

# Lower Thames Crossing

## Outline Landscape and Ecology Management Plan

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## Covering Note

This document is a draft version of the Outline Landscape and Ecological Management Plan (OLEMP) that is proposed for inclusion within our Development Consent Order (DCO) application.

This version is a work in progress and reflects our proposals at the time of our DCO application in October 2020.

A small number of areas are being revised and supplemented to reflect our latest proposals, as set out in this consultation. As a result, there are some elements of this document which are superseded by the information set out in the rest of the consultation materials. This includes the precise extent of each mitigation area set out in the document, which are based on our Order Limits in the October submission, and do not reflect the changes set out in this consultation.

This version was issued for comment to a number of stakeholders in February 2021, and we are currently working to incorporate their feedback. In addition, we will consider the response to this consultation as we finalise this document for inclusion into our DCO application later this year.

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# 1 Introduction

## 1.1 Scope of this document

- 1.1.1 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). Highways England's Design Manual for Roads and Bridges (DMRB) standards GM 701 Series 3000 and GS 801 Series 3000 documents establish the general maintenance and inspection requirements for motorways and all-purpose trunk roads.
- 1.1.2 This outline LEMP focuses on the management requirements for the land parcels that perform specific landscape and ecological mitigation 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 (REF TBC).
- 1.1.3 The LEMP would be further developed by the Principal Contractor for approval by the Secretary of State (SoS) in consultation with relevant stakeholders, including:
- a. Natural England
  - b. Relevant local planning authorities.
- 1.1.4 The LEMP submitted to the SoS for approval must be substantially in accordance with the outline LEMP, including the habitat management requirements, targets and prescriptions set out in the outline LEMP.
- 1.1.5 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 identified outside of the highways operational boundary that require a bespoke approach.
- 1.1.6 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.

## 1.2 Context of this document

- 1.2.1 This outline LEMP has been developed in support of Highways England's application for a Development Consent Order (DCO).
- 1.2.2 The outline LEMP is part of a suite of documents that capture the Project's landscape and ecology design and environmental commitments. These documents include:
- a. The draft DCO (REF TBC)
  - b. The Environmental Statement (REF TBC), including:

- i. The Environmental Masterplan (REF TBC), which defines the spatial layout of physical mitigation proposals.
  - ii. The Register of Environmental Actions and Commitments (REAC), which defines commitments on the processes that need to be used in the delivery, management, monitoring and maintenance of the works.
- c. The Code of Construction Practice (CoCP) which covers commitments pertaining to the processes of construction only.
  - d. The Design Principles 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.

## 1.3 Structure of this document

1.3.1 This document is structured as follows:

- a. **Chapter 1** – Introduces the outline LEMP.
- b. **Chapter 2** – Describes the high-level design objectives and vision for the Project. These are Highways England's overarching objectives for the design of permanent works.
- c. **Chapter 3** – Provides an overview of how the outline LEMP will be implemented, including identifying roles and responsibilities of identified parties.
- d. **Chapters 4, 5 and 6** – 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. **Chapter 7** – 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.
- f. **Chapter 8** – Contains the list of guidance documents and material referenced in the outline LEMP.
- g. **Chapter 9** – Contains a glossary of the technical terms and acronyms used within this outline LEMP.

## 1.4 How to read this document

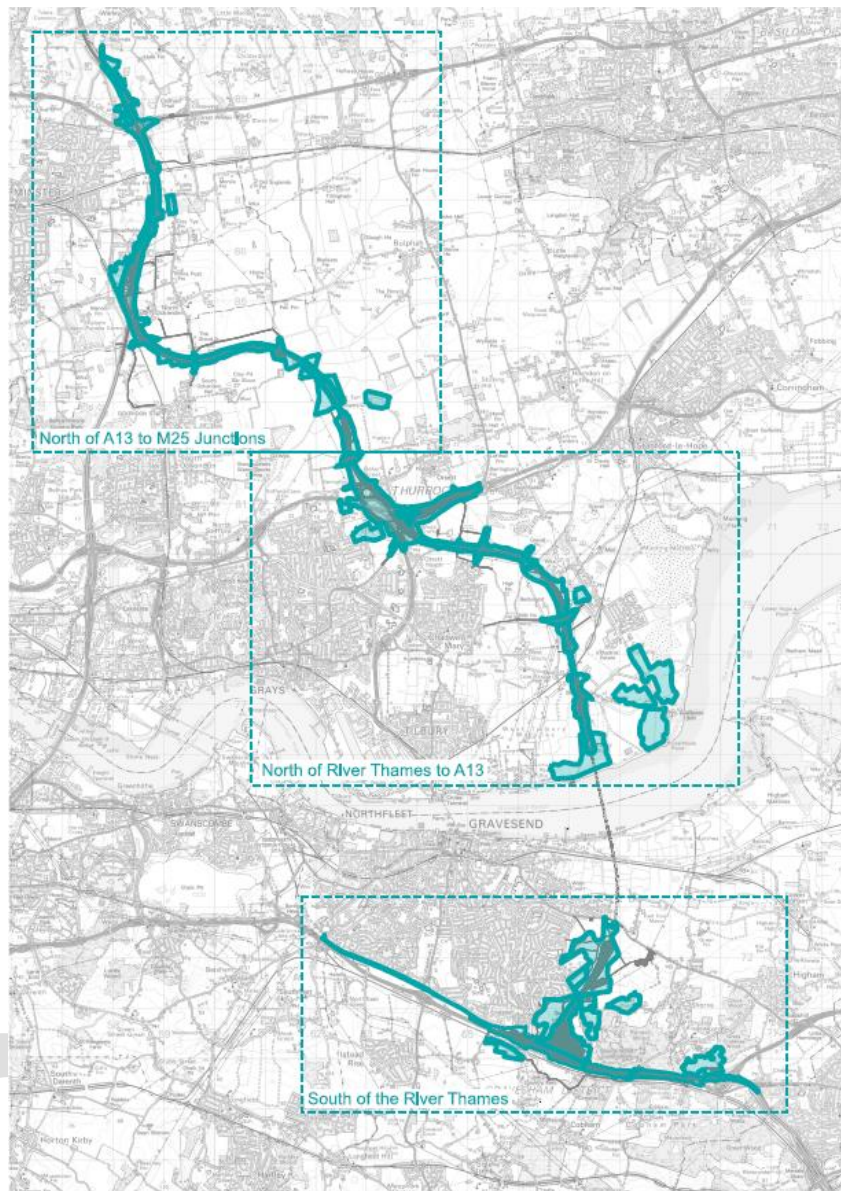
1.4.1 Due to the large-scale nature of the Project, the structure of this this outline LEMP has been broken down geographically into three regional areas. The three regional areas are:

- a. South of the River Thames (Chapter 4)
- b. North of the River Thames to the A13 junction (Chapter 5)
- c. North of the A13 junction to the M25 junction 29 (Chapter 6)

1.4.2 The regional areas are illustrated in Plate 1.1 below.



**Plate 1.1 Location of regional areas**



- 1.4.3 Each regional area has been further broken down into a number of management areas. These management areas comprise land parcels grouped into areas that perform similar landscape and ecological functions.
- 1.4.4 For completeness, this outline LEMP also contains management areas that describe the design proposals within, and adjacent to, the Project route and the proposed junctions. These land parcels will be covered by DMRB standards GM 701 Series 3000 and GS 801 Series 3000 for their management and inspection. However, this outline LEMP describes the outline management requirements of these parcels, informed by the local character and providing further information on the form and function of the landscape proposals contained within.
- 1.4.5 Chapter 7 provides a description of each of the individual typologies that form the proposed Environmental Masterplan (REF TBC).
- 1.4.6 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 Chapter 7. This has been summarised in the management matrix table (Table 1.1).

- 1.4.7 This enables the document to be structured in a way that allows the document to be sub-divided in the future to reflect different contractors/land management agents. The table below will assist in extracting the relevant typologies needed for either an individual management area or regional areas.
- 1.4.8 Where relevant Chapter 7 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 and a link to the relevant 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.
- 1.4.9 The methodologies employed for creating the proposed habitat typologies, including the detailed requirements for site preparation prior to any planting, would follow published guidance, including but not limited to:
- 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, 2020)

**Table 1.1 Management matrix table**

	LE1.3 Species Rich Grassland	LE1.3 Species Rich - Chalk	LE1.3 Species Rich - Wildflower Annual Grassland	LE1.4 Rock and Scree	LE2.1 Woodland	LE2.1 Woodland - inc Non-Native Species	LE2.1 Woodland - Edible Species	LE2.2 Woodland Edge	LE2.2 Woodland Edge - Scrub	LE2.4 Linear Belt of Shrubs and Trees	LE2.5 Shrubs with Intermittent Trees	LE2.7 Scattered Trees	LE2.8 Scrub	LE3.1 Amenity Tree and Shrub Planting - Orchard	LE4.3 Native Species Hedge (untrimmed)	LE4.4 Native Hedgerow with Trees	LE5.1 Individual Trees	LE6.1 Water Bodies (Standing Water)	LE6.1 Water Bodies and Associated Plants (Swamp)	LE6.2 Banks and Ditches	LE6.4 Marsh and Wet Grassland - Fen	LE6.4 Marsh and Wet Grassland	LE7.2 Green Roofs	E3.2 Proposed Ancient Woodland Compensation	E3.2 Open Mosaic Habitat	E3.2 Translocated Acidic Grassland	
<b>4.0 South of the River</b>																											
4.1	A2 / M2 Corridor																										
4.2	Land East of Brewers Wood (AWC)																										
4.3	Land West of Jeskyns (AWC)																										
4.4	Green Bridges																										
4.5	Chalk Park South (Land North of Claylane Wood including AWC)																										
4.6	A2 / M2 / Lower Thames Crossing Junction																										
4.7	Thong Open Mosaic Habitat																										
4.8	Land North of Brummelhill Wood (AWC)																										
4.9	Gateway to Shorne Woods Country Park																										
4.10	Chalk Park North																										
4.11	Replacement Pitch and Putt																										
<b>5.0 North of the River to A13 Junction</b>																											
5.1	Tilbury Fields																										
5.2	Coalhouse Fort Water Vole Habitat																										
5.3	Coalhouse Fort Open Mosaic Habitat Area																										
5.4	Tilbury Link																										
5.5	Chadwell Link																										
5.6	Green Bridges																										
5.7	Linford Open Mosaic Habitat																										
5.8	Rainbow Shaw (AWC)																										
5.9	Baker Street Community Woodland																										
5.10	Ron Evans Replacement Land																										
5.11	A13 Junction																										
<b>6.0 North of the A13 Junction to the M25 Junctions</b>																											
6.1	Ockenden Link																										
6.2	Orsett Fen - Wetland Mitigation																										
6.3	Coles Reservoir Open Mosaic Habitat Area																										
6.4	Green Bridges																										
6.5	M25 Junction																										
6.6	Thames Chase Compensation Land																										
6.7	Folkes Lane Woodland Compensation																										

## 2 Project aims and objectives

### 2.1 Project Description

- 2.1.1 The A122 Lower Thames Crossing (the Project) would provide a connection between the A2 and M2 in Kent, east of Gravesend, crossing under the River Thames through a tunnel, before joining the M25 south of junction 29. The Project route is presented in Plate 2.1.
- 2.1.2 The A122 road would be approximately 23km long, 4.25km of which would be in tunnel. On the south side of the River Thames, the Project route would link the tunnel to the A2 and M2. On the north side, it would link to the A13 and junction 29 of the M25. The tunnel entrances would be located to the east of the village of Chalk on the south of the River Thames and to the west of East Tilbury on the north side.
- 2.1.3 Junctions are proposed at the following locations:
- a. New junction with the A2 to the south-east of Gravesend
  - b. Modified junction with the A13/A1089 in Thurrock
  - c. New junction with the M25 between junctions 29 and 30
- 2.1.4 To align with NPSNN policy and to help the Project meet the Scheme Objectives, it is proposed that road user charges would be levied. Vehicles would be charged for using the new tunnel.
- 2.1.5 The Project route would be three lanes in both directions, except for:
- a. link roads
  - b. stretches of the carriageway through junctions
  - c. the southbound carriageway from the M25 to the junction with the A13/A1089, which would be two lanes
- 2.1.6 In common with other A-roads, the A122 would operate with no hard shoulder but would feature a 1m hard strip on either side of the carriageway. It would also feature technology including stopped vehicle and incident detection, lane control, variable speed limits and electronic signage and signalling. Our A122 road design outside of the tunnel includes emergency areas spaced at intervals between 800 metres and 1.6km (less than one mile). The tunnel would include a range of enhanced systems and response measures instead of emergency areas.
- 2.1.7 The A122 would be classified as an 'all-purpose trunk road' with green signs. For the benefit of safety, walkers, cyclists, horse-riders and slow-moving vehicles would be prohibited from using it.
- 2.1.8 The Project would include adjustment to a number of side roads. There would also be changes to a number of public rights of way, used by walkers, cyclists and horse riders. Construction of the Project would also require the installation and diversion of a number of utilities, including gas pipelines, overhead power lines and underground electricity cables, as well as water supplies and telecommunications assets and associated infrastructure.

- 2.1.9 The Project has been developed to avoid or minimise significant effects on the environment. Some of the measures adopted include landscaping, noise mitigation, green bridges, floodplain compensation, new areas of ecological habitat and two new parks.

**Plate 2.1 Lower Thames Crossing route**



## 2.2 Scheme Objectives

- 2.2.1 Highways England 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 (REF TBC).
- a. To support sustainable local development and regional economic growth in the medium to long term
  - b. To be affordable to government and users.

- 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.

2.2.2 In addition to the objectives above, the Project is being developed in line with the National Policy Statement for National Networks (NPSNN), which sets out government policies for nationally significant infrastructure road projects for England.

2.2.3 As the Project includes both gas pipeline and overhead electric line Nationally Significant Infrastructure Projects, the Overarching National Policy Statement for Energy (EN-1) (NPS EN-1), National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (NPS EN-4) and National Policy Statement for Electricity Networks Infrastructure (EN-5) (NPS EN-5) have effect and have therefore also been considered.

## 2.3 Design Principles

2.3.1 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.

2.3.2 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, forming a green corridor along the length of the Project.
- b. Landscape integration – to reflect the surrounding landscape character that the Project route passes through.
- c. Visual screening – to screen views of the Project route and infrastructure from existing (and future) visual receptors.

## 3 Implementation of the Landscape and Ecology Management Plan

### 3.1 Roles and Responsibilities

*Highways England 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 will be a contractual requirement, but ongoing (long-term) management, maintenance and monitoring, beyond initial establishment periods, may be delivered by Highways England's Operational and Maintenance Teams or through agreement with third parties and landowners (to be confirmed). These details will be discussed with all stakeholders in the development of the detailed LEMP in accordance with DCO Requirement 5.*

#### Advisory Group

*The intention is for an advisory group to be set up to help inform decision making throughout the duration of this LEMP.*

### 3.2 Habitat management duration

3.2.1 Table 3.1 below describes the duration of establishment required for each of the landscape / ecology habitat types provided within this outline LEMP.

**Table 3.1 Establishment Duration Table**

Habitat Type	Duration of Establishment
Grassland management	20 years
Rock and Scree	5 years
Woodland (created)	20 years
Amenity tree planting	20 years
Shrub and tree planting	5 years
Hedgerow planting	5 years
Water bodies and marginal / emergent planting	5 years
Ancient Woodland Compensation Areas including soil and material salvage	25 years
Open Mosaic Habitat Areas	20 years
Acidic grassland soil salvage	20 years

### 3.3 Securing Mechanism

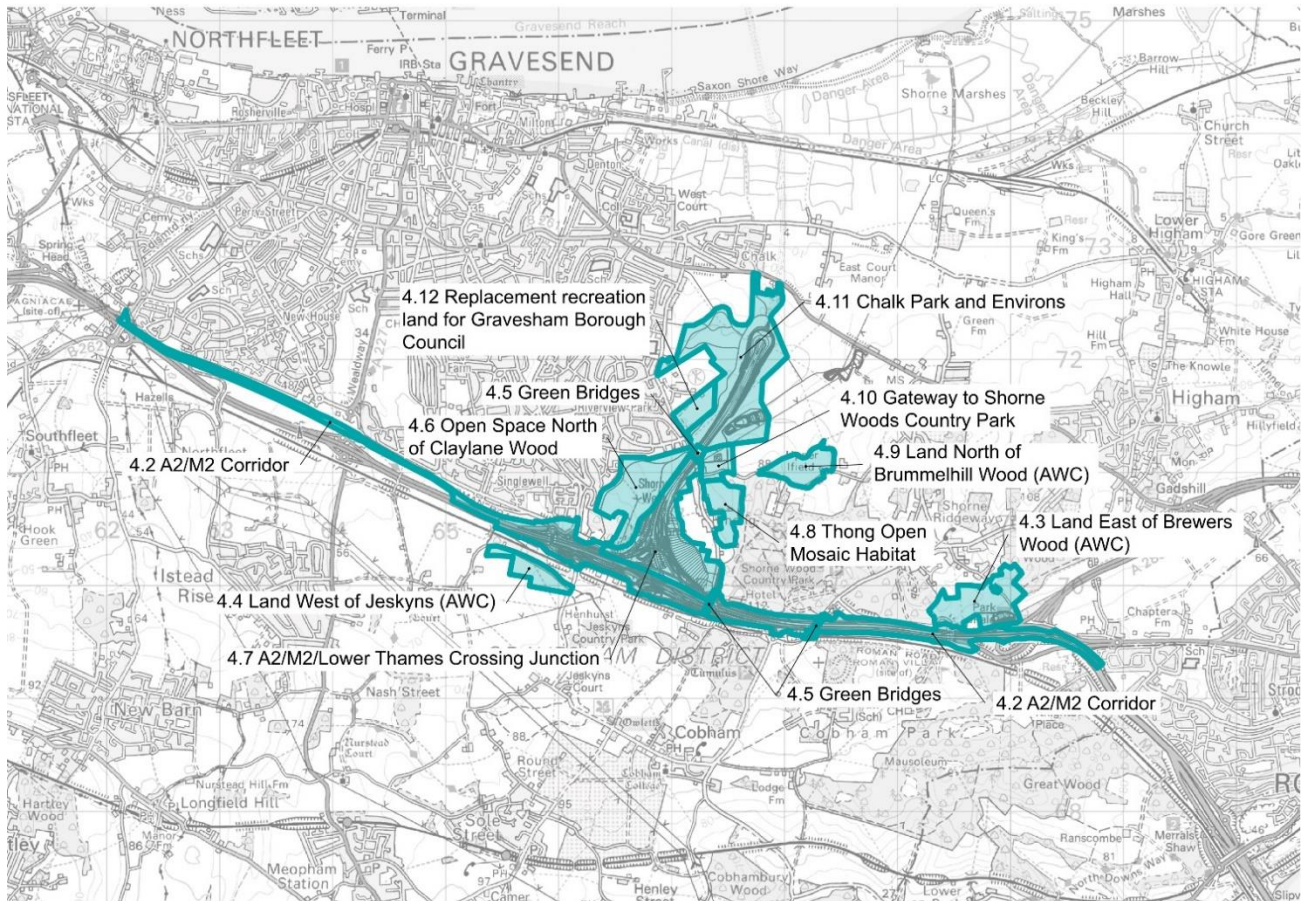
- 3.3.1 This outline LEMP describes the management requirements for the identified landscape and ecological typologies identified in each management area as described in Chapters 4, 5 and 6. When the LEMP is developed in accordance with the outline LEMP, the management requirements will develop into specific smart objectives and targets for each area in discussion with appropriate stakeholders.
- 3.3.2 The LEMP would be secured through Schedule 2 Requirement 5 of the draft DCO. The LEMP must be prepared substantially in accordance with this outline LEMP submitted as part of the application.
- 3.3.3 The LEMP would be submitted to and approved in writing by the Secretary of State, following consultation by Highways England 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 carried over into the Handover EMP (EMP3).

