, and pattern and type of fields and enclosure) (source of definition: GLVIA3).
Local Nature Reserve	**LNR**	Locally designated nature site protected through the planning system.
M25 junction 29		Improvement works to M25 junction 29 and to the M25 north of junction 29. The M25 through junction 29 will be widened from three lanes to four in both directions with hard shoulders.
M25 Motorway	**M25**	Orbital motorway that encircles most of Greater London.
Macrophytes	**-**	Aquatic plants that grow in or near water.
Mardyke	**-**	A small river, mainly in Thurrock, that flows into the River Thames at Purfleet, close to the QEII Bridge.
Mardyke Viaduct		New viaduct to carry the A122 Lower Thames Crossing road over the Mardyke and a farm access track. The Mardyke is a small river, mainly in Thurrock, that flows into the River Thames at Purfleet.
Materials Management Plan	**MMP**	
Mitigation	**-**	Measures that have been identified through the assessment process to further reduce the impact of significant effects.
Monitoring	**-**	A programme of observation, measurement and recording of environmental variables and operational parameters over a period of time for a defined purpose.
Muckingford Road	**-**	Realignment of Muckingford Road and construction of a new green bridge with shared pedestrian and cycle facility to carry the realigned Muckingford Road over the A122 Lower Thames Crossing road.

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Term	Abbreviation	Explanation
National Cycle Network	**NCN**	A series of traffic-free paths and quiet, on-road cycling and walking routes that connect to every major town and city. These routes are promoted for both recreational and active travel purposes.
National Cycle Route	**NCR**	A cycle route part of the National Cycle Network created by Sustrans to encourage cycling throughout Britain.
National Highways	**-**	A UK government-owned company with responsibility for managing the motorways and major roads in England. Formerly known as Highways England.
National Policy Statement	**NPS**	There are 12 designated National Policy Statements (NPSs), setting out government policy on different types of national infrastructure development, including energy, transport, water and waste. NPSs provide the framework within which Examining Authorities make their recommendations to the Secretary of State.
National Policy Statement for National Networks	**NPSNN**	The NPSNN sets out the need for, and Government's policies to deliver, development of Nationally Significant Infrastructure Projects on the national road and rail networks in England. It provides planning guidance for promoters of Nationally Significant Infrastructure Projects on the road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State.
Nationally Significant Infrastructure Project	**NSIP**	Major infrastructure developments in England and Wales, such as proposals for power plants, large renewable energy projects, new airports and airport extensions, major road projects, etc. that require a development consent under the Planning Act 2008.
Native planting	**-**	Plants which are indigenous to a given area in geologic time. This includes plants that have developed, occur naturally or existed for many years in an area (trees, flowers, grasses and other plants).
Natural England	**NE**	An executive non-departmental public body, sponsored by the Department for Environment, Food & Rural Affairs, which is the government's adviser for the natural environment in England, helping to protect England's nature and landscapes for people to enjoy and for the services they provide.
North Portal	**-**	The North Portal (northern tunnel entrance) would be located to the west of East Tilbury. Emergency access and vehicle turn-around facilities would be provided at the tunnel portal. The tunnel portal structures would accommodate service buildings for control operations, mechanical and electrical equipment, drainage and maintenance operations.
North Portal emergency and maintenance access	**-**	Emergency and maintenance access for the Tunnel, located at the North Portal.
North Portal Tunnel Services Building	**-**	Building located at the North Portal to accommodate mechanical, electrical and drainage equipment, and to control normal and maintenance operation of the tunnels.
North Road	**-**	Realignment eastwards of North Road and construction of a new green bridge with shared pedestrian and cycle facility to carry the realigned North Road over the A122 Lower Thames Crossing road.
Notable species	**-**	Species which are legally protected under international or national legislation, and/or are of local conservation concern.
Ockendon link	**-**	Section of the A122 Lower Thames Crossing between the A13 junction/Green Lane and the A122 Lower Thames Crossing/M25 junction.