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## 4 Management Areas – South of the River Thames

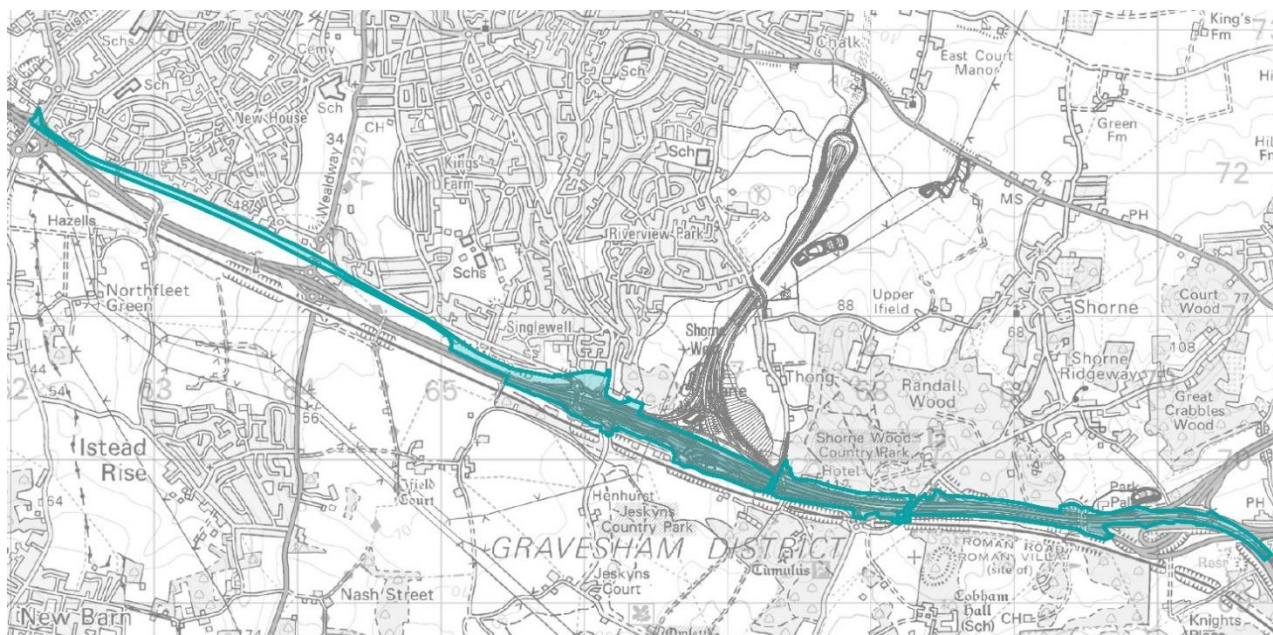
**Plate 4.1 Location of management areas within the South of the River Thames regional area**



- 4.1.1 The management areas within the South of the River Thames regional area shown in Plate 4.2. This chapter provides a description of the management area, and the outline management requirements for each area.
- 4.1.2 The following management areas within this chapter describe the sectional areas of the route (REF TBC). 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:
- 4.1 A2/M2 Corridor
  - 4.6 A2/M2/Lower Thames Crossing junction

## 4.2 A2/M2 Corridor

Plate 4.2 A2/M2 Corridor



### Description of Management Area

- 4.2.1 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 Area of Outstanding Natural Beauty (AONB) and has a heavily wooded character, particularly in the eastern extents of the management area.
- 4.2.2 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 the HS1 corridor.
- 4.2.3 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.
- 4.2.4 This management area is shown in the Environmental Masterplan (REF TBC), Section 1, Sheets 1-4 and Sheets 7-17.

### Management Requirements

- 4.2.5 The management requirements of this area are:
  - a. To provide suitable woodland to screen views from within the Kent Downs AONB.

- 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**

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

- a. LE1.3 Species rich grassland
- b. LE2.1 Native 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. LE6.1 Water bodies
- i. LE6.4 Wet grassland.

## 4.3 Land East of Brewers Wood (Ancient Woodland Compensation)

Plate 4.3 Land east of Brewers Wood



### Description of Management Area

- 4.3.1 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 XX ha in size.
- 4.3.2 The existing landscape is predominately open grassland with several individual mature trees located on the sloping ground down to the A2 corridor.
- 4.3.3 This management area is shown in the Environmental Masterplan (REF TBC) Section 2, Sheets 5-6.

### Management Requirements

- 4.3.4 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 open rides and glades, to allow the ancient woodland time to mature.
  - c. New woodland will be protected 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 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. Open rides and glades to be established along utility diversion routes and 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. Understorey and groundcover planting to be managed 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**

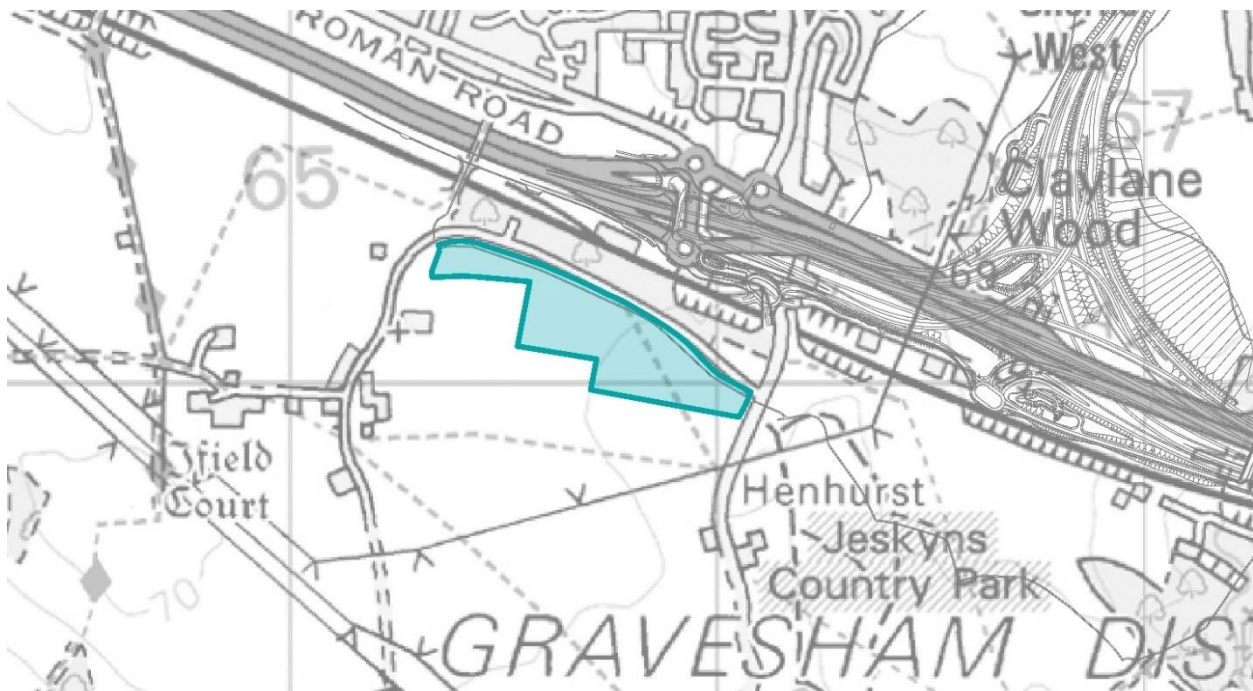
4.3.5 The planting and habitat typologies present within this area are listed below:

- a. LE 1.3 Species Rich Grassland
- b. LE 6.1 Water Bodies
- c. E3.2 Ancient Woodland Compensation

4.3.6 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

## 4.4 Land West of Jeskyns (Ancient Woodland Compensation)

Plate 4.4 Land West of Jeskyns



### Description of Management Area

- 4.4.1 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 lies adjacent to Church Road. The management area is approximately XXm<sup>2</sup> in size.
- 4.4.2 Saint Margaret's Church of England is located approximately XX ha to the west of the management area.
- 4.4.3 The existing area is comprised mainly of arable fields with a vegetated boundary to Church Road.
- 4.4.4 This management area is shown in the Environmental Masterplan (REF TBC), Section 2, Sheets 5-6.

### Management Requirements

- 4.4.5 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: W10, and W8b (*Fraxinus excelsior* – *Acer campestre* – *Mercurialis perennis* woodland).

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

### **Typologies Present**

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

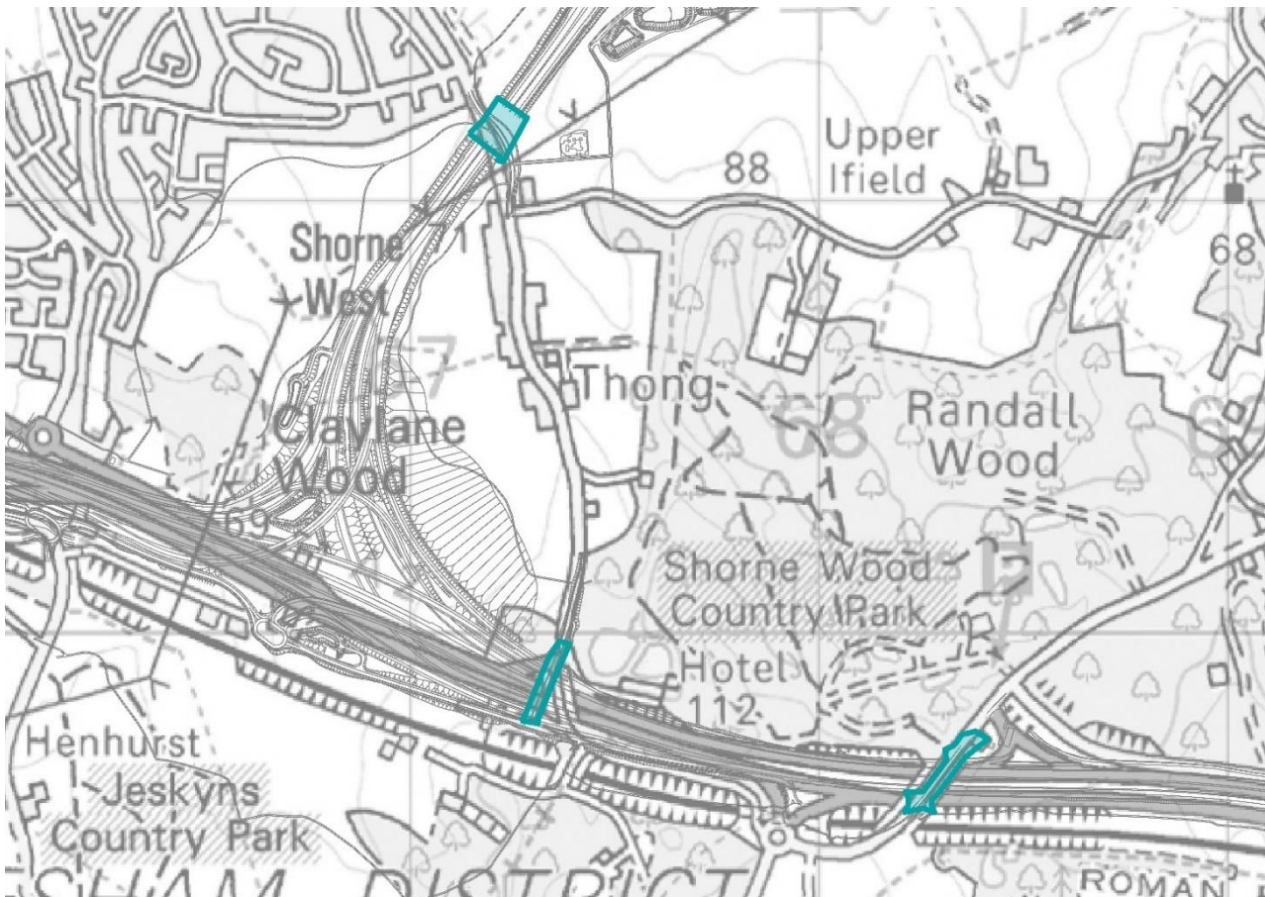
- a. LE1.3 Species Rich Grassland
- b. LE4.4 Native Hedgerow with trees
- c. LE6.1 Water Bodies
- d. E.2 Ancient Woodland Compensation.

4.4.7 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

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## 4.5 Green Bridges (Brewers Road, Thong Lane over A2, Thong Lane over LTC)

Plate 4.5 Green bridges



### Description of Management Area

- 4.5.1 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 A122.
- 4.5.2 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.

### Management Requirements

- 4.5.3 The management requirements for the green bridges in this management area are:
- To provide habitat connectivity for species including a range of protected and notable species between Shorne Woods and Ashenbank Woods, Jeskyns and Cobham Park. Habitat would be managed to provide strong green corridors providing shelter, foraging and linear features allowing easy detection within the landscape.



- 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 the green bridge. 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 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.

### **Typologies Present**

4.5.4 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
- c. LE2.2 Woodland Edge
- d. LE2.5 Shrubs with intermittent trees

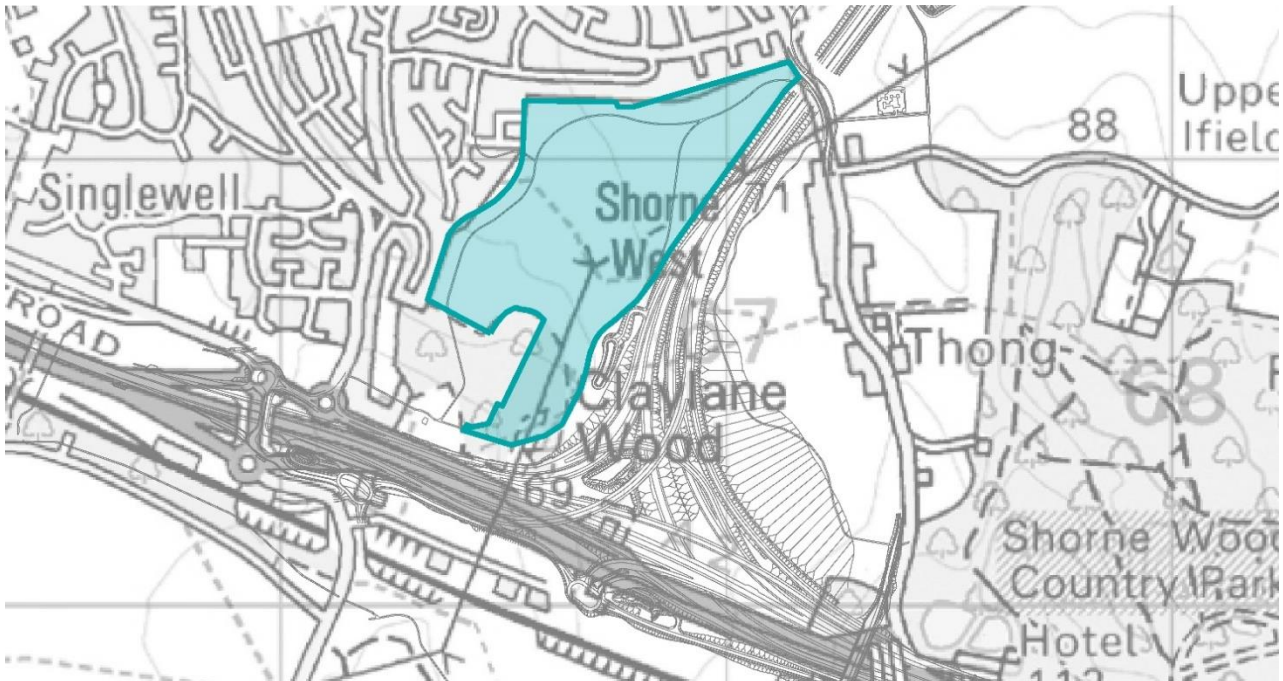
- e. LE2.7 Scattered trees
- f. LE4.4 Native hedgerow with trees

4.5.5 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

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## 4.6 Open Space North of Claylane Wood

**Plate 4.6 Open Space North of Claylane Wood**



### Description of Management Area

- 4.6.1 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.
- 4.6.2 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.
- 4.6.3 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.
- 4.6.4 This management area is shown in the Environmental Masterplan (REF TBC), Section 2, Sheets 5-6.

### Management Requirements

- 4.6.5 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, so new habitat should tend towards this community.
  - b. 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 blocked of woodland, providing shelter, foraging and commuting habitats for a range of species, particularly dormice and bats.

- c. To provide woodland planting of suitable depth and quality to provide visual screening for receptors at the eastern edge of Gravesend.
- d. 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.
- e. To manage the open grassland areas so that they reference the historic layout and runways of the former RAF Gravesend.

### **Typologies Present**

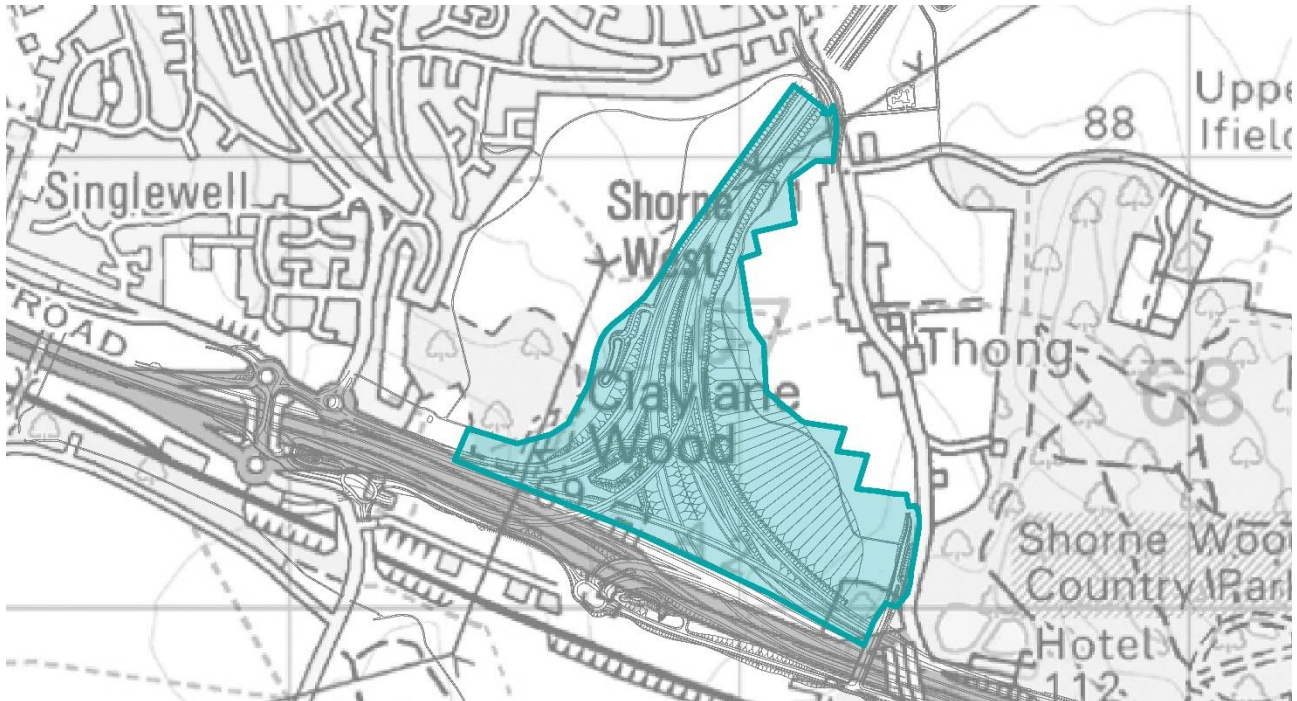
4.6.6 The planting and habitat typologies present within this area are listed below:

- a. LE1.3 Species Rich Chalk Grassland
- b. LE1.3 Species Rich – Annual Wildflower Grassland
- c. LE2.8 Scrub
- d. LE4.3 Native Species Hedge – Untrimmed
- e. LE6.1 Water Bodies
- f. E.2 Ancient Woodland Compensation

4.6.7 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

## 4.7 A2/M2/Lower Thames Crossing junction

Plate 4.7 A2/M2/Lower Thames Crossing junction



### Description of Management Area

- 4.7.1 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.
- 4.7.2 The existing landscape is mainly comprised of existing arable fields, with some vegetation adjacent the existing A2 carriageway and paddocks and vegetation around the edge of the village of Thong.
- 4.7.3 The management area is approximately XXha in size and includes the proposed A2/M2/Lower Thames Crossing and associated structures.
- 4.7.4 This management area is shown in the Environmental Masterplan (REF TBC), Section 2, Sheets xx.

### Management Requirements

- 4.7.5 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 circle' 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 of these NVC communities.
  - 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. The woodland to provide visual screening as well as softening the appearance of the earthworks.
- e. Reinststate 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.
- g. To screen and integrate the proposed substation located to the west of Thong Lane.

### **Typologies Present**

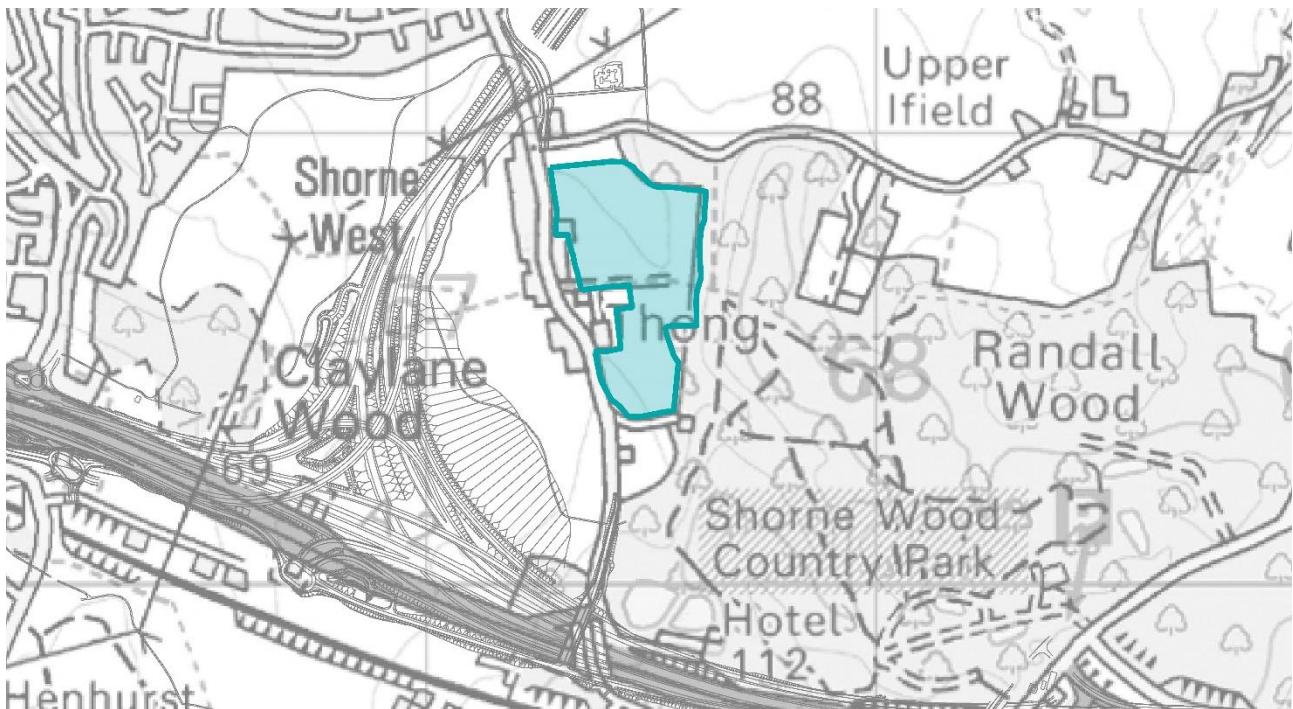
4.7.6 The planting and habitat typologies present within this area are listed below:

- a. LE1.3 Species Rich Grassland
- b. LE2.1 Native Woodland
- c. LE2.2 Woodland Edge
- d. LE2.7 Scattered trees
- e. LE2.8 Scrub
- f. LE4.4 Native species hedgerow with trees
- g. LE6.1 Water bodies (standing water)
- h. LE6.4 Marsh and wet grassland

4.7.7 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

## 4.8 Thong Open Mosaic Habitat

Plate 4.8 Thong Open Mosaic Habitat



### Description of Management Area

- 4.8.1 This management area is located between the village of Thong and the western extents of Shorne Woods Country Park. The existing land is predominately used for grazing and paddock enclosure, with fencing and small tree and scrub at boundaries.
- 4.8.2 The management area is approximately XXha in size.
- 4.8.3 This management area is shown in the Environmental Masterplan (REF TBC), Section 2, Sheets xx.

### Management Requirements

- 4.8.4 The management requirements of this area are:
- To establish a mosaic of open habitat which would provide suitable habitat for the translocation of species including amphibians (notably GCN), and reptiles.
  - 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.
  - Hibernacula and refuges for translocated species would also be provided around the site, based on good practice guidance designs (English Nature, 2001).

## Typologies Present

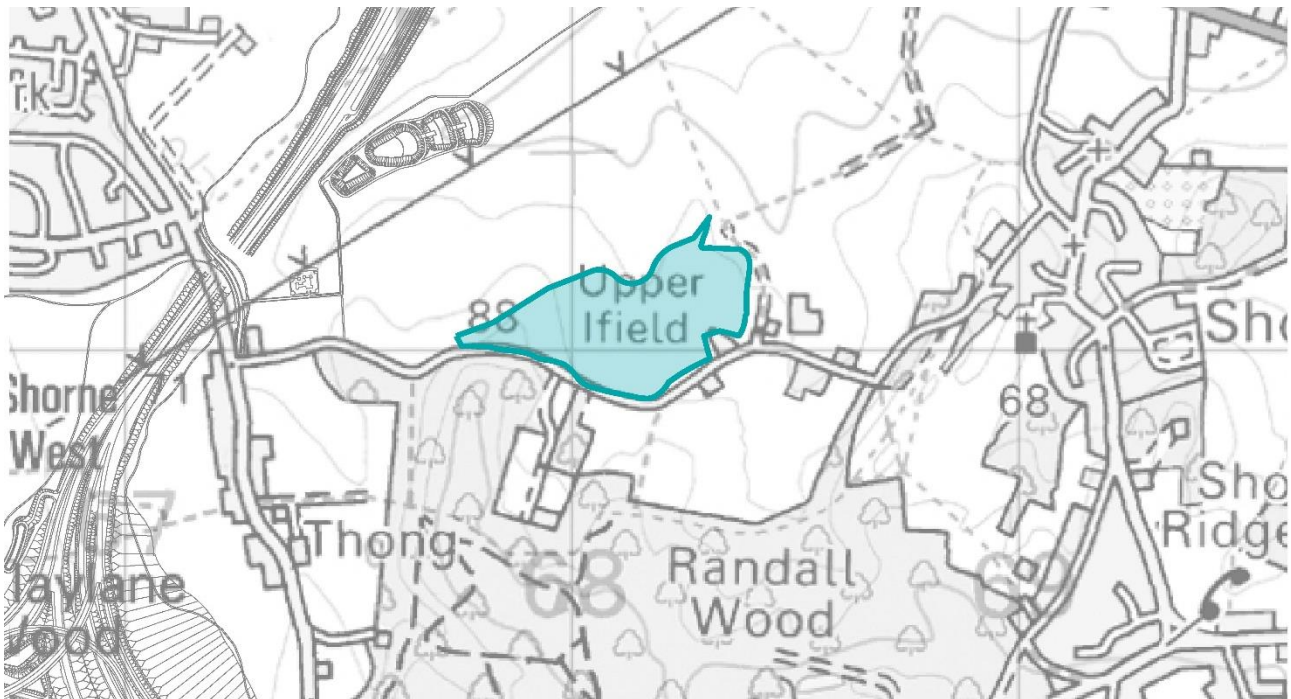
- 4.8.5 The planting and habitat typologies present within this area are listed below:
- a. LE6.1 Water Bodies
  - b. E.2 Open Mosaic Habitat
- 4.8.6 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

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## 4.9 Land North of Brummelhill Wood (Ancient Woodland Compensation)

Plate 4.9 Land north of Brummelhill Wood



### Description of Management Area

- 4.9.1 This management area is located within two land parcels to the north of Shorne Ifield Road and the existing Brummelhill Wood.
- 4.9.2 The existing land is currently used for agriculture, with intermittent scrub and tree planting along the boundary to Shorne Ifield Way.
- 4.9.3 The management area is approximately XXha in size.
- 4.9.4 This management area is shown in the Environmental Masterplan (REF TBC), Section 2, Sheets xx.

### Management Requirements

- 4.9.5 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.
  - b. To create a 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. 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**

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

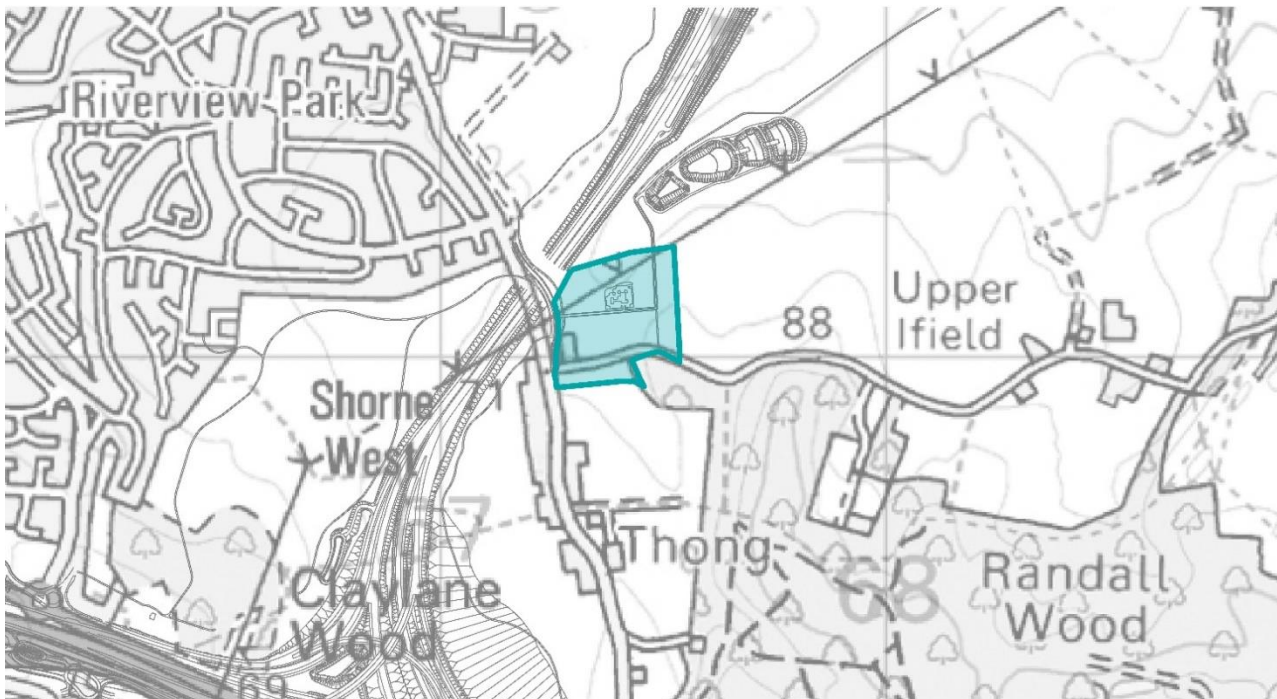
- a. LE6.1 Water Bodies
- b. E.2 Ancient Woodland Compensation

4.9.7 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

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## 4.10 Gateway to Shorne Woods Country Park

Plate 4.10 Gateway to Shorne Woods County Park



### Description of Management Area

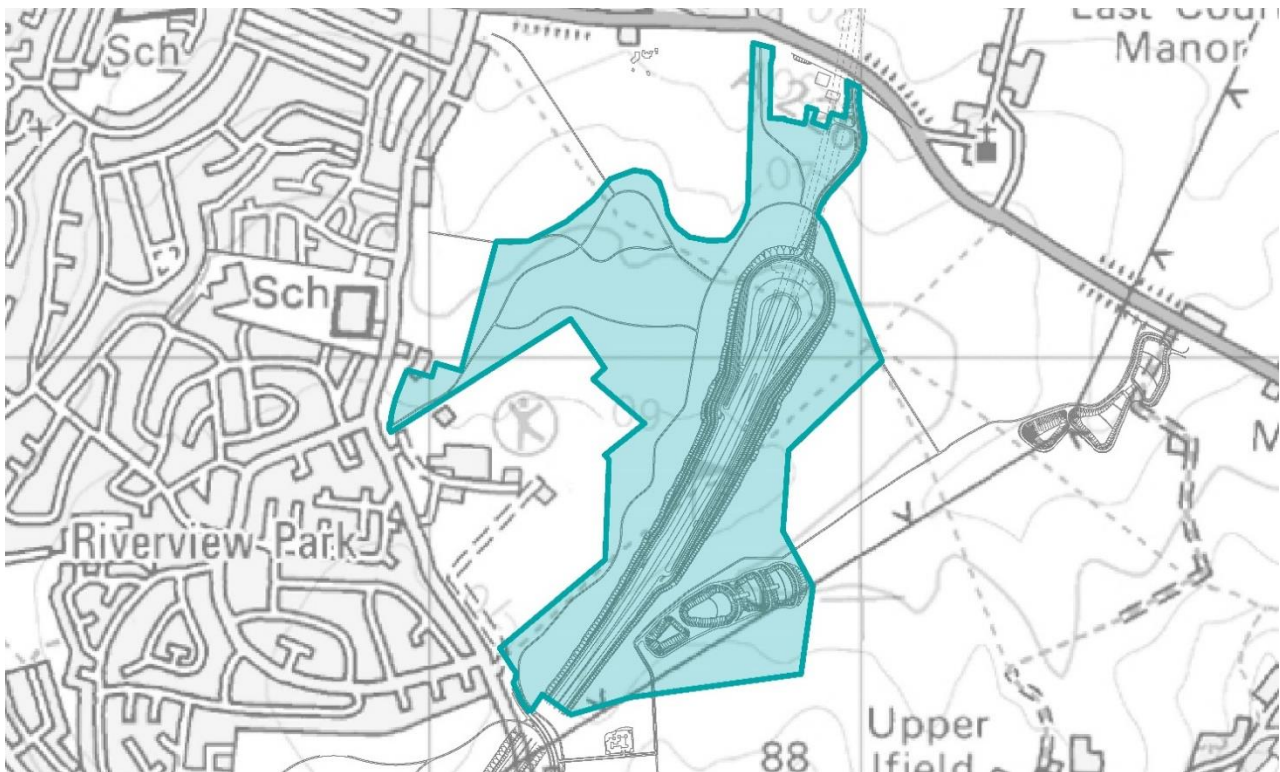
- 4.10.1 This management area is located to the north-east of the village of Thong and north of Shorne Ifield Road.
- 4.10.2 The existing land is currently utilised as a landscaping/nursery business with outbuildings and areas used to grow nursery stock. The business would be extinguished to accommodate the construction of the Thong Lane over A122 Lower Thames Crossing green bridge, Thong Lane realignment and utilities diversions taking place on the land.
- 4.10.3 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.
- 4.10.4 The management area is approximately XXha in size.
- 4.10.5 This management area is shown in the Environmental Masterplan (REF TBC).

### Management Requirements

*This management area is subject to change ahead of the finalisation of the outline LEMP. Placeholder text has been included above for the description of the management area. The outline management requirements for this area are currently being progressed.*

## 4.11 Chalk Park and Environs

Plate 4.11 Chalk Park and Environs



### Description of Management Area

- 4.11.1 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.
- 4.11.2 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.
- 4.11.3 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.
- 4.11.4 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. As a result, the Southern Valley Golf Course is to be extinguished.
- 4.11.5 The Project route enters the portal structure within this management area. The portal structure has been designed to accommodate the Tunnel Services Building and located within the cutting of the South Portal, to screen views of the structure from the surrounding landscape.

- 4.11.6 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.
- 4.11.7 An access road has been designed to connect the South Portal to the A226. The alignment and character of the access road has been designed to replicate that of a country lane, similar to those found within the local area.
- 4.11.8 A substation has been designed off the access road and has been located near the vicinity of existing barns and farm buildings. The substation will be integrated and screened from the wider landscape by a mixture of earthworks and woodland planting.
- 4.11.9 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.
- 4.11.10 The management area is approximately XXha in size.
- 4.11.11 This management area is shown in the Environmental Masterplan (REF TBC)..

### **Management Requirements**

- 4.11.12 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 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. Woodland planting to soften the appearance of the excavated material hill and soften the edge of Gravesend and to create a desirable separation between the edge of the settlement and the South Portal.
  - d. Woodland and top of the hill to be managed 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. Planting would look to follow historic patterns. 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.
- 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. Drainage attenuation ponds to the east of the proposed alignment to be located within species rich grasslands and/or chalk grasslands as appropriate to the underlying geology.

### **Typologies Present**

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

- a. LE1.3 Species Rich Grassland
- b. LE1.3 Species Rich Grassland – Chalk
- c. LE1.4 Rock and Scree
- d. LE2.1 Woodland – Inc Non-Native Species

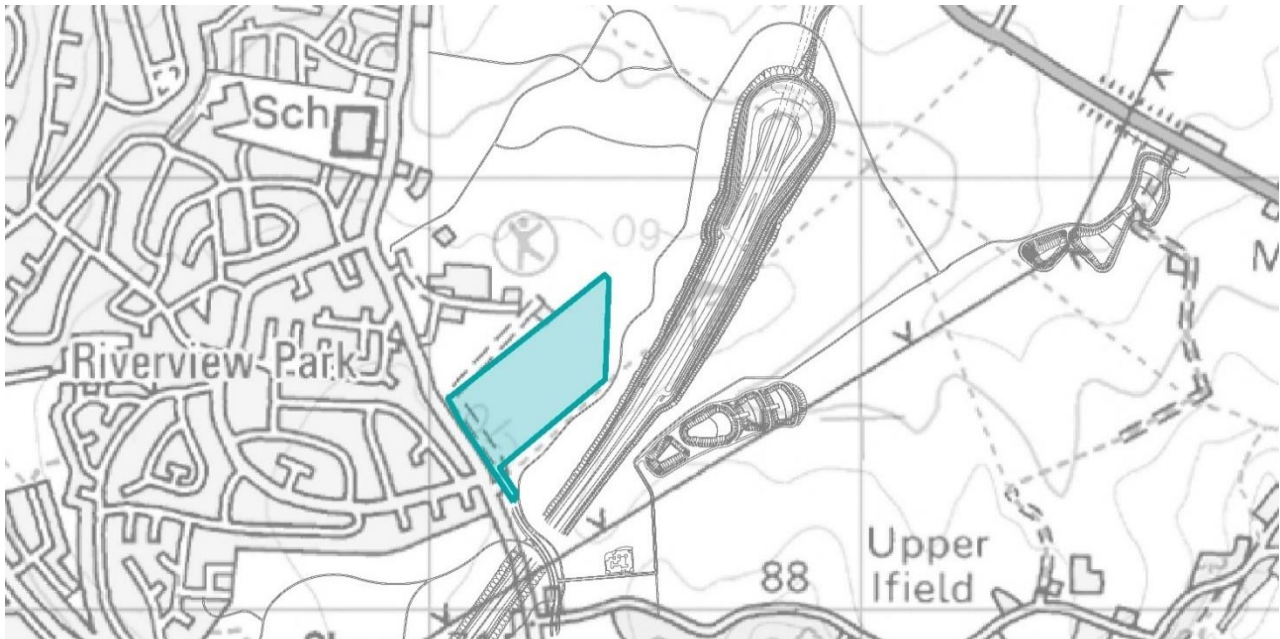
- e. LE2.2 Woodland Edge
- f. LE2.8 Scrub
- g. LE4.4 Native Hedgerow with Trees
- h. LE6.1 Water Bodies (Standing Water)
- i. LE6.4 Marsh and Wet Grassland
- j. LE7.2 Green Roofs

4.11.14 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

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## 4.12 Replacement recreation land for Gravesham Borough Council

Plate 4.12 Replacement recreation land for Gravesham Borough Council



### Description of Management Area

- 4.12.1 This management area is located to the north-west of the proposed Thong Lane green bridge over the A122 Lower Thames Crossing, and adjoins onto the eastern boundary of the Cascades Leisure Centre site.
- 4.12.2 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.
- 4.12.3 The management area includes the existing clubhouse of Southern Valley Golf Club and the access road to the club from Thong Lane.
- 4.12.4 As part of the proposals, the existing pitch and putt golf course located within the northern extents of the Cascade facilities is to be relocated in this management area, utilising the existing landscape features, golf club and access road in the creation of a new pitch and putt course.
- 4.12.5 The management area is approximately XXha in size.
- 4.12.6 This management area is shown in the Environmental Masterplan (REF TBC)..