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Term	Abbreviation	Explanation
Ockendon Road	**-**	Vertical realignment of Ockendon Road and construction of a new bridge to carry Ockendon Road over the northbound carriageway of the A122 Lower Thames Crossing road.
Open Mosaic Habitat	**OMH**	Open Mosaic Habitats on Previously Developed Land (OMH) are found mainly in urban and formerly industrial areas and have high biodiversity value. This value includes rare plants, mosses, lichens and a large number of rare invertebrates, especially bees, wasps and beetles.
Open space	**-**	Open space is defined in section 19 of the Acquisition of Land Act 1981 as 'any land laid out as a public garden, or used for the purposes of public recreation, or land being a disused burial ground'.
Order Limits	**-**	The Order Limits are the outermost extent of the Lower Thames Crossing indicated on the Plans by a red line. This is the Limit of Land to be Acquired or Used (LLAU) by the Lower Thames Crossing. This is the area in which the DCO would apply.
Ordnance datum	**-**	A standardised point representing average (mean) sea level, used by the Ordnance Survey as the basis for measurement of height (altitude) on UK maps, reported as metres 'Above Ordnance Datum'
Ordnance Survey	**OS**	The national mapping agency of Great Britain.
Permissive paths	**-**	A path over which there is no formal right of access (i.e. not a public right of way) whose use by the public is allowed by the landowner.
Perpetuity		A minimum period of 125 years
Priority habitat	**-**	UK Biodiversity Action Plan (BAP) priority habitats are those identified as being the most threatened and requiring conservation action under the UK BAP.
Public Right of Way	**PRoW**	A right possessed by the public to pass along routes over land at all times. Although the land may be owned by a private individual, the public may still gain access across that land along a specific route. The mode of transport allowed differs according to the type of Public Right of Way, which can consist of footpaths, bridleways and open and restricted byways.
Rectory Road	**-**	Proposed construction of a new bridge in the same location carrying Rectory Road over the new A122 Lower Thames Crossing link roads and over the improved A13. The bridge would be widened to provide a separate shared footway/cycle track and a horse-riding track.
Register of Environmental Actions and Commitments	**REAC**	The REAC identifies the environmental commitments that would be implemented during the construction and operational phases of the Project if the Development Consent Order is granted, and forms part of the Code of Construction Practice (Application Document 6.3, ES Appendix 2.2).
Reinstatement	**-**	The act of restoring something to a condition agreed with the relevant authorities.
Resilience	**-**	The capacity of an ecological feature to respond to a perturbation or disturbance by resisting damage and recovering quickly.
Riparian zone	**-**	The riparian zone or riparian area is the interface between land and a stream or river.
Scheduled monument	**SM**	A 'nationally important' archaeological site or historic building, given protection against unauthorised change and included in the Schedule of Monuments kept by the Secretary of State for Culture, Media and Sport. The protection given to scheduled