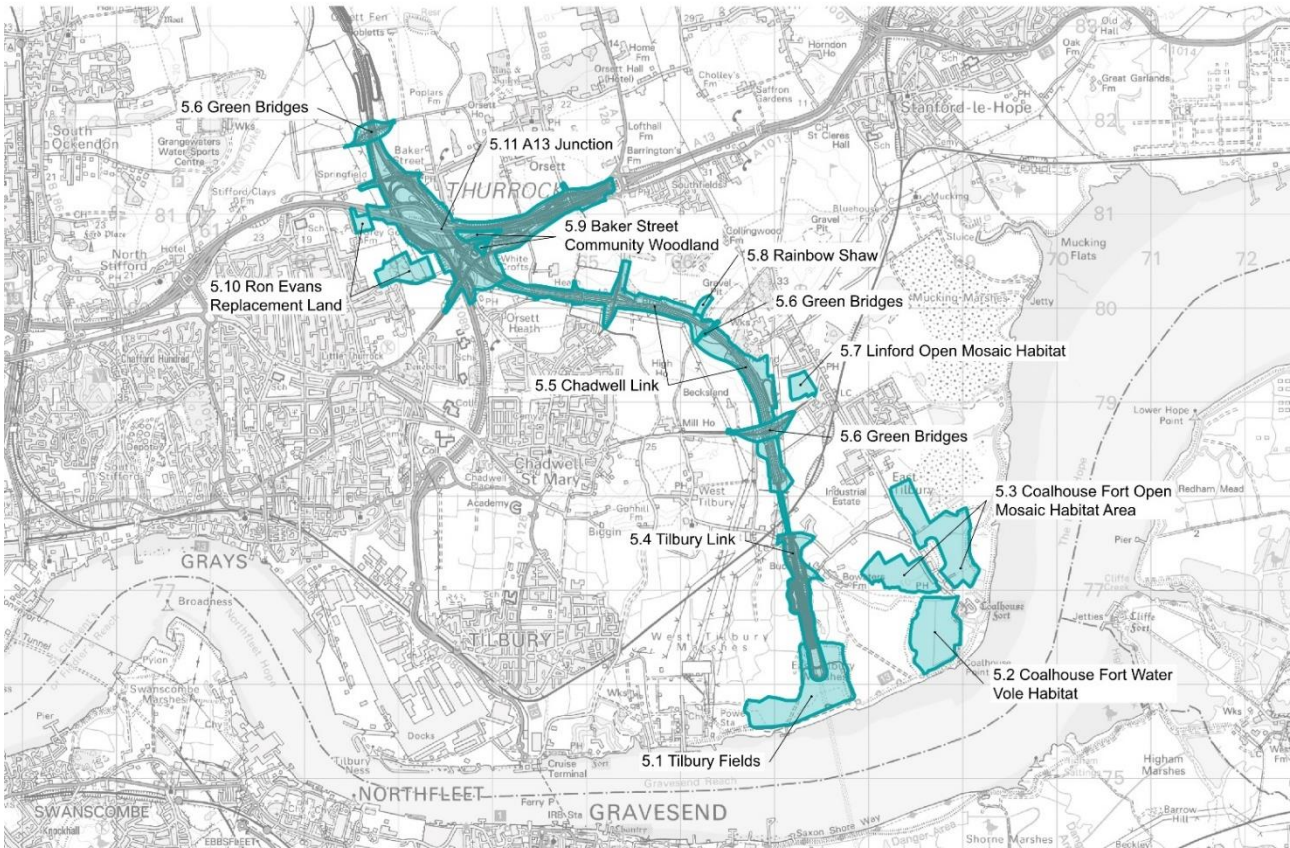
### Management Requirements

*This management area is subject to change ahead of the finalisation of the outline LEMP. Placeholder text has been included above for the description of the management area. The outline management requirements for this area are currently being progressed.*



## 5 Management Areas – North of the River to A13 junction

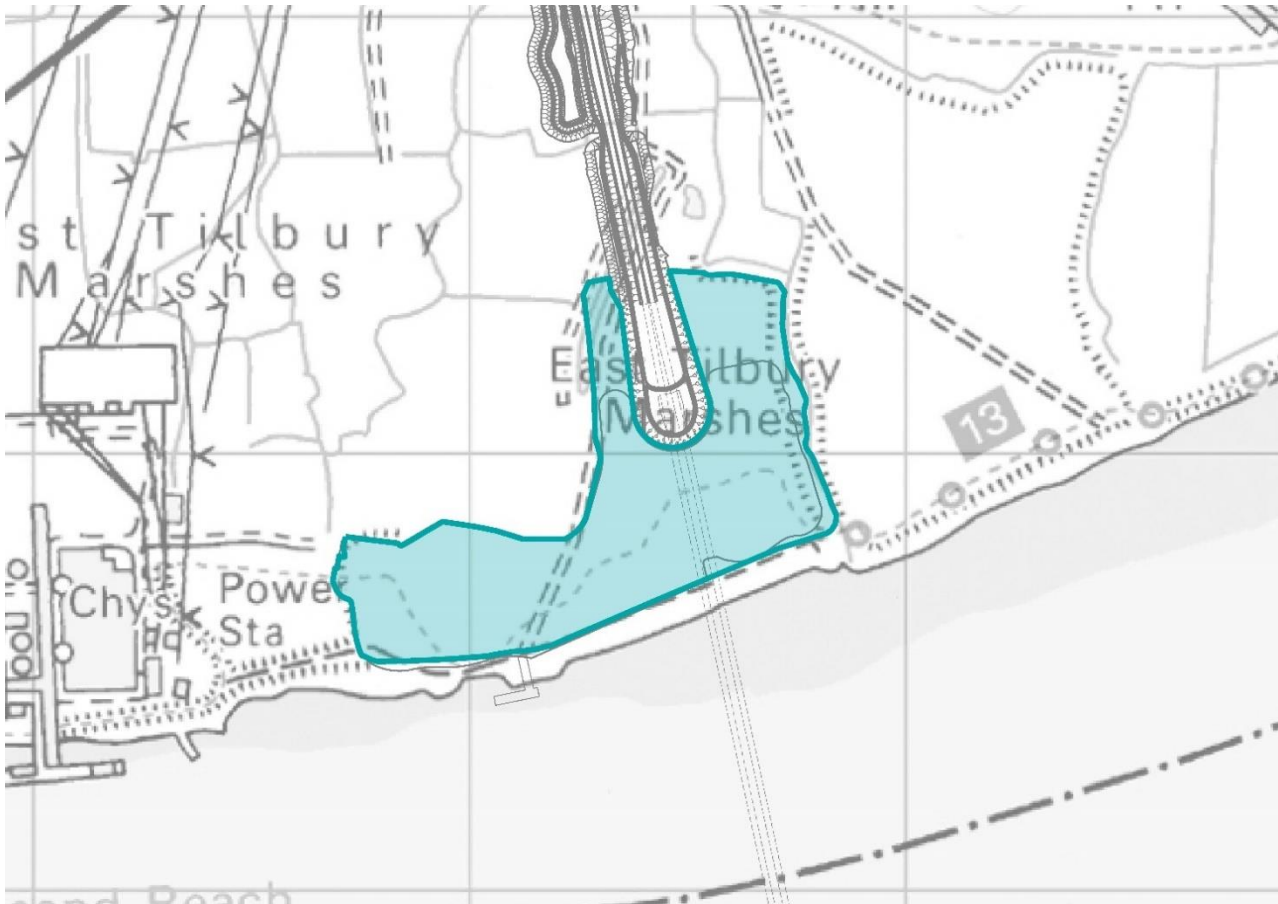
**Plate 5.1 Location of management areas within the North of the River Thames to the A13 junction regional area**



- 5.1.1 The management areas within the North of the River Thames to the A13 junction regional area are shown in Plate 5.1. This chapter provides a description of the management area, and the outline management requirements for each area
- 5.1.2 The following management areas within this chapter describe the sectional areas of the route (REF TBC). 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:
- 5.4 Tilbury link
  - 5.5 Chadwell link
  - 5.11 A13 junction

## 5.2 Tilbury Fields

Plate 5.2 Tilbury Fields



### Description of Management Area

- 5.2.1 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.
- 5.2.2 The management area extends to the edge of the former Tilbury Power station to the west, and east Tilbury landfill to the east.
- 5.2.3 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.
- 5.2.4 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 contrasts with the existing retained marshland within the surrounding landscape.
- 5.2.5 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.
- 5.2.6 The proposed design for the landscape earthworks utilising the excavated material have drawn inspiration from the landform of the nearby heritage assets such as Coalhouse Fort and Tilbury Fort, as well as the forts south of the River Thames. The proposed design has been provisionally named as Tilbury Fields.

- 5.2.7 The earthworks have been designed to create targeted views towards these nearby heritage assets, providing a vantage point above the surrounding raised landfill areas.
- 5.2.8 The management area is approximately XXha in size.
- 5.2.9 This management area is shown in the Environmental Masterplan (REF TBC).

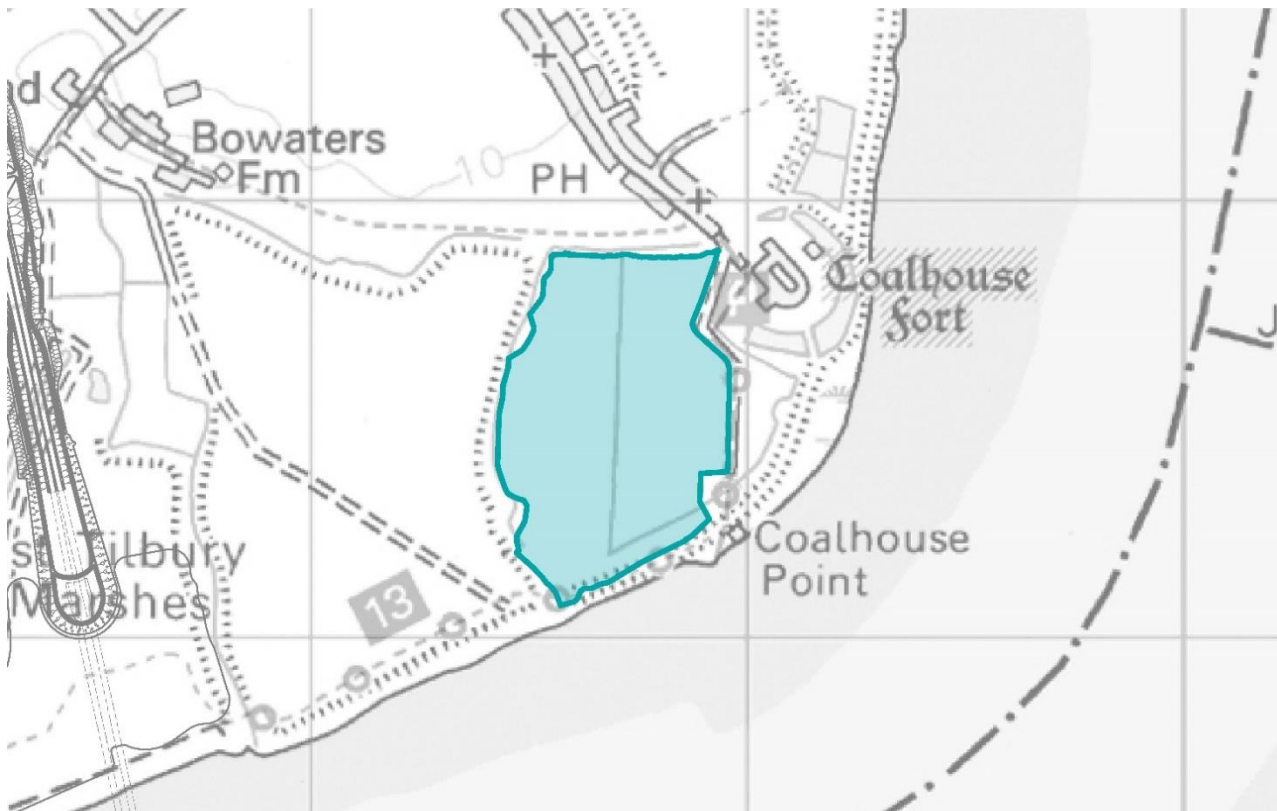
### **Management Requirements**

*This management area is subject to change ahead of the finalisation of the outline LEMP. Placeholder text has been included above for the description of the management area. The outline management requirements for this area are currently being progressed.*

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## 5.3 Coalhouse Fort Water Vole Habitat

Plate 5.3 Coalhouse Fort water vole habitat



### Description of Management Area

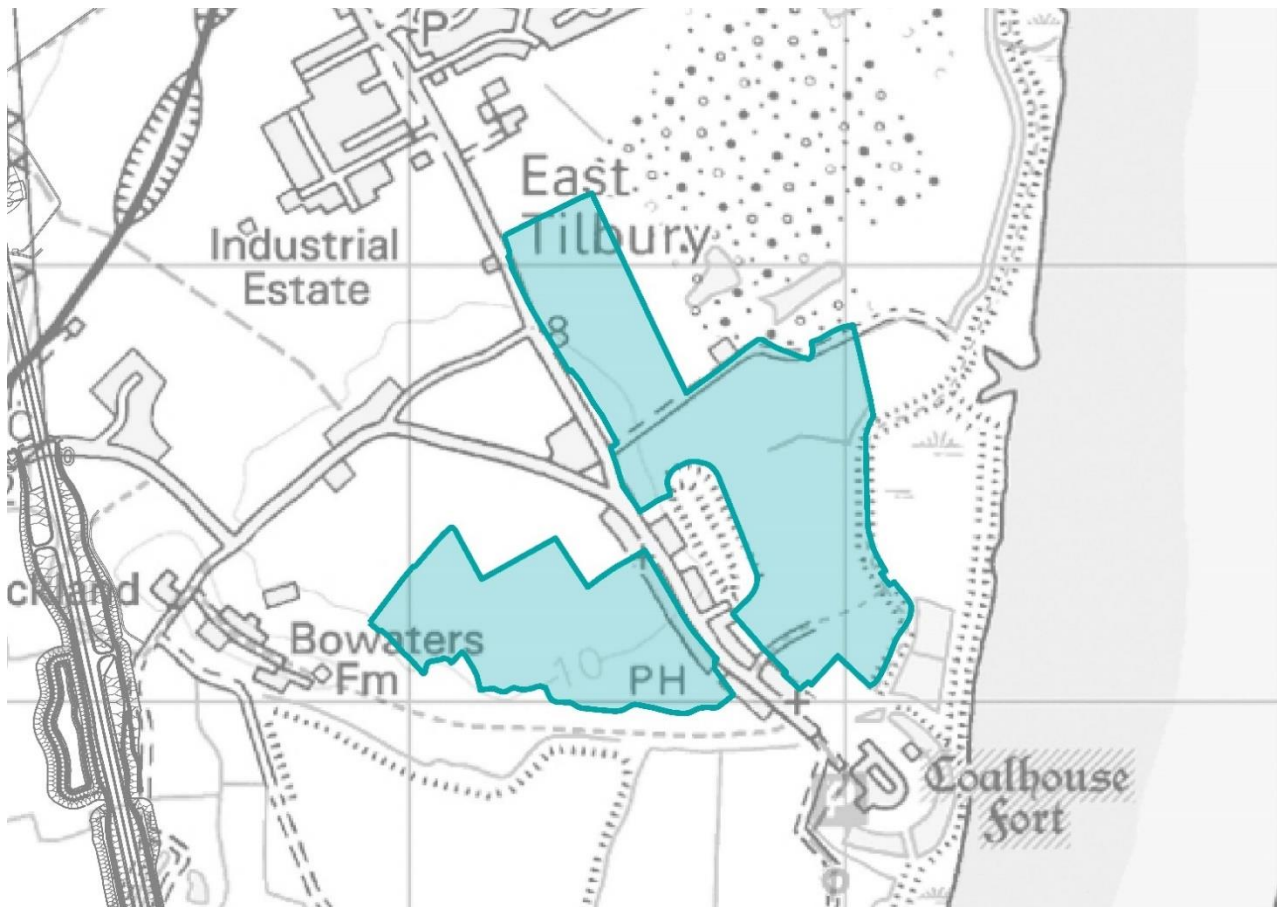
- 5.3.1 This management area is located to the west of Coalhouse Fort just to the North of the River Thames.
- 5.3.2 The management area extends west to a drainage ditch on the boundary to the East Tilbury landfill.
- 5.3.3 The existing landscape is comprised of arable, agricultural land, and is low-lying at its natural level in contrast to the surrounding land which has been raised as part of landfill activities.
- 5.3.4 An existing ditch runs through the middle of the management area, bisecting the area as it runs in a north-south alignment.
- 5.3.5 The management area is approximately XXha in size.
- 5.3.6 This management area is shown in the Environmental Masterplan (REF TBC).

### Management Requirements

*This management area is subject to change ahead of the finalisation of the outline LEMP. Placeholder text has been included above for the description of the management area. The outline management requirements for this area are currently being progressed.*

## 5.4 Coalhouse Fort Open Mosaic Habitat Area

Plate 5.4 Coalhouse Fort Open Mosaic Habitat



### Description of Management Area

- 5.4.1 This management area is located to the north of Coalhouse Fort and is comprised of 9 fields, totalling approximately XXha in size.
- 5.4.2 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 Ancient Monument that lies outside the Order Limits.
- 5.4.3 The land is currently used for agriculture with a number of vegetated field boundaries.
- 5.4.4 This management area is shown in the Environmental Masterplan (REF TBC), Section 9, Sheets 16-18 and 20-22.

### Management Requirements

- 5.4.5 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 suitable invertebrate habitat to offset that lost as a result of the Project, notably around Low Street Pit Local Wildlife Site (LWS).

- b. To translocate acid grassland from Low Street Pit LWS to the southern section of the eastern parcel, as identified in the Environmental Masterplan (REF TBC), 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. To establish an open mosaic habitat within all other areas of land within this management area, as identified in the Environmental Masterplan (REF TBC), 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. This differs from the open mosaic description as found in Section 7.22.

### Typologies Present

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

- a. LE6.1 Water Bodies
- b. E.2 Open Mosaic Habitat
- c. E.2 Translocated Acidic Grassland

5.4.7 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

## 5.5 Tilbury link

**Plate 5.5 Tilbury link**



### Description of Management Area

- 5.5.1 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.
- 5.5.2 The Tilbury Loop railway line passes through the middle of the management area running approximately in an east-west alignment.
- 5.5.3 The current landscape to the south of the Tilbury Loop railway line mainly comprises of 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.
- 5.5.4 North of the Tilbury Loop railway line, the existing landscape is used for agriculture, but with a more regular field pattern and vegetated boundaries.
- 5.5.5 Low Street Pit LWS is located to the east of the proposed Tilbury viaduct as it rises over the Tilbury Loop railway line.
- 5.5.6 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.
- 5.5.7 The management area is approximately XXha in size.
- 5.5.8 This management area is shown in the Environmental Masterplan (REF TBC).

## Management Requirements

- 5.5.9 The management requirements of this area are:
- a. To the south of the Tilbury Loop railway line, to reinstate the watercourses 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. To reflect the existing field pattern within the marshes, proposed drainage basins shall be designed and managed in a long linear form with suitable bank and ditch planting to integrate within the surrounding marshland landscape.
  - c. 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.
  - d. As the proposed carriageway rises above the Tilbury Loop railway line, woodland planting shall be managed to follow the existing wooded ridge and so as not to align with the Project route. The woodland shall be managed to create a contrast against the flat marshland landscape and accentuate the ridgeline.
  - e. To the north of the Tilbury Loop railway line, woodland planting on the embankment to be managed to provide visual screening of gantries and infrastructure on the Project Route for views from nearby residential properties.
  - f. 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.
  - g. To manage ditches at the base of proposed embankment and false cut earthworks.
  - h. To replace the Tilbury Green Common land and reconnect the two parts of the existing common land. With the use of a footpath which allows the public to enjoy the same rights and an improved characteristic of the setting, with woodland planting and WCH route being of a higher standard than the existing footpath.

## Typologies Present

- 5.5.10 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
- h. LE6.1 Water Bodies (Standing Water)
- i. LE6.2 Banks and Ditches
- j. LE6.4 Marsh and Wet Grassland

5.5.11 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

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## 5.6 Chadwell link

Plate 5.6 Chadwell link



### Description of Management Area

- 5.6.1 This management area extends from Muckingford Road in the south to the A13 junction in the north. The existing landscape mainly comprises of arable agricultural fields in a medium sized irregular pattern. Field boundaries comprise of hedgerows with occasional woodland blocks.
- 5.6.2 Five lines of high voltage overhead powerlines traverse the management area and are dominant vertical features.
- 5.6.3 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 a number of watercourses and water bodies including an existing irrigation reservoir with vegetated and wooded banks.
- 5.6.4 The Project route is within cutting as it passes beneath Horford Road and within false cut earthworks through the rest of the management area to provide visual screening.
- 5.6.5 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.
- 5.6.6 Woodland areas are mainly located on the upper slopes of the valley and around the Orsett Golf Course and edge of the cement works at xx.
- 5.6.7 The management area is approximately XXha in size.
- 5.6.8 This management area is shown in the Environmental Masterplan (REF TBC).

### Management Requirements

- 5.6.9 The management requirements of this area are:

- 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. The woodland areas to be managed to be viewed as 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 to 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 gold 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 views for the opposite slope and the planting shall be managed to be viewed as a series of layered vegetated areas.

### Typologies Present

5.6.10 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. LE2.2 Woodland Edge - Scrub
- e. LE2.5 Shrubs with Intermittent Trees
- f. LE2.7 Scattered Trees
- g. LE2.8 Scrub
- h. LE4.4 Native hedgerow with trees
- i. LE6.1 Water Bodies (Standing Water)

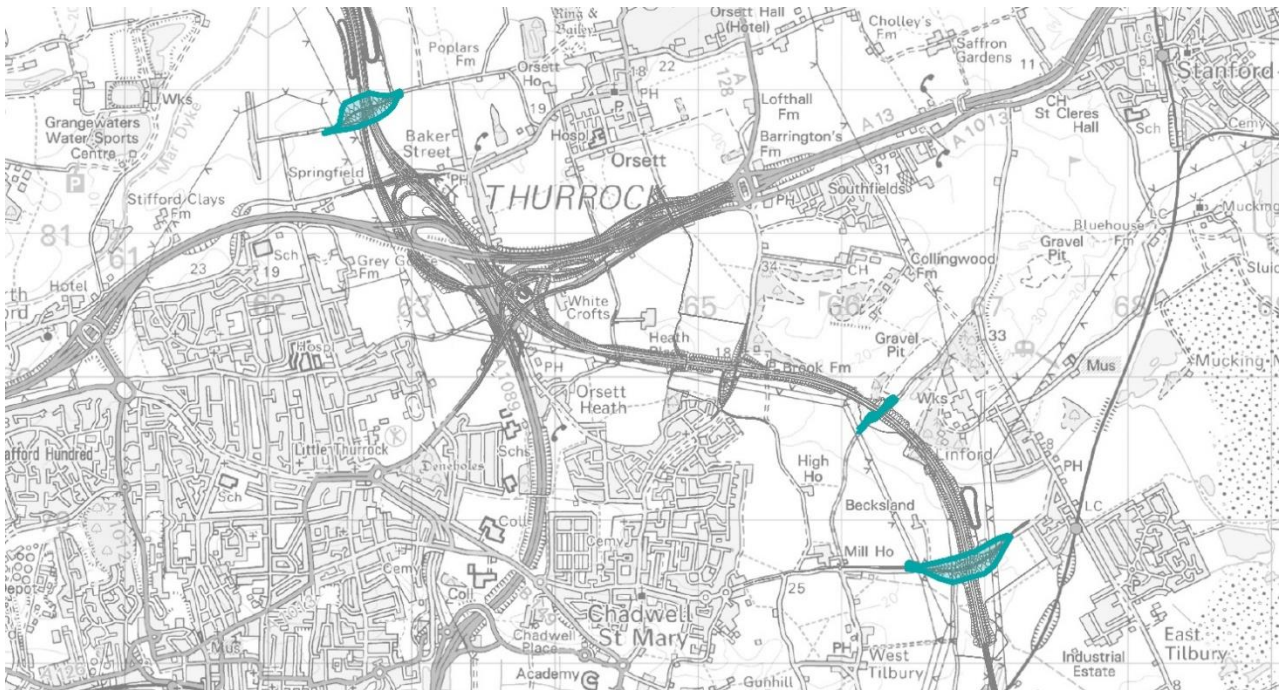
- j. LE6.2 Banks and Ditches
- k. LE6.4 Marsh and Wet Grassland

5.6.11 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

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## 5.7 Green Bridges (Muckingford Road, Hoford Road and Green Lane)

Plate 5.7 Green bridges



### Description of Management Area

- 5.7.1 This management area contains the proposed green bridges over the A122 Lower Thames Crossing at Muckingford Road, Hoford Road and Green Lane.
- 5.7.2 This management area is shown in the Environmental Masterplan (REF TBC).
- 5.7.3 Management Requirements The management aim and requirements for all of the bridges are:
- 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. 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 within the landscape.
  - 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.
  - Establish and manage species that are suitable 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.

5.7.4 The individual management requirements for each bridge are:

#### **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. Open grassland areas, 7m wide, 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.

#### **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**

5.7.5 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

5.7.6 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

## 5.8 Linford Open Mosaic Habitat

Plate 5.8 Linford Open Mosaic Habitat



### Description of Management Area

- 5.8.1 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.
- 5.8.2 The existing landscape comprises of an arable agricultural field with vegetated boundaries on the northern, western and eastern sides of the field.
- 5.8.3 The management area is approximately XXha in size.
- 5.8.4 This management area is shown in the Environmental Masterplan (REF TBC).

### Management Requirements

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

## Typologies Present

- 5.8.6 The planting and habitat typologies present within this area are listed below:
- a. E.2 Open Mosaic Habitat
- 5.8.7 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

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## 5.9 Rainbow Shaw Ancient Woodland Compensation

Plate 5.9 Rainbow Shaw



### Description of Management Area

- 5.9.1 This management area is located to the north of Horford Road and the Project Road, and lies adjacent to the existing, retained woodland at Rainbow Shaw.
- 5.9.2 The existing landscape comprises of arable, agricultural fields.
- 5.9.3 The management area is approximately XXha in size.
- 5.9.4 This management area is shown in the Environmental Masterplan (REF TBC).

### Management Requirements

- 5.9.5 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 so this newly planted management area should develop into those NVC communities.
  - 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.
  - 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

- 5.9.6 The planting and habitat typologies present within this area are listed below:
- a. E.2 Ancient Woodland Compensation
- 5.9.7 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

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## 5.10 Baker Street Woodland

Plate 5.10 Baker Street Woodland



### Description of Management Area

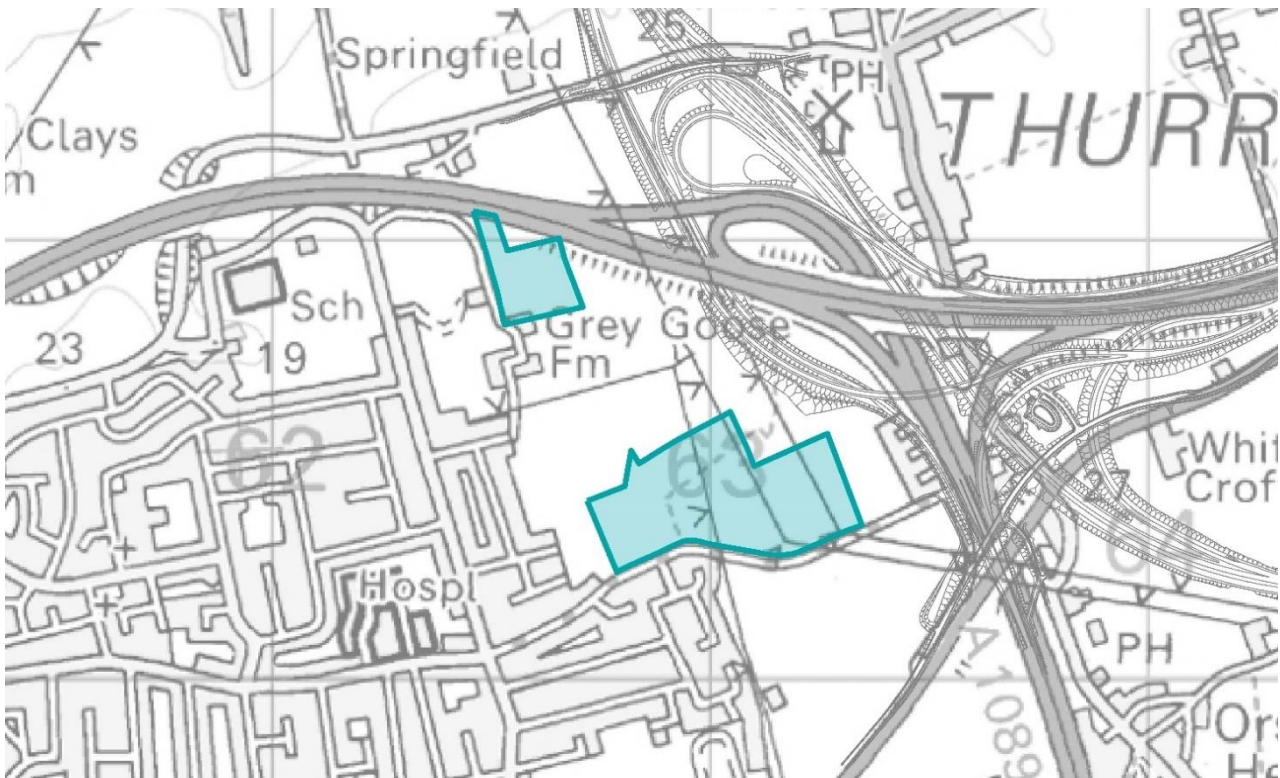
- 5.10.1 This management area is located to the south of the existing A13 junction.
- 5.10.2 The management area comprises of two land parcels that can be accessed for maintenance directly off the realigned Baker Street, at 'islands' located within the proposed slip roads and carriageways at the A13 junction.
- 5.10.3 The existing landscape mainly comprises of arable, agricultural fields in the southern parcel and woodland planting associated around the existing A13 to A1089 slip road. The slip road itself is to be realigned as part of the A13 junction works and the hardstanding within this management area is to be removed.
- 5.10.4 The management area is approximately XXha in size.
- 5.10.5 This management area is shown in the Environmental Masterplan (REF TBC).

### Management Requirements

*This management area is subject to change ahead of the finalisation of the outline LEMP. Placeholder text has been included above for the description of the management area. The outline management requirements for this area are currently being progressed.*

## 5.11 Ron Evans Replacement Land

Plate 5.11 Ron Evans Replacement Land



### Description of Management Area

- 5.11.1 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.
- 5.11.2 The current landscape comprises of arable, agricultural land with vegetated boundaries to the existing Ron Evans Memorial land.
- 5.11.3 A number of high voltage overhead powerlines cross the management area.
- 5.11.4 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.
- 5.11.5 The management area is approximately XXha in size.
- 5.11.6 This management area is shown in the Environmental Masterplan (REF TBC).

### Management Requirements

*This management area is subject to change ahead of the finalisation of the outline LEMP. Placeholder text has been included above for the description of the management area. The outline management requirements for this area are currently being progressed.*

## 5.12 A13 junction

Plate 5.12 A13 junction



### Description of Management Area

- 5.12.1 This management area is located within and around the existing A13 junction with the A1089.
- 5.12.2 The existing landscape is comprised of mainly arable agricultural fields within the northern, eastern and southern extents of the management area.
- 5.12.3 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.
- 5.12.4 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.
- 5.12.5 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.
- 5.12.6 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.
- 5.12.7 As part of the Project works, these routes have been realigned to tie in with the proposed A13 junction alignment and associated slip roads, resulting in a number of 'islanded' land parcels between slip roads.
- 5.12.8 The management area is approximately XXha in size.
- 5.12.9 This management area is shown in the Environmental Masterplan (REF TBC).

## Management Requirements

- 5.12.10 The management requirements of this area are:
- 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 taking 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

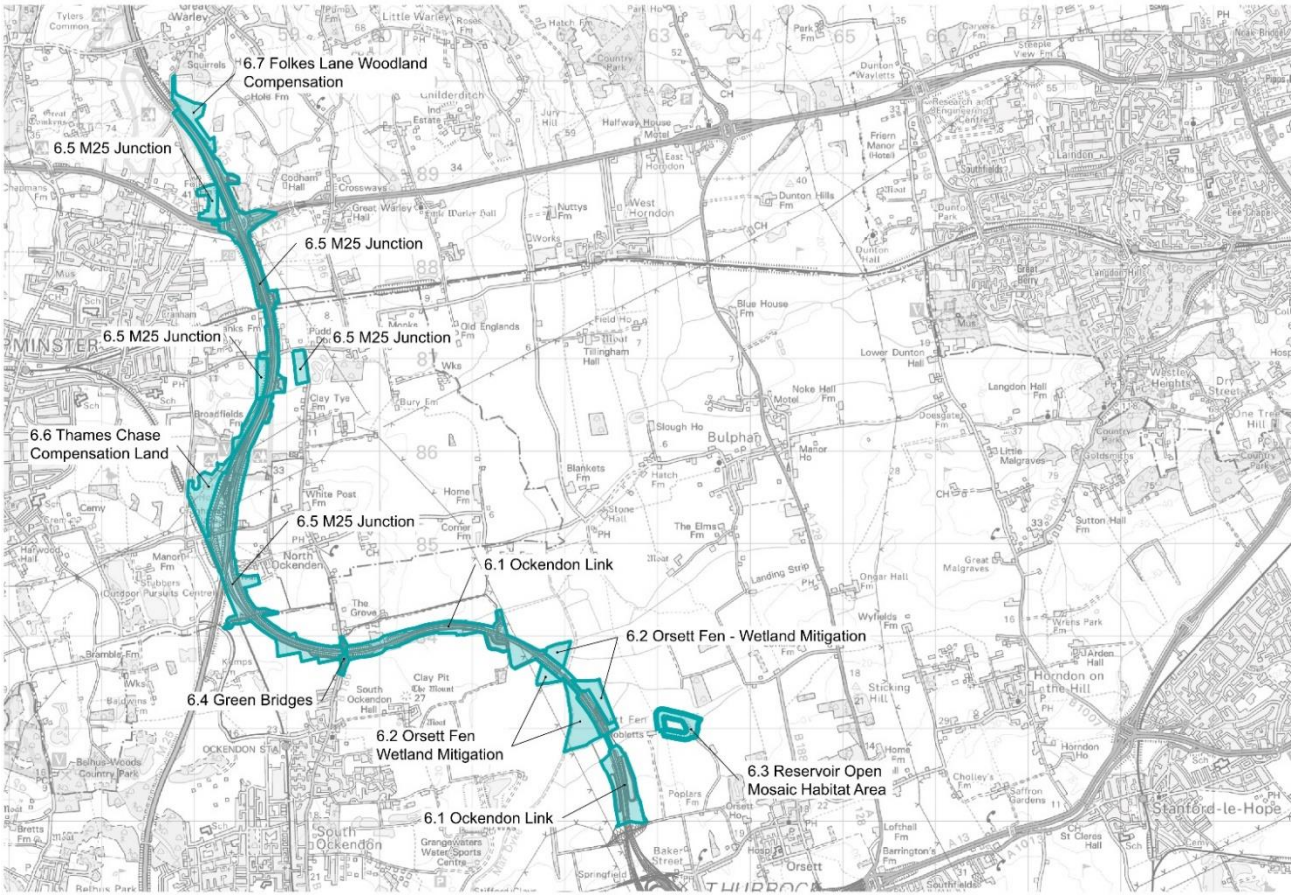
- 5.12.11 The planting and habitat typologies present within this area are listed below:
- a. LE1.3 Species Rich Grassland
  - b. LE2.1 Woodland – Including Non-Native species
  - c. LE2.2 Woodland Edge
  - d. LE2.4 Linear Belt of Shrubs and Trees
  - e. LE2.5 Shrubs with Intermittent Trees
  - f. LE4.4 Native Hedgerow with Trees
  - g. LE6.1 Water Bodies (Standing Water)
  - h. LE6.2 Banks and Ditches
  - i. LE6.4 Marsh and Wet Grassland

5.12.12 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

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## 6 Management Areas – North of A13 junction to M25

**Plate 6.1 Location of management areas within the north of the A13 junction to the M25 junction 29 regional area.**

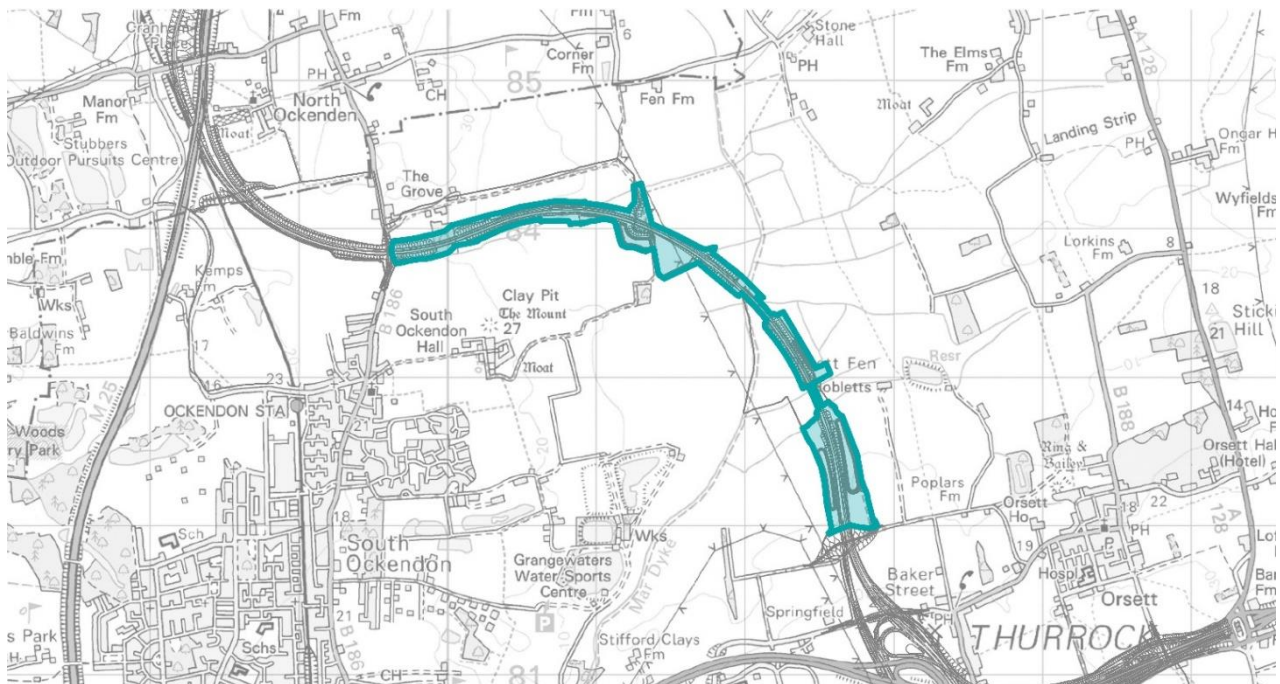


- 6.1.1 The management areas within the north of the A13 junction to the M25 junction 29 regional area shown in Plate 6.1. This chapter provides a description of the management area, and the outline management requirements for each area
- 6.1.2 The following management areas within this chapter describe the sectional areas of the route (REF TBC). 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 GM701 3000 and GS801 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:
- a. 6.1 Ockendon link
  - b. 6.5 M25 junction



## 6.2 Ockendon link

Plate 6.2 Ockendon link



### Description of Management Area

- 6.2.1 This management area extends from the A13 junction north and north-west towards the proposed junction with the M25.
- 6.2.2 The existing landscape within the management area is predominately 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.
- 6.2.3 The majority of the existing landscape is arable, agricultural land of large rectilinear fields with sparse hedgerows and occasional small woodland blocks.
- 6.2.4 The Mardyke river traverses the middle of the management area from the north-east to the south-west where it eventually discharges into the River Thames.
- 6.2.5 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 of agricultural land, with PRoW though the area designated as common land.
- 6.2.6 Towards the western extent of the management area, the landscape borders with areas of landfill and areas of landscape which have been raised as a result of the landfill activities.
- 6.2.7 Further west, the management area passes through an area of woodland planting known as The Wilderness.
- 6.2.8 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.

- 6.2.9 As the Project route moves west beyond the Mardyke River, the vertical alignment falls gradually until it is within cutting to provide a suitable clearance beneath North Road green bridge.
- 6.2.10 The management area is approximately XXha in size.
- 6.2.11 This management area is shown in the Environmental Masterplan (REF TBC).

### Management Requirements

- 6.2.12 The management requirements of this area are:
- 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 softened to 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 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.

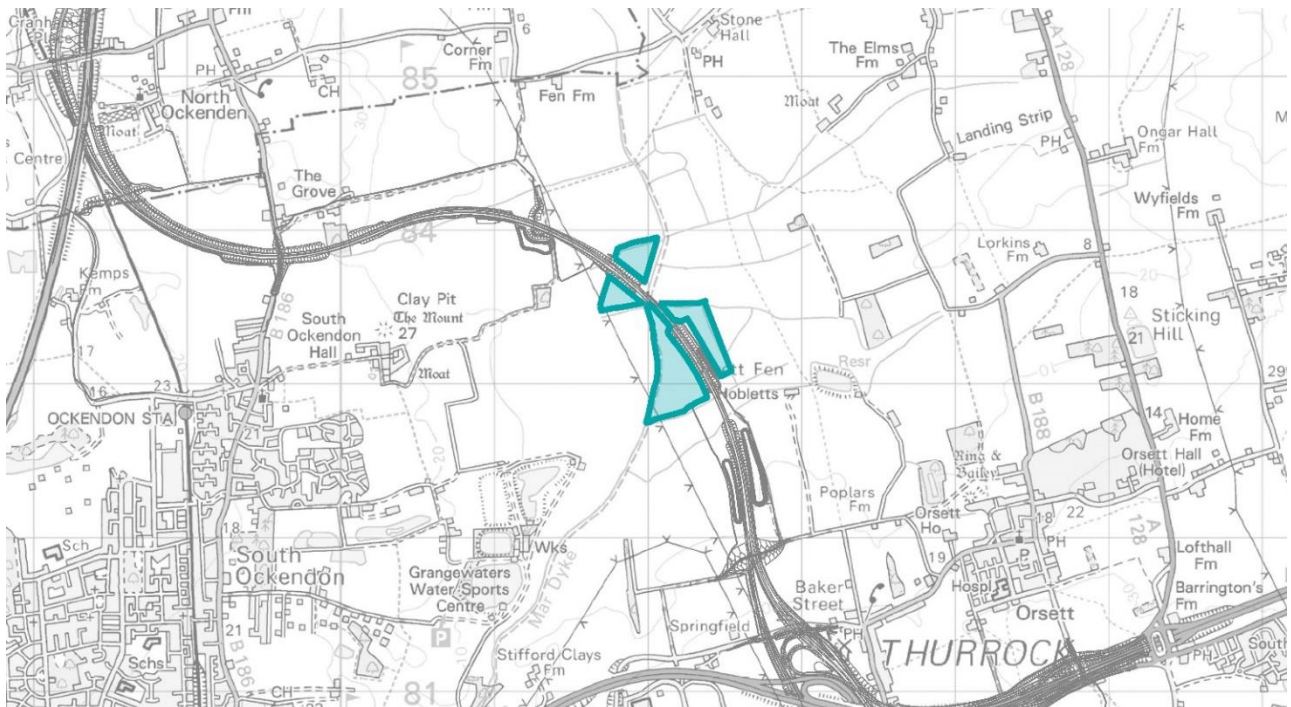
- i. Hedgerows to be managed to create strong green corridors, providing shelter, foraging and commuting opportunities for a variety of reptile, bird, invertebrate, amphibian and mammal species, and linking into the North Road green bridge and the landfill site.
- j. Replacement woodland and woodland edge planting within the Wilderness to be managed to reflect the species, form and pattern found within the existing woodland.