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Term	Abbreviation	Explanation
		monuments is given under the Ancient Monuments and Archaeological Areas Act 1979.
Secretary of State	**SoS**	The Secretary of State has overall responsibility for the policies of the Department for Transport.
Setting (Cultural heritage)	**-**	The surroundings in which a heritage asset is experienced. Elements of a setting may make a positive or negative contribution to the value of an asset.
Site of Special Scientific Interest	**SSSI**	A conservation designation denoting an area of particular ecological or geological importance.
South Portal	**-**	The South Portal of the Project (southern tunnel entrance) would be located to the south-east of the village of Chalk. Emergency access and vehicle turn-around facilities would be provided at the tunnel portal. The tunnel portal structures would accommodate service buildings for control operations, mechanical and electrical equipment, drainage and maintenance operations.
South Portal emergency loop road	**-**	Proposed emergency and maintenance access for the tunnel, located at the South Portal.
South Portal Tunnel Services Building	**-**	Proposed building located at the South Portal of the Project to accommodate mechanical, electrical and drainage equipment, and to control normal and maintenance operation of the tunnels.
Stakeholder	**-**	Organisations and individuals who could affect or be affected by the Project, or who otherwise have an interest in the Project.
Statutory Environmental Body	**SEB**	Any principal council as defined in subsection (1) of section 270 of the Local Government Act 1982 for the area where the land is situated. Where the land is situated in England; Natural England, Historic England, the Environment Agency, Natural Resources Wales and the National Assembly for Wales where, in the opinion of the Secretary of State, the land is sufficiently near to Wales to be of interest to them and any other public authority which has environmental responsibilities and which the Secretary of State considers likely to have an interest in the Project.
Statutory utilities	**SU**	These are generally considered to include electricity, gas, water and sewage and communications services.
Stifford Clays Road	**-**	Proposed realignment southwards of Stifford Clays Road as part of the Project, and construction of new bridges to carry the realigned Stifford Clays Road over the A122 Lower Thames Crossing and link roads.
Subsoil	**-**	Weathered soil layer extending between the natural topsoil and the unweathered basal layer (geological parent material) below, or similar material on which topsoil can be spread. Subsoil has lower organic matter and plant nutrient content than topsoil. In most cases, topsoils require a subsoil to perform one or a number of natural soil functions.
Terms of Reference	**TOR**	The key details of meetings, including the objective, attendees and outline agenda.
Thames Chase Community Forest	**-**	Overlooking 40 square miles of countryside surrounding the London/Essex border, the Thames Chase Community Forest encompasses countryside areas situated in Barking and Dagenham, Brentwood, Havering and Thurrock.
Thames Chase Forest Centre	**-**	The Forest Centre is at the heart of the Community Forest and includes a visitor centre, café and the surrounding woodlands. The Forest Centre lies south of M25 junction 29, in Upminster.

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Term	Abbreviation	Explanation
The tunnel	**-**	Proposed 4.25km (2.5 miles) road tunnel beneath the River Thames, comprising two bores, one for northbound traffic and one for southbound traffic. Cross-passages connecting each bore would be provided for emergency incident response and tunnel user evacuation. Tunnel portal structures would accommodate service buildings for control operations, mechanical and electrical equipment, drainage and maintenance operations. Emergency access and vehicle turn-around facilities would also be provided at the tunnel portals.
Thong Lane green bridge north	**-**	A new green bridge proposed as part of the Project, taking Thong Lane over the new A122, between Thong village and Gravesend.
Thong Lane green bridge south	**-**	Existing Thong Lane bridge over the A2 replaced with a green bridge.
Tilbury Viaduct	**-**	A new viaduct proposed as part of the Project, to carry the new A122 over the existing Tilbury Loop railway line, existing Station Road, and existing bridleway BR58 (Coal Road).
Tilbury2	**-**	A new port development and associated terminals, built on part of the land of the former Tilbury Power Station, from the Port of Tilbury London Limited.
Topography	**-**	Local detail or specific features of landform.
Topsoil	**-**	Upper layer of a soil profile, usually darker in colour (because of its higher organic matter content) and more fertile than subsoil, and which is a product of natural biological and environmental processes.
Translocate	**-**	The movement of something from one place to another.
Tree Preservation Order	**TPO**	A Tree Preservation Order is an order made by a local planning authority in England to protect specific trees, groups of trees or woodlands in the interests of amenity. An Order prohibits the: cutting down, topping, lopping, uprooting, wilful damage or wilful destruction of trees without the local planning authority's written consent.
UK Biodiversity Action Plan	**UK BAP**	UK list of priority species and habitats compiled in response to Article 6 of the Biodiversity Convention.
Water body	**-**	A discrete and significant element of surface water, such as a lake, reservoir, stream, river or canal; part of a stream, river or canal; a transitional water (estuary); or a stretch of coastal water, which is a defined management unit under the Water Framework Directive (2000/60/EC). Groundwater bodies are defined as distinct volumes of groundwater within an aquifer or aquifers.
Walkers, cyclists and horse riders.	**WCH**	Walkers, cyclists and horse riders.

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