### **Typologies Present**

- 6.2.13 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
  - c. LE2.1 Woodland - Wet
  - d. LE2.2 Woodland Edge
  - e. LE2.5 Shrubs with Intermittent Trees
  - f. LE4.4 Native Hedgerow with Trees
  - g. LE6.1 Water Bodies (Standing Water)
  - h. LE6.2 Banks and Ditches
  - i. LE6.4 Marsh and Wet Grassland
- 6.2.14 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

## 6.3 Orsett Fen – Wetland Creation

Plate 6.3 Orsett Fen – Wetland Creation



### Description of Management Area

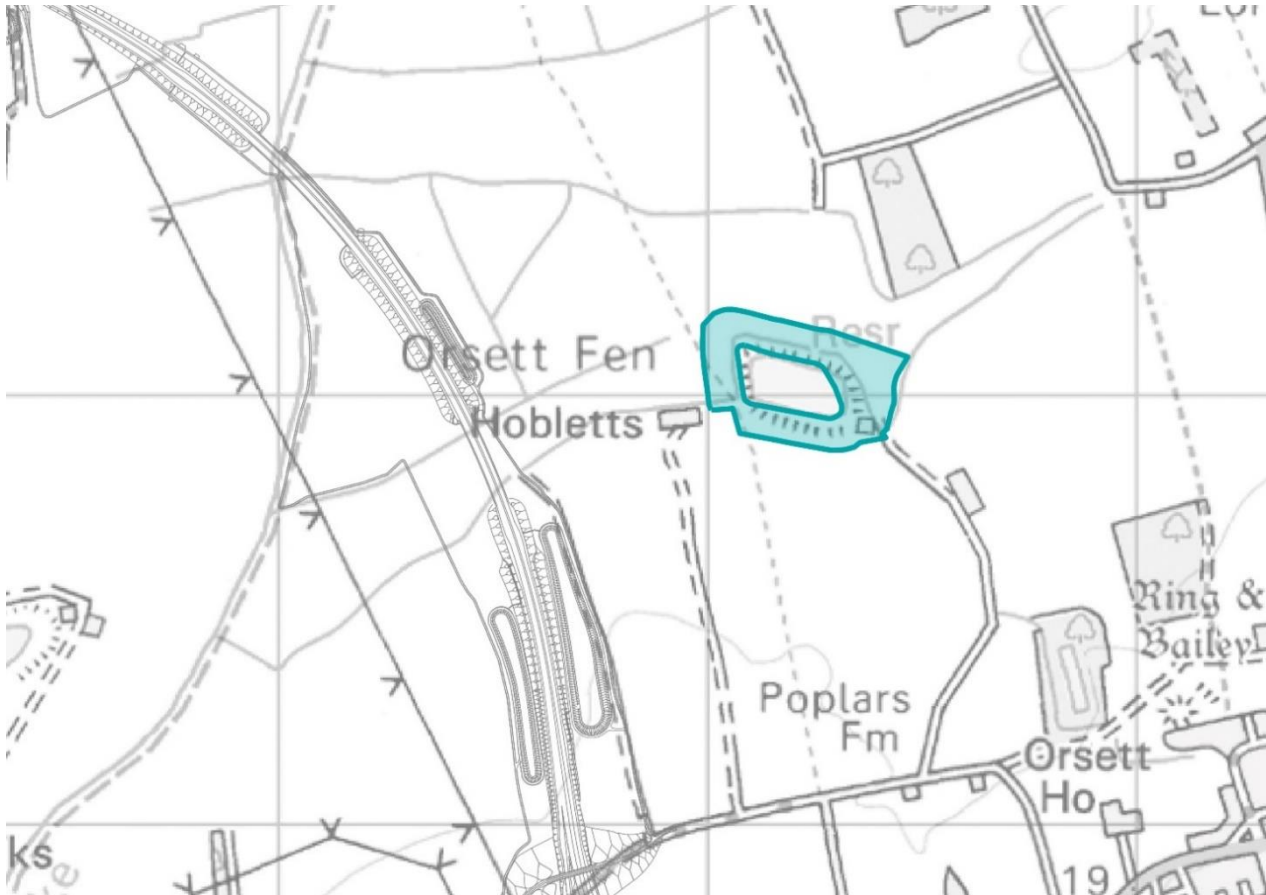
- 6.3.1 This management area is located within the Orsett Fen, which is designated as Common Land and is former fenland. The management area is within Flood Zone 2 and 3.
- 6.3.2 The current landscape is comprised of arable agricultural fields, with gappy hedgerows and ditches forming the boundaries. On the western boundary, the management area borders the Mardyke River and Mardyke trail.
- 6.3.3 The Project route within this management area is a combination of embankment and viaduct as the Project crosses over the flood zones.
- 6.3.4 The management area is approximately XXha in size.
- 6.3.5 This management area is shown in the Environmental Masterplan (REF TBC).

### Management Requirements

*This management area is subject to change ahead of the finalisation of the outline LEMP. Placeholder text has been included above for the description of the management area. The outline management requirements for this area are currently being progressed.*

## 6.4 Reservoir – Open Mosaic

Plate 6.4 Reservoir – Open Mosaic Habitat



### Description of Management Area

- 6.4.1 This management area is located to the east of the Orsett Fen, on an existing reservoir owned by the Coles.
- 6.4.2 The existing reservoir is located within embankments and the existing landscape comprises of a mixture of woodland and scrub planting.
- 6.4.3 The management area is approximately XXha in size.
- 6.4.4 This management area is shown in the Environmental Masterplan (REF TBC).

### Management Requirements

- 6.4.5 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 reptiles and amphibians.
  - 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

- 6.4.6 The planting and habitat typologies present within this area are listed below:
- a. E.2 Open Mosaic Habitat
- 6.4.7 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

## 6.5 Green Bridges (North Road)

Plate 6.5 Green bridges



### Description of Management Area

- 6.5.1 This management area is located on the current alignment of North Road, between South Ockendon and North Ockendon.
- 6.5.2 The current character of North Road comprises a rural road with hedgerow planting adjacent to the road, with a small grass verge. The road currently has no safe provision for pedestrians with no footpath or hardstanding running adjacent the road.
- 6.5.3 Beyond the hedgerows, North road is located with existing arable, agricultural fields.
- 6.5.4 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.
- 6.5.5 The management area is approximately XXha in size.
- 6.5.6 This management area is shown in the Environmental Masterplan (REF TBC).

## Management Requirements

- 6.5.7 The management requirements of this area are:
- b. To design and manage a continuous hedgerow and planting connecting the landscape either side of the Project route.
  - c. The alignment of North Road to reflect the existing character of a rural road by replicating hedgerow planting either side on the road and connecting into the existing hedgerows.
  - d. Hedgerow planting to be managed to provide a wildlife corridor for invertebrates, reptiles and amphibians, birds, bats and other mammals, following an existing bat commuting route.
  - e. Open grassland areas, 7m wide, to be managed to provide a sheltered corridor across the Project route.
  - f. 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.
  - g. 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 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
  - i. 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

- 6.5.8 The planting and habitat typologies present within this area are listed below:
- a. LE1.3 Species Rich Grassland
  - b. LE2.5 Shrubs with Intermittent Trees
  - c. LE4.4 Native Hedgerow with Trees
- 6.5.9 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

## 6.6 M25 junction

Plate 6.6 M25 junction



### Description of Management Area

- 6.6.1 This management area extends from North Road green bridge in the south on the Project route and extends north towards the Folkes Lane overbridge on the M25.
- 6.6.2 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.
- 6.6.3 The varied topography within this management area results in the Project route and M25 passing through a series of cuttings and embankments.
- 6.6.4 The management area is approximately XXha in size.
- 6.6.5 This management area is shown in the Environmental Masterplan (REF TBC).

### Management Requirements

- 6.6.6 The management requirements of this area are:
  - 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.
- d. To create and establish an open mosaic habitat to the south of St Marys Lane. As this area is designed primarily for GCN habitat, following discussion with Natural England, the ratio of habitat types in this area should be 70% grassland, 10% woodland, 10% bare ground and 10% scrub. This differs from the open mosaic description as found in Section 7.23.
- e. Land parcel north of Ockendon road to be returned to landowner, with woodland planting to perimeter of land parcel to be managed so as to provide visual screening and to reinforce the wooded character of the junction.
- f. 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.
- g. Woodland planting to be managed to soften the appearance of any engineered earthworks associated within the junction and slip roads.
- h. 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.
- i. 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.
- j. 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.
- k. 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.

## Typologies Present

- 6.6.7 The planting and habitat typologies present within this area are listed below:
- a. LE1.3 Species Rich Grassland
  - b. LE2.1 Woodland
  - c. LE2.1 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. LE6.1 Water Bodies (Standing Water)
  - h. LE6.2 Banks and Ditches
  - i. LE6.4 Marsh and Wet Grassland
  - j. E.2 Open Mosaic Habitat
- 6.6.8 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

## 6.7 Thames Chase Compensation

**Plate 6.7 Thames Chase Compensation Land**



### Description of Management Area

- 6.7.1 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.
- 6.7.2 In addition to the compensation land provided to the south of Thames Chase, this management area also includes the land reinstated within Thames Chase itself, adjacent the proposed slip road.
- 6.7.3 The existing landscape to the south of Thames Chase is comprised of arable, agricultural land and has a vegetated boundary to the railway line.
- 6.7.4 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.
- 6.7.5 The management area is approximately XXha in size.
- 6.7.6 This management area is shown in the Environmental Masterplan (REF TBC).

### Management Requirements

- 6.7.7 The management requirements of this area are:
  - 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**

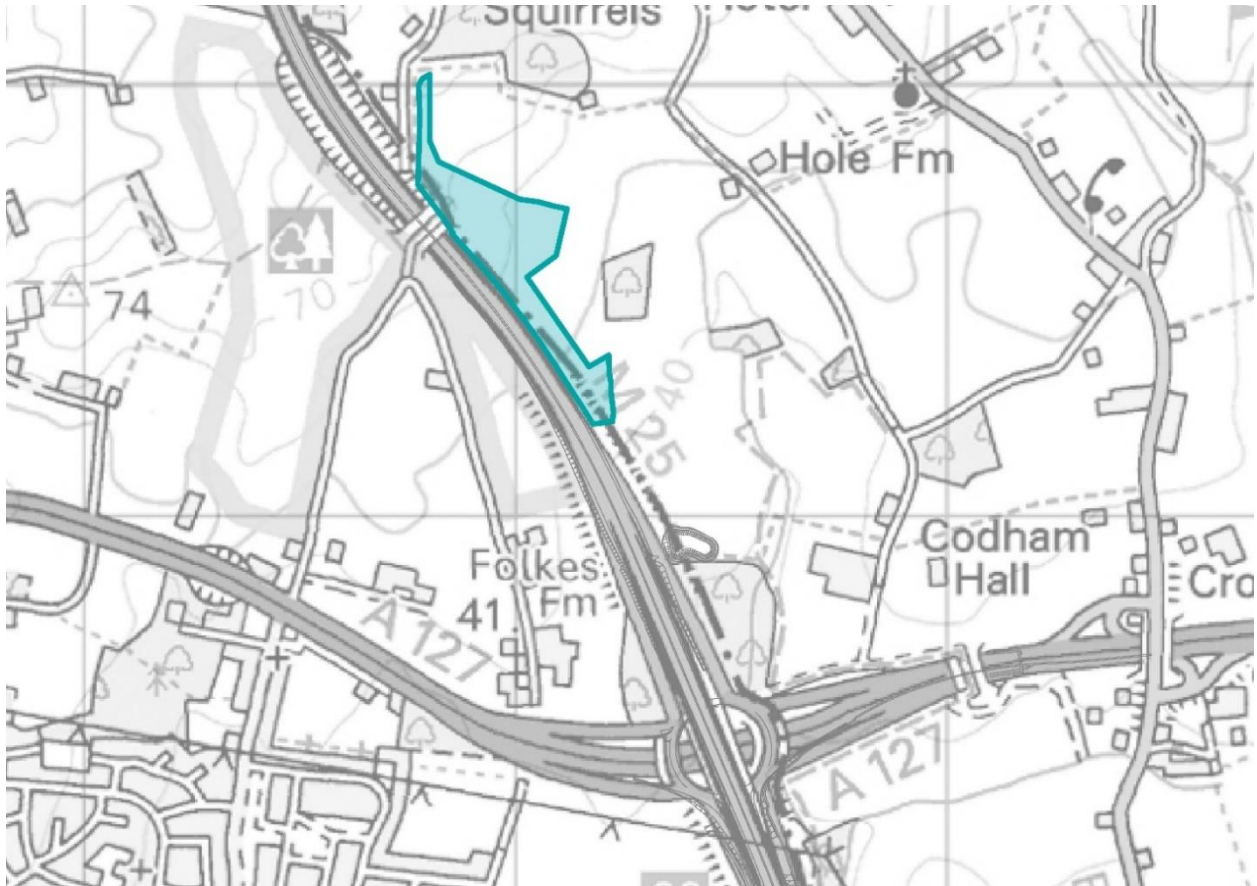
6.7.8 The planting and habitat typologies present within this area are listed below:

- 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. LE6.1 Water Bodies (Standing Water)
- h. LE6.2 Banks and Ditches
- i. LE6.4 Marsh and Wet Grassland

6.7.9 The outline management prescriptions and programmes for the typologies listed above are detailed in Chapter 7 of this document.

## 6.8 Folkes Lane Woodland Compensation

Plate 6.8 Folkes Lane Replacement



### Description of Management Area

*This management area is subject to change ahead of the finalisation of the outline LEMP. Placeholder text has been included above for the description of the management area. The outline management requirements for this area are currently being progressed.*

## 7 Habitat Typologies

### 7.1 LE1.3 Species Rich Grassland

#### Description

- 7.1.1 Species rich grassland is proposed throughout the Project route, on grass verges, embankments and cutting edges adjacent to the carriageway.
- 7.1.2 Species rich grasslands are an integral part of the landscape mitigation, by softening the edge of the Project route and integrating it within the surrounding landscape.

#### Outline Requirements

- 7.1.3 The following outline requirements are for all areas of species rich grassland and should align with MPI-85-102020 (Highways England, 2020):
- Species rich grassland to provide a robust and easily managed ground cover for the soft estate around the Project route.
  - Species rich grassland where possible shall replicate the existing grassland communities within the surrounding landscape or existing on site.
  - 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.
  - 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.
  - To enhance the biodiversity value of the Project route.
  - To ensure successful establishment of the proposed species.
  - To create grassland habitats that follow the priority habitat descriptions for lowland meadows<sup>1</sup>.
- 7.1.4 A list of potential native species planting is shown in the appendix to the Design Principles. Species mix shall be developed during the detail design stage to be tolerant of the roadside verge environment and underlying substrate used in the creation of earthworks.

#### Outline Prescriptions

- 7.1.5 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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<sup>1</sup> [Lowland meadows \(UK BAP Priority Habitat description\) \(jncc.gov.uk\)](https://jncc.gov.uk/lowland-meadows)

7.1.6 Table 7.1 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

**Table 7.1 Outline 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 Highways England	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 Highways England	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 Highways England	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	Specialist contractor appointed by Highways England	Late Autumn	N	Y	Y	Y	Y

Action			Years 0-5				
Task	Responsibility	Season	1	2	3	4	5
in late summer/early autumn and cuttings removed from site							
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 Highways England	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 Highways England	In autumn where required	Y	Y	Y	Y	Y

7.1.7 Following establishment, the following management prescriptions are proposed:

- 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

7.1.8 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 sward shall cover at least 90% of the area to be managed to ensure this typology fulfils the environmental function required
- b. The area shall contain no more than 10% cover of competitive or problem species such as nettles (*Urtica dioica*), cow parsley (*Anthriscus sylvestris*), hemlock (*Conium maculatum*), gorse (*Ulex europaeus*), bracken (*Pteridium aquilinum*), thistles (*Cirsium* spp.), dock (*Rumex* spp.).
- c. Species rich grassland to support at least 12 or more plant species per m<sup>2</sup>, and managed to prevent natural succession to scrub and woodland and retain the open grassland character.
- d. Target species numbers to be met by Year 5.

### Outline Monitoring frequency and methods

7.1.9 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.



- 7.1.10 After the 5-year establishment period, long-term 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). These would continue every five years with the detailed monitoring approach being refined over this period as part of the steering group discussions.
- 7.1.11 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

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## 7.2 LE1.3 Species Rich Chalk Grassland

### Overarching Aims

- 7.2.1 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

- 7.2.2 Species rich chalk grassland are areas of meadow comprising a diverse selection of native perennial wildflowers and grasses that thrive on chalky soil.
- 7.2.3 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.
- 7.2.4 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.
- 7.2.5 A list of potential species mix is shown in the Appendix to the Design Principles and should be appropriate to the underlying geology and aspect.

### Outline Requirements

- 7.2.6 The following outline requirements are for all areas of species-rich chalk grassland and should align with MPI-85-102020 (Highways England, 2020).
- a. To provide a 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; and
  - d. The area shall contain no more than 10% cover of competitive or problem species such as nettles (*Urtica dioica*), cow parsley (*Anthriscus sylvestris*), hemlock (*Conium maculatum*), gorse (*Ulex europaeus*), bracken (*Pteridium aquilinum*), thistles (*Cirsium* spp.), dock (*Rumex* spp.).
  - e. Species rich grassland to support at least 12 or more plant species per m<sup>2</sup>, and 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<sup>2</sup>.

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<sup>2</sup> [Lowland calcareous grassland \(UK BAP Priority Habitat description\) \(jncc.gov.uk\)](https://jncc.gov.uk)

## Outline Prescriptions

- 7.2.7 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.2.8 Table 7.2 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

**Table 7.2 Outline 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 Highways England	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 Highways England	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 Highways England	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	Specialist contractor appointed by Highways England	Late Autumn	N	Y	Y	Y	Y

Action			Years 0-5				
Task	Responsibility	Season	1	2	3	4	5
July/August. The grass meadow should be cut in late summer/early autumn and cuttings removed from site							
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 Highways England	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 Highways England	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 Highways England	As required	Y	Y	Y	Y	Y

- 7.2.9 Following establishment, the following management prescriptions are proposed:
- Species rich chalk grassland shall be mown annually

### Outline Measure of Success

- 7.2.10 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:
- The sward shall cover at least 80% of the area to be managed where necessary to ensure this typology fulfils the environmental function required; and
  - The area shall contain no more than 10% scrub cover.
  - Species rich chalk grassland to support 12 or more species plants capable of thriving even under frequent mowing.
  - Target species numbers to be met by Year 3

## Outline Monitoring frequency and methods

- 7.2.11 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.
- 7.2.12 After the 5-year establishment period, long-term 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). These would continue every five years with the detailed monitoring approach being refined over this period as part of the steering group discussions.
- 7.2.13 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

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## 7.3 LE1.3 Species Rich Annual Wildflower grassland

### Overarching Aims

- 7.3.1 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

- 7.3.2 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 years growth.
- 7.3.3 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.
- 7.3.4 Species selection are to be appropriate to the location or as exist already on site, with a species composition and diversity capable of being maintained by one cut per year, so that in time, biodiversity interest is developed.
- 7.3.5 A list of potential species mixes for annual wildflower grassland is shown in the Appendix to the Design Principles and should be appropriate to the underlying geology and aspect.

### Outline Requirements

- 7.3.6 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, 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 as a colourful and species rich meadow by allowing the more desirable species to flourish and reducing the vigour of the more extensive species.
  - d. To create grassland habitats that follow the priority habitat descriptions for lowland meadows.

## Outline Prescriptions

- 7.3.7 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.3.8 Table 7.3 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

**Table 7.3 Outline 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 Highways England	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 Highways England	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 Highways England	As required	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	Specialist contractor appointed by Highways England	As required	Y	Y	Y	Y	Y

Action			Years 0-5				
Task	Responsibility	Season	1	2	3	4	5
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	Specialist contractor appointed by Highways England	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 Highways England	As required	Y	Y	Y	Y	Y

- 7.3.9 Following establishment, the following management prescriptions are proposed:
- a. Species rich annual wildflower grassland shall be mown annually

### Outline Measure of Success

- 7.3.10 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 sward shall cover at least 90% of the area to be managed to ensure this typology fulfils the environmental function required; and
  - b. The area shall contain no more than 10% cover of competitive or problem species such as nettles (*Urtica dioica*), cow parsley (*Anthriscus sylvestris*), hemlock (*Conium maculatum*), gorse (*Ulex europaeus*), bracken (*Pteridium aquilinum*), thistles (*Cirsium* spp.), dock (*Rumex* spp.).
  - c. Species rich grassland to support at least 12 or more plant species per m<sup>2</sup>, and managed to prevent natural succession to scrub and woodland and retain the open grassland character.
  - d. Target species numbers to be met by Year 5.

### Outline Monitoring frequency and methods

- 7.3.11 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.
- 7.3.12 After the 5-year establishment period, long-term 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). These would continue every five



years with the detailed monitoring approach being refined over this period as part of the steering group discussions.

- 7.3.13 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

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## 7.4 LE1.4 Rock and Scree

### Description

- 7.4.1 Rock and scree are areas of free and loose rock and scree material.
- 7.4.2 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.
- 7.4.3 Rock and scree are proposed on the cutting faces, and will be allowed to be naturally colonised by grass, herb and scrub species, suitable to underlying geology.

### Outline Requirements

- 7.4.4 The following outline requirements are for all areas of rock and scree:
- To create species interest by creation of small ledges and pockets of nutrient-poor fine material on the cutting face.
  - Natural colonisation to be encouraged on the chalk face, to break up the bare faces of the chalk cutting.
  - Control of tree seedlings and scrub to prevent encroachment over the ground flora.
  - To create grassland habitats that follow the priority habitat descriptions for inland rock outcrop and scree habitats<sup>3</sup>.

### Outline Prescriptions

- 7.4.5 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.4.6 Table 7.4 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

**Table 7.4 Outline 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 Highways England	Quarterly	Y	Y	Y	Y	Y
Injurious weeds are to be eradicated, removed and disposed of off-site, as per the latest	Specialist contractor appointed by Highways England	As required	Y	Y	Y	Y	Y

<sup>3</sup> [Inland rock outcrop and scree habitats \(UK BAP Priority Habitat description\) \(jncc.gov.uk\)](https://jncc.gov.uk)

Action			Years 0-5				
Task	Responsibility	Season	1	2	3	4	5
Defra/Natural England guidance.							
All litter/foreign debris should be removed from planted areas and taken off site	Specialist contractor appointed by Highways England	As required	Y	Y	Y	Y	Y

- 7.4.7 Following establishment, the following management prescriptions are proposed:
- a. Removal of scrub encroachment every 3 years.

### Outline Measure of Success

- 7.4.8 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. Obvious natural colonisation on face edges by Year 3

### Outline Monitoring frequency and methods

- 7.4.9 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.
- 7.4.10 After the 5-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 with consultation with the steering group.
- 7.4.11 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

## 7.5 LE2.1 Woodland

### Description

- 7.5.1 Planting areas comprising of lowland, mixed, mainly native deciduous woodland with native/commonly naturalised ground flora, shrub edge planting and tall herb edge planting (grass/forb mix).
- 7.5.2 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, to provide visual screening of the road from nearby receptors and to integrate the road into the surrounding landscape.
- 7.5.3 Proposed woodland would also provide biodiversity benefit as well as delivering the mitigation described above.
- 7.5.4 A list of potential species for consideration for the woodland planting species mix is shown in the Appendix to the Design Principles. Species selection should be appropriate to the underlying geology and substrate.

### Outline Requirements

- 7.5.5 The following outline requirements apply to all areas of woodland planting:
- To create the form and pattern of native woodlands of the same character found in the neighbouring areas. Species mix and selection shall be comprised of 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<sup>4</sup>.
  - To create thick woodland to screen views towards roads in areas as defined in the Environmental Masterplan.
  - Woodland planting to be designed and managed to create seasonal variety and visual interest.
  - 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 into existing woodland areas.
  - Woodland to be managed to create a diversity of habitat within the woodland, 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 understory.
  - Where appropriate, woodland to incorporate open rides and glades within the woodland structure to add biodiversity benefit.

### Outline Prescriptions

- 7.5.6 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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<sup>4</sup> [Lowland mixed deciduous woodland \(UK BAP Priority Habitat description\) \(jncc.gov.uk\)](https://jncc.gov.uk/lowland-mixed-deciduous-woodland)

7.5.7 Table 7.5 below describes the programme of work for establishment and initial maintenance, and then goes on to explain the outline long-term management.

**Table 7.5 Outline 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 Highways England	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 Highways England	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 Highways England	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 Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	N	Y	Y	Y	Y
All litter/foreign debris should be removed from planted areas and taken off site	Specialist contractor appointed by Highways England	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 Highways England	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds	Specialist contractor appointed by Highways England	Twice yearly - May and September	Y	Y	Y	Y	Y
Removal of all tree guards, stakes	Specialist contractor appointed by Highways England	As required	N	N	N	N	Y

7.5.8 Following establishment, the following management prescriptions are proposed:

- 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 5 years throughout the management period.
- c. Thinning to maintain and promote a healthy woodland structure every 5 years throughout the management period.

### **Outline Measure of Success**

7.5.9 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. Years 1-2
  - iii. 80% establishment of planting
- b. Year 5
  - i. 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 (Post 5 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.
  - iv. Native ground flora shall have been allowed to develop.

### **Outline Monitoring frequency and methods**

7.5.10 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.

7.5.11 After the 5-year establishment period, long-term 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 every five years with the detailed monitoring approach being refined over this period as part of the steering group discussions.

7.5.12 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

## 7.6 LE2.1 Woodland including non-native species

### Description

- 7.6.1 Planting areas comprising of lowland, mixed, native deciduous woodland containing a significant proportion of non-native species for climate change resilience. Also comprises native/commonly naturalised ground flora, shrub edge planting and tall herb edge planting (grass/forb mix).
- 7.6.2 Woodland including non-native is predominantly used for large areas of woodland creation that do not adjoin onto existing woodlands, particularly around junctions. Exceptions are within Thames Chase and the Thames Chase compensation land.
- 7.6.3 Woodland with non-native species perform 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.
- 7.6.4 The inclusion of non-native species shall provide additional diversity in the woodland mix to provide resilience against disease and predicted climate change.
- 7.6.5 A list of potential species for consideration for the species mix for woodland, including non-native species, is shown in the Appendix to the Design Principles. Species selection should consider the local underlying geology and substrate within the new planting areas.

### Outline Requirements

- 7.6.6 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 be largely comprised of 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 be comprised of 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.

- f. Woodland to be managed to create a diversity of habitat within the woodland, 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 understory.

### **Outline Prescriptions**

- 7.6.7 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.6.8 Table 7.6 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

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**Table 7.6 Outline 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 Highways England	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 Highways England	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 Highways England	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 Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	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 Highways England	Twice yearly - October and March	Y	Y	Y	Y	Y

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 Highways England	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 Highways England	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds	Specialist contractor appointed by Highways England	Twice yearly - May and September	Y	Y	Y	Y	Y

7.6.9 Following establishment, the following management prescriptions are proposed:

- 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 5 years throughout the management period.
- c. Thinning to maintain and promote a healthy woodland structure every 10 years throughout the management period.

### Outline Measure of Success

7.6.10 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
  - i. 80% establishment of planting
- b. Year 5
  - ii. All plant failures to have been replaced and replanted.
- c. 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 shall have been allowed to develop.

### **Outline Monitoring frequency and methods**

- 7.6.11 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.
- 7.6.12 After the 5-year establishment period, long-term 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 every five years with the detailed monitoring approach being refined over this period as part of the steering group discussions.
- 7.6.13 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

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## 7.7 LE2.1 Woodland Edible Species

### Description

- 7.7.1 Lowland, mixed, mainly native deciduous woodland comprising mostly of species bearing edible fruits and nuts for human consumption. Also comprises native/commonly naturalised ground flora, shrub edge planting and tall herb edge planting (grass/forb mix).
- 7.7.2 A list of potential species to be considered for the species mix for woodland edible species is shown in the Appendix to the Design Principles. Species selection should consider the underlying geology and substrate used within the planting areas.

### Outline Requirements

- 7.7.3 The following outline requirements are for all areas of woodland planting including edible species:
- a. Woodland to be managed to include edible species.
  - b. Woodland to be managed to provide visual screening and containment within the A13 junction
  - c. Dense areas of bramble or similar to deter access to adjacent roads and land parcels in combination with boundary fencing.
  - d. Woodland planting and understorey/woodland edge 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 planting and understorey/woodland edge to be managed to create a diversity of habitat within the woodland, 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

- 7.7.4 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.7.5 Table 7.7 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

**Table 7.7 Outline Establishment regime**

<b>Action</b>			<b>Years 0-5</b>				
<b>Task</b>	<b>Responsibility</b>	<b>Season</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by Highways England	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 Highways England	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 Highways England	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 Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	N	Y	Y	Y	Y
All guards should be checked and adjusted, repaired or replaced as	Specialist contractor appointed by Highways England	Twice yearly - October and March	Y	Y	Y	Y	Y

Action			Years 0-5				
Task	Responsibility	Season	1	2	3	4	5
necessary twice yearly in October and March.							
All litter/foreign debris should be removed from planted areas and taken off site	Specialist contractor appointed by Highways England	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 Highways England	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds	Specialist contractor appointed by Highways England	Twice yearly - May and September	Y	Y	Y	Y	Y

7.7.6 Following establishment, the following management prescriptions are proposed:

- 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 5 years throughout the management period.
- c. Thinning to maintain and promote a healthy woodland structure every 5 years throughout the management period.

### Outline Measure of Success

7.7.7 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. Years 1-2
  - i. 80% establishment of planting
- b. Year 5
  - i. 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. 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. Successful fruit and nut production.
- iii. Invasive weeds kept to less than 20% ground cover.
- iv. Native ground flora shall have been allowed to develop.

### **Outline Monitoring frequency and methods**

- 7.7.8 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.
- 7.7.9 After the 5-year establishment period, long-term 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 every five years with the detailed monitoring approach being refined over this period as part of the steering group discussions.
- 7.7.10 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the annual monitoring reporting.

## 7.8 LE2.2 Woodland Edge

### Description

- 7.8.1 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.
- 7.8.2 Woodland edge is proposed throughout the Project and to all areas of woodland creation.
- 7.8.3 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.
- 7.8.4 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.
- 7.8.5 A list of potential species to be considered for the species mix for woodland edible species is shown in the Appendix to the Design Principles. Species selection should consider the underlying geology and substrate used within the planting areas.

### Outline Requirements

- 7.8.6 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 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

- 7.8.7 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.8.8 Table 7.8 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.



**Table 7.8 Outline 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 Highways England	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 Highways England	As required	Y	Y	Y	Y	Y
Prune weak plants in Year 1 and 2 to encourage new growth development	Specialist contractor appointed by Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	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 Highways England	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 Highways England	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 Highways England	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds	Specialist contractor appointed by Highways England	Twice yearly - May and September	Y	Y	Y	Y	Y

7.8.9 Following establishment, the following management prescriptions are proposed:

### **Outline Measure of Success**

7.8.10 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. Years 1-2
  - i. 80% establishment of planting
- b. Year 5
  - i. 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. 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 shall have been allowed to develop.

### **Outline Monitoring frequency and methods**

7.8.11 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.

7.8.12 After the 5-year establishment period, long-term 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 every five years with the detailed monitoring approach being refined over this period as part of the steering group discussions.

7.8.13 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

## 7.9 LE2.4 Linear Belt of Shrubs and Trees

### Description

- 7.9.1 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.
- 7.9.2 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.
- 7.9.3 Linear belts of shrubs and trees are also proposed to replace existing belts of trees that have been lost due to construction works.

### Outline Requirements

- 7.9.4 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 be comprised of 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 the woodland, 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 understory.
  - 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

- 7.9.5 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.9.6 Table 7.9 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

**Table 7.9 Outline 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 Highways England	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 Highways England	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 Highways England	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 Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	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	Specialist contractor appointed by Highways England	Once yearly - Nov to Feb	N	Y	Y	Y	Y

Action			Years 0-5				
Task	Responsibility	Season	1	2	3	4	5
undertaken once yearly during Nov and Feb.							
All guards should be checked and adjusted, repaired or replaced as necessary twice yearly in October and March.	Specialist contractor appointed by Highways England	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 Highways England	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 Highways England	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds	Specialist contractor appointed by Highways England	Twice yearly - May and September	Y	Y	Y	Y	Y

### Outline Measure of Success

7.9.7 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. Years 1-2
  - i. 80% establishment of planting
- b. Year 5
  - v. 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. Native ground flora shall have been allowed to develop

### Outline Monitoring frequency and methods

7.9.8 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.

7.9.9 After the 5-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 with consultation with the steering group.

- 7.9.10 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

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## 7.10 LE2.5 Shrubs with Intermittent Trees

### Description

- 7.10.1 Mixed, mainly native deciduous shrubs with intermittent larger tree planting with native/commonly naturalised ground flora.
- 7.10.2 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.
- 7.10.3 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.
- 7.10.4 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 by 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.

### Outline Requirements

- 7.10.5 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 be comprised of 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

- 7.10.6 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.10.7 Table 7.10 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

**Table 7.10 Outline 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 Highways England	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 Highways England	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 Highways England	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 Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	Y	Y	Y	Y	Y



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 Nov and Feb.	Specialist contractor appointed by Highways England	Once yearly - Nov to Feb	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 Highways England	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 Highways England	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 Highways England	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds	Specialist contractor appointed by Highways England	Twice yearly - May and September	Y	Y	Y	Y	Y

## Outline Measure of Success

7.10.8 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
  - i. 80% establishment of planting
- b. Year 5
  - i. 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. 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 shall have been allowed to develop.

### **Outline Monitoring frequency and methods**

- 7.10.9 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.
- 7.10.10 After the 5-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 with consultation with the steering group.
- 7.10.11 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

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## 7.11 LE2.7 Scattered Trees & LE5.1 Individual Trees

### Description

- 7.11.1 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.
- 7.11.2 Scattered trees are proposed throughout the Project to replace existing features lost in the landscape due to construction works.
- 7.11.3 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.
- 7.11.4 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.
- 7.11.5 Scattered trees and individual trees are also proposed to link areas of woodland planting.

### Outline Requirements

- 7.11.6 The following outline requirements apply to all areas of scattered trees and individual trees:
- To provide appropriate landscape integration at locations defined in the Environmental Masterplan.
  - Species mix and selection shall be comprised of local provenance stock and species mixes shall be adapted to reflect the local character.
  - Scattered and individual trees to be designed and managed to create seasonal variety and visual interest.
  - 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 into existing woodland/shrub areas.

### Outline Prescriptions

- 7.11.7 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.11.8 Table 7.11 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

**Table 7.11 Outline 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 Highways England	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 Highways England	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 Highways England	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 Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	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 Highways England	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 Highways England	As required	Y	Y	Y	Y	Y
Hand weed control to be undertaken twice during the year (Spring and Summer)	Specialist contractor appointed by Highways England	April, August	Y	Y	Y	Y	Y

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 Highways England	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 Highways England	Twice yearly - May and September	Y	Y	Y	Y	Y

### Outline Measure of Success

- 7.11.9 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. Years 1-2
    - i. 80% establishment of planting
  - b. Year 5
    - i. 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

- 7.11.10 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.
- 7.11.11 After the 5-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 with consultation with the steering group.
- 7.11.12 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

## 7.12 LE2.8 Scrub

### Overarching Aims

- 7.12.1 Scrub planting is used throughout the Project to replace vegetation loss, provide visual screening and to provide wildlife and landscape connectivity where appropriate.

### Description

- 7.12.2 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.
- 7.12.3 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.
- 7.12.4 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.
- 7.12.5 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.
- 7.12.6 A list of potential species mix for areas of scrub planting is shown in the Appendix to the Design Principles.

### Outline Requirements

- 7.12.7 The following outline requirements apply to all areas of scrub planting:
- 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.
  - 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 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.
  - To provide structure in the landscape.
  - 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.
  - To provide suitable shelter, foraging, nesting and commuting habitat for a range of species including dormice, amphibians and reptiles, birds and small mammals.
- 7.12.8 This will be agreed between Highways England and the identified management agent.

## Outline Prescriptions

- 7.12.9 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.12.10 Table 7.12 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

**Table 7.12 Outline 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 Highways England	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 Highways England	As required	Y	Y	Y	Y	Y
Prune weak plants in Year 1 and 2 to encourage new growth development.	Specialist contractor appointed by Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	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	Specialist contractor appointed by Highways England	5-7 year rotation from year 5 - Nov to Feb	N	N	N	N	Y

Action			Years 0-5				
Task	Responsibility	Season	1	2	3	4	5
programme every 5-7 years							
All guards should be checked and adjusted, repaired or replaced as necessary twice yearly in October and March.	Specialist contractor appointed by Highways England	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 Highways England	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 Highways England	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds	Specialist contractor appointed by Highways England	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 Highways England	Twice yearly - May and September	Y	Y	Y	Y	Y

7.12.11 Following establishment, the following management prescriptions are proposed:

- a. Coppice scrub to encourage regrowth. Cut areas of scrub in a rotation, aiming to retain all ages. Leave berry bearing scrub cutting until after December so the resource remains available for birds and mammals. 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

7.12.12 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. Years 1-2
  - i. 80% establishment of planting
- b. Year 5



- i. 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. 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 shall have been allowed to develop.

### **Outline Monitoring frequency and methods**

- 7.12.13 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.
- 7.12.14 After the 5-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 with consultation with the steering group.
- 7.12.15 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

## 7.13 LE3.1 Amenity Tree and Shrub Planting - Orchard

### Description

- 7.13.1 Comprising either specimen/feature trees and large shrubs or small groups, amenity trees and shrubs are planted primarily for the enjoyment of people, providing aesthetic qualities, seasonal interest and shade as well as creating habitat and contributing to biodiversity. The orchard's main function is to provide an edible fruit or nut harvest. These trees should be managed accordingly.
- 7.13.2 Orchards are proposed within 4.9 Gateway to Shorne Woods Country Park management area. Orchards have been proposed to recreate historic areas of orchard planting that have been removed in the same location.
- 7.13.3 Orchard planting replicates the former land use, and by designing sufficient spacing can be planted above proposed utilities works and provide a vegetated connection between Shorne Woods Country park and the woodland planting on and adjacent to the Thong Lane green bridge over Lower Thames Crossing.
- 7.13.4 Orchard planting can provide an additional community benefit and interest, replicating the historic character and linking areas of planting.

### Outline Requirements

- a. To provide appropriate fruiting trees for community benefit and interest in the Gateway to Shorne Woods Country Park, as well as the biodiversity benefits to a range of pollinating insects, nesting birds, reptiles and small mammals.
- b. Canopies and tree cover to give visual impression of a connected wooded corridor as far as reasonably practicable. Orchard habitats would follow the priority habitat descriptions for traditional orchards<sup>5</sup>.
- c. Where established in proximity to underground and overhead utilities, to be managed to retain safety distances and heights as agreed with the statutory stakeholder.

### Outline Prescriptions

- 7.13.5 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.13.6 Table 7.13 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

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<sup>5</sup> [Traditional orchards \(UK BAP Priority Habitat description\) \(jncc.gov.uk\)](https://jncc.gov.uk/traditional-orchards)

**Table 7.13 Outline 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 Highways England	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 Highways England	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 Highways England	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 Highways England	Once yearly - Nov to Feb	Y	Y	N	N	N
General pruning. Prune dead, dying, crossing, rubbing and damaged branches and encourage new leader if necessary. For fruit trees prune to encourage production of fruit to normal good horticultural standards	Specialist contractor appointed by Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	N	Y	Y	Y	Y

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 Highways England	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 Highways England	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds	Specialist contractor appointed by Highways England	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 Highways England	Twice yearly - May and September	Y	Y	Y	Y	Y

7.13.7 Following establishment, the long-term maintenance to be as set out in Natural England Technical Information Note (TIN012) Traditional Orchard.<sup>6</sup>

### Outline Measure of Success

7.13.8 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
  - i. 80% establishment of planting
- b. Year 5
  - i. 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. Fruit/nut production
  - ii. Invasive weeds kept to less than 10% of ground cover.
  - iii. The area shall contain no more than 10% scrub cover.

<sup>6</sup> <http://publications.naturalengland.org.uk/publication/19007>

### **Outline Monitoring frequency and methods**

- 7.13.9 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.
- 7.13.10 After the 5-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 with consultation with the steering group.
- 7.13.11 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

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## 7.14 LE4.3 Native species hedge (Untrimmed)

### Overarching Aims

- 7.14.1 Native species hedges (untrimmed) provide wildlife corridors and habitat connectivity throughout the Project and integrate the Project Route into the adjacent landscape.

### Description

- 7.14.2 Native species rich hedgerows are comprised of native scrub species providing containment, significant wildlife habitat and an ecological corridor. No annual hedge trimming required; hedge left to develop naturally.
- 7.14.3 These hedgerows are proposed as an integral component of the landscape mitigation design, linking habitat areas, and providing natural boundaries to the Project.
- 7.14.4 Hedge species are to be appropriate to the location or as exist already on site.
- 7.14.5 A list of potential native species hedge planting is shown in the Appendix to the Design Principles.

### Outline Requirements

- 7.14.6 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. 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<sup>7</sup>.

7.14.7 This will be agreed between Highways England and the identified management agent.

### Outline Prescription

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

7.14.9 Table 7.14 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

**Table 7.14 Outline 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 Highways England	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 Highways England	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 again following winter. In the 2nd winter cut back previous seasons 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	Specialist contractor appointed by Highways England	Once yearly - Nov to Feb	Y	Y	Y	N	N

<sup>7</sup> [Hedgerows \(UK BAP Priority Habitat description\) \(jncc.gov.uk\)](https://jncc.gov.uk)

Action			Years 0-5				
Task	Responsibility	Season	1	2	3	4	5
trimming/pruning of hedge will be required							
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 Nov and Feb.	Specialist contractor appointed by Highways England	Once yearly - Nov to Feb	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 Highways England	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 Highways England	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 Highways England	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds	Specialist contractor appointed by Highways England	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 Highways England	Twice yearly - May and September	Y	Y	Y	Y	Y

7.14.10 Following establishment, the following management prescriptions are proposed:

- a. Trim to required height and width with a mechanical flail, every 3 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

7.14.11 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 native hedge shall form a continuous structure and shall be



- b. Form a biodiverse habitat providing shelter and food sources (nectar, berries etc)
- c. Invasive weeds and undesirable species are removed.
- d. Native ground flora shall have been allowed to develop.

### **Outline Monitoring frequency and methods**

- 7.14.12 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.
- 7.14.13 After the 5-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. 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 with consultation with the steering group.
- 7.14.14 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

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## 7.15 LE4.4 Native hedgerow with Trees

### Description

- 7.15.1 Native species rich hedgerows comprised of native scrub species providing containment, significant wildlife habitat and an ecological corridor. Hedge interspersed with standard trees which are allowed to grow on to maturity.

### Outline Requirements

- 7.15.2 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<sup>8</sup>.

### Outline Prescriptions

- 7.15.3 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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<sup>8</sup> [Hedgerows \(UK BAP Priority Habitat description\) \(jncc.gov.uk\)](https://jncc.gov.uk)

7.15.4 Table 7.15 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

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**Table 7.15 Outline 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 Highways England	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 Highways England	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 Highways England	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 again following winter. In the 2nd winter cut back previous seasons 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 Highways England	Once yearly - Nov to Feb	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 Highways England	Once yearly - Nov to Feb	Y	Y	Y	Y	Y
Any dead or damaged plants should be replaced annually with	Specialist contractor appointed by Highways England	Once yearly - Nov to Feb	N	Y	Y	Y	Y

Action			Years 0-5				
Task	Responsibility	Season	1	2	3	4	5
matching species of the same size during the next planting season after failure. To be undertaken once yearly during Nov and Feb.							
All guards should be checked and adjusted, repaired or replaced as necessary twice yearly in October and March.	Specialist contractor appointed by Highways England	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 Highways England	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 Highways England	April, August and January	Y	Y	Y	Y	Y
Selective spot treatment of herbicide as required for larger pernicious weeds	Specialist contractor appointed by Highways England	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 Highways England	Twice yearly - May and September	Y	Y	Y	Y	Y

- 7.15.5 Following establishment, the following management prescriptions are proposed:
- a. Maintain habitat integrity and removing of undesirable species.

### Outline Measure of Success

- 7.15.6 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 native hedge shall form a continuous structure and shall be fit for purpose.
  - b. Form a biodiverse habitat providing shelter and food sources (nectar, berries etc)
  - c. Invasive weeds and undesirable species are removed.
  - d. Native ground flora shall have been allowed to develop.
  - e. Intermittent individual plants shall have been allowed to reach maturity and not managed to as a hedge.

### **Outline Monitoring frequency and methods**

- 7.15.7 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.
- 7.15.8 After the 5-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. 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 with consultation with the steering group.
- 7.15.9 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

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## 7.16 LE6.1 Water Bodies

### Description

- 7.16.1 Wildlife 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; an absence of fish.

### Outline Requirements

- 7.16.2 The following outline requirements are for all water bodies.
- To integrate the water bodies into the surrounding landscape by ensuring pond shape reflects local field and vegetation patterns.
  - To plant the edge of water bodies with marginal and emergent planting.
  - Water bodies to be managed to provide biodiversity and landscape amenity value. Habitats would follow the priority habitat descriptions for ponds<sup>9</sup>.

### Outline Prescriptions

- 7.16.3 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.16.4 Table 7.16 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

**Table 7.16 Outline 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 Highways England	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 Highways England	As required	Y	Y	Y	Y	Y

<sup>9</sup> [Ponds \(UK BAP Priority Habitat description\) \(jncc.gov.uk\)](https://jncc.gov.uk)

Action			Years 0-5				
Task	Responsibility	Season	1	2	3	4	5
Annual removal of excess vegetation and invasive weeds from edges/margins (non-reeds)	Specialist contractor appointed by Highways England	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 Highways England	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 Highways England	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 Highways England	Autumn	-	Y	-	Y	-
Annual jet washing of any markers/mooring piles and other water relates structures	Specialist contractor appointed by Highways England	Early Spring	Y	Y	Y	Y	Y
Additional checks after extreme weather events	Specialist contractor appointed by Highways England	As required	Y	Y	Y	Y	Y

### Outline Measure of Success

7.16.5 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. To establish and maintain marginal/emergent planting areas.
- b. Years 1-2
  - i. Good macrophyte cover achieved. Approximately 70% coverage in wildlife ponds.
  - ii. No single species become dominant.
- c. Year 2-3



- i. Injurious weeds total no more than 20% of the area coverage.
- d. Long-term
- i. A diversity of species occurring with injurious weeds totally 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**

- 7.16.6 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.
- 7.16.7 After the 5-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. 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 with consultation with the steering group.
- 7.16.8 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

## 7.17 LE6.2 Banks and Ditches

### Description

- 7.17.1 This typology covers the creation of new ditches to offset the loss of watercourses and water vole habitat as a result of the Project. Ditches would be designed to offer water vole foraging and burrowing opportunities with banks 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).

### Outline Requirements

- 7.17.2 The following requirements are for all areas of banks and ditches.
- a. To profile ditches to provide burrow opportunities for water vole 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

- 7.17.3 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.17.4 Table 7.17 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

**Table 7.17 Outline Establishment regime**

Action			Years 0-5 and 10					
Task	Responsibility	Season	1	2	3	4	5	10
Attendance of quarterly site inspections with the Project Landscape Architect	Specialist contractor appointed by Highways England	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 Highways England	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 Highways England	Autumn/winter	-	-	-	-	Y	Y
For water vole ditches, riparian vegetation cutting in a three to five years rotation.	Specialist contractor appointed by Highways England	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 Highways England	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 Highways England	As required	Y	Y	Y	Y	Y	Y

### Outline Measure of Success

7.17.5 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. 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 area shall contain no more than 10% scrub cover.
- d. Invasive/non-native weeds kept to less than 10% of ground cover.
- e. 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**

- 7.17.6 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.
- 7.17.7 After the 5-year establishment period, monitoring visits every three years would be undertaken 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 with consultation with the steering group.
- 7.17.8 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

## 7.18 LE6.4 Marsh and Wet Grassland - Fen

### Description

- 7.18.1 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.
- 7.18.2 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.

### Outline Requirements

- a. To manage the existing Orsett Fen area to recreate the wetland character of the former fenland.
- 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 the 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

- 7.18.3 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.18.4 Table 7.18 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

**Table 7.18 Outline 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 Highways England	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 Highways England	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 during Nov and Feb.	Specialist contractor appointed by Highways England	Once yearly - Nov to Feb	N	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 Highways England	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 Highways England	Summer	Y	Y	Y	Y	Y
Cutting back of vegetation on a rotational basis once yearly to prevent	Specialist contractor appointed by Highways England	Once yearly - Early Autumn	N	Y	Y	Y	Y

Action			Years 0-5				
Task	Responsibility	Season	1	2	3	4	5
scrub build up and maintain open fen typology							

### Outline Measure of Success

- 7.18.5 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:
- The sward shall cover at least 80% of the area to be managed where necessary to ensure this typology fulfils the environmental function required.
  - The area shall contain no more than 10% scrub cover.
  - Wet grassland to support 12 or more species plants capable of thriving in wet conditions.
  - Target species numbers to be met by Year 3

### Outline Monitoring frequency and methods

- 7.18.6 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.
- 7.18.7 After the 5-year establishment period, monitoring visits every five years would be undertaken 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 with consultation with the steering group.
- 7.18.8 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

## 7.19 LE6.4 Marsh and Wet Grassland

### Description

- 7.19.1 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.

### 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

- 7.19.2 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.19.3 Table 7.19 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

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**Table 7.19 Outline 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 Highways England	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 Highways England	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 Highways England	Late Autumn	N	Y	Y	Y	Y
Areas within 4m of ditches to be left uncut for 5 years (potentially cut every 3 years if required to avoid ditches)	Specialist contractor appointed by Highways England	Late Autumn	N	N	Y	N	Y

Action			Years 0-5				
Task	Responsibility	Season	1	2	3	4	5
becoming blocked with vegetation). This is in line with typology 7.17 above.							
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 Highways England	As required	Y	Y	Y	Y	Y
In areas where seed has not taken, re-prepare ground and re-seed in autumn before ground becomes saturated	Specialist contractor appointed by Highways England	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 Highways England	As required	Y	Y	Y	Y	Y

### Outline Measure of Success

- 7.19.4 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:
- The sward shall cover at least 80% of the area to be managed where necessary to ensure this typology fulfils the environmental function required.
  - The area shall contain no more than 10% scrub cover.
  - Wet grassland to support at least 12 or more plant species per m<sup>2</sup>, managed to prevent natural succession to scrub and woodland and retain the open grassland character.
  - Target species numbers to be met by Year 3.

### **Outline Monitoring frequency and methods**

- 7.19.5 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.
- 7.19.6 After the 5-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 with consultation with the steering group.
- 7.19.7 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

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## 7.20 LE7.2 Green Roofs

### Description

- 7.20.1 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.
- 7.20.2 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.
- 7.20.3 The green roof at the South Portal shall reflect the surrounding chalk grassland character.
- 7.20.4 The green roof at the North Portal shall reflect the character of the surrounding marshland character.

### Outline Requirements

- 7.20.5 The following outline requirements are for all green roofs.
- To provide a visually interesting, planted roof that is of low maintenance.
  - Species mix shall be reflective of the surrounding landscape and comprise of local species which provide food sources for both larval and adult stage invertebrates.
  - Green roof shall fulfil its purpose to provide sustainable drainage and insulation.
  - Green roof shall be designed and managed so that it flows seamlessly into the adjacent grassland.

### Outline Prescriptions

- 7.20.6 The exact details of the management activities to be undertaken will be developed between all relevant parties during the development of the LEMP
- 7.20.7 Table 7.20 below describes the programme of work for establishment and initial maintenance (first five years), and then goes on to explain the outline long-term management.

**Table 7.20 Outline 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 Safety procedures are	Specialist contractor appointed by Highways England	Quarterly	Y	Y	Y	Y	Y

Action			Years 0-5				
Task	Responsibility	Season	1	2	3	4	5
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 Highways England	As required	Y	Y	Y	Y	Y
All litter/foreign debris should be removed from roof as required	Specialist contractor appointed by Highways England	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 Nov and Feb. Advice should be sought from green roof system installer	Specialist contractor appointed by Highways England	Once yearly - Nov to Feb	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 Highways England	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 Highways England	As required	Y	Y	Y	Y	Y
Annual removal of excess vegetation and invasive weeds (including any gravel margins)	Specialist contractor appointed by Highways England	Summer	Y	Y	Y	Y	Y

### **Outline Measure of Success**

- 7.20.8 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 prevent scour and washout at times of water inundation.
  - b. Maintain species diversity and structure.
  - c. Target species numbers to be met by Year 3.
  - d. Creation of a diverse floral assemblage which supports a broad range of invertebrate species.
  - e. Invasive weeds kept to less than 10% of ground cover.

### **Outline Monitoring frequency and methods**

- 7.20.9 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.
- 7.20.10 After the 5-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 with consultation with the steering group.
- 7.20.11 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

## 7.21 E.2 Ancient Woodland Compensation

### Overarching Aims

- 7.21.1 This typology builds on that for woodland (LE2.1 in Section 7.5), aiming to develop broad-leaved native species woodland which develops into the NVC communities of adjacent woodland blocks (predominantly W10 and W8).
- 7.21.2 Where practicable, to utilities as much of the existing soil resource as possible from existing ancient woodland areas directly affected by the Project. This would aid habitat development in terms of its speed and diversity.

### Description of salvaging ancient woodland soil and material

- 7.21.3 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.
- 7.21.4 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 Anderson and Groutage (2003). Once this movement of materials was complete, woodland planting in line with the proposals detailed in Section 7.5 would be undertaken.

### Outline Requirements

- 7.21.5 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 Chapters 4, 5 and 6.

### Outline Prescriptions

- 7.21.6 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. A steering group would provide guidance on the detailed specification of ancient woodland soil and material salvage, including receptor site preparation.
- 7.21.7 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.

- 7.21.8 Approach to ancient woodland soil translocation:
- a. Carry out pre-construction botanical surveys to produce a baseline for the donor areas and receptor site.
  - b. Carry out soil sampling tests and analysis the data for the detailed areas within receptor area to ensure best point to point matching with the donor sites.
  - c. Produce a detailed specification for ancient woodland soil translocation in consultation with the steering group – to include stringent soil protection measures and new tree planting plans. The specification and detailed method statements will be submitted to the steering group for comment prior to being finalised for use.
  - d. Prepare donor areas for soil removal (e.g. tree coppicing/felling/stump removal, debris removal) ensuring soil conditions are kept as favourable as possible (i.e. limiting disturbance and compaction from plant).
  - e. Prepare receptor area: install tree protection around any existing trees, remove any debris, strip existing topsoil and remove off site and limit compaction of exposed subsoil.
  - f. Translocate soil from donor areas to the receptor site (wherever possible native coppice stools will also be translocated).
  - g. Tree planting within receptor area: trees planted will be native species recorded in the donor areas and locally sourced.

### **Outline Measure of Success**

- 7.21.9 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. 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 shall have been allowed to develop through provision of a variable light environment including shaded areas beneath a closed canopy at year 25.

### **Outline Monitoring frequency and methods**

- 7.21.10 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.



- 7.21.11 After the 5-year establishment period, long-term 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 every five years with the detailed monitoring approach being refined over this period as part of the steering group discussions.
- 7.21.12 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

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## 7.22 E.2 Open Mosaic Habitat

### Overarching requirements

- 7.22.1 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

- 7.22.2 Open mosaic habitat is proposed as essential component of the landscape mitigation design and will provide biodiversity and nature conservation value.
- 7.22.3 Open mosaic habitat is a dynamic habitat the value of which is generated through regular disturbance, avoiding habitat succession, and retaining structural diversity.
- 7.22.4 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.
- 7.22.5 Open mosaic habitat can include varied microtopography to incorporate south-facing banks which can be created using inert material such as pulverised fuel ash (PFA)/sands/gravels.
- 7.22.6 The proposed make-up of the open mosaic habitat is:
- Scrub: no greater than 10% coverage
  - Bare ground: approx. 10% coverage (small patches spread across site rather than single areas)
  - Rough grassland: approx. 30% coverage
  - Low nutrient, free draining grassland: 50% coverage (PFA to provide a minimum 10% overall area substrate and left to regenerate naturally)
  - Wildlife ponds and hibernacula and refuges to be created in line with good practice guidance (English Nature, 2001).

### Outline Requirements

- 7.22.7 The following outline requirements are for all areas of open mosaic habitat.
- To provide replacement habitat for reptiles, amphibians, invertebrates, and other fauna.
  - To be a receptor site for translocated species including amphibians and reptiles.
  - 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<sup>10</sup>.

7.22.8 This will be agreed between Highways England and the identified management agent.

### **Outline Prescriptions**

7.22.9 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.

- 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.

### **Measure of Success**

7.22.10 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. Establishment of open mosaic habitat in accordance with the structural composition specified within the Design Principles.
- b. Establishment of floral species composition in line with planting palette set out within Design Principles.

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<sup>10</sup> [Open mosaic habitats on previously developed land \(UK BAP Priority Habitat description\) \(jncc.gov.uk\)](https://jncc.gov.uk)

- c. Colonisation by diverse invertebrate species assemblage typical of open mosaic habitat along the Greater Thames Estuary National Character Area
- d. Pond creation in line with design approach in Great Crested Newt Mitigation Guidelines (English Nature, 2001).

### **Outline Monitoring frequency and methods**

- 7.22.11 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.
- 7.22.12 After the 5-year establishment period, long-term 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, as well as ground truth habitat and botanical surveys to assess species diversity within grassland swards. These would continue every five years with the detailed monitoring approach being refined over this period as part of the steering group discussions.
- 7.22.13 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

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## 7.23 E.2 Acid Grassland Soil Salvage

### Description

- 7.23.1 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 5.3). Acid grassland occurs on nutrient poor and free-draining soils of acidic pH. Characteristic floral species can support a diverse assemblage of invertebrate species.

### Outline Requirements

- 7.23.2 The following outline requirements are for all areas of translocated acidic grassland.
- To maintain and promote structural and botanical diversity, and prevent the grassland scrubbing over.
- 7.23.3 This will be agreed between Highways England and the identified management agent.

### Outline Prescriptions

- 7.23.4 The exact details of the work activities will be developed between all parties during the development of the LEMP. A steering 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).
- 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.
  - The sward would cover at least 90% of the receptor site which no more than 10% cover of competitive or problem species.
  - To create grassland habitats the follow the priority habitat description for lowland dry acid grassland<sup>11</sup>.

### Outline Measure of Success

- 7.23.5 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:
- Unlike the species rich grassland typologies, acid grassland can, in contrast, be less species diverse (less than five species per 4m<sup>2</sup>), although can exceed 25 species per 4m<sup>2</sup>. 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*).
  - Scrub encroachment into the grassland habitat would be limited to no greater than 10% of the total area.

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<sup>11</sup> [Lowland dry acid grassland \(UK BAP Priority Habitat description\) \(jncc.gov.uk\)](https://jncc.gov.uk/priority-habitats/lowland-dry-acid-grassland)

### **Outline Monitoring frequency and methods**

- 7.23.6 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.
- 7.23.7 After the 5-year establishment period, long-term 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). These would continue every five years with the detailed monitoring approach being refined over this period as part of the steering group discussions.
- 7.23.8 Highways England's appointed monitoring party will carry out the monitoring visits and feed back to the steering group as part of the monitoring report.

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## Glossary

Term	Explanation
<b>Alignment</b>	The alignment is the horizontal and vertical route of a road, defined as a series of horizontal tangents and curves or vertical crest and sag curves, and the gradients connecting them.
<b>AONB</b>	Area of Outstanding Natural Beauty: Statutory designation intended to conserve and enhance the ecology, natural heritage and landscape value of an area of countryside.
<b>DCO</b>	Development Consent Order
<b>DMRB</b>	Design Manual for Roads and Bridges: 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 (Highways England, Transport Scotland, The Welsh Government or the Department for Regional Development (Northern Ireland)) is highway authority. The DMRB has been developed as a series of documents published by the Overseeing Organisations of England, Scotland, Wales and Northern Ireland. For the Lower Thames Crossing the Overseeing Organisation is Highways England.
<b>Green bridge</b>	Heavy Weight Green Bridge: incorporates tree planting and be wooded in character. Light Weight Green Bridge: includes hedgerows, scrub and grassland as minimum.
<b>Ha</b>	Hectares
<b>Landscape element</b>	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).
<b>Mardyke</b>	A small river, mainly in Thurrock, that flows into the River Thames at Purfleet, close to the QEII Bridge.
<b>NPS</b>	National Policy Statement (see NPSNN)
<b>NPSNN</b>	National Policy Statement for National Networks: 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.
<b>OMH</b>	Open mosaic habitat
<b>REAC</b>	Register of Environmental Actions and Commitments



Term	Explanation
<b>Prescription</b>	An outline list of tasks and activities required to manage the proposed typology.
<b>The Project</b>	The Lower Thames Crossing project is a proposed tunnel, associated structures and connecting roads, which crosses the River Thames linking Essex, Thurrock and Kent.
<b>PRoW</b>	Public Right of Way: 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 consist of footpaths, bridleways and open and restricted byways.
<b>SEB(s)</b>	Statutory Environmental Body(ies): 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.
<b>Setting</b>	This is defined in the National Planning Policy Framework as ‘The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive or negative contribution to the significance of the asset, may affect the ability to appreciate that significance or may be neutral.’
<b>WCH</b>	Walking, cycling and horse riding

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